

Space Propulsion

P. O. Box 109600
West Palm Beach, FL 33410-9600



Pratt & Whitney
A United Technologies Company

Certified Mail 7000 0520 0016 6762 6839

January 31, 2003

Florida Department of Environmental Protection
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, FL 32399-2400

Attention: Mr. Alvaro Linero

RE: PRATT & WHITNEY-LOX-KEROSENE ROCKET ENGINE
DEP FILE NO. 0990021-004-AC (PSD-FL-294)
Proposed Oxygen Injection Study Plan

Dear Mr. Linero,

Please find attached a proposed plan for an Oxygen Injection Study for the LOX/Kerosene Rocket Engine Test Stand.

This plan is submitted for FDEP review and approval in compliance with Section III, Condition A.2 of the revised construction permit.

The purpose of this plan is for "evaluating the technical feasibility and cost effectiveness of direct O2 injection for reducing CO emissions in the exhausts of rocket engines tested at permittee's facility." It is not a plan or proposal to implement any control devices for Pratt & Whitney's engine testing.

Background:

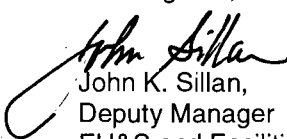
Pratt & Whitney requested a construction permit extension because changes in business and economic conditions impacted the feasibility of this new test stand and put its future in question. FDEP issued an extension in case these conditions improve. At this time, Pratt & Whitney is still uncertain whether this new rocket test stand will be built and is continuing to evaluate options.

In the interim, submittal of this oxygen injection study plan will maintain the construction permit in effect in the event that the new rocket test stand will be built eventually.

Should Pratt & Whitney decide that the new rocket test stand will not be constructed, Pratt & Whitney will notify FDEP to request the cancellation of this construction permit. Any work on the oxygen injection study would also be discontinued at that time.

Please contact Dean Gee @ 561-796-2108 if you have any questions.

Best regards,


John K. Sillan,
Deputy Manager
EH&S and Facilities

RECEIVED

FEB 05 2003

BUREAU OF AIR REGULATION

Enclosure: Proposed Plan for Oxygen Injection Study

Cc:

Palm Beach County Health Dept.
Air Pollution Control Section
Attn: Selva Selvendran
POBox 29 (901 Evernia St.)
West Palm Beach, FL 33402-0029

File: B.4.3.2.2

DRAFT

Proposed Plan for Oxygen Injection Study to Control CO Emissions From LOX/Kerosene RD180 Rocket Tests Pratt & Whitney – West Palm Beach Title V Permit # 099-0021-002 -AV

Background:

This proposed plan is submitted for FDEP review and approval in compliance with Section III, Condition A.2 of revised construction permit issued for the LOX/Kerosene Rocket Engine Stand. FDEP requires that this oxygen injection study must be completed within 1 year of FDEP's approval of this plan.

Pratt & Whitney has not begun construction of the new stand nor determined if it will be built yet. In the interim, submittal of this oxygen injection study plan will maintain the construction permit in effect in the event that the new rocket test stand will be built eventually.

Should Pratt & Whitney determine that the new rocket test stand is not needed and will not be constructed, Pratt & Whitney will notify FDEP and request the cancellation of this construction permit. This study would also be discontinued.

Proposed Plan:

This Oxygen Injection Study plan is required by the construction permit issued by FDEP for a LOX/Kerosene test stand. The purpose of this plan is for "evaluating the technical feasibility and cost effectiveness of direct O₂ injection for reducing CO emissions in the exhausts of rocket engines tested at permittee's facility." It is not a plan or proposal to implement any control devices for Pratt & Whitney's engine testing. It is a "white paper" for discussion purposes and not a plan for implementation.

The main features of the Oxygen Injection Study plan are described below:

1. Review the current status of Best Available Control Technology for reducing CO emissions as applied to large combustion sources of similar operating duration and thrust (i.e., other LOX/kerosene fueled rocket testing applications).
2. Evaluate the combustion dynamics, combustion efficiency, and the stoichiometry of RD180 rocket engine CO emissions formation and potential control during testing.
3. Determine the mass of oxygen required to convert remaining CO to CO₂.

DRAFT

4. Determine potential methods of adding or injecting additional oxygen to achieve more complete combustion for CO as an "end of pipe" control method.
5. Develop conceptual design of most feasible method(s) of adding oxygen.
6. Develop order of magnitude costs for the oxygen injection method(s).
7. Evaluate the costs, benefits, safety, and environmental aspects to determine the technical and economic feasibility for oxygen injection to control CO emissions from RD180 testing.
8. It is proposed that one draft of the study will be submitted to FDEP for comments before submittal of the final report.

SENDER: COMPLETE THIS SECTION	COMPLETE THIS SECTION ON DELIVERY	
<ul style="list-style-type: none"> Complete items 1, 2, and 3. Also complete item 4 if Restricted Delivery is desired. Print your name and address on the reverse so that we can return the card to you. Attach this card to the back of the mailpiece, or on the front if space permits. 	A. Received by (Please Print Clearly)	B. Date of Delivery
	<p><i>[Signature]</i> 8-2-03</p>	
1. Article Addressed to: Mr. John K. Sillian Manager, Facilities Management United Technologies Corp. Pratt & Whitney PO Box 109600 W. Palm Beach, FL 33410-9600	C. Signature X <i>[Signature]</i> <input type="checkbox"/> Agent <input checked="" type="checkbox"/> Addressee	
	D. Is delivery address different from item 1? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No If YES, enter delivery address below:	
	3. Service Type <input checked="" type="checkbox"/> Certified Mail <input type="checkbox"/> Express Mail <input type="checkbox"/> Registered <input type="checkbox"/> Return Receipt for Merchandise <input type="checkbox"/> Insured Mail <input type="checkbox"/> C.O.D.	
	4. Restricted Delivery? (Extra Fee) <input type="checkbox"/> Yes	
2. Article Number (Copy from service label) 7001 0320 0001 3692 8192		

PS Form 3811, July 1999 Domestic Return Receipt 102595-00-M-0952

PSD 294
2/12/04

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PS Form 3800, January 2001 See Reverse for Instructions	

7001 0320 0001 3692 8192



Jeb Bush
Governor

Department of Environmental Protection

Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

David B. Struhs
Secretary

July 31, 2002

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Mr. John K. Sillian, Manager
Facilities Management
United Technologies Corp. – Pratt & Whitney
Post Office Box 109600
West Palm Beach, Florida 33410-9600

Re: DEP File No. 0990021-004-AC (PSD-FL-294)
LOX/Kerosene Rocket Engine Stand
Extension Request

Dear Mr. Sillian:

Pursuant to your request for extension of the referenced air construction permit, the Department hereby extends and modifies the permit as follows:

FIRST PAGE OF PERMIT

Expires: ~~June 30, 2003~~ **September 30, 2004**

SECTION II – CONDITION 6

Expiration: This air construction permit shall expire on ~~June 30, 2003~~ **September 30, 2004**. The permittee, for good cause, may request that this construction/PSD permit be extended. Such a request shall be submitted to the Department's Bureau of Air Regulation prior to 60 days before the expiration of the permit. [Rules 62-210.300(1), 62-4.070(4), 62-4.080, and 62-4.210, F.A.C.]

PSD Expiration: Approval to construct shall become invalid if construction is not commenced within 18 months after receipt of ~~such approval~~ **this permit extension**, or if construction is discontinued for a period of 18 months or more, or if construction is not completed within a reasonable time. The Department may extend the 18-month period upon a satisfactory showing that an extension is justified. [Rules 62-4.070(4), 62-4.210(2) & (3), and 62-210.300(1)(a), F.A.C.]

SECTION III – CONDITION A.2

Oxygen Injection Study: Within 180 days of the issuance of this permit **extension**, the permittee shall develop a plan for an Oxygen Injection Study for review and approval by the Department. The permittee shall complete and submit to the Department an engineering and cost study evaluating the technical feasibility and cost effectiveness of direct O₂ injection for reducing CO emissions in the exhausts of rocket engines tested at the permittee's facility. The study shall be completed within one year of approval by the Department of the plan for the oxygen injection study. [Rule 62-4.070(3) and BACT]

"More Protection, Less Process"

Printed on recycled paper.

Please note that the Department did not adjust the determination of Best Available Control Technology (BACT). Any further requests for extensions should be accompanied by a demonstration that the BACT is adequate or a revised BACT proposal as well as a detailed revised construction and startup schedule.

A copy of this letter shall be filed with the referenced permit and shall become part of the permit. This permitting decision is issued pursuant to Chapter 403, Florida Statutes.

A person whose substantial interests are affected by the proposed permitting decision may petition for an administrative proceeding (hearing) under sections 120.569 and 120.57 of the Florida Statutes. The petition must contain the information set forth below and must be filed (received) in the Office of General Counsel of the Department at 3900 Commonwealth Boulevard, Mail Station #35, Tallahassee, Florida, 32399-3000. Petitions filed by the permit applicant or any of the parties listed below must be filed within fourteen days of receipt of this notice of intent. Petitions filed by any persons other than those entitled to written notice under section 120.60(3) of the Florida Statutes must be filed within fourteen days of publication of the public notice or within fourteen days of receipt of this notice of intent, whichever occurs first. Under section 120.60(3), however, any person who asked the Department for notice of agency action may file a petition within fourteen days of receipt of that notice, regardless of the date of publication. A petitioner shall mail a copy of the petition to the applicant at the address indicated above at the time of filing. The failure of any person to file a petition within the appropriate time period shall constitute a waiver of that person's right to request an administrative determination (hearing) under sections 120.569 and 120.57 F.S., or to intervene in this proceeding and participate as a party to it. Any subsequent intervention will be only at the approval of the presiding officer upon the filing of a motion in compliance with Rule 28-106.205 of the Florida Administrative Code.

A petition that disputes the material facts on which the Department's action is based must contain the following information: (a) The name and address of each agency affected and each agency's file or identification number, if known; (b) The name, address, and telephone number of the petitioner, the name, address, and telephone number of the petitioner's representative, if any, which shall be the address for service purposes during the course of the proceeding; and an explanation of how the petitioner's substantial interests will be affected by the agency determination; (c) A statement of how and when petitioner received notice of the agency action or proposed action; (d) A statement of all disputed issues of material fact. If there are none, the petition must so indicate; (e) A concise statement of the ultimate facts alleged, including the specific facts the petitioner contends warrant reversal or modification of the agency's proposed action; (f) A statement of the specific rules or statutes the petitioner contends require reversal or modification of the agency's proposed action; and (g) A statement of the relief sought by the petitioner, stating precisely the action petitioner wishes the agency to take with respect to the agency's proposed action.

A petition that does not dispute the material facts upon which the Department's action is based shall state that no such facts are in dispute and otherwise shall contain the same information as set forth above, as required by Rule 28-106.301.

Because the administrative hearing process is designed to formulate final agency action, the filing of a petition means that the Department's final action may be different from the position taken by it in this notice. Persons whose substantial interests will be affected by any such final decision of the Department on the application have the right to petition to become a party to the proceeding, in accordance with the requirements set forth above. Mediation is not available in this proceeding.

In addition to the above, a person subject to regulation has a right to apply for a variance from or waiver of the requirements of particular rules, on certain conditions, under Section 120.542 F.S. The relief provided by this state statute applies only to state rules, not statutes, and not to any federal regulatory requirements. Applying for a variance or waiver does not substitute or extend the time for filing a petition for an administrative hearing or exercising any other right that a person may have in relation to the action proposed in this notice of intent.

The application for a variance or waiver is made by filing a petition with the Office of General Counsel of the Department, 3900 Commonwealth Boulevard, Mail Station #35, Tallahassee, Florida 32399-3000. The petition must specify the following information: (a) The name, address, and telephone number of the petitioner; (b) The name, address, and telephone number of the attorney or qualified representative of the petitioner, if any; (c) Each rule or portion of a rule from which a variance or waiver is requested; (d) The citation to the statute underlying (implemented by) the rule identified in (c) above; (e) The type of action requested; (f) The specific facts that would justify a variance or waiver for the petitioner; (g) The reason why the variance or waiver would serve the purposes of the underlying statute (implemented by the rule); and (h) A statement whether the variance or waiver is permanent or temporary and, if temporary, a statement of the dates showing the duration of the variance or waiver requested.

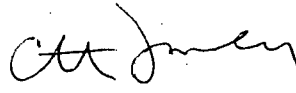
The Department will grant a variance or waiver when the petition demonstrates both that the application of the rule would create a substantial hardship or violate principles of fairness, as each of those terms is defined in Section 120.542(2) F.S., and that the purpose of the underlying statute will be or has been achieved by other means by the petitioner.

Persons subject to regulation pursuant to any federally delegated or approved air program should be aware that Florida is specifically not authorized to issue variances or waivers from any requirements of any such federally delegated or approved program. The requirements of the program remain fully enforceable by the Administrator of the EPA and by any person under the Clean Air Act unless and until the Administrator separately approves any variance or waiver in accordance with the procedures of the federal program.

This permitting decision is final and effective on the date filed with the clerk of the Department unless a petition is filed in accordance with the above paragraphs or unless a request for extension of time in which to file a petition is filed within the time specified for filing a petition pursuant to Rule 62-110.106, F.A.C., and the petition conforms to the content requirements of Rules 28-106.201 and 28-106.301, F.A.C. Upon timely filing of a petition or a request for extension of time, this order will not be effective until further order of the Department.

Any party to this permitting decision (order) has the right to seek judicial review of it under section 120.68 of the Florida Statutes, by filing a notice of appeal under Rule 9.110 of the Florida Rules of Appellate Procedure with the clerk of the Department of Environmental Protection in the Office of General Counsel, Mail Station #35, 3900 Commonwealth Boulevard, Tallahassee, Florida, 32399-3000, and by filing a copy of the notice of appeal accompanied by the applicable filing fees with the appropriate District Court of Appeal. The notice must be filed within thirty days after this order is filed with the clerk of the Department.

Executed in Tallahassee, Florida


for Howard L. Rhodes, Director
Division of Air Resources
Management

CERTIFICATE OF SERVICE

The undersigned duly designated deputy agency clerk hereby certifies that this PERMIT MODIFICATION was sent by certified mail (*) and copies were mailed by U.S. Mail before the close of business on 7/31/02 to the person(s) listed:

cc: Jim Stormer, Palm Beach County PHU
Tom Tittle, DEP SED
Benny Susi, P. E. Golder Associates

Clerk Stamp

FILING AND ACKNOWLEDGMENT FILED,
on this date, pursuant to §120.52, Florida Statutes,
with the designated Department Clerk, receipt of
which is hereby acknowledged.

Victoria Gibson July 31, 2002
(Clerk) (Date)

SENDER: COMPLETE THIS SECTION

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- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

Mr. John K. Sillian
 Manager, Facilities Management
 United Technologies Corp.
 Pratt & Whitney
 PO Box 109600
 W. Palm Beach, FL 33410-9600

COMPLETE THIS SECTION ON DELIVERY

A. Received by (Please Print Clearly) B. Date of Delivery

John Sillian 8-2-00

C. Signature

John Sillian Agent Addressee

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 Street, Apt. No.,
 or PO Box 109600
 City, State, ZIP+4
 W. Palm Bch., FL 33410-9600

PS Form 3800, January 2001

See Reverse for Instructions

Space Propulsion

P. O. Box 109600
West Palm Beach, FL 33410-9600



Pratt & Whitney

A United Technologies Company

Certified Mail 7000-0600-0023-1145-3189

February 25, 2002

Florida Department of Environmental Protection
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, FL 32399-2400

Attention: Mr. A. Linero, P.E.

RE: United Technologies Corporation - Pratt & Whitney
DEP File No. 0990021-004-AC (PSD-FL-294)
LOX / Kerosene Rocket Engine Test Stand
Extension Request

Dear Mr. Linero:

Pratt & Whitney hereby requests that the Department extends the above-referenced construction permit. Pratt & Whitney has recently conducted an evaluation of the RD-180 program and has arrived at the conclusion that the construction of this program will likely be delayed to the year 2006. The above-referenced construction permit will expire on March 31, 2003 and Pratt & Whitney is requesting the Department to extend the expiration date to March 31, 2006. Additionally, Pratt & Whitney is requesting that the oxygen injection study be delayed to one year prior to the proposed expiration date (i.e., March 31, 2005). Pratt & Whitney assures the Department that all applicable conditions will be met.

Please call if you have any questions.

Sincerely,

John K. Sillan, Deputy Manager
EH&S and Facilities

cc: D. Gee-Pratt & Whitney
D. Alberghini-Pratt & Whitney
B. Susi - Golder Associates
File: B.4.3.2.2 - LOX / Kerosene Rocket Test Stand
B.4.4.3 - Correspondence

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FEB 27 2002

BUREAU OF AIR REGULATION

Space Propulsion

P. O. Box 109600
West Palm Beach, FL 33410-9600



Pratt & Whitney
A United Technologies Company

Certified Mail 7000-0600-0023-1145-3189

February 25, 2002

Florida Department of Environmental Protection
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, FL 32399-2400

Attention: Mr. A. Linero, P.E.

RE: United Technologies Corporation - Pratt & Whitney
DEP File No. 0990021-004-AC (PSD-FL-294)
LOX / Kerosene Rocket Engine Test Stand
Extension Request

RECEIVED
FEB 27 2002
BUREAU OF ENVIRONMENTAL PROTECTION

Dear: Mr. Linero:

Pratt & Whitney hereby requests that the Department extends the above-referenced construction permit. Pratt & Whitney has recently conducted an evaluation of the RD-180 program and has arrived at the conclusion that the construction of this program will likely be delayed to the year 2006. The above-referenced construction permit will expire on March 31, 2003 and Pratt & Whitney is requesting the Department to extend the expiration date to March 31, 2006. Additionally, Pratt & Whitney is requesting that the oxygen injection study be delayed to one year prior to the proposed expiration date (i.e., March 31, 2005). Pratt & Whitney assures the Department that all applicable conditions will be met.

Please call if you have any questions.

Sincerely,

John K. Sillan, Deputy Manager
EH&S and Facilities

cc: D. Gee-Pratt & Whitney
D. Alberghini-Pratt & Whitney
B. Susi - Golder Associates
File: B.4.3.2.2 - LOX / Kerosene Rocket Test Stand
B.4.4.3 - Correspondence

SENDER: COMPLETE THIS SECTION	COMPLETE THIS SECTION ON DELIVERY	
<ul style="list-style-type: none"> Complete items 1, 2, and 3. Also complete item 4 if Restricted Delivery is desired. Print your name and address on the reverse so that we can return the card to you. Attach this card to the back of the mailpiece, or on the front if space permits. 	A. Received by (Please Print Clearly)	B. Date of Delivery 9-10-01
1. Article Addressed to: Mr. John K. Silan, Manager Facilities Management United Technologies Corp. - Pratt & Whitney P. O. Box 109600 W. Palm Beach, FL 33410-9600	C. Signature <i>[Signature]</i>	<input type="checkbox"/> Agent <input type="checkbox"/> Addressee
	D. Is delivery address different from item 1? If YES, enter delivery address below:	<input type="checkbox"/> Yes <input type="checkbox"/> No
2. Article Number (Copy from service label) 7000 0600 0026 4129 8085	3. Service Type <input checked="" type="checkbox"/> Certified Mail <input type="checkbox"/> Express Mail <input type="checkbox"/> Registered <input type="checkbox"/> Return Receipt for Merchandise <input type="checkbox"/> Insured Mail <input type="checkbox"/> C.O.D.	
PS Form 3811, July 1999	Domestic Return Receipt	102595-99-M-1789

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7000 0600 0026 4129 8085		<table border="1"> <tr> <td>Postage</td> <td>\$</td> <td rowspan="4" style="text-align: center; vertical-align: middle;">Postmark Here</td> </tr> <tr> <td>Certified Fee</td> <td></td> </tr> <tr> <td>Return Receipt Fee (Endorsement Required)</td> <td></td> </tr> <tr> <td>Restricted Delivery Fee (Endorsement Required)</td> <td></td> </tr> <tr> <td>Total Postage & Fees</td> <td>\$</td> <td></td> </tr> </table>	Postage	\$	Postmark Here	Certified Fee		Return Receipt Fee (Endorsement Required)		Restricted Delivery Fee (Endorsement Required)		Total Postage & Fees	\$	
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Recipient's Name (Please Print Clearly) (to be completed by mailer) John K. Silan Street, Apt. No., or PO Box No. P. O. Box 109600 City, State, ZIP+4 W. Palm Beach, FL 33410-9600														
PS Form 3800, February 2000 See Reverse for Instructions														

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
NOTICE OF FINAL PERMIT

In the Matter of an
Application for Permit by:

Mr. John K. Sillan, Manager
Facilities Management
United Technologies Corp. – Pratt & Whitney
Post Office Box 109600
West Palm Beach, Florida 33410-9600

DEP File No. 0990021-004-AC
Permit No. PSD-FL-294
LOX/Kerosene Rocket Engine Test Stand
Palm Beach County

Enclosed is the Final Permit Number PSD-FL-294 to construct a liquid oxygen and kerosene-fueled rocket engine test stand at the existing United Technologies – Pratt and Whitney facility near Jupiter in Palm Beach County County. This permit is issued pursuant to Chapter 403, Florida Statutes.

Any party to this order (permit) has the right to seek judicial review of the permit pursuant to Section 120.68, F.S., by the filing of a Notice of Appeal pursuant to Rule 9.110, Florida Rules of Appellate Procedure, with the Clerk of the Department in the Legal Office; and by filing a copy of the Notice of Appeal accompanied by the applicable filing fees with the appropriate District Court of Appeal. The Notice of Appeal must be filed within 30 (thirty) days from the date this Notice is filed with the Clerk of the Department.

Executed in Tallahassee, Florida.



C.H. Fancy, P.E., Chief
Bureau of Air Regulation

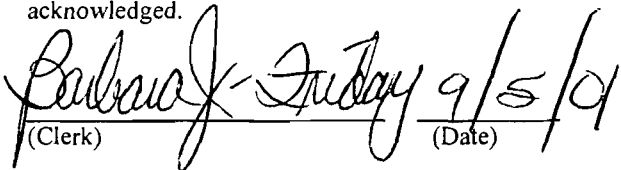
CERTIFICATE OF SERVICE

The undersigned duly designated deputy agency clerk hereby certifies that this NOTICE OF FINAL PERMIT (including the FINAL permit) was sent by certified mail* and copies were mailed by U.S. Mail before the close of business on 9/5/01 to the person(s) listed:

John K. Sillan, UTC-P&W*
Benny Susi, P.E. Golder Associates
Gregg Worley, EPA
John Bunyak, NPS
Isidore Goldman, DEP SED
Jim Stormer, Palm Beach County PHU ✓

Clerk Stamp

FILING AND ACKNOWLEDGMENT FILED, on this date, pursuant to §120.52, Florida Statutes, with the designated Department Clerk, receipt of which is hereby acknowledged.


(Clerk) Friday 9/5/01 (Date)



Department of Environmental Protection

Jeb Bush
Governor

Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

David B. Struhs
Secretary

PERMITTEE

United Technologies Corp.-Pratt & Whitney
P.O. Box 109600
West Palm Beach, FL 33410-9600

Permit No.	0990021-004-AC PSD-FL-294
Project	LOX/Kerosene Rocket Engine Test Stand
Expires:	June 30, 2003

AUTHORIZED REPRESENTATIVE:

Mr. John K. Sillan, Manager Facilities Management

PROJECT AND LOCATION

This permit authorizes the permittee to construct a LOX/Kerosene Rocket Engine Test Stand at its existing facility located on 17900 Beeline Highway (SR 710) in Palm Beach County. The permittee is limited to firing no more than 318,000 gallons of fuel per year in the test stand and is required to establish an ambient air quality monitoring program. The SIC codes for this facility are 3724 and 3764.

The UTM coordinates of the site are Zone 17; 567.3 km E; 2974.4 km N. The Everglades National Park is approximately 120 km (74.9 miles) from the site.

STATEMENT OF BASIS

This construction/PSD permit is issued under the provisions of Chapter 403 of the Florida Statutes (F.S.), and the Florida Administrative Code (F.A.C.) Chapters 62-4, 62-204, 62-210, 62-212, 62-296, and 62-297. The above named permittee is authorized to construct the emissions units in accordance with the conditions of this permit and as described in the application, approved drawings, plans, and other documents on file with the Department of Environmental Protection (Department).

APPENDICES

The attached appendices are a part of this permit:

Appendix BD	BACT Determination
Appendix GC	General Permit Conditions
Appendix NSPS-Kb	40 CFR 60 Subpart Kb - Standards Of Performance For Volatile Organic Liquid Storage Vessels

Howard L. Rhodes, Director
Division of Air Resources
Management

AIR CONSTRUCTION PERMIT
SECTION I. FACILITY INFORMATION

FACILITY DESCRIPTION

United Technologies Corp.- Pratt & Whitney (UTC-P&W) proposes to construct a Liquid Oxygen (LOX)/Kerosene Rocket Engine Test Stand at the E-5 rocket test area located at 17900 Beeline Highway (SR 710) in West Palm Beach, Palm Beach County.

The proposed project will result in a significant emissions increase of carbon monoxide (CO) according to Table 212.400-2, Florida Administrative Code (F.A.C.). The project is therefore subject to review for Prevention of Significant Deterioration (PSD) and a determination of Best Available Control Technology (BACT) in accordance with Rule 62-212.400, F.A.C.

PROJECT DETAILS

The applicant proposes to construct and operate a LOX/Kerosene Rocket Engine Stand at its existing rocket test facility in Palm Beach County. The applicant also operates a gas turbine testing facility and a helicopter development facility at the existing site. This project will consist of: liquid oxygen and fuel storage tanks with respective capacities of approximately 64,000 and 36,000 gallons capacities; an engine containment can; a water-cooled silencer; an exhaust gas deflector; a lined cooling water retention pond; and an elevated 1-million gallon water supply tank.

The proposed facility will consist of the following emissions units.

EMISSIONS UNIT NO.	EMISSIONS UNIT DESCRIPTION
075	LOX/Kerosene Rocket Engine Test Stand
076	NSPS Storage Tank – Approximately 36,000 Gallon Capacity

REGULATORY CLASSIFICATION

The facility is classified as a Major Source of air pollution under the PSD and Title V programs based on potential emissions of carbon monoxide (CO), volatile organic compounds (VOC), nitrogen oxides (NO_x), sulfur dioxide (SO₂), trichloroethylene, and total combined hazardous air pollutants (HAPs). This facility is not within an industry included in the list of the 28 Major Facility Categories per Table 62-212.400-1, F.A.C. The project permitted herein is subject to the requirements of the Prevention of Significant Deterioration air quality rules for CO emissions and New Source Performance Standards for fuel storage tanks as well as state rules cited in the general and specific conditions.

REVIEWING AND PROCESS SCHEDULE

- Date of Receipt of Application 06-20-00
- First Request for Additional Information 07-19-00
- Final Request for Additional Information 10-01-00
- Date Application Complete 10-09-00
- Waiver of Processing Clock by 30 days 12-19-00
- Intent Issued 01-29-01
- Received Request to Extend Time to File Petition until 05-17-01 02-22-01
- Received Request to Extend Time to File Petition until 08-15-01 05-17-01
- Re-issued Intent, Draft Permit and Draft BACT 07-10-01
- Received Proof of Publication 07-26-01
- Permit Issued 08-31-01

AIR CONSTRUCTION PERMIT
SECTION I. FACILITY INFORMATION

RELEVANT DOCUMENTS

The documents listed below constitute the basis for the permit and are on file with the Department.

- Permit application
- Applicant's additional information noted above
- Department's Technical Evaluation and Preliminary Determination and Intent to Issue

AIR CONSTRUCTION PERMIT
SECTION II. FACILITY-WIDE SPECIFIC CONDITIONS

The following specific conditions apply to all emissions units at this facility addressed by this permit.

ADMINISTRATIVE

1. Regulating Agencies: All documents related to applications for permits to construct, or modify an emissions unit should be submitted to the Bureau of Air Regulation (BAR), Florida Department of Environmental Protection at Mail Station #5505, 2600 Blair Stone Road, Tallahassee, Florida 32399-2400, phone number 850/488-0114. All documents related to reports, tests, operation permit applications, minor modifications and notifications shall be submitted to the Palm Beach County Health Department, post Office Box 29, 901 Evernia Street, West Palm Beach, Florida 33402-0029, Phone 562-355-3136.
2. General Conditions: The permittee is subject to and shall operate under the attached General Permit Conditions G.1 through G.15 listed in Appendix GC of this permit. General Permit Conditions are binding and enforceable pursuant to Chapter 403 of the Florida Statutes. [Rule 62-4.160, F.A.C.]
3. Terminology: The terms used in this permit have specific meanings as defined in the corresponding chapters of the Florida Administrative Code.
4. Applicable Regulations, Forms and Application Procedures: Unless otherwise indicated in this permit, the construction and operation of the subject emissions unit shall be in accordance with the capacities and specifications stated in the application. The facility is subject to all applicable provisions of Chapter 403, F.S. and Florida Administrative Code Chapters 62-4, 62-110, 62-204, 62-212, 62-213, 62-296, 62-297 and the Code of Federal Regulations Title 40, Part 60, adopted by reference in the Florida Administrative Code (F.A.C.) regulations. The permittee shall use the applicable forms listed in Rule 62-210.900, F.A.C. and follow the application procedures in Chapter 62-4, F.A.C. Issuance of this permit does not relieve the facility owner or operator from compliance with any applicable federal, state, or local permitting or regulations. [Rules 62-204.800, 62-210.300 and 62-210.900, F.A.C.]
5. New or Additional Conditions: Pursuant to Rule 62-4.080, F.A.C., for good cause shown and after notice and an administrative hearing, if requested, the Department may require the permittee to conform to new or additional conditions. The Department shall allow the permittee a reasonable time to conform to the new or additional conditions, and on application of the permittee, the Department may grant additional time. [Rule 62-4.080, F.A.C.]
6. Expiration: This air construction permit shall expire on June 30, 2003. The permittee, for good cause, may request that this construction/PSD permit be extended. Such a request shall be submitted to the Department's Bureau of Air Regulation prior to 60 days before the expiration of the permit. [Rules 62-210.300(1), 62-4.070(4), 62-4.080, and 62-4.210, F.A.C.]

PSD Expiration: Approval to construct shall become invalid if construction is not commenced within 18 months after receipt of such approval, or if construction is discontinued for a period of 18 months or more, or if construction is not completed within a reasonable time. The Department may extend the 18-month period upon a satisfactory showing that an extension is justified.

[Rules 62-4.070(4), 62-4.210(2) & (3), and 62-210.300(1)(a), F.A.C.]

BACT Determination: In conjunction with extension of the 18 month period to commence or continue construction, or extension of the permit expiration date, the permittee may be required to demonstrate the adequacy of any previous determination of Best Available Control Technology (BACT) for the source as applied to any new or modified emission units.

[Rules 62-4.070(4), 62-4.210(2) & (3), 62-210.300(1)(a), and 62-212.400(6)(b), F.A.C.]

AIR CONSTRUCTION PERMIT

SECTION II. FACILITY-WIDE SPECIFIC CONDITIONS

7. Modifications: No emissions unit or facility subject to this permit shall be constructed or modified without obtaining an air construction permit from the Department. Such permit must be obtained prior to the beginning of construction or modification.
[Rules 62-210.300(1) and 62-212.300(1)(a), F.A.C.]
8. Title V Operation Permit Required: This permit authorizes construction and/or installation of the permitted emissions unit and initial operation to determine compliance with Department rules. A revision to the facility's Title V operation permit is required for regular operation of the permitted emissions unit. The owner or operator shall apply for and receive a Title V operation permit or permit modification prior to expiration of this permit. To apply for a Title V operation permit, the applicant shall submit the appropriate application form, compliance test results, and such additional information as the Department may by law require. The application shall be submitted to the Department's appropriate District office.
[Rules 62-4.030, 62-4.050, 62-4.220, and Chapter 62-213, F.A.C.]

GENERAL EMISSIONS LIMITING STANDARDS

9. General Visible Emissions Standard: Except for emissions units that are subject to a particulate matter or opacity limit set forth or established by rule and reflected by conditions in this permit, no person shall cause, let, permit, suffer, or allow to be discharged into the atmosphere the emissions of air pollutants from any activity, the density of which is equal to or greater than that designated as Number 1 on the Ringelmann Chart (20% opacity). The test method for visible emissions shall be EPA Method 9, incorporated and adopted by reference in Chapter 62-297, F.A.C. Test procedures shall meet all applicable requirements of Chapter 62-297, F.A.C. [Rule 62-296.320(4)(b)1, F.A.C.]
10. Unconfined Emissions of Particulate Matter: [Rules 62-296.320(4)(c) and 62-212.400, F.A.C.]
- (i) No person shall cause, let, permit, suffer or allow the emissions of unconfined particulate matter from any activity, including vehicular movement; transportation of materials; construction, alteration, demolition or wrecking; or industrially related activities such as loading, unloading, storing or handling; without taking reasonable precautions to prevent such emissions.
- (ii) Any permit issued to a facility with emissions of unconfined particulate matter shall specify the reasonable precautions to be taken by that facility to control the emissions of unconfined particulate matter.
- (iii) Reasonable precautions include the following:
- Paving and maintenance of roads, parking areas and yards.
 - Application of water or chemicals to control emissions from such activities as demolition of buildings, grading roads, construction, and land clearing.
 - Application of asphalt, water, oil, chemicals or other dust suppressants to unpaved roads, yards, open stock piles and similar activities.
 - Removal of particulate matter from roads and other paved areas under the control of the owner or operator of the facility to prevent re-entrainment, and from buildings or work areas to prevent particulate from becoming airborne.
 - Landscaping or planting of vegetation.
 - Use of hoods, fans, filters, and similar equipment to contain, capture and/or vent particulate matter.
 - Confining abrasive blasting where possible.
 - Enclosure or covering of conveyor systems.

AIR CONSTRUCTION PERMIT

SECTION II. FACILITY-WIDE SPECIFIC CONDITIONS

(iv) In determining what constitutes reasonable precautions for a particular source, the Department shall consider the cost of the control technique or work practice, the environmental impacts of the technique or practice, and the degree of reduction of emissions expected from a particular technique or practice.

11. General Pollutant Emission Limiting Standards: [Rule 62-296.320(1)(a)&(2), F.A.C.]

(i) No person shall store, pump, handle, process, load, unload or use in any process or installation, volatile organic compounds or organic solvents without applying known and existing vapor emission control devices or systems deemed necessary and ordered by the Department.

(ii) No person shall cause, suffer, allow or permit the discharge of air pollutants which cause or contribute to an objectionable odor. (Not federally enforceable)

[Note: An objectionable odor is defined in Rule 62-210.200(203), F.A.C., as any odor present in the outdoor atmosphere which by itself or in combination with other odors, is or may be harmful or injurious to human health or welfare, which unreasonably interferes with the comfortable use and enjoyment of life or property, or which creates a nuisance.]

OPERATIONAL REQUIREMENTS

12. Plant Operation - Problems: If temporarily unable to comply with any of the conditions of the permit due to breakdown of equipment or destruction by hazard of fire, wind or by other cause, the permittee shall immediately notify the Department's appropriate district office and the appropriate local program office. The notification shall include pertinent information as to the cause of the problem, and what steps are being taken to correct the problem and to prevent its recurrence, and where applicable, the owner's intent toward reconstruction of destroyed facilities. Such notification does not release the permittee from any liability for failure to comply with Department rules.

[Rule 62-4.130, F.A.C.]

13. Circumvention: No person shall circumvent any air pollution control device or allow the emission of air pollutants without the applicable air pollution control device operating properly.

[Rule 62-210.650, F.A.C.]

14. Excess Emissions: For purposes of this permit, all limits established pursuant to the State Implementation Plan, including those limits established as BACT, include emissions during periods of startup and shutdown, and are not subject to the provisions of Rule 62-210.700(1), F.A.C.

Excess emissions which are caused entirely or in part by poor maintenance, poor operation, or any other equipment or process failure which may reasonably be prevented during start-up, shutdown or malfunction shall be prohibited pursuant to Rule 62-210.700(4), F.A.C.

[Rules 62-4.070(3) and 62-210.700(5), F.A.C.]

COMPLIANCE MONITORING AND TESTING REQUIREMENTS

15. Determination of Process Variables: [Rule 62-297.310(5), F.A.C.]

(i) Required Equipment. The owner or operator of an emissions unit for which compliance tests are required shall install, operate, and maintain equipment or instruments necessary to determine process variables, such as process weight input or heat input, when such data are needed in conjunction with emissions data to determine the compliance of the emissions unit with applicable emission limiting standards.

AIR CONSTRUCTION PERMIT

SECTION II. FACILITY-WIDE SPECIFIC CONDITIONS

(ii) **Accuracy of Equipment.** Equipment or instruments used to directly or indirectly determine process variables, including devices such as belt scales, weight hoppers, flow meters, and tank scales, shall be calibrated and adjusted to indicate the true value of the parameter being measured with sufficient accuracy to allow the applicable process variable to be determined within 10% of its true value.

16. **Special Compliance Tests:** When the Department, after investigation, has good reason (such as complaints, increased visible emissions or questionable maintenance of control equipment) to believe that any applicable emission standard contained in a Department rule or in a permit issued pursuant to those rules is being violated, it shall require the owner or operator of the facility to conduct compliance tests which identify the nature and quantity of pollutant emissions from the emissions units and to provide a report on the results of said tests to the Department.
[Rule 62-297.310(7)(b), F.A.C.]

REPORTING AND RECORD KEEPING REQUIREMENTS

23. **Duration of Record Keeping:** Upon request, the permittee shall furnish all records and plans required under Department rules. During enforcement actions, the retention period for all records will be extended automatically unless otherwise stipulated by the Department. The permittee shall hold at the facility or other location designated by this permit records of all monitoring information (including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation) required by the permit, copies of all reports required by this permit, and records of all data used to complete the application for this permit. These materials shall be retained at least five years from the date of the sample, measurement, report, or application unless otherwise specified by Department rule. [Rules 62-4.160(14)(a)&(b) and 62-213.440(1)(b)2.b., F.A.C.]
24. **Test Reports:** The owner or operator of an emissions unit for which a compliance test is required shall file a report with the Department on the results of each such test. The required test report shall be filed with the Department as soon as practical but no later than 45 days after the last sampling run of each test is completed. The test report shall provide sufficient detail on the emissions unit tested and the test procedures used to allow the Department to determine if the test was properly conducted and the test results properly computed. As a minimum, the test report, other than for an EPA Method 9 test, shall provide the applicable information listed in Rule 62-297.310(8)(c), F.A.C.
[Rule 62-297.310(8), F.A.C.]
25. **Excess Emissions Report:** If excess emissions occur, the owner or operator shall notify the appropriate Department District Office and the appropriate local program within one working day of: the nature, extent, and duration of the excess emissions; the cause of the excess emissions; and the actions taken to correct the problem. In addition, the Department may request a written summary report of the incident. [Rule 62-4.130, F.A.C.]
26. **Excess Emissions Report - Malfunctions:** In case of excess emissions resulting from malfunctions, each owner or operator shall notify the appropriate Department District Office and the appropriate local program in accordance with Rule 62-4.130, F.A.C. A full written report on the malfunctions shall be submitted in a quarterly report if requested by the Department. [Rule 62-210.700(6), F.A.C.]
27. **Annual Operating Report for Air Pollutant Emitting Facility:** The Annual Operating Report for Air Pollutant Emitting Facility shall be completed each year and shall be submitted to the appropriate Department District Office and the appropriate local program by March 1 of the following year.
[Rule 62-210.370(3), F.A.C.]

AIR CONSTRUCTION PERMIT
SECTION III. EMISSIONS UNIT SPECIFIC CONDITIONS

SUBSECTION A: The following specific conditions apply to the following emissions units:

EMISSIONS UNIT NO.	EMISSIONS UNIT DESCRIPTION
075	LOX/Kerosene Rocket Engine Test Stand

EMISSIONS UNIT(S) DETAILS

LOX/Kerosene Rocket Engine Test Stand, designated Emissions Unit 075, consisting of an engine containment can, a water-cooled silencer, and an exhaust gas deflector. Emissions are controlled through the use of a minimum oxidant to fuel ratio and the water-cooled silencer.

{Permitting note(s): The emissions unit has been reviewed under the PSD Program for carbon monoxide (CO). As a new major source of CO, the emissions unit is subject to the Best Available Control Technology (BACT) requirements of Rule 62-212.400(5)(c), F.A.C. Potential emissions of particulate matter (PM and PM10), sulfur dioxide (SO₂), oxides of nitrogen (NO_x), and volatile organic compounds have been estimated at 2.3, 1.4, 1.4, and 2.9 tons per year, respectively. The emissions unit is not subject to any New Source Performance Standards (40 CFR Part 60) or National Emission Standards for Hazardous Air Pollutants (40 CFR Part 61). The emissions unit has been identified as a Source Category for future regulatory action under the National Emission Standards for Hazardous Air Pollutants for Source Categories (40 CFR Part 63). A case-by-case determination of the Maximum Achievable Control Technology (MACT) under 40 CFR Part 63, Subpart B was not required.}

CONSTRUCTION REQUIREMENTS

- A.1. **Test Stand:** The test stand shall be constructed in accordance with the conceptual design specifications provided within the application and the following specifications:
- (i). **Water Cooled Silencer:** Approximate diameter of 20 feet and an approximate length of 80 feet; and
 - (ii). **Exhaust Gas Deflector:** Approximate height of 70 feet, approximate distance from Water Cooled Silencer of 100 feet. The surface between the water-cooled silencer shall be paved to minimize soil erosion.

[BACT and Rules 62-4.070(3) and 62-296.320(4)(c), F.A.C.]

The applicant will provide detailed dimensions once the final design is completed.

- A.2. **Oxygen Injection Study:** Within 180 days of the issuance of this permit, the permittee shall develop a plan for an Oxygen Injection Study for review and approval by the Department. The permittee shall complete and submit to the Department an engineering and cost study evaluating the technical feasibility and cost effectiveness of direct O₂ injection for reducing CO emissions in the exhausts of rocket engines tested at the permittee's facility. The study shall be completed within one year of approval by the Department of the plan for the oxygen injection study. [Rule 62-4.070(3) and BACT]

OPERATING RESTRICTIONS

- A.3. **Permitted Capacity:** The permittee shall not allow, cause, suffer or permit the operation of the unit in excess of the following capacities without prior authorization from the Permitting Authority:

AIR CONSTRUCTION PERMIT

SECTION III. EMISSIONS UNIT SPECIFIC CONDITIONS

- (i). **Test Duration:** Rocket engine test firing duration shall not exceed a total of 240 seconds per 8-hour period.
- (ii). **Test Firings:** Rocket engine test firings shall not exceed 2,880 seconds per year (12-month rolling total).
- (iii). **Oxidant/Fuel Ratio:** All rocket engine test firings shall be conducted at a minimum oxidant/fuel ratio of 2.72 pounds of oxygen per pound of fuel (4-minute average).
- (iv). **Fuel Usage:** Rocket engine test firings shall not consume more than 6,625 gallons per minute (4-minute average), 26,500 gallons per 8-hour period, and 318,000 gallons per year (12-month rolling total)
- (v). **Quench Water:** All rocket engine test firings shall be conducted with sufficient quench water flow to minimize NO_x formation.

[BACT, Rules 62-4.160(2), 62-210.200(228), and 62-210.300, F.A.C.]

{Permitting note: Prior authorization includes the issuance of construction, reconstruction, or modification permits or a determination by the Permitting Authority that the action is not subject to Rule 62-210.300(1), F.A.C.}

A.4. **Methods of Operation:** The permittee shall not allow, cause, suffer or permit any change in the method(s) of operation resulting in increased short-term or long-term potential emissions, without prior authorization from the Permitting Authority. The authorized methods of operation include the following:

- (i) **Fuels:** The permittee is authorized to use kerosene as the rocket engine fuel.
- (ii). **Oxidants:** The permittee is authorized to use liquid oxygen (LOX) as the rocket engine fuel oxidizer.

[BACT, Rules 62-4.160(2), 62-210.200(228) and 62-210.300, F.A.C.]

A.5. **Test Conditions:** Rocket engine test firings shall be restricted to daylight hours (1 hour after sunrise and 1 hour prior to sunset) and only under ambient conditions that provide good dispersion of the exhaust gases in accordance with a Test Plan to be submitted to the Palm Beach County Health Department (PBCHD) for approval prior to the initial test. The Palm Beach County Health Department (PBCHD) may approve non-daylight hour testing on a case-by-case basis. [BACT, Rules 62-4.070(3), F.A.C.]

A.6. **Hours of Operation:** The permittee is authorized to operate the unit continuously within the limits of the permitted capacities of **Condition A.3** and the test conditions of **Condition A.5** of this permit. [BACT, Rules 62-4.160(2), 62-210.200(228) and 62-210.300, F.A.C.]

EMISSION LIMITATIONS AND STANDARDS

A.7. **Visible Emissions:** The permittee shall not allow visible emissions that exceed forty (40) percent opacity from any rocket engine test firing. [BACT, Rule 62-212.400, F.A.C.]

AIR CONSTRUCTION PERMIT

SECTION III. EMISSIONS UNIT SPECIFIC CONDITIONS

- A.8. **Carbon Monoxide Emissions**: Rocket engine test firings shall not result in CO emissions greater than 20.75 tons per minute (4-minute average), 83 tons per 8-hour period, and 1,000 tons per year (12-month rolling total) as determined using the NASA-Lewis chemical equilibrium computer program or equivalent method approved by the Department or the Palm Beach County Health Department. [BACT, Rules 62-4.160(2), 62-210.200(228), and 62-210.300, F.A.C.]
- A.9. **BACT Determination**: The permittee shall comply with the requirements of Appendix BD of this permit. [BACT and Rule 62-212.400(5)(c), F.A.C.]

TEST METHODS AND PROCEDURES.

- A.10. **Visible Emissions**: All visible emissions tests performed pursuant to the requirements of this permit shall comply with the following provisions:
- (i). **Test Method**: The test method for visible emissions shall be DEP Method 9, incorporated in Rule 62-297.401(9)(c), F.A.C. The required minimum period of observation for a compliance test shall for operations that are normally completed within less than the minimum observation period and do not recur within that time, the period of observation shall be equal to the duration of the operation completion time. The opacity test observation period shall include the period during which the highest opacity emissions can reasonably be expected to occur. [BACT, Rule 62-297.310(4)(a)2.a, F.A.C.]
- (ii). **Test Procedures**: Test procedures shall meet all applicable requirements of Chapter 62-297, F.A.C. [Rule 62-296.410(3)(c), F.A.C.]
- A.11. **Carbon Monoxide Emissions**: The permittee shall, prior to any rocket engine test firings, establish an ambient air quality monitoring program to measure ambient air concentrations of CO before, during, and after a rocket engine test firing. The program shall be approved by the Palm Beach County Health Department (PBCHD). It may be discontinued upon request and with approval of PBCHD following a minimum of four test firings.
[Rule 62-212.400(5)(g), F.A.C.]

COMPLIANCE DEMONSTRATIONS AND PERIODIC MONITORING

- A.12. **Initial Compliance Demonstrations**: The permittee shall conduct a visible emissions compliance test during the initial rocket engine test firing and each subsequent test firing when a lower average oxidant/fuel ratio is used. Initial compliance with the CO emission limitations shall be demonstrated through compliance with **Conditions A.8** and **A.11** of this permit.
[BACT and Rule 62-297.310(7)(a)1., F.A.C.]
- A.13. **Compliance Demonstrations**: The permittee shall demonstrate compliance with the CO emission limitation by use of the ambient air quality monitoring program required by **Condition 11** of this permit. [BACT and Rule 62-4.070(3), F.A.C.]
- A.14. **Compliance Demonstrations for Permit Renewal**: The permittee shall have a formal compliance test conducted for visible emissions annually during each federal fiscal year (October 1 – September 30).
[BACT and Rule 62-297.310(7), F.A.C.]

AIR CONSTRUCTION PERMIT
SECTION III. EMISSIONS UNIT SPECIFIC CONDITIONS

- A.15. **Flow Monitors:** The permittee shall install, maintain, operate and calibrate flow monitors to measure the oxidant, fuel and quench water flow rates during each rocket engine test firing. All instrumentation shall be properly maintained and functional at all times, except during instrument breakdown, calibration or repair to ensure compliance with **Conditions A.3, A.4, A.5, and A.8** of this permit. [Rule 62-4.070(3), F.A.C.]
- A.16. **Recordkeeping:** The permittee shall maintain the following records:
- (i). Test Identification Number;
 - (ii). Test Date and Time (Start and Finish);
 - (iii). Test Duration (Planned and Actual);
 - (iv). Oxidant and Fuel Types;
 - (v). Oxidant/Fuel Ratio (Planned and Actual);
 - (vi). Fuel Usage (gallons per minute);
 - (vii). Quench Water System in Operation During Test;
 - (viii). Test Condition Summary;
 - (ix). CO Ambient Concentrations;
 - (x). Test Plan Conditions Excursions; and
 - (xi). Daily and Monthly Totals of Test Duration, Test Firings, and Fuel Usage.
- [Rule 62-4.070(3), F.A.C.]
- A.17. **Reporting:** The permittee shall submit the following reports:
- (i). **Test Notifications:** Notification to the PBCHD at least 24 hours prior to a rocket engine test firing. The notification shall include the date and time of the test firing, the expected duration of the test firing, the planned oxidant/fuel ratio, and the planned fuel usage rate.
[BACT and Rule 62-4.070(3), F.A.C.]
 - (ii) **Test Plan Excursion Reports:** In the event an excursion from the test plan conditions (i.e., test duration > 240 seconds, O/F ratio less than 2.72, fuel usage > 26,500 gallons, a flame out, etc.) occurs during a test, a verbal report shall be provided to the PBCHD within 24 hours of the test. Within sixty (60) days of an excursion, the permittee shall submit an analysis describing the excursion event/parameter, measures taken to prevent recurrences, and excess emissions (opacity) observed, if any. The report shall include ambient air quality impacts associated with the excess emissions if requested by PBCHD.
[Rule 62-4.130, F.A.C.]
- A.18. **Excess Emissions:** Excess emissions and excursion from test plan conditions shall be reported to PBCHD as described in **Condition A.17**. Excess emissions parameters reported shall be limited to visible emissions (opacity) and shall be allowed provided the permittee demonstrates that the emissions did not result in a predicted ambient impact greater than the National Ambient Air Quality Standards (NAAQS) for CO. [BACT and Rule 62-4.070(3), F.A.C.]

AIR CONSTRUCTION PERMIT
SECTION III. EMISSIONS UNIT SPECIFIC CONDITIONS

SUBSECTION B: The following specific conditions apply to the following emissions units:

EMISSIONS UNIT No.	EMISSIONS UNIT DESCRIPTION
076	NSPS Storage Tank – 36,000 Gallon Nominal Capacity

EMISSIONS UNITS DETAILS

Emissions Unit 076 is a stationary storage tank having an approximate capacity of 36,000 gallons. The tank is subject to specific recordkeeping requirements of 40 CFR 60 Subpart Kb. The tank will store and handle kerosene, a volatile organic liquid (VOL), for the LOX/Kerosene Rocket Engine Test Stand (E.U. ID No. 075).

{Permitting notes: The unit is classified as a new facility under the New Source Performance Standards (40 CFR 60 Subpart Kb) and subject to the recordkeeping requirement of 40 CFR 60 Subpart Kb.}

The following specific conditions apply to the emissions unit(s) listed above:

OPERATING RESTRICTIONS

- B.1. **Permitted Tank Throughput:** The permittee shall not allow, cause, suffer, or permit the operation of Emissions Unit 076 in excess of 354,000 gallons throughput per year without prior authorization from the Permitting Authority. This annual throughput represents fuel volume consumed by 12 rocket tests plus 1 tank refill. [Rules 62-4.160(2), 62-210.200(228), 62-210.300, F.A.C.]
- B.2. **Methods of Operation:** The permittee shall not allow, cause, suffer or permit any change in the method of operation of Emissions Unit 076 without prior authorization from the Permitting Authority. The authorized methods of operation include the following:
 - (i). **VOL Type(s):** The permittee is authorized to store and handle kerosene.
 - (ii). **VOL Vapor Pressure:** The permittee shall not store or handle any fuels within the units with a maximum true vapor pressure greater than 15.0 kPa (2.176 psi).
 [Rules 62-4.160(2), 62-210.200(228), 62-210.300, F.A.C., 40 CFR 60.110b(c)]
- B.3. **Hours of Operation:** The permittee is authorized to operate the units continuously.
 [Rule 62-4.070(3), F.A.C.]

COMPLIANCE DEMONSTRATIONS AND PERIODIC MONITORING

- B.4. **Compliance Demonstrations:** The permittee shall demonstrate compliance with the operating restriction of **Condition B.1.** based on record keeping as required by **Condition B.5.** of this permit.
 [Rule 62-297.310(7), F.A.C.]
- B.5. **Records:** The permittee shall implement the following periodic monitoring requirements to ensure compliance with the Specific Conditions **B.1** and **B.2.** of this permit:
 - (i). **Monthly Throughput:** The permittee shall monitor and record the monthly throughput of volatile organic liquids through each tank.
 - (ii). **Volatile Organic Liquid Types:** The permittee shall monitor and record the type (Name and True Vapor Pressure at 80°F) of volatile organic liquids stored and handled in each tank.
 [Rule 62-213.440(1)(b), F.A.C.]

AIR CONSTRUCTION PERMIT
SECTION III. EMISSIONS UNIT SPECIFIC CONDITIONS

New Source Performance Standards (NSPS)

{Permitting note: The unit is subject to the recordkeeping requirements of 40 CFR 60 Subpart Kb provided the permittee complies with the requirements of 40 CFR 60.110b, Applicability.}

B.6. 40 CFR 60 Subpart Kb—Standards of Performance for Volatile Organic Liquid Storage Vessels (Including Petroleum Liquid Storage Vessels) for which Construction, Reconstruction, or Modification Commenced after July 23, 1984: The permittee shall comply with the applicable requirements of 40 CFR 60 Subpart Kb contained in Appendix NSPS-Kb. Specifically:

- (a) 40 CFR 60.110b, Applicability,
- (b) 40 CFR 60.111b, Definitions,
- (c) 40 CFR 60.116b, Monitoring of Operations

[40 CFR 60.40b(a), Rule 62-204.800(7)(b), F.A.C.]

APPENDIX BD - DETERMINATION OF
BEST AVAILABLE CONTROL TECHNOLOGY (BACT)

United Technologies Corp.- Pratt & Whitney
LOX/Kerosene Rocket Engine Stand Project
Palm Beach County

DEP File No. 0990021-004-AC
PSD-FL-294

Department of Environmental Protection
Division of Air Resources Management
Bureau of Air Regulation

August 31, 2001

APPENDIX BD - BACT DETERMINATION

United Technologies Corp. – Pratt & Whitney LOX/Kerosene Rocket Engine Stand Project Palm Beach County

United Technologies Corp.- Pratt & Whitney (UTC-P&W) proposes to construct a Liquid Oxygen (LOX)/Kerosene Rocket Engine Test Stand at the E-5 rocket test area located at 17900 Beeline Highway (SR 710) near Jupiter, Palm Beach County.

The proposed project will result in a significant emissions increase of carbon monoxide (CO) according to Table 212.400-2, Florida Administrative Code (F.A.C.). The project is therefore subject to review for Prevention of Significant Deterioration (PSD) and a determination of Best Available Control Technology (BACT) in accordance with Rule 62-212.400, F.A.C.

The details of PSD applicability and a description of the process are presented in the separate Technical Evaluation and Preliminary Determination issued concurrently with this determination.

BACT DETERMINATION REQUESTED BY THE APPLICANT:

The applicant requested that the Department's BACT determination for CO emissions require no control equipment due to prohibitive cost and impracticability of controlling such a large exhaust stream. Instead, the applicant proposed that the BACT requirements focus on combustion control by way of adjusting the oxygen to fuel ratio to maximize combustion efficiency thus reducing CO emissions.

BACT DETERMINATION PROCEDURE:

In accordance with Chapter 62-212, F.A.C., a BACT determination is based on the maximum degree of reduction of each pollutant emitted which the Department of Environmental Protection (Department), on a case by case basis, taking into account energy, environmental and economic impacts, and other costs, determines is achievable through application of production processes and available methods, systems, and techniques. In addition, the regulations state that, in making the BACT determination, the Department shall give consideration to:

- Any Environmental Protection Agency determination of BACT pursuant to Section 169, and any emission limitation contained in 40 CFR Part 60 - Standards of Performance for New Stationary Sources or 40 CFR Part 61 - National Emission Standards for Hazardous Air Pollutants.
- All scientific, engineering, and technical material and other information available to the Department.
- The emission limiting standards or BACT determinations of any other state.
- The social and economic impact of the application of such technology.

The EPA currently stresses that BACT should be determined using the "top-down" approach. The first step in this approach is to determine, for the emission unit in question, the most stringent control available for a similar or identical emission unit or emission unit category. If it is shown that this level of control is technically or economically infeasible for the emission unit in question, then the next most stringent level of control is determined and similarly evaluated. This process

APPENDIX BD - BACT DETERMINATION

continues until the BACT level under consideration cannot be eliminated by any substantial or unique technical, environmental, or economic objections.

Under 40 CFR Part 60 - Standards of Performance for New Stationary Sources (NSPS) there is no promulgated emission standard that applies to emissions from rocket engine test facilities.

Under 40 CFR Part 61 - National Emission Standards for Hazardous Air Pollutants (NESHAP) there is a promulgated emission standard that applies to emissions from rocket engine test facilities. The Standard, 40 CFR Part 61, Subpart D applies specifically to Beryllium Rocket Motor Firing. It includes an emission standard based on a time-weighted atmospheric concentration of beryllium and a requirement to monitor ambient air concentrations to ensure compliance with the emission standard. The monitoring program requires prior approval from the Administrator.

Under 40 CFR Part 63 - National Emission Standards for Hazardous Air Pollutants (NESHAP) for Source Categories, Rocket Engine Test Firing is a targeted source category. On December 8, 1998 the EPA workgroup working on this matter, distributed Information Collection Requests to the major companies (including OTC Pratt & Whitney) potentially affected by such a NESHAP. The Department's contacted Mr. Richard A. Copland, the project team leader at EPA. According to Mr. Copland, (based on the information received) it appears at this time that there will be no controls due to the relatively short firing time, remote facility locations, costs, etc. EPA is still researching the matter so Mr. Copland's assessment of the present situation is not considered as final.

BACT DETERMINATIONS BY EPA AND STATES:

The Department's review for any prior BACT determinations for emissions from rocket engine test facilities referred to in the RACT/BACT/LAER Clearinghouse identified the following:

- MS-0019, State of Mississippi, December 1990 BACT Determination for the National Aeronautics and Space Administration's (NASA) Stennis Space Center. The BACT determination required use of a deflector ramp to aid in dispersion and prevent scouring of soil and restrictions on meteorological conditions to prevent possible acid rain formation. Specific numerical limits were not established. The project was associated with the Advanced Solid Rocket Motor (ASRM). The project was later discontinued when Congress suspended funding.

OTHER INFORMATION AVAILABLE TO THE DEPARTMENT

The primary sources of information related to rocket engine test stands included the applicant's data, the MDEQ, and the NESHAP activities. These sources provided information on existing test stands, emissions, permitting requirements and control strategies.

The applicant provided estimates of emissions based on a fuel combustion model developed by NASA. Known as the NASA-Lewis chemical equilibrium computer program, emission estimates were provided by the applicant in supplemental information filed during the application completeness process. The NASA-Lewis chemical equilibrium computer program appears to be the primary source of most emission estimates for rocket engine test operations.

The Department contacted the Mississippi Department of Environmental Quality (MDEQ) regarding the 1990 BACT determination. MDEQ provided additional information as well as

APPENDIX BD - BACT DETERMINATION

identifying a current in-house project for the NASA Stennis Space Center. The project included the establishment of federally enforceable permit conditions on the facility's LOX/hydrocarbon rocket engine test stands. A copy of the draft permit (1000-00005) was provided to the Department for review. The enforceable conditions within the permit included the following:

- Emissions Limitations: PM (10,270 lb/test), PM₁₀ (6,060 lb/test), SO₂ (2,520 lb/test), NO_x (2520 lb/test) CO (558,600 lb/test) and VOC (50 lb/test).
- Fuel Authorizations: Liquid Hydrogen (LH2)/Liquid Oxygen (LOX) and hydrocarbon fuels.
- Emission Estimates: NASA-Lewis chemical equilibrium computer program or an equivalent version.
- Records: For each test - the duration, the fuels and the calculated emission rates for PM, PM₁₀, SO₂, NO_x, CO, and VOC. Semiannual report showing number of tests per month, total emissions per month, and the highest lb/test emissions rate during the reporting period.

The Department is also aware of the other rocket engine test stands, however, the 1990 MDEQ PSD review is the only one that included a BACT determination and is thus the BACT "floor."

PROPOSED PROJECT AND EMISSIONS

The applicant proposes to construct and operate a LOX/Kerosene Rocket Engine Stand at its existing rocket test facility in Palm Beach County. The applicant also operates a gas turbine testing facility and a helicopter development facility at the existing site. This project will consist of liquid oxygen and fuel storage tanks (64,000 and 36,000 gallon capacities), an engine containment can, a water-cooled silencer, an exhaust gas deflector, a lined cooling water retention pond, and an elevated 1-million gallon water supply tank.

Emissions will be generated from combustion of fuel during 12 test firings per year lasting 240 seconds each. These emissions have been estimated according to the NASA combustion model as indicated next:

Pollutant	CO	CO ₂	H ₂	VOC	PM	SO _x	NO _x
lb/sec	694	1,366	17	2	1.6	<1	1
TPY	1,000	1,967	25	3	2.3	1.4	1.4

As indicated in the table above, the only regulated pollutant believed to be emitted in significant quantities is CO in the amount of 1,000 TPY. No estimates are given for HAPs. In any case, HAPs emissions are believed to be less than 10 TPY of any single HAP and less than 25 TPY of all HAPs combined.

APPENDIX BD - BACT DETERMINATION

BACT CONTROL OPTIONS

The applicant has requested that the Department's BACT determination for CO emissions require no add-on control equipment due to prohibitive cost and impracticability of controlling such a large exhaust stream. Instead, the applicant proposed that the BACT requirements focus on combustion control by way of adjusting the oxygen to fuel ratio to maximize combustion efficiency thus reducing CO emissions, limiting test duration to no longer than 240 seconds per test, and limiting testing to no more than 12 tests per year.

The applicant's BACT evaluation referred to a Russian rocket test stand that employed a water injection and ducting system solely for the purpose of avoiding heat detection by surveillance satellites during the Cold-War era. According to the applicant, the Russian test stand was not designed as an emission control system and should not be considered as any sort of exemplary emission control system. This is the only rocket test stand reported by the applicant that may be construed to have any add-on controls.

BACT DETERMINATION

If the BACT analysis is based on the transfer of CO oxidation technology from the gas turbine industry, differences in exhaust concentrations must be considered. Based on the modeled exhaust flow, the molar concentration of exhaust gases will be about 23% CO, 28% CO₂, 8% H₂ and 41% H₂O vapor. Kerosene rocket engines fire a fuel rich mixture for heat control flexibility, firing at approximately 82% of theoretical O₂ required for complete combustion. Consequently, CO emissions from engines of this type are very high compared to combustion turbines that rarely exceed 150-200 ppm CO even at medium loads.

Turbine exhaust oxidation technology applied to a rocket engine test stand will result in far greater costs. Estimates provided by the applicant indicate that a conventional incinerator would cost about \$579,000,000 with an annualized cost of about \$68,000,000. An additional \$100,000,000 would be required, according to the applicant, to construct an appropriate infrastructure for a control device designed to withstand the maximum thrust and high temperatures of the rocket engine exhaust. The Department does not necessarily accept these figures, but agrees that actual figures can be many millions of dollars.

If a system could be designed to capture the rocket engine exhaust gases and convert the CO to CO₂ catalytically or by thermal oxidation, it would be massive (~ 60 ft. diameter) and have to withstand extreme temperatures and thrust pressures adding significantly to construction and operating costs. Cost effectiveness for catalytic oxidation of natural gas-fired turbine exhausts for the largest sizes of utility turbines ranges from \$5,000 to over \$8,000 per ton of CO removed. When scaled up for the extreme conditions of a rocket engine exhaust and the numerous uncertainties inherent in such a system, the overall cost effectiveness might exceed \$100,000 per ton depending on the safety factors used in the design. Considering these uncertainties, the Department concludes that catalytic oxidation such as employed by turbines would not be practicable or cost-effective and neither would incineration.

Yet, it is conceivable that other means could be used for injecting oxygen into the exhaust gases to create conditions suitable for oxidation of much of the CO. An automobile emission control system with air injection is one example. Since this facility will emit at least 1,000 TPY CO, and since CO is a criteria air pollutant, the Department proposes that a study be done by the applicant

APPENDIX BD - BACT DETERMINATION

to evaluate the feasibility of direct O₂ injection into the gas stream downstream of the body of the engine. The study should employ kinetic modeling to determine the practicability and economic feasibility of adding the balance of stoichiometric oxygen required for complete combustion via direct injection at an appropriate point or points in the rocket engine exhaust. A period of one year is provided for completion of the study and submitting it to the Department.

The Department agrees with the applicant's finding that existing oxidation technology is not feasible at this time. As a result, the Department has determined BACT for the rocket engine test stand to be a visible emissions limitation of forty (40) percent opacity and the following work practices:

- Carbon Monoxide (CO) Emissions – Rocket engine test firings shall not result in CO emissions greater than 20.75 tons per minute (4-minute average), 83 tons per 8-hour period, and 1,000 tons per year (12-month rolling total) as determined using the NASA-Lewis chemical equilibrium computer program or equivalent method approved by the Department or the Palm Beach Public Health Department.
- Test Stand - The test stand shall be constructed in accordance with the conceptual design specifications provided within the application including a Water Cooled Silencer and an Exhaust Gas Deflector with an approximate height of 70 feet, an approximate distance from Water Cooled Silencer of 100 feet. The surface between the water-cooled silencer and the exhaust gas deflector shall be paved.
- Test Duration – Rocket engine test firings shall not exceed a total of 240 seconds per 8-hour period.
- Test Firings – Rocket engine test firings shall not exceed 2,880 seconds per year (12-month rolling total).
- Oxidant/Fuel Ratio – All rocket engine test firings shall be conducted at a minimum oxidant/fuel ratio of 2.72 lb O₂/lb of fuel (4 minute average).
- Fuel Usage – Rocket engine test firings shall not consume more than 6,625 gallons per minute (4-minute average), 26,500 gallons per 8-hour period, and 318,000 gallons per year (12-month rolling total).
- Quench Water - All rocket engine test firings shall be conducted with sufficient quench water to minimize NO_x formation.
- Fuel and Oxidizer Types - Rocket engine test firings shall be limited to the firing of kerosene as the fuel and liquid oxygen (LOX) as the oxidizer.
- Test Conditions – Rocket engine test firings shall be restricted to daylight hours (1 hour after sunrise and 1 hour prior to sunset) and only under ambient conditions that provide good dispersion of the exhaust gases in accordance with a Test Plan to be submitted to the Palm Beach County Health Department (PBCHD) for approval prior to the initial test. PBCHD may approve non-daylight hour testing on a case-by-case basis.

APPENDIX BD - BACT DETERMINATION

- Within 180 days of the issuance of this permit, the permittee shall develop a plan for an Oxygen Injection Study for review and approval by the Department. The permittee shall complete and submit to the Department an engineering and cost study evaluating the technical feasibility and cost effectiveness of direct O₂ injection for reducing CO emissions in the exhausts of rocket engines tested at the permittee's facility. The study shall be completed within one year of approval by the Department of the plan for the oxygen injection study.

COMPLIANCE REQUIREMENTS

- The permittee shall, prior to any rocket engine test firings, establish an ambient air quality monitoring program to measure ambient air concentrations of CO before, during, and after a rocket engine test firing. The program shall be approved by the Palm Beach County Health Department (PBCHD). It may be discontinued upon request and with approval of PBCHD following a minimum of four test firings.
- The permittee shall conduct a visible emissions compliance test during the initial rocket engine test firing and each subsequent test firing when a lower average oxidant/fuel ratio is used. Initial compliance with the CO emission limitations shall be demonstrated through compliance with the oxygen to fuel requirements and the ambient monitoring program described above.
- Excess emissions and excursions from test plan conditions shall be reported to PBCHD. Excess emissions parameters reported shall be limited to visible emissions (opacity) and shall be allowed provided the permittee demonstrates that the emissions did not result in a predicted ambient impact greater than the National Ambient Air Quality Standards (NAAQS) for CO.
- Additional compliance requirements are incorporated as conditions in the permit.

DETAILS OF THE ANALYSIS MAY BE OBTAINED BY CONTACTING:

A. A. Linero, P.E. Administrator *AAL* 8/30
Bureau of Air Regulation
2600 Blair Stone Road, MS # 5505
Tallahassee, Florida 32399-2400
850/488-0114

Recommended By:

Approved By:

CH Fancy
C. H. Fancy, P.E., Chief
Bureau of Air Regulation

Howard L. Rhodes
Howard L. Rhodes, Director
Division of Air Resources Management

9/4/01
Date:

9/4/01
Date:

APPENDIX GC
GENERAL PERMIT CONDITIONS [F.A.C. 62-4.160]

- G.1 The terms, conditions, requirements, limitations, and restrictions set forth in this permit are "Permit Conditions" and are binding and enforceable pursuant to Sections 403.161, 403.727, or 403.859 through 403.861, Florida Statutes. The permittee is placed on notice that the Department will review this permit periodically and may initiate enforcement action for any violation of these conditions.
- G.2 This permit is valid only for the specific processes and operations applied for and indicated in the approved drawings or exhibits. Any unauthorized deviation from the approved drawings or exhibits, specifications, or conditions of this permit may constitute grounds for revocation and enforcement action by the Department.
- G.3 As provided in Subsections 403.087(6) and 403.722(5), Florida Statutes, the issuance of this permit does not convey any vested rights or any exclusive privileges. Neither does it authorize any injury to public or private property or any invasion of personal rights, nor any infringement of federal, state or local laws or regulations. This permit is not a waiver or approval of any other Department permit that may be required for other aspects of the total project which are not addressed in the permit.
- G.4 This permit conveys no title to land or water, does not constitute State recognition or acknowledgment of title, and does not constitute authority for the use of submerged lands unless herein provided and the necessary title or leasehold interests have been obtained from the State. Only the Trustees of the Internal Improvement Trust Fund may express State opinion as to title.
- G.5 This permit does not relieve the permittee from liability for harm or injury to human health or welfare, animal, or plant life, or property caused by the construction or operation of this permitted source, or from penalties therefore; nor does it allow the permittee to cause pollution in contravention of Florida Statutes and Department rules, unless specifically authorized by an order from the Department.
- G.6 The permittee shall properly operate and maintain the facility and systems of treatment and control (and related appurtenances) that are installed or used by the permittee to achieve compliance with the conditions of this permit, as required by Department rules. This provision includes the operation of backup or auxiliary facilities or similar systems when necessary to achieve compliance with the conditions of the permit and when required by Department rules.
- G.7 The permittee, by accepting this permit, specifically agrees to allow authorized Department personnel, upon presentation of credentials or other documents as may be required by law and at a reasonable time, access to the premises, where the permitted activity is located or conducted to:
- a) Have access to and copy and records that must be kept under the conditions of the permit;
 - b) Inspect the facility, equipment, practices, or operations regulated or required under this permit, and,
 - c) Sample or monitor any substances or parameters at any location reasonably necessary to assure compliance with this permit or Department rules.

Reasonable time may depend on the nature of the concern being investigated.

- G.8 If, for any reason, the permittee does not comply with or will be unable to comply with any condition or limitation specified in this permit, the permittee shall immediately provide the Department with the following information:
- a) A description of and cause of non-compliance; and
 - b) The period of noncompliance, including dates and times; or, if not corrected, the anticipated time the non-compliance is expected to continue, and steps being taken to reduce, eliminate, and prevent recurrence of the non-compliance.

The permittee shall be responsible for any and all damages which may result and may be subject to enforcement action by the Department for penalties or for revocation of this permit.

APPENDIX GC
GENERAL PERMIT CONDITIONS [F.A.C. 62-4.160]

- G.9 In accepting this permit, the permittee understands and agrees that all records, notes, monitoring data and other information relating to the construction or operation of this permitted source which are submitted to the Department may be used by the Department as evidence in any enforcement case involving the permitted source arising under the Florida Statutes or Department rules, except where such use is prescribed by Sections 403.73 and 403.111, Florida Statutes. Such evidence shall only be used to the extent it is consistent with the Florida Rules of Civil Procedure and appropriate evidentiary rules.
- G.10 The permittee agrees to comply with changes in Department rules and Florida Statutes after a reasonable time for compliance, provided, however, the permittee does not waive any other rights granted by Florida Statutes or Department rules.
- G.11 This permit is transferable only upon Department approval in accordance with Florida Administrative Code Rules 62-4.120 and 62-730.300, F.A.C., as applicable. The permittee shall be liable for any non-compliance of the permitted activity until the transfer is approved by the Department.
- G.12 This permit or a copy thereof shall be kept at the work site of the permitted activity.
- G.13 This permit also constitutes:
- a) Determination of Best Available Control Technology for carbon monoxide (X)
 - b) Determination of Prevention of Significant Deterioration for carbon monoxide (X); and
 - c) Compliance with New Source Performance Standards, Subpart Kb (X).
- G.14 The permittee shall comply with the following:
- a) Upon request, the permittee shall furnish all records and plans required under Department rules. During enforcement actions, the retention period for all records will be extended automatically unless otherwise stipulated by the Department.
 - b) The permittee shall hold at the facility or other location designated by this permit records of all monitoring information (including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation) required by the permit, copies of all reports required by this permit, and records of all data used to complete the application or this permit. These materials shall be retained at least three years from the date of the sample, measurement, report, or application unless otherwise specified by Department rule.
 - c) Records of monitoring information shall include:
 - 1. The date, exact place, and time of sampling or measurements;
 - 2. The person responsible for performing the sampling or measurements;
 - 3. The dates analyses were performed;
 - 4. The person responsible for performing the analyses;
 - 5. The analytical techniques or methods used; and
 - 6. The results of such analyses.
- G.15 When requested by the Department, the permittee shall within a reasonable time furnish any information required by law which is needed to determine compliance with the permit. If the permittee becomes aware that relevant facts were not submitted or were incorrect in the permit application or in any report to the Department, such facts or information shall be corrected promptly.

Subpart Kb—Standards of Performance for Volatile Organic Liquid Storage Vessels (Including Petroleum Liquid Storage Vessels) for Which Construction, Reconstruction, or Modification Commenced After July 23, 1984

[SOURCE: 52 FR 11429, Apr. 8, 1987, unless otherwise noted.]

§ 60.110b Applicability and designation of affected facility.

(a) Except as provided in paragraphs (b), (c), and (d) of this section, the affected facility to which this subpart applies is each storage vessel with a capacity greater than or equal to 40 cubic meters (m³) that is used to store volatile organic liquids (VOL's) for which construction, reconstruction, or modification is commenced after July 23, 1984.

(b) Except as specified in paragraphs (a) and (b) of § 60.116b, storage vessels with design capacity less than 75 m³ are exempt from the General Provisions (part 60, subpart A) and from the provisions of this subpart.

(c) Except as specified in paragraphs (a) and (b) of § 60.116b, vessels either with a capacity greater than or equal to 151 m³ storing a liquid with a maximum true vapor pressure less than 3.5 kPa or with a capacity greater than or equal to 75 m³ but less than 151 m³ storing a liquid with a maximum true vapor pressure less than 15.0 kPa are exempt from the General Provisions (part 60, subpart A) and from the provisions of this subpart.

(d) This subpart does not apply to the following:

- (1) Vessels at coke oven by-product plants.
- (2) Pressure vessels designed to operate in excess of 204.9 kPa and without emissions to the atmosphere.
- (3) Vessels permanently attached to mobile vehicles such as trucks, railcars, barges, or ships.
- (4) Vessels with a design capacity less than or equal to 1,589.874 m³ used for petroleum or condensate stored, processed, or treated prior to custody transfer.
- (5) Vessels located at bulk gasoline plants.
- (6) Storage vessels located at gasoline service stations.
- (7) Vessels used to store beverage alcohol.

[52 FR 11429, Apr. 8, 1987, as amended at 54 FR 32973, Aug. 11, 1989]

§ 60.111b Definitions.

Terms used in this subpart are defined in the Act, in subpart A of this part, or in this subpart as follows:

(a) Bulk gasoline plant means any gasoline distribution facility that has a gasoline throughput less than or equal to 75,700 liters per day. Gasoline throughput shall be the maximum calculated design throughput as may be limited by compliance with an enforceable condition under Federal requirement or Federal, State or local law, and discoverable by the Administrator and any other person.

(d) Fill means the introduction of VOL into a storage vessel but not necessarily to complete capacity.

(e) Gasoline service station means any site where gasoline is dispensed to motor vehicle fuel tanks from stationary storage tanks.

STANDARDS OF PERFORMANCE FOR VOLATILE ORGANIC LIQUID STORAGE VESSELS

(f) Maximum true vapor pressure means the equilibrium partial pressure exerted by the stored VOL at the temperature equal to the highest calendar-month average of the VOL storage temperature for VOL's stored above or below the ambient temperature or at the local maximum monthly average temperature as reported by the National Weather Service for VOL's stored at the ambient temperature, as determined:

- (1) In accordance with methods described in American Petroleum Institute Bulletin 2517, Evaporation Loss From External Floating Roof Tanks, (incorporated by reference—see § 60.17); or
- (2) As obtained from standard reference texts; or
- (3) As determined by ASTM Method D2879–83 (incorporated by reference—see § 60.17);
- (4) Any other method approved by the Administrator.

(g) Reid vapor pressure means the absolute vapor pressure of volatile crude oil and volatile nonviscous petroleum liquids except liquified petroleum gases, as determined by ASTM D323–82 (incorporated by reference—see § 60.17).

(h) Petroleum means the crude oil removed from the earth and the oils derived from tar sands, shale, and coal.

(i) Petroleum liquids means petroleum, condensate, and any finished or intermediate products manufactured in a petroleum refinery.

(j) Storage vessel means each tank, reservoir, or container used for the storage of volatile organic liquids but does not include:

- (1) Frames, housing, auxiliary supports, or other components that are not directly involved in the containment of liquids or vapors; or
- (2) Subsurface caverns or porous rock reservoirs.

(k) Volatile organic liquid (VOL) means any organic liquid which can emit volatile organic compounds into the atmosphere except those VOL's that emit only those compounds which the Administrator has determined do not contribute appreciably to the formation of ozone. These compounds are identified in EPA statements on ozone abatement policy for SIP revisions (42 FR 35314, 44 FR 32042, 45 FR 32424, and 45 FR 48941).

(l) Waste means any liquid resulting from industrial, commercial, mining or agricultural operations, or from community activities that is discarded or is being accumulated, stored, or physically, chemically, or biologically treated prior to being discarded or recycled.

[52 FR 11429, Apr. 8, 1987, as amended at 54 FR 32973, Aug. 11, 1989]

§ 60.112b Standard for volatile organic compounds (VOC).

§ 60.113b Testing and procedures.

§ 60.114b Alternative means of emission limitation.

§ 60.115b Reporting and recordkeeping requirements.

§ 60.116b Monitoring of operations.

(a) The owner or operator shall keep copies of all records required by this section, except for the record required by paragraph (b) of this section, for at least 2 years. The record required by paragraph (b) of this section will be kept for the life of the source.

(b) The owner or operator of each storage vessel as specified in § 60.110b(a) shall keep readily accessible records showing the dimension of the storage vessel and an analysis showing the capacity of the storage vessel. Each storage vessel with a design capacity less than 75 m³ is subject to no provision of this subpart other than those required by this paragraph.

STANDARDS OF PERFORMANCE FOR VOLATILE ORGANIC LIQUID STORAGE VESSELS

(c) Except as provided in paragraphs (f) and (g) of this section, the owner or operator of each storage vessel either with a design capacity greater than or equal to 151 m³ storing a liquid with a maximum true vapor pressure greater than or equal to 3.5 kPa or with a design capacity greater than or equal to 75 m³ but less than 151 m³ storing a liquid with a maximum true vapor pressure greater than or equal to 15.0 kPa shall maintain a record of the VOL stored, the period of storage, and the maximum true vapor pressure of that VOL during the respective storage period.

(d) Except as provided in paragraph (g) of this section, the owner or operator of each storage vessel either with a design capacity greater than or equal to 151 m³ storing a liquid with a maximum true vapor pressure that is normally less than 5.2 kPa or with a design capacity greater than or equal to 75 m³ but less than 151 m³ storing a liquid with a maximum true vapor pressure that is normally less than 27.6 kPa shall notify the Administrator within 30 days when the maximum true vapor pressure of the liquid exceeds the respective maximum true vapor pressure values for each volume range.

(e) Available data on the storage temperature may be used to determine the maximum true vapor pressure as determined below.

(1) For vessels operated above or below ambient temperatures, the maximum true vapor pressure is calculated based upon the highest expected calendar-month average of the storage temperature. For vessels operated at ambient temperatures, the maximum true vapor pressure is calculated based upon the maximum local monthly average ambient temperature as reported by the National Weather Service.

(2) For crude oil or refined petroleum products the vapor pressure may be obtained by the following:

(i) Available data on the Reid vapor pressure and the maximum expected storage temperature based on the highest expected calendar-month average temperature of the stored product may be used to determine the maximum true vapor pressure from nomographs contained in API Bulletin 2517 (incorporated by reference-see § 60.17), unless the Administrator specifically requests that the liquid be sampled, the actual storage temperature determined, and the Reid vapor pressure determined from the sample(s).

(ii) The true vapor pressure of each type of crude oil with a Reid vapor pressure less than 13.8 kPa or with physical properties that preclude determination by the recommended method is to be determined from available data and recorded if the estimated maximum true vapor pressure is greater than 3.5 kPa.

(3) For other liquids, the vapor pressure:

(i) May be obtained from standard reference texts, or

(ii) Determined by ASTM Method D2879-83 (incorporated by reference-see § 60.17); or

(iii) Measured by an appropriate method approved by the Administrator; or

(iv) Calculated by an appropriate method approved by the Administrator.

§ 60.117b Delegation of authority.

(a) In delegating implementation and enforcement authority to a State under section 111(c) of the Act, the authorities contained in paragraph (b) of this section shall be retained by the Administrator and not transferred to a State.

(b) Authorities which will not be delegated to States: §§ 60.111b(f)(4), 60.114b, 60.116b(e)(3)(iii), 60.116b(e)(3)(iv), and 60.116b(f)(2)(iii).

[52 FR 11429, Apr. 8, 1987, as amended at 52 FR 22780, June 16, 1987]

Florida Department of
Environmental Protection

Memorandum

TO: Howard Rhodes

THROUGH: Clair Fancy

FROM: A. A. Linero

DATE: August 30, 2001

SUBJECT: United Technologies Corp.-Pratt & Whitney
DEP File No. 0990021-004-AC (PSD-FL-294)
LOX/Kerosene Rocket Engine Test Stand

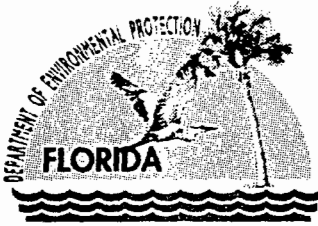
Attached for your review and approval is the final permit for the construction of a LOX/Kerosene Rocket Engine Test Stand at the subject facility near in Palm Beach County.

They will conduct 12 tests per year lasting 240 seconds each. The project is a major source of carbon monoxide (~ 1000 tons per year). CO emissions will be reduced by a high oxygen to fuel ratio. The water quenching to reduce noise should also minimize NOx formation.

They will conduct testing in daylight hours and gather ambient data on CO during test firing to verify modeled CO concentrations.

Based on extension requests submitted by Pratt & Whitney as well as the date we received proof of Pubic Notice, I calculate Day 90 as September 15. I recommend your approval and signature.

AAL/



Jeb Bush
Governor

Department of Environmental Protection

Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

David B. Struhs
Secretary

July 10, 2001

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Mr. John K. Sillan, Manager
Facilities Management
United Technologies Corp.-Pratt & Whitney
P.O. Box 109600
West Palm Beach, Florida 33410-9600

Re: DEP File No. 0990021-004-AC (PSD-FL-294)
LOX/Kerosene Rocket Engine Test Stand

Dear Mr. Sillan:

Enclosed is one copy of the modified draft air construction permit to construct a LOX/Kerosene Rocket Engine Test Stand located at 17900 Beeline Highway, near Jupiter, Palm Beach County, Florida. The revised Technical Evaluation and Preliminary Determination, the Department's Intent to Issue Air Construction Permit and the "Public Notice of Intent to Issue Air Construction Permit" are also included. These documents replace those issued on January 29.

The "Public Notice" must be published one time only, as soon as possible, in the legal advertisement section of a newspaper of general circulation in the area affected, pursuant to the requirements Chapter 50, Florida Statutes. Proof of publication, i.e., newspaper affidavit, must be provided to the Department's Bureau of Air Regulation office within seven days of publication. Failure to publish the notice and provide proof of publication may result in the denial of the permit.

Please submit any written comments you wish to have considered concerning the Department's proposed action to A. A. Linero, P.E., Administrator, New Source Review Section at the above letterhead address. If you have any other questions, please contact Mr. Linero at 850/921-9523.

Sincerely,

C. H. Fancy, P.E., Chief,
Bureau of Air Regulation

CHF/al

Enclosures

In the Matter of an
Application for Permit by:

John K. Sillan, Manager Facilities Management
United Technologies Corp.-Pratt & Whitney
P.O. Box 109600
West Palm Beach, Florida 33410-9600

DEP File No. 0990021-004-AC (PSD-FL-294)
LOX/Kerosene Rocket Engine Test Stand
Palm Beach County

INTENT TO ISSUE AIR CONSTRUCTION PERMIT

The Department of Environmental Protection (Department) gives notice of its intent to issue an air construction permit (copy of draft permit attached) for the proposed project, detailed in the application specified above and the enclosed Technical Evaluation and Preliminary Determination, for the reasons stated below. This Intent replaces a previous one issued on January 29, 2001.

The applicant, United Technologies Corp.-Pratt & Whitney, initially applied on June 20, 2000 to the Department for an air construction permit to construct a LOX/Kerosene Rocket Engine Test Stand to be located at 17900 Beeline Highway, Jupiter, Palm Beach County.

The Department has permitting jurisdiction under the provisions of Chapter 403, Florida Statutes (F.S.), and Florida Administrative Code (F.A.C.) Chapters 62-4, 62-210, and 62-212. The above actions are not exempt from permitting procedures. The Department has determined that an air construction permit is required to construct the project.

The Department intends to issue this air construction permit based on the belief that reasonable assurances have been provided to indicate that operation of these emission units will not adversely impact air quality, and the emission units will comply with all appropriate provisions of Chapters 62-4, 62-204, 62-210, 62-212, 62-296, and 62-297, F.A.C.

Pursuant to Section 403.815, F.S., and Rule 62-110.106(7)(a)1., F.A.C., you (the applicant) are required to publish at your own expense the enclosed Public Notice of Intent to Issue Air Construction Permit. The notice shall be published one time only in the legal advertisement section of a newspaper of general circulation in the area affected. Rule 62-110.106(7)(b), F.A.C., requires that the applicant cause the notice to be published as soon as possible after notification by the Department of its intended action. For the purpose of these rules, "publication in a newspaper of general circulation in the area affected" means publication in a newspaper meeting the requirements of Sections 50.011 and 50.031, F.S., in the county where the activity is to take place. If you are uncertain that a newspaper meets these requirements, please contact the Department at the address or telephone number listed below. The applicant shall provide proof of publication to the Department's Bureau of Air Regulation, at 2600 Blair Stone Road, Mail Station #5505, Tallahassee, Florida 32399-2400 (Telephone: 850/488-0114; Fax 850/ 922-6979). You must provide proof of publication within seven days of publication, pursuant to Rule 62-110.106(5), F.A.C. No permitting action for which published notice is required shall be granted until proof of publication of notice is made by furnishing a uniform affidavit in substantially the form prescribed in section 50.051, F.S. to the office of the Department issuing the permit. Failure to publish the notice and provide proof of publication may result in the denial of the permit pursuant to Rules 62-110.106(9) & (11), F.A.C.

The Department will issue the final permit with the attached conditions unless a response received in accordance with the following procedures results in a different decision or significant change of terms or conditions.

The Department will accept written comments and requests for public meetings concerning the proposed permit issuance action for a period of thirty (30) days from the date of publication of Public Notice of Intent to Issue Air Permit. Written comments and requests for public meetings should be provided to the Department's Bureau of Air Regulation at 2600 Blair Stone Road, Mail Station #5505, Tallahassee, FL 32399-2400. Any written comments filed shall be made available for public inspection. If written comments received result in a significant change in the proposed agency action, the Department shall revise the proposed permit and require, if applicable, another Public Notice.

The Department will issue the permit with the attached conditions unless a timely petition for an administrative hearing is filed pursuant to sections 120.569 and 120.57 F.S., before the deadline for filing a petition. The procedures for petitioning for a hearing are set forth below.

A person whose substantial interests are affected by the proposed permitting decision may petition for an administrative proceeding (hearing) under sections 120.569 and 120.57 of the Florida Statutes. The petition must contain the information set forth below and must be filed (received) in the Office of General Counsel of the Department at 3900 Commonwealth Boulevard, Mail Station #35, Tallahassee, Florida, 32399-3000. Petitions filed by the permit applicant or any of the parties listed below must be filed within fourteen days of receipt of this notice of intent. Petitions filed by any persons other than those entitled to written notice under section 120.60(3) of the Florida Statutes must be filed within fourteen days of publication of the public notice or within fourteen days of receipt of this notice of intent, whichever occurs first. Under section 120.60(3), however, any person who asked the Department for notice of agency action may file a petition within fourteen days of receipt of that notice, regardless of the date of publication. A petitioner shall mail a copy of the petition to the applicant at the address indicated above at the time of filing. The failure of any person to file a petition within the appropriate time period shall constitute a waiver of that person's right to request an administrative determination (hearing) under sections 120.569 and 120.57 F.S., or to intervene in this proceeding and participate as a party to it. Any subsequent intervention will be only at the approval of the presiding officer upon the filing of a motion in compliance with Rule 28-106.205 of the Florida Administrative Code.

A petition that disputes the material facts on which the Department's action is based must contain the following information: (a) The name and address of each agency affected and each agency's file or identification number, if known; (b) The name, address, and telephone number of the petitioner, the name, address, and telephone number of the petitioner's representative, if any, which shall be the address for service purposes during the course of the proceeding; and an explanation of how the petitioner's substantial interests will be affected by the agency determination; (c) A statement of how and when petitioner received notice of the agency action or proposed action; (d) A statement of all disputed issues of material fact. If there are none, the petition must so indicate; (e) A concise statement of the ultimate facts alleged, including the specific facts the petitioner contends warrant reversal or modification of the agency's proposed action; (f) A statement of the specific rules or statutes the petitioner contends require reversal or modification of the agency's proposed action; and (g) A statement of the relief sought by the petitioner, stating precisely the action petitioner wishes the agency to take with respect to the agency's proposed action.

A petition that does not dispute the material facts upon which the Department's action is based shall state that no such facts are in dispute and otherwise shall contain the same information as set forth above, as required by Rule 28-106.301.

Because the administrative hearing process is designed to formulate final agency action, the filing of a petition means that the Department's final action may be different from the position taken by it in this notice. Persons whose substantial interests will be affected by any such final decision of the Department on the application have the right to petition to become a party to the proceeding, in accordance with the requirements set forth above. Mediation is not available in this proceeding.

In addition to the above, a person subject to regulation has a right to apply for a variance from or waiver of the requirements of particular rules, on certain conditions, under Section 120.542 F.S. The relief provided by this state statute applies only to state rules, not statutes, and not to any federal regulatory requirements. Applying for a variance or waiver does not substitute or extend the time for filing a petition for an administrative hearing or exercising any other right that a person may have in relation to the action proposed in this notice of intent.

The application for a variance or waiver is made by filing a petition with the Office of General Counsel of the Department, 3900 Commonwealth Boulevard, Mail Station #35, Tallahassee, Florida 32399-3000. The petition must specify the following information: (a) The name, address, and telephone number of the petitioner; (b) The name, address, and telephone number of the attorney or qualified representative of the petitioner, if any; (c) Each rule or portion of a rule from which a variance or waiver is requested; (d) The citation to the statute underlying (implemented by) the rule identified in (c) above; (e) The type of action requested; (f) The specific facts that would justify a variance or waiver for the petitioner; (g) The reason why the variance or waiver would serve the purposes of the underlying statute (implemented by the rule); and (h) A statement whether the variance or waiver is permanent or temporary and, if temporary, a statement of the dates showing the duration of the variance or waiver requested.

The Department will grant a variance or waiver when the petition demonstrates both that the application of the rule would create a substantial hardship or violate principles of fairness, as each of those terms is defined in Section 120.542(2) F.S., and that the purpose of the underlying statute will be or has been achieved by other means by the petitioner.

Persons subject to regulation pursuant to any federally delegated or approved air program should be aware that Florida is specifically not authorized to issue variances or waivers from any requirements of any such federally delegated or approved program. The requirements of the program remain fully enforceable by the Administrator of the EPA and by any person under the Clean Air Act unless and until the Administrator separately approves any variance or waiver in accordance with the procedures of the federal program.

Executed in Tallahassee, Florida.



C. H. Fancy, P.E., Chief
Bureau of Air Regulation

CERTIFICATE OF SERVICE

The undersigned duly designated deputy agency clerk hereby certifies that this Intent to Issue Air Construction Permit (including the Public Notice, Technical Evaluation and Preliminary Determination, Draft Best Available Control Technology Determination, and the Draft permit) was sent by certified mail (*) and copies were mailed by U.S. Mail before the close of business on 7/10/01 to the person(s) listed:

John K. Sillan*
Benny Susi, P.E., Golder Associates
Isidore Goldman, SED

Darrel Graziani, PBCHD
Gregg Worley, EPA
John Bunyak, NPS

Clerk Stamp

FILING AND ACKNOWLEDGMENT FILED,
on this date, pursuant to §120.52, Florida Statutes,
with the designated Department Clerk, receipt of
which is hereby acknowledged.

Charlotte J. Hayes 7/10/01
(Clerk) (Date)

PUBLIC NOTICE OF INTENT TO ISSUE AIR CONSTRUCTION PERMIT

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION

DEP File No. 0990021-004-AC (PSD-FL-294)

United Technologies Corp.-Pratt & Whitney
LOX/Kerosene Rocket Engine Test Stand
Palm Beach County

The Department of Environmental Protection (Department) gives notice of its intent to issue an air construction permit to United Technologies Corp.-Pratt & Whitney for construction of a LOX/Kerosene Rocket Engine Test Stand located at 17900 Beeline Highway, near Jupiter, Palm Beach County. A Best Available Control Technology (BACT) determination was required for emissions of carbon monoxide (CO) pursuant to Rule 62-212.400, F.A.C., Prevention of Significant Deterioration (PSD). The applicant's mailing address is: United Technologies Corp.-Pratt & Whitney, Post Office Box 109600, West Palm Beach, Florida 33410-9600.

Emissions of CO are estimated to be approximately 1,000 tons per year. These emissions shall be restricted by limiting fuel usage to 318,000 gallons per year, test firings to 12 per year, and duration of firings to 240 seconds each. The minimum oxidant to fuel ratio will be 2.72 pounds of oxygen per ton of fuel. The Department will require the applicant to establish and operate an ambient air quality monitoring program.

An air quality impact analysis was conducted. Emissions from the facility will not significantly contribute to or cause a violation of any state or federal ambient air quality standards or PSD increment.

The Department will issue the final permit with the attached conditions unless a response received in accordance with the following procedures results in a different decision or significant change of terms or conditions.

The Department will accept written comments and requests for public meetings concerning the proposed permit issuance action for a period of thirty (30) days from the date of publication of this Public Notice of Intent to Issue Air Construction Permit. Written comments and requests for public meetings should be provided to the Department's Bureau of Air Regulation at 2600 Blair Stone Road, Mail Station #5505, Tallahassee, FL 32399-2400. Any written comments filed shall be made available for public inspection. If written comments received result in a significant change in the proposed agency action, the Department shall revise the proposed permit and require, if applicable, another Public Notice.

The Department will issue the permit with the attached conditions unless a timely petition for an administrative hearing is filed pursuant to sections 120.569 and 120.57 F.S., before the deadline for filing a petition. The procedures for petitioning for a hearing are set forth below. Mediation is not available in this proceeding.

A person whose substantial interests are affected by the proposed permitting decision may petition for an administrative proceeding (hearing) under sections 120.569 and 120.57 of the Florida Statutes. The petition must contain the information set forth below and must be filed (received) in the Office of General Counsel of the Department at 3900 Commonwealth Boulevard, Mail Station #35, Tallahassee, Florida, 32399-3000. Petitions filed by the permit applicant or any of the parties listed below must be filed within fourteen days of receipt of this notice of intent. Petitions filed by any persons other than those entitled to written notice under section 120.60(3) of the Florida Statutes must be filed within fourteen days of publication of the public notice or within fourteen days of receipt of this notice of intent, whichever occurs first. Under section 120.60(3), however, any person who asked the Department for notice of agency action may file a petition within fourteen days of receipt of that notice, regardless of the date of

NOTICE TO BE PUBLISHED IN THE NEWSPAPER

publication. A petitioner shall mail a copy of the petition to the applicant at the address indicated above at the time of filing. The failure of any person to file a petition within the appropriate time period shall constitute a waiver of that person's right to request an administrative determination (hearing) under sections 120.569 and 120.57 F.S., or to intervene in this proceeding and participate as a party to it. Any subsequent intervention will be only at the approval of the presiding officer upon the filing of a motion in compliance with Rule 28-106.205 of the Florida Administrative Code.

A petition that disputes the material facts on which the Department's action is based must contain the following information: (a) The name and address of each agency affected and each agency's file or identification number, if known; (b) The name, address, and telephone number of the petitioner, the name, address, and telephone number of the petitioner's representative, if any, which shall be the address for service purposes during the course of the proceeding; and an explanation of how the petitioner's substantial interests will be affected by the agency determination; (c) A statement of how and when petitioner received notice of the agency action or proposed action; (d) A statement of all disputed issues of material fact. If there are none, the petition must so indicate; (e) A concise statement of the ultimate facts alleged, including the specific facts the petitioner contends warrant reversal or modification of the agency's proposed action; (f) A statement of the specific rules or statutes the petitioner contends require reversal or modification of the agency's proposed action; and (g) A statement of the relief sought by the petitioner, stating precisely the action petitioner wishes the agency to take with respect to the agency's proposed action.

A petition that does not dispute the material facts upon which the Department's action is based shall state that no such facts are in dispute and otherwise shall contain the same information as set forth above, as required by rule 28-106.301

Because the administrative hearing process is designed to formulate final agency action, the filing of a petition means that the Department's final action may be different from the position taken by it in this notice. Persons whose substantial interests will be affected by any such final decision of the Department on the application have the right to petition to become a party to the proceeding, in accordance with the requirements set forth above.

A complete project file is available for public inspection during normal business hours, 8:00 a.m. to 5:00 p.m., Monday through Friday, except legal holidays, at:

Dept. of Environmental Protection Bureau of Air Regulation Suite 4, 111 S. Magnolia Drive Tallahassee, FL 32301 Telephone: 850/488-0114 Fax: 850/922-6979	Palm Beach County Health Dept. Env. Science & Engineering Div. 901 Evernia Street West Palm Beach, FL 33401 Telephone: 561/355-3070 Fax: 561/355-2442	Dept. of Environmental Protection Southeast District Office 400 North Congress Avenue West Palm Beach, FL 33416-5425 Telephone: 561/681-6600 Fax: 561/681-6755
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The complete project file includes the application, technical evaluations, draft permit, and the information submitted by the responsible official, exclusive of confidential records under Section 403.111, F.S. Interested persons may contact the Administrator, New Source Review Section at 111 South Magnolia Drive, Suite 4, Tallahassee, FL 32301 or call 850/488-0114 for additional information. The Department's Intent to Issue and related documents can also be viewed at <http://www8.myflorida.com/licensingpermitting/learn/environment/air/airpermit.html>

TECHNICAL EVALUATION
AND
PRELIMINARY DETERMINATION

United Technologies Corp.-Pratt & Whitney

LOX/Kerosene Rocket Engine Test Stand
Palm Beach County

DEP File No. 0990021-004-AC
PSD-FL-294

Department of Environmental Protection
Division of Air Resources Management
Bureau of Air Regulation

Month Day, 2001

TECHNICAL EVALUATION/PRELIMINARY DETERMINATION

1. APPLICATION INFORMATION

Applicant Name and Address

United Technologies Corp.-Pratt & Whitney
17900 Beeline Highway (SR 710)
Jupiter, Florida 33478

Authorized Representative: John K. Sillan, Manager Facilities Management

Application Review Schedule

Date of Receipt of Application	06-20-00
First Request for Additional Information	07-19-00
Final Request for Additional Information	10-01-00
Date Application Complete	10-09-00
Waiver of Processing Clock by 30 days	12-19-00
Intent Issued	01-29-01
Intent Re-issued	06-21-01

2. FACILITY INFORMATION

Facility Location

The existing facility is located at 17900 Beeline Highway (SR 710) near Jupiter, Palm Beach County. The proposed LOX/Kerosene Rocket Test Stand will be located at the E-5 rocket test area. The facility is located more than 100 kilometers (62 miles) from the nearest PSD Class I area, Everglades National Park. The UTM coordinates of the site are Zone 17, 567.3 km East and 2974.4 km North.

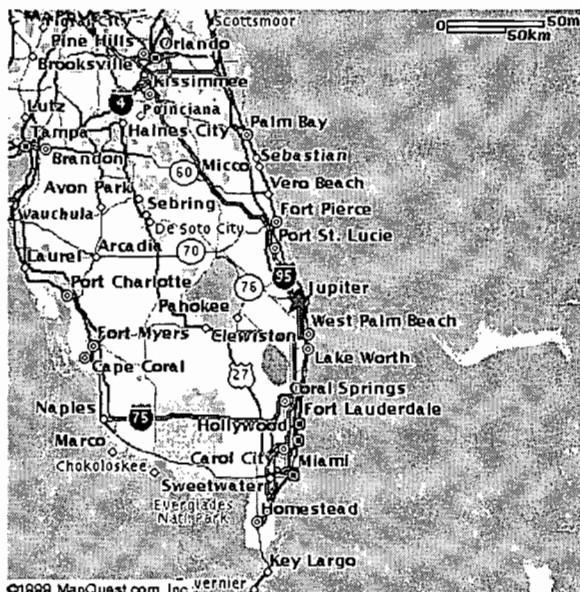


Figure 1 – Jupiter, Florida

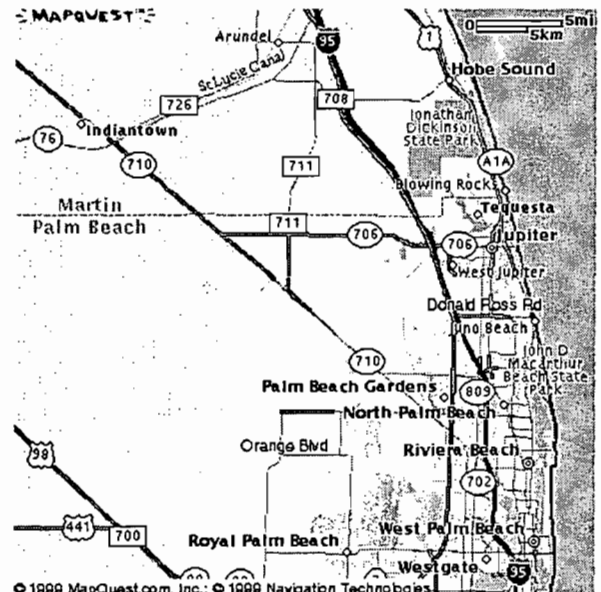


Figure 2 – Site - SR 710 and CR 711

TECHNICAL EVALUATION/PRELIMINARY DETERMINATION

Standard Industrial Classification Codes (SIC)

Major Group Number	37	Transportation Equipment
Group Numbers	372	Aircraft and Parts
	376	Guided Missile and Space Vehicles and Parts
Industry Numbers	3724	Aircraft Engines and Engine Parts
	3764	Guided Missile and Space Vehicle Propulsion Units and Propulsion Unit Parts

Facility Description

The facility is engaged in research and development as well as manufacturing activities associated with gas turbine and rocket engines. Gas turbine engine operations include the engineering, manufacturing, and testing of prototype parts and engines. Rocket engine operations include the engineering, manufacturing, and testing of prototype and commercial engines. A Materials Laboratory that develops and tests new materials supports both engine group operations.

Area Designations

The facility is located within an area that is currently designated as attainment for the pollutant's ozone, carbon monoxide, sulfur dioxide, and nitrogen dioxide; and unclassifiable for the pollutants lead and PM₁₀ (Particulate Matter less than 10 micrometers in diameter). The area is further designated as a maintenance area for the pollutant ozone and a PSD Class II area.

Facility Classifications

Preconstruction Review Programs: The facility is classified as an existing "Major Source" under the Prevention of Significant Deterioration (PSD) program with potential emissions of Carbon Monoxide (CO), Oxides of Nitrogen (NO_x), and Sulfur Dioxide (SO₂) greater than 250 tons per year. The facility is not on the list of the 28 Major Facility Categories (Table 62-212.400-1, F.A.C.).

Hazardous Air Pollutant (HAP) Programs: The facility is classified as an existing "Major Source" under the Section 112 of the Clean Air Act (CAA) with potential emissions of total HAPs greater than 25 tons per year. In addition, the facility includes the following regulated and source category activities:

- 40 CFR Part 63, Subpart T, Halogenated Solvent Cleaners;
- 40 CFR Part 63, Subpart GG, Aerospace Manufacturing and Rework Facilities; and
- Source Categories: Combustion Turbines, Engine Test Firing; Industrial/Commercial/Institutional Boilers; Miscellaneous Metal Parts And Products; Paint Stripping Operations; Reciprocating Internal Combustion Engines; Rocket Engine Test Firing; and Site Remediation.

TECHNICAL EVALUATION/PRELIMINARY DETERMINATION

New Source Performance Standards: The facility operates several emission units subject to the following standards:

- 40 CFR Part 60, Subpart Kb, Standards of Performance for Volatile Organic Liquid Storage Vessels (Including Petroleum Liquid Storage Vessels) for Which Construction, Reconstruction, or Modification Commenced After July 23, 1984; and
- 40 CFR Part 60, Subpart Dc, Standards of Performance for Small Industrial/Commercial/Institutional Boilers.

Title V Operating Permit Program: The facility is classified as a "Major Source" under the Title V program based on potential emissions of CO, NO_x, SO₂, Particulate Matter (PM), and Volatile Organic Compound (VOC) greater than 100 tons per year and total HAP emissions greater than 25 tons per year.

Facility Emissions

The facility's current potential emissions, based on the initial Title V permit application include the following:

Pollutant	PTE (Tons Per Year)
Oxides Of Nitrogen (NO _x)	1,756
Sulfur Dioxide (SO ₂)	571
Carbon Monoxide (CO)	389
Volatile Organic Compounds (VOC)	152
Particulate Matter (PM)	121
Total HAPs	43

3. PROJECT DESCRIPTION

Background

On June 20, 2000, the applicant applied for an air construction permit for the expansion of its existing rocket engine operations. The proposed project includes the construction and operation of a LOX/Kerosene Rocket Engine Stand at its existing facility in West Palm Beach. This project will consist of liquid oxygen and fuel storage tanks (64,000 and 36,000 gallon capacities), an engine containment can, a water-cooled silencer, an exhaust gas deflector, a lined cooling water retention pond, and an elevated 1-million gallon water supply tank.

TECHNICAL EVALUATION/PRELIMINARY DETERMINATION

Emissions Units:

The proposed project includes the addition of the following emissions units at the site:

EMISSION UNIT NO.	EMISSION UNIT DESCRIPTION
075	LOX/Kerosene Rocket Engine Test Stand ⁽¹⁾
076	Kerosene Fuel Storage Tank
Note: ⁽¹⁾ The EPA has determined that emissions from Rocket Firing at Test Stands are considered point source emissions; June 9, 1988	

Emissions

The potential emissions associated with the proposed project were estimated by the applicant using the "NASA Combustion Deck TEP" model and emission factors for flares from AP-42. The predicted short-term and annual emissions associated with 12 test firings per year and a duration of 240 seconds per test are as follows:

Pollutant	CO	CO ₂	H ₂	VOC	PM	SO _x	NO _x
lb/sec	694.4	1,366.0	17.1	2.0	1.6	<1	0.97
TPY	1,000.0	1,967.0	24.7	2.9	2.3	1.4	1.4

Classification

Preconstruction Review Programs: The proposed project is classified as a major modification at an existing major source of air pollution. Based on the potential emissions of CO, the proposed project is subject to the requirements of Rule 62-212.400, F.A.C., Prevention of Significant Deterioration.

Hazardous Air Pollutant (HAP) Programs: The U.S. EPA is currently developing a National Emission Standard for Hazardous Air Pollutants (NESHAP) for Rocket Engine Test Firing under Section 112 of the Clean Air Act and will propose such standards in the future. Until a NESHAP is proposed, the Department is required by its rules to develop a case-by-case determination of Maximum Achievable Control Technology (MACT) determination for new major sources of HAPs.

Potential emissions of HAPs have not been quantified, but are expected to be less than 10 tons per year and total HAPs less than 25 tons per year based on the applicant's estimates of PM and VOC emissions. As such, a case-by-case MACT determination was not required for the project at this time. The Department reserves the right to re-address HAPs should better emissions data become available or upon promulgation of the Rocket Engine Test Firing NESHAP.

New Source Performance Standards: The proposed project is not subject to any standards adopted under Section 111 of the CAA.

Title V Operating Permit Program: The proposed project will require a revision to the Title V operating permit upon completion of construction and a demonstration of compliance.

TECHNICAL EVALUATION/PRELIMINARY DETERMINATION

4. RULE APPLICABILITY

The proposed project is subject to pre-construction review and permitting requirements under the provisions of Chapter 403, Florida Statutes, and Chapters 62-4, 62-204, 62-210, 62-212, 62-296, and 62-297 of the Florida Administrative Code (F.A.C.). This facility is located in Palm Beach County, an area designated as a PSD area for the pollutant Carbon Monoxide in accordance with Rule 62-204.360, F.A.C.

The proposed project is subject to Rule 62-212.400, F.A.C., Prevention of Significant Deterioration (PSD), for CO and is also subject to reporting and record keeping requirements of 40 C.F.R. 60.116b for the kerosene fuel storage tank.

Federal PSD requirements are contained in the CFR, Title 40, Part 52.21. Florida has adopted PSD regulations (Rule 62-212.400, F.A.C.) that are essentially the same as the federal regulations. Florida's State Implementation Plan (SIP), which contains PSD regulations, has been approved by EPA; therefore, PSD approval authority has been granted to DEP. PSD regulations require that all new major stationary facilities or major modifications to existing major facilities, which emit air pollutants regulated under the Clean Air Act (CAA), must be reviewed and a permit issued before the commencement of construction.

The control technology review requirements of the federal and state PSD regulations require that all applicable federal and state emission-limiting standards be met, and that Best Available Control Technology (BACT) be applied to control emissions from the source (Rule 62-212.400, (5)(c), F.A.C.). The BACT requirements are applicable to all regulated pollutants for which the increase in emissions from the facility or modification exceeds the significant emission rate.

BACT is defined in 52.21 (b)(12) and Rule 62-210.200, F.A.C., as: "An emissions limitation (including a visible emission standard) based on the maximum degree of reduction of each pollutant subject to regulation under the Act which would be emitted by any proposed major stationary source or major modification which the Administrator, on a case-by-case basis, taking into account energy, environmental, and economic impacts, and other costs, determines is achievable through application of production processes and available methods, systems, and techniques (including fuel cleaning or treatment or innovative fuel combustion techniques) for control of such pollutant.

In no event shall application of best available control technology result in emissions of any pollutant, which would exceed the emissions allowed by any applicable standard under 40 CFR Parts 60 and 61. If the Administrator determines that technological or economic limitations on the application of measurement methodology to a particular part of a source or facility would make the imposition of an emission standard infeasible, a design, equipment, work practice, operational standard or combination thereof, may be prescribed instead to satisfy the requirement for the application of BACT. Such standard shall, to the degree possible, set forth the emissions reductions achievable by implementation of such design, equipment, work practice, or operation and shall provide for compliance by means which achieve equivalent results."

TECHNICAL EVALUATION/PRELIMINARY DETERMINATION

The postconstruction monitoring requirements (Rule 62-212.400(5)(g), F.A.C.) of the state PSD regulations allow the Department to require the owner to conduct air quality monitoring and provide the data to the Department if the Department finds that such monitoring is necessary to determine the effect that emissions from the project are having on air quality in any area.

The emission units affected by this permit shall comply with all applicable provisions of the Florida Administrative Code (including applicable portions of the Code of Federal Regulations incorporated therein) and, specifically, the following Chapters and Rules:

Chapter 62-4	Permits.
Rule 62-204.220	Ambient Air Quality Protection
Rule 62-204.240	Ambient Air Quality Standards
Rule 62-204.800	Federal Regulations Adopted by Reference (40CFR60 in Particular)
Rule 62-210.300	Permits Required
Rule 62-210.350	Public Notice and Comments
Rule 62-210.370	Reports
Rule 62-210.550	Stack Height Policy
Rule 62-210.650	Circumvention
Rule 62-210.700	Excess Emissions
Rule 62-210.900	Forms and Instructions
Rule 62-212.300	General Pre-construction Review Requirements
Rule 62-212.400	Prevention of Significant Deterioration (including BACT & Postconstruction Monitoring)
Rule 62-213	Operation Permits for Major Sources of Air Pollution
Rule 62-296.320	General Pollutant Emission Limiting Standards
Rule 62-297.310	General Test Requirements
Rule 62-297.401	Compliance Test Methods

5. PROJECT ANALYSIS

The Department's analysis of the proposed project included review of the permit application, the emissions units, the emissions estimates and methodologies, the applicable regulations, the air quality control strategy, and the ambient air quality data and potential impacts of the proposed project. The results of the Department's analyses on the air quality control strategy and ambient air quality impact analyses are presented below.

Air Quality Control Strategy – Carbon Monoxide

The applicant has requested that the Department's BACT determination for CO emissions require no add-on control equipment due to prohibitive cost and impracticability of controlling such a large exhaust stream. Instead, the applicant proposed that the BACT requirements focus on combustion control by way of adjusting the oxygen to fuel ratio to maximize combustion efficiency thus reducing CO emissions, limiting test duration to no longer than 240 seconds per test, and limiting testing to no more than 12 tests per year.

TECHNICAL EVALUATION/PRELIMINARY DETERMINATION

The applicant's BACT evaluation referred to a Russian rocket test stand that employed a water injection and ducting system solely for the purpose of avoiding heat detection by surveillance satellites during the Cold-War era. According to the applicant, the Russian test stand was not designed as an emission control system and should not be considered as any sort of exemplary emission control system. This is the only rocket test stand known to have any equipment that could be construed as add-on controls.

The molar concentration of the rocket engine exhaust gases was estimated to contain approximately 23% CO, 28% CO₂, 8% H₂ and 41% H₂O vapor by the applicant using the TEP model. The applicant reported that kerosene rocket engines fire a fuel rich mixture for heat control flexibility, firing approximately 82% of the theoretical O₂ required for complete combustion. Consequently, CO emissions from engines of this type are very high compared to combustion turbines and other sources that burn fuel for purposes of energy transfer or conversion to steam or power. At the same time, use of liquid oxygen reduces the availability of atmospheric nitrogen for participation in NO_x formation.

Add-on Controls – Incineration: The applicant reported that if CO oxidation technology from the gas turbine industry was considered, differences in exhaust concentrations will affect the design and costs for adaptation to rocket engines. Turbine exhaust oxidation technology applied to a rocket engine test stand will result in greater costs due to the severity of the exhaust conditions. Estimates provided by the applicant indicate that a conventional incinerator would cost about 579 million dollars with an annualized cost of about 68 million. An additional 100 million would be required, according to the applicant, to construct an appropriate infrastructure for a control device designed to withstand the maximum thrust and high temperatures of the rocket engine exhaust.

BACT-Determination: Details of the Department's BACT determination are given in the separate Draft BACT Determination issued concurrently with this evaluation. The Department does not necessarily accept the cost estimates of \$579,000,000 with annualized costs of \$68,000,000 for add-on emissions control or the \$100,000,000 infrastructure cost estimate. However, the Department agrees with the applicants finding that existing oxidation technology is not feasible at this time. As a result, the Department has preliminarily proposed BACT for the rocket engine test stand to be a visible emissions limitation of forty (40) percent opacity and the following work practices:

- Carbon Monoxide (CO) Emissions – Rocket engine test firings shall not result in CO emissions greater than 41.5 tons per minute (2-minute average), 83 tons per 8-hour period, and 1,000 tons per year (12-month rolling total) as determined using the NASA-Lewis chemical equilibrium computer program or equivalent method approved by the Department.
- Test Stand - The test stand shall be constructed in accordance with the design specifications provided within the application including a Water Cooled Silencer and an Exhaust Gas Deflector with a Minimum height of 70 feet, maximum distance from Water Cooled Silencer of 100 feet. The surface between the water-cooled silencer and the exhaust gas deflector shall be paved.

TECHNICAL EVALUATION/PRELIMINARY DETERMINATION

- Test Duration – Rocket engine test firings shall not exceed a total 240 seconds per 8-hour period
- Test Firings – Rocket engine test firings shall not exceed 2,880 seconds per year (12-month rolling total);
- Oxidant/Fuel Ratio – All rocket engine test firings shall be conducted at a minimum oxidant/fuel ratio of 2.72 lb. O₂/lb. Fuel. *↔ Over the length of the test*
- Fuel Usage – Rocket engine test firings shall not consume more than 6,625 gallons per minute (4-minute average), 26,500 gallons per 8-hour period, and 318,000 gallons per year (12-month rolling total).
- Quench Water - All rocket engine test firings shall be conducted with sufficient quench water to minimize NO_x formation. *Quench.*
- Fuel and Oxidizer Types - Rocket engine test firings shall be limited to the firing of kerosene as the fuel and liquid oxygen (LOX) as the oxidizer.
- Test Conditions – Rocket engine test firings shall be restricted to daylight hours (1 hour after sunrise and 1 hour prior to sunset) and only under ambient conditions that provide good dispersion of the exhaust gases in accordance with a Test Plan to be submitted to the Palm Beach County Health Department (PBCHD) for approval prior to the initial test. Non-daylight hour testing maybe approved on a case-by-case basis by the Palm Beach County Health Department (PBCHD).
- Test Notifications – At least 24 hours prior to a rocket engine test firing, notification shall be provided to the PBCHD. The notification shall include the date and time of the test firing, the expected duration of the test firing, the planned oxidant/fuel ratio, and the planned fuel usage rate. In the event that an upset occurs during a test (i.e., test duration > 240 seconds, O/F ratio less than 2.72, fuel usage > 13,250 gpm, a flame out, etc.), a written excess emissions report shall be provided to the PBCHD within 24 hours of the test. The report shall identify the upset and impacts.
- Postconstruction Monitoring – The permittee shall, prior to any rocket engine test firings, establish an ambient air quality monitoring program to measure ambient air concentrations of CO before, during, and after a rocket engine test firing. The Program shall be approved by the Palm Beach County Health Department (PBCHD) and may be discontinued upon written request and PBCHD approval.
- Oxygen Injection Study – Within one year of initial issuance of this permit, the permittee shall complete and submit to the Department an engineering and cost study evaluating the technical feasibility and cost effectiveness of direct O₂ injection for reducing CO emissions in the exhausts of rocket engines tested at the permittee's facility. The study shall evaluate possibilities for direct O₂ injection including a heat-shielded, internally-cooled oxygen lance for injecting stoichiometric rates of oxygen into the exhaust downstream of the engine. Appropriate kinetic modeling shall be utilized to predict the oxidation reaction rates and overall CO conversion for various configurations of the injection apparatus and various injection locations and methods.

TECHNICAL EVALUATION/PRELIMINARY DETERMINATION

- Compliance Demonstrations – Compliance with the visible emissions limitation shall be demonstrated initially for each new oxidant/fuel ratio and annually thereafter. Compliance with the CO emissions limitation shall be demonstrated initially and continuously thereafter through the use of the NASA Lewis chemical equilibrium computer program or its equivalent as approved by the Department or Palm Beach County Health Department and the ambient air quality monitoring program.
- Excess Emissions - Excess emissions shall be allowed provided the permittee demonstrates that the emissions did not result in any of the following:
 1. a predicted ambient impact greater than the National Ambient Air Quality Standards (NAAQS) for CO after adjustment based on the ambient monitoring program;
 2. a significant emissions increase in a PSD Pollutant; or
 3. emissions of a hazardous air pollutant in an amount of 10 tons per year or greater individually or 25 tons per year or greater collectively.

Air Quality Impacts

The proposed project will increase CO emissions at a level in excess of PSD significant amounts. The air quality impact analyses required by the PSD regulations for this pollutant include:

- An analysis of existing air quality;
- A significant impact analysis;
- An Ambient Air Quality Standards (AAQS) analysis; and
- An analysis of impacts on soils, vegetation, and visibility and of growth-related air quality modeling impacts.

The analysis of existing air quality generally relies on preconstruction monitoring data collected with EPA-approved methods. The significant impact and AAQS analyses depend on air quality dispersion modeling carried out in accordance with EPA guidelines.

Based on the required analyses, the Department has reasonable assurance that the proposed project, as described in this report and subject to the conditions of approval proposed herein, will not cause or significantly contribute to a violation of any AAQS or PSD increment. A discussion of the required analyses follows.

Analysis of Existing Air Quality: Preconstruction ambient air quality monitoring is required for all pollutants subject to PSD review unless otherwise exempted or satisfied. This monitoring requirement may be satisfied by using previously existing representative monitoring data, if available. An exemption to the monitoring requirement may be obtained if either of the following conditions is met: the maximum predicted air quality impact resulting from the projected emissions increase, as determined by air quality modeling, is less than a pollutant-specific de minimus concentration, or the existing ambient concentrations are less than a pollutant-specific de minimus concentration. If preconstruction ambient monitoring is exempted, determination of background concentrations for PSD significant pollutants with established AAQS may still be necessary for use in any required AAQS analysis. These

TECHNICAL EVALUATION/PRELIMINARY DETERMINATION

concentrations may be established from the required preconstruction ambient air quality monitoring analysis or from the existing representative monitoring data. These background ambient air quality concentrations are added to pollutant impacts predicted by modeling.

For this project, the maximum eight-hour CO impacts from the project were predicted to be 627 ug/m³, which is greater than the de minimus level of 575 ug/m³; therefore, preconstruction monitoring is required. However, the applicant requested that the previously existing monitoring data from monitors located in West Palm Beach be considered as representative. The Department agreed with the applicant's request and allowed the data to be used to satisfy the preconstruction monitoring requirement and to establish a background concentration for use in the required AAQS analysis.

Models and Meteorological Data Used In Significant Impact, PSD Increment And AAQS Analyses: The applicant used the EPA-approved Industrial Source Complex Short-Term (ISCST3) dispersion model to evaluate the pollutant emissions from the proposed project and other existing major facilities. The model determines ground-level concentrations of inert gases or small particles emitted into the atmosphere by point, area, and volume sources. The model incorporates elements for plume rise, transport by the mean wind, Gaussian dispersion, and pollutant removal mechanisms such as deposition. The ISCST3 model allows for the separation of sources, building wake downwash, and various other input and output features. A series of specific model features, recommended by the EPA, are referred to as the regulatory options. The applicant used the EPA recommended regulatory options in each modeling scenario. Direction-specific downwash parameters were used for all sources for which downwash was considered. The stacks associated with this project all satisfy the good engineering practice (GEP) stack height criteria.

Meteorological data used in the ISCST3 model consisted of a concurrent 5-year period of hourly surface weather observations and twice-daily upper air soundings from the National Weather Service (NWS) station at West Palm Beach, Florida. The 5-year period of meteorological data was from 1987 through 1991. This NWS station was selected for use in the study because it is the closest primary weather station to the study area and is most representative of the project site. The surface observations included wind direction, wind speed, temperature, cloud cover, and cloud ceiling.

For this project, only the impacts of CO emissions are being evaluated. Since the CO standards are based on short-term averages and five years of data were used in ISCST3, the highest-second-high (HSH) short-term predicted concentrations were compared with the appropriate AAQS. For determining the project's significant impact area in the vicinity of the facility, the highest short-term predicted concentrations were compared to their respective significant impact levels.

Significant Impact Analysis: Initially, the applicant conducted modeling to determine whether the proposed project's CO emissions were predicted to have a significant impact in the vicinity of the facility. The applicant placed over 950 receptors along the site boundary and out to 35 km from the facility. The table below shows the results of this modeling. The radius of significant impact is also shown. The EPA has not established PSD Class I or II increments for CO.

TECHNICAL EVALUATION/PRELIMINARY DETERMINATION

Maximum Project Air Quality Impact for Comparison With the PSD Class II Significant Impact Level in the Vicinity of the Facility

Averaging Time	Maximum Predicted Impact (ug/m3)	Significant Impact Level (ug/m3)	Significant Impact?	Radius of Significant Impact (km)
8-HOUR	627	500	YES	35
1-HOUR	5,012	2,000	YES	35

As shown in the tables the maximum predicted air quality impacts due to CO emissions from the proposed project are greater than the PSD significant impact levels in the vicinity of the facility. Therefore, the applicant was required to do full impact CO modeling in the vicinity of the facility, within the applicable significant impact area, to determine the impacts of the project along with all other sources in the vicinity of the facility. The significant impact area is based upon the predicted radius of significant impact. Full impact modeling is modeling that considers not only the impact of the project but the impacts of the existing facility and other sources, including background concentrations, located within the vicinity of the project to determine whether all increments or AAQS are predicted to be met.

Procedure for Performing AAQS Analyses: For the AAQS analyses, receptor grids normally are based on the size of the significant impact area for each pollutant. The size of the significant impact areas for the required CO analysis were based on a 35 km radius of significant impact. The results of the CO AAQS analysis are summarized in the table below. As shown in this table, emissions from the proposed facility are not expected to cause or significantly contribute to a violation of any AAQS.

Ambient Air Quality Impacts

Averaging Time	Modeled Sources Impact (ug/m ³)	Background Conc. (ug/m ³)	Maximum Predicted Impact (ug/m ³)	AAQS (ug/m ³)	Predicted Impact Greater Than AAQS?
8-hour	5,823	3,450	9,267	10,000	NO
1-hour	11,009	5,777	16,786	40,000	NO

Additional Impacts Analysis - Impacts On Soils, Vegetation, Wildlife, and Visibility: The maximum ground-level concentrations predicted to occur due to CO emissions as a result of the proposed project, including all other nearby sources, will be below the associated AAQS which are designed to protect both the public health and welfare. This project will not have a harmful impact on soils and vegetation in the PSD Class II area in the vicinity of the facility.

TECHNICAL EVALUATION/PRELIMINARY DETERMINATION

Additional Impacts Analysis Growth-Related Air Quality Impacts: There will be no growth associated with this project.

Postconstruction Monitoring: The maximum ground level concentration was predicted to be within 90 percent of the AAQS using the available ambient monitoring data, the existing source inventory, the estimated emissions from the rocket engine test firing, and the ISCST3 dispersion model. Although the ISCST3 dispersion model is the default regulatory model, its application to short-term release scenarios is limited. In addition, the emission estimates for the rocket engine test firing are based on theoretical calculations and may vary significantly. For these reasons and the very high concentration of CO predicted within the rocket engine exhaust gases, the Department will require the applicant to establish an air monitoring program to monitor CO concentrations down wind of the test stand in accordance with Rule 62-212.400(5)(g), F.A.C.

The monitoring program shall be established prior to the initial test firing and shall provide for the collection of data for a minimum of four (4) test firings, one in each calendar quarter. The program will allow the applicant to discontinue monitoring upon approval of the PBCHD during extended periods when testing is not scheduled.

6. CONCLUSION

Based on information provided by the applicant, supplemented by other information available to the Department, the restriction within the draft permit and BACT Determination, the Department has reasonable assurance that the proposed project will not cause a violation of any air quality standard or PSD increment.

APPENDIX BD - DETERMINATION OF
BEST AVAILABLE CONTROL TECHNOLOGY (BACT)

United Technologies Corp.- Pratt & Whitney
LOX/Kerosene Rocket Engine Stand Project
Palm Beach County

DEP File No. 0990021-004-AC
PSD-FL-294

Department of Environmental Protection
Division of Air Resources Management
Bureau of Air Regulation

Month Day, 2001

APPENDIX BD - BACT DETERMINATION

United Technologies Corp. – Pratt & Whitney LOX/Kerosene Rocket Engine Stand Project Palm Beach County

United Technologies Corp.- Pratt & Whitney (UTC-P&W) proposes to construct a Liquid Oxygen (LOX)/Kerosene Rocket Engine Test Stand at the E-5 rocket test area located at 17900 Beeline Highway (SR 710) near Jupiter, Palm Beach County.

The proposed project will result in a significant emissions increase of carbon monoxide (CO) according to Table 212.400-2, Florida Administrative Code (F.A.C.). The project is therefore subject to review for Prevention of Significant Deterioration (PSD) and a determination of Best Available Control Technology (BACT) in accordance with Rule 62-212.400, F.A.C.

The details of PSD applicability and a description of the process are presented in the separate Technical Evaluation and Preliminary Determination issued concurrently with this determination.

BACT DETERMINATION REQUESTED BY THE APPLICANT:

The applicant requested that the Department's BACT determination for CO emissions require no control equipment due to prohibitive cost and impracticability of controlling such a large exhaust stream. Instead, the applicant proposed that the BACT requirements focus on combustion control by way of adjusting the oxygen to fuel ratio to maximize combustion efficiency thus reducing CO emissions.

BACT DETERMINATION PROCEDURE:

In accordance with Chapter 62-212, F.A.C., a BACT determination is based on the maximum degree of reduction of each pollutant emitted which the Department of Environmental Protection (Department), on a case by case basis, taking into account energy, environmental and economic impacts, and other costs, determines is achievable through application of production processes and available methods, systems, and techniques. In addition, the regulations state that, in making the BACT determination, the Department shall give consideration to:

- Any Environmental Protection Agency determination of BACT pursuant to Section 169, and any emission limitation contained in 40 CFR Part 60 - Standards of Performance for New Stationary Sources or 40 CFR Part 61 - National Emission Standards for Hazardous Air Pollutants.
- All scientific, engineering, and technical material and other information available to the Department.
- The emission limiting standards or BACT determinations of any other state.
- The social and economic impact of the application of such technology.

The EPA currently stresses that BACT should be determined using the "top-down" approach. The first step in this approach is to determine, for the emission unit in question, the most stringent control available for a similar or identical emission unit or emission unit category. If it is shown that this level of control is technically or economically infeasible for the emission unit in question, then the next most stringent level of control is determined and similarly evaluated. This process

APPENDIX BD - BACT DETERMINATION

continues until the BACT level under consideration cannot be eliminated by any substantial or unique technical, environmental, or economic objections.

Under 40 CFR Part 60 - Standards of Performance for New Stationary Sources (NSPS) there is no promulgated emission standard that applies to emissions from rocket engine test facilities.

Under 40 CFR Part 61 - National Emission Standards for Hazardous Air Pollutants (NESHAP) there is a promulgated emission standard that applies to emissions from rocket engine test facilities. The Standard, 40 CFR Part 61, Subpart D applies specifically to Beryllium Rocket Motor Firing. It includes an emission standard based on a time-weighted atmospheric concentration of beryllium and a requirement to monitor ambient air concentrations to ensure compliance with the emission standard. The monitoring program requires prior approval from the Administrator.

Under 40 CFR Part 63 - National Emission Standards for Hazardous Air Pollutants (NESHAP) for Source Categories, Rocket Engine Test Firing is a targeted source category. On December 8, 1998 the EPA workgroup working on this matter, distributed Information Collection Requests to the major companies (including OTC Pratt & Whitney) potentially affected by such a NESHAP. The Department's contacted Mr. Richard A. Copland, the project team leader at EPA. According to Mr. Copland, (based on the information received) it appears at this time that there will be no controls due to the relatively short firing time, remote facility locations, costs, etc. EPA is still researching the matter so Mr. Copland's assessment of the present situation is not considered as final.

BACT DETERMINATIONS BY EPA AND STATES:

The Department's review for any prior BACT determinations for emissions from rocket engine test facilities referred to in the RACT/BACT/LAER Clearinghouse identified the following:

- MS-0019, State of Mississippi, December 1990 BACT Determination for the National Aeronautics and Space Administration's (NASA) Stennis Space Center. The BACT determination required use of a deflector ramp to aid in dispersion and prevent scouring of soil and restrictions on meteorological conditions to prevent possible acid rain formation. Specific numerical limits were not established. The project was associated with the Advanced Solid Rocket Motor (ASRM). The project was later discontinued when Congress suspended funding.

OTHER INFORMATION AVAILABLE TO THE DEPARTMENT

The primary sources of information related to rocket engine test stands included the applicant's data, the MDEQ, and the NESHAP activities. These sources provided information on existing test stands, emissions, permitting requirements and control strategies.

The applicant provided estimates of emissions based on a fuel combustion model developed by NASA. Known as the NASA-Lewis chemical equilibrium computer program, emission estimates were provided by the applicant in supplemental information filed during the application completeness process. The NASA-Lewis chemical equilibrium computer program appears to be the primary source of most emission estimates for rocket engine test operations.

The Department contacted the Mississippi Department of Environmental Quality (MDEQ) regarding the 1990 BACT determination. MDEQ provided additional information as well as

APPENDIX BD - BACT DETERMINATION

identifying a current in-house project for the NASA Stennis Space Center. The project included the establishment of federally enforceable permit conditions on the facility's LOX/hydrocarbon rocket engine test stands. A copy of the draft permit (1000-00005) was provided to the Department for review. The enforceable conditions within the permit included the following:

- Emissions Limitations: PM (10,270 lb/test), PM₁₀ (6,060 lb/test), SO₂ (2,520 lb/test), NO_x (2520 lb/test) CO (558,600 lb/test) and VOC (50 lb/test).
- Fuel Authorizations: Liquid Hydrogen (LH2)/Liquid Oxygen (LOX) and hydrocarbon fuels.
- Emission Estimates: NASA-Lewis chemical equilibrium computer program or an equivalent version.
- Records: For each test - the duration, the fuels and the calculated emission rates for PM, PM₁₀, SO₂, NO_x, CO, and VOC. Semiannual report showing number of tests per month, total emissions per month, and the highest lb/test emissions rate during the reporting period.

The Department is also aware of the other rocket engine test stands, however, the 1990 MDEQ BACT determination is the only one that included a BACT determination and is thus a BACT floor.

PROPOSED PROJECT AND EMISSIONS

The applicant proposes to construct and operate a LOX/Kerosene Rocket Engine Stand at its existing rocket test facility in West Palm Beach. The applicant also operates a gas turbine testing facility and a helicopter development facility at the existing site. This project will consist of liquid oxygen and fuel storage tanks (64,000 and 36,000 gallon capacities), an engine containment can, a water-cooled silencer, an exhaust gas deflector, a lined cooling water retention pond, and an elevated 1-million gallon water supply tank.

Emissions will be generated from combustion of fuel during 12 test firings per year lasting 240 seconds each. These emissions have been estimated according to the NASA combustion model as indicated next:

Pollutant	CO	CO ₂	H ₂	VOC	PM	SO _x	NO _x
lb/sec	694	1,366	17	2	1.6	<1	1
TPY	1,000	1,967	25	3	2.3	1.4	1.4

As indicated in the table above, the only regulated pollutant believed to be emitted in significant quantities is CO in the amount of 1,000 TPY. No estimates are given for HAPs. In any case, HAPs emissions are believed to be less than 10 TPY of any single HAP or less than 25 TPY of all HAPs combined.

APPENDIX BD - BACT DETERMINATION

BACT CONTROL OPTIONS

The applicant has requested that the Department's BACT determination for CO emissions require no add-on control equipment due to prohibitive cost and impracticability of controlling such a large exhaust stream. Instead, the applicant proposed that the BACT requirements focus on combustion control by way of adjusting the oxygen to fuel ratio to maximize combustion efficiency thus reducing CO emissions, limiting test duration to no longer than 240 seconds per test, and limiting testing to no more than 12 tests per year.

The applicant's BACT evaluation referred to a Russian rocket test stand that employed a water injection and ducting system solely for the purpose of avoiding heat detection by surveillance satellites during the Cold-War era. According to the applicant, the Russian test stand was not designed as an emission control system and should not be considered as any sort of exemplary emission control system. This is the only rocket test stand reported by the applicant that may be construed to have any add-on controls.

BACT DETERMINATION

If the BACT analysis is based on the transfer of CO oxidation technology from the gas turbine industry, differences in exhaust concentrations must be considered. Based on the modeled exhaust flow, the molar concentration of exhaust gases will be about 23% CO, 28% CO₂, 8% H₂ and 41% H₂O vapor. Kerosene rocket engines fire a fuel rich mixture for heat control flexibility, firing at approximately 82% of theoretical O₂ required for complete combustion. Consequently, CO emissions from engines of this type are very high compared to combustion turbines that rarely exceed 150-200 ppm CO even at medium loads.

Turbine exhaust oxidation technology applied to a rocket engine test stand will result in far greater costs. Estimates provided by the applicant indicate that a conventional incinerator would cost about \$579,000,000 with an annualized cost of about \$68,000,000. An additional \$100,000,000 would be required, according to the applicant, to construct an appropriate infrastructure for a control device designed to withstand the maximum thrust and high temperatures of the rocket engine exhaust. The Department does not necessarily accept these figures, but agrees that actual figures can be many millions of dollars.

If a system could be designed to capture the rocket engine exhaust gases and convert the CO to CO₂ catalytically or by thermal oxidation, it would be massive (~ 60 ft. diameter) and have to withstand extreme temperatures and thrust pressures adding significantly to construction and operating costs. Cost effectiveness for catalytic oxidation of natural gas-fired turbine exhausts for the largest sizes of utility turbines ranges from \$5,000 to over \$8,000 per ton of CO removed. When scaled up for the extreme conditions of a rocket engine exhaust and the numerous uncertainties inherent in such a system, the overall cost effectiveness might exceed \$100,000 per ton depending on the safety factors used in the design. Considering these uncertainties, the Department concludes that catalytic oxidation such as employed by turbines would not be practicable or cost-effective and neither would incineration.

Yet, it is conceivable that other means could be used for injecting oxygen into the exhaust gases to create conditions suitable for oxidation of much of the CO. An automobile emission control system with air injection is one example. Since this facility will emit at least 1,000 TPY CO, and since CO is a criteria air pollutant, the Department proposes that a study be done by the applicant

APPENDIX BD - BACT DETERMINATION

to evaluate the feasibility of direct O₂ injection into the gas stream downstream of the body of the engine. The study should employ kinetic modeling to determine the practicability and economic feasibility of adding the balance of stoichiometric oxygen required for complete combustion via direct injection at an appropriate point or points in the rocket engine exhaust. A period of one year is provided for completion of the study and submitting it to the Department.

The Department agrees with the applicant's finding that existing oxidation technology is not feasible at this time. As a result, the Department has determined BACT for the rocket engine test stand to be a visible emissions limitation of forty (40) percent opacity and the following work practices:

- Carbon Monoxide (CO) Emissions – Rocket engine test firings shall not result in CO emissions greater than 41.5 tons per minute (2-minute average), 83 tons per 8-hour period, and 1,000 tons per year (12-month rolling total) as determined using the NASA-Lewis chemical equilibrium computer program or equivalent method approved by the Department or the Palm Beach Public Health Department.
- Test Stand - The test stand shall be constructed in accordance with the design specifications provided within the application including a Water Cooled Silencer and an Exhaust Gas Deflector with a Minimum height of 70 feet, maximum distance from Water Cooled Silencer of 100 feet. The surface between the water-cooled silencer and the exhaust gas deflector shall be paved.
- Test Duration – Rocket engine test firings shall not exceed a total of 240 seconds per 8-hour period.
- Test Firings – Rocket engine test firings shall not exceed 2,880 seconds per year (12-month rolling total).
- Oxidant/Fuel Ratio – All rocket engine test firings shall be conducted at a minimum oxidant/fuel ratio of 2.72 lb. O₂/lb. Fuel.
- Fuel Usage – Rocket engine test firings shall not consume more than 6,625 gallons per minute (4-minute average), 26,500 gallons per 8-hour period, and 318,000 gallons per year (12-month rolling total).
- Quench Water - All rocket engine test firings shall be conducted with sufficient quench water to minimize NO_x formation.
- Fuel and Oxidizer Types - Rocket engine test firings shall be limited to the firing of kerosene as the fuel and liquid oxygen (LOX) as the oxidizer.
- Test Conditions – Rocket engine test firings shall be restricted to daylight hours (1 hour after sunrise and 1 hour prior to sunset) and only under ambient conditions that provide good dispersion of the exhaust gases in accordance with a Test Plan to be submitted to the Palm Beach County Health Department (PBCHD) for approval prior to the initial test. Non-daylight hour testing may be approved on a case-by-case basis by the Palm Beach County Health Department (PBCHD).

APPENDIX BD - BACT DETERMINATION

- Test Notifications – At least 24 hours prior to a rocket engine test firing, notification shall be provided to the PBCHD. The notification shall include the date and time of the test firing, the expected duration of the test firing, the planned oxidant/fuel ratio, and the planned fuel usage rate. In the event that an upset occurs during a test (i.e., test duration > 240 seconds, O/F ratio less than 2.72, fuel usage > 13,250 gpm, a flame out, etc.), a written excess emissions report shall be provided to the PBCHD within 24 hours of the test. The report shall identify the upset and impacts.
- Postconstruction Monitoring – The permittee shall, prior to any rocket test firings, establish an approved ambient air quality monitoring program to measure ambient air concentrations of CO before, during, and after a rocket engine test firing. The Program shall be approved by the Palm Beach County Health Department (PBCHD) and may be discontinued upon written request and PBCHD approval.
- Oxygen Injection Study – Within one year of initial issuance of this permit, the permittee shall complete and submit to the Department an engineering and cost study evaluating the technical feasibility and cost effectiveness of direct O₂ injection for reducing CO emissions in the exhausts of rocket engines tested at the permittee's facility. The study shall evaluate possibilities for direct O₂ injection including a heat-shielded, internally-cooled oxygen lance for injecting stoichiometric rates of oxygen into the exhaust downstream of the engine. Appropriate kinetic modeling shall be utilized to predict the oxidation reaction rates and overall CO conversion for various configurations of the injection apparatus and various injection locations and methods.
- Compliance Demonstrations – Compliance with the visible emissions limitation shall be demonstrated initially for each new oxidant/fuel ratio and annually thereafter. Compliance with the CO emissions limitation shall be demonstrated initially and continuously thereafter through the use of the NASA Lewis chemical equilibrium computer program or its equivalent as approved by the Department or the Palm Beach County Health Department and the ambient air quality monitoring program.
- Excess Emissions - Excess emissions shall be allowed provided the permittee demonstrates that the emissions did not result in a predicted ambient impact greater than the National Ambient Air Quality Standards (NAAQS) for CO adjusted based on the ambient monitoring program; a significant emissions increase in a PSD Pollutant; or result in emissions of a hazardous air pollutant in an amount of 10 tons per year or greater individually or 25 tons per year or greater collectively.

APPENDIX BD - BACT DETERMINATION

DETAILS OF THE ANALYSIS MAY BE OBTAINED BY CONTACTING:

A. A. Linero, P.E. Administrator
Bureau of Air Regulation
2600 Blair Stone Road, MS # 5505
Tallahassee, Florida 32399-2400
850/488-0114

Recommended By:

Approved By:

C. H. Fancy, P.E., Chief
Bureau of Air Regulation

Howard L. Rhodes, Director
Division of Air Resources Management

Date:

Date:

Facsimile Transmission Form



Pratt & Whitney

A United Technologies Company

FACILITIES MANAGEMENT

Pratt & Whitney
Florida Plant Site
P.O. Box 109600
West Palm Beach, FL 33410-9600

Date: 7/26/01

Deliver the following pages to:

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THE ORIGINAL IS COMING BY
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DG

THE PALM BEACH POST

Published Daily and Sunday
West Palm Beach, Palm Beach County, Florida

PROOF OF PUBLICATION

STATE OF FLORIDA COUNTY OF PALM BEACH

Before the undersigned authority personally appeared Tyler Dixon who on oath says that she is Classified Advertising Manager, Inside Sales of The Palm Beach Post, a daily and Sunday newspaper published at West Palm Beach in Palm Beach County, Florida; that the attached copy of advertising, being a Notice in the matter of Air Const Permit in the --- Court, published in said newspaper in the issues of July 23, 2001.

Affiant further says that the said The Post is a newspaper published at West Palm Beach, in said Palm Beach County, Florida, and that the said newspaper has heretofore been continuously published in said Palm Beach County, Florida, daily and Sunday and has been entered as second class mail matter at the post office in West Palm Beach, in said Palm Beach County, Florida, for a period of one year next preceding the first publication of the attached copy of advertisement; and affiant further says that she/he has neither paid nor promised any person, firm or corporation any discount rebate, commission or refund for the purpose of securing this advertisement for publication in the said newspaper.

Sworn to and subscribed before this 26 day of July,
A.D. 2001

[Signature]
[Signature]

Personally known XX or Produced Identification _____
Type of Identification Produced _____



NO. 351874
PUBLIC NOTICE OF INTENT
TO ISSUE AN
CONSTRUCTION PERMIT
STATE OF FLORIDA
DEPARTMENT OF
ENVIRONMENTAL
PROTECTION
DEP File No.
080021-004-AC
(PDD-PL-004)
United Technologies
Corp-Frall & Whaley
LUX/Kerosene Rocket
Engine Test Stand
Palm Beach County

The Department of Environmental Protection (Department) gives notice of its intent to issue an air construction permit to United Technologies Corp-Frall & Whaley for construction of a LUX/Kerosene Rocket Engine Test Stand located at 17800 Bessie Highway, near Jubilee, Palm Beach County, A Best Available Control Technology (BACT) determination is required for emissions of carbon monoxide (CO) pursuant to Rule 62-212.000, F.A.C., Prevention of Significant Deterioration (PSD). The applicant's mailing address is: United Technologies Corp-Frall & Whaley, Post Office Box 19000, West Palm Beach, Florida 33416-0000.

Emissions of CO are estimated to be approximately 1,000 tons per year. Three violations shall be restricted by limiting total usage to 315,000 gallons per year, total usage to 12 per year, and duration of usage to 240 seconds each. The minimum oxidant to fuel ratio will be 2.72 pounds of oxygen per ton of fuel. The Department will require the applicant to establish and operate an ambient air quality monitoring program.

An air quality impact analysis was conducted. Emissions from the facility will not significantly contribute to or cause a violation of any state or federal ambient air quality standards of PSD increment. The Department will issue the final permit with the attached conditions unless a response received in accordance with the following procedures results in a different decision or significant change of stated conditions.

The Department will accept written comments and requests for public meetings concerning the proposed permit issuance action for a period of thirty (30) days from the date of publication of this public notice of intent to issue Air Construction Permit. Written comments and requests for public meetings should be provided to the Department's Bureau of Air Regulation at 2800 Blair Stone Road, Mail Station 85505, Tallahassee, FL 32309-2400. Any written comments filed shall be made available for public inspection. If written comments received result in a significant change in the proposed agency action, the Department shall revise the proposed permit and require, if applicable, another public notice.

The Department will issue the permit with the attached conditions unless a timely petition for an administrative hearing is filed pursuant to sections 120.565 and 120.57 F.S., before the deadline for filing a petition. The procedures for petitioning for a hearing are set forth below. Notification is not available in this proceeding.

A person whose substantial interests are affected by the proposed permitting decision may petition for an administrative proceeding (hearing) under sections 120.565 and 120.57 of the Florida Statutes. The petition must contain the information set forth below and must be filed (received) in the Office of General Counsel of the Department at 3000 Commonwealth Boulevard, West Branch 205, Tallahassee, Florida 32309-0600. Petitions filed by the permit applicant or any of the parties listed below must be filed within fourteen days of receipt of this notice of intent. Petitions filed by any persons other than those entitled to written notice under section 120.56(3) of the Florida Statutes must be filed within fourteen days of publication of the public notice or within fourteen days of receipt of this notice of intent, whichever occurs first. Under section 120.56(3), however, any person who seeks the De-

West Palm Beach, FL
39410-5426
Telephone: 813/861-0800
Fax: 501/851-0755
The complete permit file includes the application, technical evaluations, draft permit, and the information submitted by the responsible official, exclusive of confidential records under Section 408.111, F.S. Interested persons may contact the Administrator, New Source Review Section at 111 South Magnolia Drive, Suite 4, Tallahassee, FL 32301 or call 850/488-0114 for additional information. The Department's intent to issue and related documents can also be viewed at <http://www.myflorida.com/licensing/permitting/> <http://permits.environment/flair.gov/permits.html>
PUB: The Palm Beach Post
July 25, 2001

BEST AVAILABLE COPY

EXHIBIT F-14c. 1001

files or within fourteen days of receipt of this notice of filing, whichever occurs first. Under section 120.00(2), however, any person who seeks the Department for notice of agency action may file a petition with the Department within 14 days of receipt of that notice, regardless of the date of publication. A petitioner shall mail a copy of the petition to the applicant at the address indicated above at the time of filing. The failure of any person to file a petition within the appropriate time period shall constitute a waiver of that person's right to request an administrative determination (hearing) under sections 120.340 and 120.37 F.S., or to intervene in the proceeding and participate as a party to it. Any subsequent intervention will be only at the approval of the presiding officer upon the filing of a motion in compliance with Rule 28-100.205 of the Florida Administrative Code.

A petition that disputes the material facts on which the Department's action is based must contain the following information: (a) The name and address of each agency affected and each agency's representative, if any, which shall be the address for service purposes during the course of the proceedings; and an explanation of how the petitioner's substantial interests will be affected by the agency determination; (b) A statement of how and when petitioner received notice of the agency action or proposed action; (c) A statement of all disputed issues of material fact. If there are none, the petition shall so indicate; (d) A concise statement of the ultimate facts at issue, including the specific facts the petitioner contends warrant reversal or modification of the agency's proposed action; (e) A statement of the specific rules or statutes the petitioner contends require reversal or modification of the agency's proposed action; and (f) A statement of the relief sought by the petitioner, stating precisely the action petitioner wishes the agency to take with respect to the agency's proposed action. A petition that does not dispute the material facts upon which the Department's action is based shall state that no such facts are in dispute and otherwise shall contain the same information as set forth above, as required by rule 28-100.301.

Because the administrative hearing process is designed to formulate final agency action, the filing of a petition means that the Department's final action may be different from the position taken by it in the notice. Persons whose substantial interests will be affected by any such final decision of the Department on the application have the right to petition to become a party to the proceeding, in accordance with the requirements set forth above.


A complete project file is available for public inspection during normal business hours, 9:00 a.m. to 5:00 p.m., Monday through Friday, except legal holidays, at:

Dept of Environmental
Protection
Bureau of Air Regulation
Suite 4, 117 S. Magnolia St
Tallahassee, FL 32301
Telephone: 850/480-0116
Fax 850/622-0070
Palm Beach County
Health Dept.
Env. Science &
Engineering Div.
901 E. Fern St
West Palm Beach, FL 33401
Telephone: 561/365-3070
Fax: 561/365-3441
Dept. of Environmental
Protection
Southeast District Office
400 North Congress Avenue

Memorandum

Florida Department of Environmental Protection

TO: Clair Fancy

FROM: A. A. Linero  7/9

DATE: July 9, 2001

SUBJECT: United Technologies Corp.-Pratt & Whitney
DEP File No. 0990021-004-AC (PSD-FL-294)
LOX/Kerosene Rocket Engine Test Stand

Attached for your review and approval is the revised Intent to Issue for the construction of a LOX/Kerosene Rocket Engine Test Stand at the subject facility near in Palm Beach County.

Pratt & Whitney never published notice and instead requested extensions of time to file a petition. We had a teleconference with them in early May and they met with Palm Beach a few days later. We made several changes in the draft package and are ready to send it out again.

Pratt and Whitney has not been in a rush for this permit. They seem to be concerned about many small details that could probably have been ironed during the comment period after public notice.

They asked for another 90-day extension of time on May 17 "to allow P&W and FDEP to complete our work on this permit and resolve these issues without the necessity for a formal hearing."

Let's send out the revised package. I'll let them know we might publish it if they don't.

I recommend your approval and signature.

AAL/

Permittee

United Technologies Corp.-Pratt & Whitney
P.O. Box 109600
Permit No.

0990021-004-AC
PSD-FL-294

West Palm Beach, FL 33410-9600
Project
LOX/Kerosene Rocket Engine Test Stand

Expires:
March 31, 2003

AUTHORIZED REPRESENTATIVE:

Mr. John K. Sillan, Manager Facilities Management

Project and Location

This permit authorizes the permittee to construct a LOX/Kerosene Rocket Engine Test Stand at its existing facility at 17900 Beeline Highway (SR 710) in West Palm Beach, Palm Beach County. The test stand shall be limited to firing no more than 318,000 gallons of fuel per year and required to establish an ambient air quality monitoring program. The SIC codes for this facility is are 3724 and 3764.

The UTM coordinates of the site are Zone 17; 567.3 km E; 2974.4 km N. The Everglades National Park is approximately 120 km (74.9 miles) from the site.
Statement of Basis

This construction/PSD permit is issued under the provisions of Chapter 403 of the Florida Statutes (F.S.), and the Florida Administrative Code (F.A.C.) Chapters 62-4, 62-204, 62-210, 62-212, 62-296, and 62-297. The above named permittee is authorized to construct the emissions units in accordance with the conditions of this permit and as described in the application, approved drawings, plans, and other documents on file with the Department of Environmental Protection (Department).

Appendices

The attached appendices are a part of this permit:

Appendix BD
BACT Determination

Appendix GC
General Permit Conditions

Appendix NSPS-Kb
40 CFR 60 Subpart Kb - Standards Of Performance For Volatile Organic Liquid Storage Vessels

Howard L. Rhodes, Director
Division of Air Resources
Management

Facility Description

United Technologies Corp.- Pratt & Whitney (UTC-P&W) proposes to construct a Liquid Oxygen (LOX)/Kerosene Rocket Engine Test Stand at the E-5 rocket test area located at 17900 Beeline Highway (SR 710) in West Palm Beach, Palm Beach County.

The proposed project will result in a significant emissions increase of carbon monoxide (CO) according to Table 212.400-2, Florida Administrative Code (F.A.C.). The project is therefore subject to review for Prevention of Significant Deterioration (PSD) and a determination of Best Available Control Technology (BACT) in accordance with Rule 62-212.400, F.A.C.

Project Details

The applicant proposes to ^{approximately} construct and operate a ^{normal} LOX/Kerosene Rocket Engine Stand at its existing rocket test facility in West Palm Beach. The applicant also operates a gas turbine testing facility and a helicopter development facility at the existing site. This project will consist of liquid oxygen and fuel storage tanks (64,000 and 36,000 gallon capacities), an engine containment can, a water-cooled silencer, an exhaust gas deflector, a lined cooling water retention pond, and an elevated 1-million gallon water supply tank.

The proposed facility will consist of the following emissions units.

Emissions Unit No.

Emissions unit Description

075

LOX/Kerosene Rocket Engine Test Stand

076

NSPS Storage Tank - ^{approximately} 36,000 Gallon Capacity

Regulatory Classification

The facility is classified as a Major or Title V Source of air pollution under the PSD and Title V programs because the facility is a major source based on potential emissions of carbon monoxide (CO), volatile organic compounds (VOC), nitrogen oxides (NOx), sulfur dioxide (SO2), trichloroethylene, and total combined hazardous air pollutants (HAPs) exceeding 25 tons per year. This facility is not within an industry included in the list of the 28 Major Facility Categories per Table 62-212.400-1, F.A.C. The project permitted herein is subject to the requirements of the federal Prevention of Significant Deterioration air quality rules for CO emissions and New Source Performance Standards for fuel storage tanks as well as state rules cited in the general and specific conditions.

Reviewing and Process Schedule

*	Date of Receipt of Application	06-20-00	
*	First Request for Additional Information		07-19-00
*	Final Request for Additional Information		10-01-00
*	Date Application Complete	10-09-00	
*	Waiver of Processing Clock by 30 days		12-19-00

* Intent Issued 01-29-01
* Received First Request to Extend Time to File Petition
02-22-01
* Received Second Request to Extend Time to File Petition
05-17-01
* Intent Re-issued

xx-xx-01

put something in

Relevant Documents

The documents listed below constitute the basis for the permit and are on file with the Department.

* Permit application
* Applicant's additional information noted above
* Department's Technical Evaluation and Preliminary Determination and Intent to Issue

The following specific conditions apply to all emissions units at this facility addressed by this permit.

Administrative

1. Regulating Agencies: All documents related to applications for permits to construct, or modify an emissions unit should be submitted to the Bureau of Air Regulation (BAR), Florida Department of Environmental Protection at Mail Station #5505, 2600 Blair Stone Road, Tallahassee, Florida 32399-2400, phone number 850/488-0114. All documents related to reports, tests, operation permit applications, minor modifications and notifications shall be submitted to the Palm Beach County Health Department, post Office Box 29, 901 Evernia Street, West Palm Beach, Florida 33402-0029, Phone 562-355-3136.
2. General Conditions: The permittee is subject to and shall operate under the attached General Permit Conditions G.1 through G.15 listed in Appendix GC of this permit. General Permit Conditions are binding and enforceable pursuant to Chapter 403 of the Florida Statutes. [Rule 62-4.160, F.A.C.]
3. Terminology: The terms used in this permit have specific meanings as defined in the corresponding chapters of the Florida Administrative Code.
4. Applicable Regulations, Forms and Application Procedures: Unless otherwise indicated in this permit, the construction and operation of the subject emissions unit shall be in accordance with the capacities and specifications stated in the application. The facility is subject to all applicable provisions of Chapter 403, F.S. and Florida Administrative Code Chapters 62-4, 62-110, 62-204, 62-212, 62-213, 62-296, 62-297 and the Code of Federal Regulations Title 40, Part 60, adopted by reference in the Florida Administrative Code (F.A.C.) regulations. The permittee shall use the applicable forms listed in Rule 62-210.900, F.A.C. and follow the application procedures in Chapter 62-4, F.A.C. Issuance of this permit does not relieve the facility owner or operator from compliance with any applicable federal, state, or local permitting or regulations.
[Rules 62-204.800, 62-210.300 and 62-210.900, F.A.C.]
5. New or Additional Conditions: Pursuant to Rule 62-4.080, F.A.C., for good cause shown and after notice and an administrative hearing, if requested, the Department may require the permittee to conform to new or additional conditions. The Department shall allow the permittee a reasonable time to conform to the new or additional conditions, and on application of the permittee, the Department may grant additional time. [Rule 62-4.080, F.A.C.]
6. Expiration: This air construction permit shall expire on March 31, 2003. The permittee, for good cause, may request that this construction/PSD

permit be extended. Such a request shall be submitted to the Department's Bureau of Air Regulation prior to 60 days before the expiration of the permit. [Rules 62-210.300(1), 62-4.070(4), 62-4.080, and 62-4.210, F.A.C.] PSD Expiration: Approval to construct shall become invalid if construction is not commenced within 18 months after receipt of such approval, or if construction is discontinued for a period of 18 months or more, or if construction is not completed within a reasonable time. The Department may extend the 18-month period upon a satisfactory showing that an extension is justified.

[Rules 62-4.070(4), 62-4.210(2) & (3), and 62-210.300(1)(a), F.A.C.] BACT Determination: In conjunction with extension of the 18 month period to commence or continue construction, or extension of the permit expiration date, the permittee may be required to demonstrate the adequacy of any previous determination of Best Available Control Technology (BACT) for the source as applied to any new or modified emission units.

[Rules 62-4.070(4), 62-4.210(2) & (3), 62-210.300(1)(a), and 62-212.400(6)(b), F.A.C.]

7. Modifications: No emissions unit or facility subject to this permit shall be constructed or modified without obtaining an air construction permit from the Department. Such permit must be obtained prior to the beginning of construction or modification.

[Rules 62-210.300(1) and 62-212.300(1)(a), F.A.C.]

8. Title V Operation Permit Required: This permit authorizes construction and/or installation of the permitted emissions unit and initial operation to determine compliance with Department rules. A revision to the facility's Title V operation permit is required for regular operation of the permitted emissions unit. The owner or operator shall apply for and receive a Title V operation permit or permit modification prior to expiration of this permit. To apply for a Title V operation permit, the applicant shall submit the appropriate application form, compliance test results, and such additional information as the Department may by law require. The application shall be submitted to the Department's appropriate District office.

[Rules 62-4.030, 62-4.050, 62-4.220, and Chapter 62-213, F.A.C.]

General Emissions Limiting Standards

9. General Visible Emissions Standard: Except for emissions units that are subject to a particulate matter or opacity limit set forth or established by rule and reflected by conditions in this permit, no person shall cause, let, permit, suffer, or allow to be discharged into the atmosphere the emissions of air pollutants from any activity, the density of which is equal to or greater than that designated as Number 1 on the Ringelmann Chart (20% opacity). The test method for visible emissions shall be EPA Method 9, incorporated and adopted by reference in Chapter 62-297, F.A.C. Test procedures shall meet all applicable requirements of Chapter 62-297, F.A.C. [Rule 62-296.320(4)(b)1, F.A.C.]

10. Unconfined Emissions of Particulate Matter: [Rules 62-296.320(4)(c) and 62-212.400, F.A.C.]

(i) No person shall cause, let, permit, suffer or allow the emissions of unconfined particulate matter from any activity, including vehicular movement; transportation of materials; construction, alteration, demolition or wrecking; or industrially related activities such as loading, unloading, storing or handling; without taking reasonable precautions to prevent such emissions.

(ii) Any permit issued to a facility with emissions of unconfined particulate matter shall specify the reasonable precautions to be taken by that facility to control the emissions of unconfined particulate matter.

- (iii) Reasonable precautions include the following:
- * Paving and maintenance of roads, parking areas and yards.
 - * Application of water or chemicals to control emissions from such activities as demolition of buildings, grading roads, construction, and land clearing.
 - * Application of asphalt, water, oil, chemicals or other dust suppressants to unpaved roads, yards, open stock piles and similar activities.
 - * Removal of particulate matter from roads and other paved areas under the control of the owner or operator of the facility to prevent re-entrainment, and from buildings or work areas to prevent particulate from becoming airborne.
 - * Landscaping or planting of vegetation.
 - * Use of hoods, fans, filters, and similar equipment to contain, capture and/or vent particulate matter.
 - * Confining abrasive blasting where possible.
 - * Enclosure or covering of conveyor systems.

(iv) In determining what constitutes reasonable precautions for a particular source, the Department shall consider the cost of the control technique or work practice, the environmental impacts of the technique or practice, and the degree of reduction of emissions expected from a particular technique or practice.

11. General Pollutant Emission Limiting Standards: [Rule 62-296.320(1)(a)&(2), F.A.C.]

(i) No person shall store, pump, handle, process, load, unload or use in any process or installation, volatile organic compounds or organic solvents without applying known and existing vapor emission control devices or systems deemed necessary and ordered by the Department.

(ii) No person shall cause, suffer, allow or permit the discharge of air pollutants which cause or contribute to an objectionable odor. (Not federally enforceable)

[Note: An objectionable odor is defined in Rule 62-210.200(203), F.A.C., as any odor present in the outdoor atmosphere which by itself or in combination with other odors, is or may be harmful or injurious to human health or welfare, which unreasonably interferes with the comfortable use and enjoyment of life or property, or which creates a nuisance.]

Operational Requirements

12. Plant Operation - Problems: If temporarily unable to comply with any of the conditions of the permit due to breakdown of equipment or destruction by hazard of fire, wind or by other cause, the permittee shall immediately notify the Department's appropriate district office and the appropriate local program office. The notification shall include pertinent information as to the cause of the problem, and what steps are being taken to correct the problem and to prevent its recurrence, and where applicable, the owner's intent toward reconstruction of destroyed facilities. Such notification does not release the permittee from any liability for failure to comply with Department rules.

[Rule 62-4.130, F.A.C.]

13. Circumvention: No person shall circumvent any air pollution control device or allow the emission of air pollutants without the applicable air pollution control device operating properly.

[Rule 62-210.650, F.A.C.]

14. Excess Emissions: For purposes of this permit, all limits established pursuant to the State Implementation Plan, including those limits established as BACT, include emissions during periods of startup and shutdown, and are

not subject to the provisions of Rule 62-210.700(1), F.A.C.

Excess emissions which are caused entirely or in part by poor maintenance, poor operation, or any other equipment or process failure which may reasonably be prevented during start-up, shutdown or malfunction shall be prohibited pursuant to Rule 62-210.700(4), F.A.C.

[Rules 62-4.070(3) and 62-210.700(5), F.A.C.]

Compliance Monitoring and Testing Requirements

15. Determination of Process Variables: [Rule 62-297.310(5), F.A.C.]

(i) Required Equipment. The owner or operator of an emissions unit for which compliance tests are required shall install, operate, and maintain equipment or instruments necessary to determine process variables, such as process weight input or heat input, when such data are needed in conjunction with emissions data to determine the compliance of the emissions unit with applicable emission limiting standards.

(ii) Accuracy of Equipment. Equipment or instruments used to directly or indirectly determine process variables, including devices such as belt scales, weight hoppers, flow meters, and tank scales, shall be calibrated and adjusted to indicate the true value of the parameter being measured with sufficient accuracy to allow the applicable process variable to be determined within 10% of its true value.

16. Special Compliance Tests: When the Department, after investigation, has good reason (such as complaints, increased visible emissions or questionable maintenance of control equipment) to believe that any applicable emission standard contained in a Department rule or in a permit issued pursuant to those rules is being violated, it shall require the owner or operator of the facility to conduct compliance tests which identify the nature and quantity of pollutant emissions from the emissions units and to provide a report on the results of said tests to the Department.

[Rule 62-297.310(7)(b), F.A.C.]

Reporting and Record Keeping Requirements

23. Duration of Record Keeping: Upon request, the permittee shall furnish all records and plans required under Department rules. During enforcement actions, the retention period for all records will be extended automatically unless otherwise stipulated by the Department. The permittee shall hold at the facility or other location designated by this permit records of all monitoring information (including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation) required by the permit, copies of all reports required by this permit, and records of all data used to complete the application for this permit. These materials shall be retained at least five years from the date of the sample, measurement, report, or application unless otherwise specified by Department rule.

[Rules 62-4.160(14)(a)&(b) and 62-213.440(1)(b)2.b., F.A.C.]

24. Test Reports: The owner or operator of an emissions unit for which a compliance test is required shall file a report with the Department on the results of each such test. The required test report shall be filed with the Department as soon as practical but no later than 45 days after the last sampling run of each test is completed. The test report shall provide sufficient detail on the emissions unit tested and the test procedures used to allow the Department to determine if the test was properly conducted and the test results properly computed. As a minimum, the test report, other than for an EPA Method 9 test, shall provide the applicable information listed in Rule 62-297.310(8)(c), F.A.C.

[Rule 62-297.310(8), F.A.C.]

25. Excess Emissions Report: If excess emissions occur, the owner or

operator shall notify the appropriate Department District Office and the appropriate local program within one working day of: the nature, extent, and duration of the excess emissions; the cause of the excess emissions; and the actions taken to correct the problem. In addition, the Department may request a written summary report of the incident. ~~Pursuant to the NESHAP requirements, excess emissions shall also be reported in accordance with 40 CFR 63, Subpart A.~~ [Rule 62-4.130, F.A.C.]

26. Excess Emissions Report - Malfunctions: In case of excess emissions resulting from malfunctions, each owner or operator shall notify the appropriate Department District Office and the appropriate local program in accordance with Rule 62-4.130, F.A.C. A full written report on the malfunctions shall be submitted in a quarterly report if requested by the Department. [Rule 62-210.700(6), F.A.C.]

27. Annual Operating Report for Air Pollutant Emitting Facility: The Annual Operating Report for Air Pollutant Emitting Facility shall be completed each year and shall be submitted to the appropriate Department District Office and the appropriate local program by March 1 of the following year. [Rule 62-210.370(3), F.A.C.]

Subsection A: The following specific conditions apply to the following emissions units:

Emissions
Unit No.

Emissions unit Description

075
LOX/Kerosene Rocket Engine Test Stand -

Emissions Unit(s) Details

LOX/Kerosene Rocket Engine Test Stand, designated Emissions Unit 075, consisting of an engine containment can, a water-cooled silencer, and an exhaust gas deflector. Emissions are controlled through the use of a minimum oxidant to fuel ratio and the water-cooled silencer.

{Permitting note(s): The emissions unit has been reviewed under the PSD Program for carbon monoxide (CO). As a new major source of CO, the emissions unit is subject to the Best Available Control Technology (BACT) requirements of Rule 62-212.400(5)(c), F.A.C. Potential emissions of particulate matter (PM and PM10), sulfur dioxide (SO2), oxides of nitrogen (NOx), and volatile organic compounds have been estimated at 2.3, 1.4, 1.4, and 2.9 tons per year, respectively. The emissions unit is not subject to any New Source Performance Standards (40 CFR Part 60) or National Emission Standards for Hazardous Air Pollutants (40 CFR Part 61). The emissions unit has been identified as a Source Category for future regulatory action under the National Emission Standards for Hazardous Air Pollutants for Source Categories (40 CFR Part 63). A case-by-case determination of the Maximum Achievable Control Technology (MACT) under 40 CFR Part 63, Subpart B was not required.}

Water Cooled Silencer - Approximate diameter of 20 feet in an approximate length of 80 feet and.

Construction Requirements

Insert from 10/17/15

Refer to MODs

A.1. Test Stand: The test stand shall be constructed in accordance with the design specifications provided within the application and the following minimum and maximum specifications:

Exhaust Gas Deflector: ~~Minimum~~ ^{approximate} height of 70 feet, ~~maximum~~ ^{approximate} distance from Water Cooled Silencer of 100 feet. The surface between the water-cooled silencer and the exhaust gas deflector shall be paved *to minimize particulate emissions due to soil erosion.*
[BACT and Rules 62-4.070(3) and 62-296.320(4)(c), F.A.C.]

A.2. Oxygen Injection Study: Within one year of initial issuance of this permit, the permittee shall complete and submit to the Department an engineering and cost study evaluating the technical feasibility and cost effectiveness of direct O2 injection for reducing CO emissions in the exhausts of rocket engines tested at the permittee's facility. The study shall evaluate possibilities for direct O2 injection including a heat-shielded, internally cooled oxygen lance for injecting stoichiometric rates of oxygen into the exhaust downstream of the engine. Appropriate kinetic modeling shall be utilized to predict the oxidation reaction rates and overall CO conversion for various configurations of the injection apparatus and various injection locations and methods.
[Rule 62-4.070(3) and BACT]

Operating Restrictions

A.3. Permitted Capacity: The permittee shall not allow, cause, suffer or permit the operation of the unit in excess of the following capacities without prior authorization from the Permitting Authority:

- (i). Test Duration: Rocket engine test firing duration shall not exceed a total of 240 seconds per 8-hour period.
- (ii). Test Firings: Rocket engine test firings shall not exceed 2,880 seconds per year (12-month rolling total).
- (iii). Oxidant/Fuel Ratio: All rocket engine test firings shall be conducted at a minimum oxidant/fuel ratio of 2.72 pounds of oxygen per pound of fuel *(A minimum average)*
- (iv). Fuel Usage: Rocket engine test firings shall not consume more than 6,625 gallons per minute (4-minute average), 26,500 gallons per 8-hour period, and 318,000 gallons per year (12-month rolling total)
- (v). Quench Water: All rocket test firings shall be conducted with sufficient water flow to minimize NOX formation.

[BACT, Rules 62-4.160(2), 62-210.200(228), and 62-210.300, ~~and 62-210.300(1), F.A.C.~~ *62-210.300(1), F.A.C.*]

F.A.C.]

{Permitting note: Prior authorization includes the issuance of construction, reconstruction, or modification permits or a determination by the Permitting Authority that the action is not subject to 62-210.300(1), F.A.C.}

A.4. Methods of Operation: The permittee shall not allow, cause, suffer or permit any change in the method(s) of operation resulting in increased short-term or long-term potential emissions, without prior authorization from the Permitting Authority. The authorized methods of operation include the following:

- (i) Fuels: The permittee is authorized to use kerosene as the rocket engine fuel.
- (ii). Oxidants: The permittee is authorized to use liquid oxygen (LOX) as the rocket engine fuel oxidizer.

[BACT, Rules 62-4.160(2), 62-210.200(228) and 62-210.300, F.A.C.]

6
A.7. Hours of Operation: The permittee is authorized to operate the unit continuously within the limits of the permitted capacities of Condition 3 and the test conditions of Condition 5 of this permit.

[BACT, Rules 62-4.160(2), 62-210.200(228) and 62-210.300, F.A.C.]

A.8. Test Conditions: Rocket engine test firings shall be restricted to daylight hours (1 hour after sunrise and 1 hour prior to sunset) and only under ambient conditions that provide good dispersion of the exhaust gases in accordance with a Test Plan to be submitted to the Palm Beach County Health Department (PBCHD) for approval prior to the initial test. The Palm Beach County Health Department (PBCHD) may approve non-daylight hour testing on a case-by-case basis.

[BACT, Rules 62-4.070(3), F.A.C.]

Emission Limitations and Standards

A.7. Visible Emissions: The permittee shall not allow visible emissions that exceed forty (40) percent opacity from any rocket engine test firing

[BACT, Rule ~~62-296.320~~(4)(b), F.A.C.]

62-212

A.8. Carbon Monoxide Emissions: Rocket engine test firings shall not result in CO emissions greater than 41.5 tons per minute (2-minute average), 83 tons per 8-hour period, and 1,000 tons per year (12-month rolling total) as determined using the NASA-Lewis chemical equilibrium computer program or equivalent method approved by the Department or the Palm Beach County Health Department.

[BACT, Rules 62-4.160(2), 62-210.200(228), and 62-210.300,

F.A.C.]

A.9. BACT Determination: The permittee shall comply with the requirements of Appendix BD of this permit.

[BACT and Rule 62-212.400(5)(c), F.A.C.]

Test Methods and Procedures.

A.10. Visible Emissions: All visible emissions tests performed pursuant to the requirements of this permit shall comply with the following provisions:

(i). Test Method: The test method for visible emissions shall be DEP Method 9, incorporated in Rule 62-297.401(9)(c), F.A.C. The required minimum period of observation for a compliance test shall for operations that are normally completed within less than the minimum observation period and do not recur within that time, the period of observation shall be equal to the duration of the operation completion time. The opacity test observation period shall include the period during which the highest opacity emissions can reasonably be expected to occur.

[BACT, Rule 62-297.310(4)(a)2.a, F.A.C.]

(ii). Test Procedures: Test procedures shall meet all applicable requirements of Chapter 62-297, F.A.C.

[Rule 62-296.410(3)(c), F.A.C.]

A.11. Carbon Monoxide Emissions: The permittee shall, prior to any rocket engine test firings, establish an ambient air quality monitoring program to measure ambient air concentrations of CO before, during, and after a rocket engine test firing. The program shall be approved by the Palm Beach County Health Department (PBCHD) and may be discontinued upon written request and PBCHD approval following a minimum of four test firings.

Compliance Demonstrations and Periodic Monitoring

A.12. Initial Compliance Demonstrations: The permittee shall conduct a visible emissions compliance test during the initial rocket engine test firing and each subsequent test firing when a ~~new~~ oxidant/fuel ratio is used. Initial compliance with the CO emission limitations shall be demonstrated through compliance with Conditions 8 and 11 of this permit.

OK.

O.K.

O.K.

New

FROM MODS

plane is it float away.

lower average

Joe
Koban

[BACT and Rule 62-297.310(7)(a)1., F.A.C.]

A.13. ~~Continuous~~ Compliance Demonstrations: The permittee shall demonstrate continuous compliance with the CO emissions limitation by use of the ambient air quality monitoring program required by Condition 11 of this permit.

[BACT and Rule 62-4.070(3), F.A.C.]

Annual 9/2
A.14. ~~Renewal~~ Compliance Demonstrations: The permittee shall have a formal compliance test conducted for visible emissions no earlier than 12 months prior to renewal of the Title-V Operating Permit.

[BACT and Rule 62-297.310(7), F.A.C.]

A.15. Flow Monitors: The permittee shall install, maintain, operate and calibrate flow monitors to measure the oxidant and fuel flow rates during each rocket engine test firing. All instrumentation shall be properly, maintained and functional at all times, except during instrument breakdown, calibration or repair to ensure compliance with Conditions 3, 4, 5, and 8 of this permit.

[Rule 62-4.070(3), F.A.C.]

A.16. Recordkeeping: The permittee shall maintain the following records:

- (i). Test Identification Number;
- (ii). Test Date and Time (Start and Finish);
- (iii). Test Duration (Planned and Actual);
- (iv). Oxidant and Fuel Types;
- (v). Oxidant/Fuel Ratio (Planned and Actual);
- (vi). Fuel Usage (gallons per minute);
- (vii). Test Condition Summary;
- (ix). CO Ambient Concentrations;
- (x). *Test Plan Conditions* Mishaps; and
- (xi). Daily and Monthly Totals of Test Duration, Test Firings, and Fuel Usage.

[Rule 62-4.070(3), F.A.C.]

A.17. Reporting: The permittee shall submit the following reports:

(i). Test Notifications: Notification to the PBCHD at least 24 hours prior to a rocket engine test firing. The notification shall include the date and time of the test firing, the expected duration of the test firing, the planned oxidant/fuel ratio, and the planned fuel usage rate.

[BACT and Rule 62-4.070(3), F.A.C.]

(ii) *TCE* Upset Reports: In the event an upset (i.e., test duration > 240 seconds, O/F ratio less than 2.72, fuel usage > 26,500 ~~gallons~~ a flame out, etc.) occurs during a test, a ~~written~~ *notification* report shall be provided to the PBCHD within 24 hours of the test. Within thirty ~~(30)~~ *(60)* days of an upset, the permittee shall submit an analysis showing the excess emissions associated ambient air quality impacts *if any, if requested*.

[Rule 62-4.130, F.A.C.]

A.18. Excess Emissions: Excess emissions shall be allowed provided the permittee demonstrates that the emissions did not result in a predicted ambient impact greater than the National Ambient Air Quality Standards (NAAQS) for CO adjusted based on the ambient monitoring program; a significant emissions increase in a PSD Pollutant; or result in emissions of a hazardous air pollutant in an amount of 10 tons per year or greater individually or 25 tons per year or greater collectively.

[BACT and Rule 62-4.070(3), F.A.C.]

1. The construction and operation of Emissions Unit 075 shall be in accordance with the capacities and specifications stated in the application. Firing of

See Mobs.

OK

Renumber

associated

See mobs for TCE means

condition A-17

engines shall not exceed 12 tests per year of 240 seconds duration for each test. [Rules 62-210.200, Definitions-Potential to Emit (PTE) and 62-213.440(1)(b)1.b., F.A.C.]

4.1. Operations monitoring records for Emissions Unit 076 shall be maintained as required by 40 C.F.R 60.116b(a) and (b). [Rule 62-4.070(3) and 40 C.F.R. 60.116b]

6. The permittee shall not cause, suffer, allow, or permit the discharge of air pollutants which cause or contribute to an objectionable odor. [Rule 62-296.320, F.A.C.]

7. The permittee shall submit an Annual Operating Report to the Department's Southeast District Office and the Palm Beach County Health Department by March 1 of the following year for the previous year's operation. [Rule 62-210.370, F.A.C.]

8. The facility shall adhere to the BACT Determination that is attached as part of this permit following this page.

Out?

Out

Subsection B: The following specific conditions apply to the following emissions units:

Emissions
Unit No.

Emissions unit Description

076
NSPS Storage Tank - 36,000 Gallon Capacity

Emissions Units Details

Emissions Unit 076 is a stationary storage tank having an approximate capacity of 36,000 gallons. The tank is subject to specific recordkeeping requirements of 40 CFR 60 Subpart Kb. The tank will store and handle kerosene, a volatile organic liquid (VOL), for the LOX/Kerosene Rocket Engine Test Stand (E.U. ID No. 075).

{Permitting notes: The unit is classified as new facilities under the New Source Performance Standards (40 CFR 60 Subpart Kb) and subject to the recordkeeping requirement of 40 CFR 60 Subpart Kb.}

The following specific conditions apply to the emissions unit(s) listed above:

Operating Restrictions

B.1. Permitted Capacity. The permittee shall not allow, cause, suffer, or permit the operation of Emissions Unit 076 in excess of 318,000 gallons per year without prior authorization from the Permitting Authority: [Rules 62-4.160(2), 62-210.200(228), 62-210.300, F.A.C.]

See Mod

B.2. Methods of Operation: The permittee shall not allow, cause, suffer or permit any change in the method of operation of Emissions Unit 076 without prior authorization from the Permitting Authority. The authorized methods of operation include the following:

(i). VOL Type(s): The permittee is authorized to store and handle kerosene.

(ii). VOL Vapor Pressure: The permittee shall not store or handle any fuels within the units with a maximum true vapor pressure greater than 15.0 kPa (2.176 psi).

[Rules 62-4.160(2), 62-210.200(228), 62-210.300, F.A.C., 40 CFR 60.110b(c)]

B.3. Hours of Operation: The permittee is authorized to operate the units continuously.

[Rule 62-4.070(3), F.A.C.]

Compliance Demonstrations and Periodic Monitoring

B.4. Compliance Demonstrations: The permittee shall demonstrate compliance with the operating restriction of Condition B.1. based on record keeping as required by Condition B.5. of this permit.

[Rule 62-297.310(7), F.A.C.]

B.5. Records: The permittee shall implement the following periodic monitoring requirements to ensure compliance with the Specific Conditions B.1 and B.2. of this permit:

(i). Monthly Throughput: The permittee shall monitor and record the monthly throughput of volatile organic liquids through each tank.

(ii). Volatile Organic Liquid Types: The permittee shall monitor and record the type (Name and True Vapor Pressure at 80°F) of volatile organic liquids stored and handled in each tank.

[Rule 62-213.440(1)(b), F.A.C.]

New Source Performance Standards (NSPS)

{Permitting note: The unit is subject to the recordkeeping requirements of 40 CFR 60 Subpart Kb provided the permittee complies with the requirements of 40 CFR 60.110b, Applicability.}

B.6. 40 CFR 60 Subpart Kb: - Standards of Performance for Volatile Organic Liquid Storage Vessels (Including Petroleum Liquid Storage Vessels) for which Construction, Reconstruction, or Modification Commenced after July 23, 1984: The permittee shall comply with the applicable requirements of 40 CFR 60 Subpart Kb contained in Appendix NSPS-Kb. Specifically:

(i) 40 CFR 60.110b, Applicability,

(ii) 40 CFR 60.111b, Definitions,

(iii) 40 CFR 60.116b, Monitoring of Operations

[40 CFR 60.40b(a), Rule 62-204.800(7)(b), F.A.C.]

Memorandum

Florida Department of Environmental Protection

TO: Clair Fancy

FROM: A. A. Linero

DATE: June 1, 2001

SUBJECT: United Technologies Corp.-Pratt & Whitney
DEP File No. 0990021-004-AC (PSD-FL-294)
LOX/Kerosene Rocket Engine Test Stand

Attached for your review and approval is the revised Intent to Issue for the construction of a LOX/Kerosene Rocket Engine Test Stand at the subject facility near in Palm Beach County.

Pratt & Whitney never published notice and instead requested extensions of time to file a petition. We had a teleconference with them in early May and they met with Palm Beach a few days later. We made several changes in the draft package and are ready to send it out again.

Pratt and Whitney has not been in a rush for this permit. They seem to be concerned about many small details that could probably have been ironed during the comment period after public notice.

They asked for another 90-day extension of time on May 17 "to allow P&W and FDEP to complete our work on this permit and resolve these issues without the necessity for a formal hearing."

Let's send out the revised package. I'll let them know we might publish it if they don't.

I recommend your approval and signature.

AAL/

DRAFT

Space Propulsion

P. O. Box 109600
West Palm Beach, FL 33410-9600



CERTIFIED MAIL
Fax Submittal 850-487-4938

May 14, 2001

Ms. Kathy Carter
Agency Clerk
Office of General Counsel
Florida Department of Environmental Protection
3900 Commonwealth Boulevard, MS 35
Tallahassee, FL 32399-3000

RECEIVED

MAY 17 2001

BUREAU OF AIR REGULATION

RE: **REQUEST FOR TIME EXTENSION TO FILE PETITION FOR HEARING**
Pratt & Whitney-Lox-Kerosene Rocket Engine
DEP File No. 0990021-004-AC (PSD-FL-294)
OGC Case No. 01-0287

Dear Ms. Carter:

The draft permit for the above-referenced facility in West Palm Beach was issued on January 29, 2001, and received on February 2, 2001, by Pratt & Whitney (P&W). Upon review of the specific permit conditions regarding the rocket test stand, P&W determined that these permit conditions required further discussion with Florida Department of Environmental Protection (FDEP) staff prior to the issuance of the final permit.

Pursuant to Rule 28-106.111, F.A.C., P&W requested an extension to file a petition for hearing under Sections 120.569 and 120.57, F.S. FDEP granted an extension as OGC Case No. 01-0287. This extension is scheduled to expire on May 17, 2001.

Pratt & Whitney has been working with FDEP and Palm Beach County Health Department to finalize the permit conditions on an informal basis. However, due to the proximity of the deadline and the amount of remaining work required to resolve the permit issues, additional time is required. P&W requests additional time to file a petition for hearing.

We believe this request for extension will allow P&W and FDEP to complete our work on this permit and resolve these issues without the necessity for a formal hearing.

Therefore, P&W requests a 90-day extension pursuant to Rule 28-106.111, F.A.C., to file a petition for hearing under Sections 120.569 and 120.57, F.S. We have attached the certificate required under Rule 28-106.111, F.A.C. See **Attachment #1**.

Please contact Mr. Dean Gee at 561-796-2108 or Mr. David Alberghini at 561-796-2448 if you have any questions.

Sincerely,

John K. Sillan
Deputy Manager
EH&S and Facilities

Attachment
O:\ehs\windocs\environ\dja\FDEP_RD180_xtnd2_5-01.doc

Cc: **A.A. Linero, FDEP**
Benny Susi, P.E., Golder Associates

B.4.2.2.3 LOX/Kerosene Rocket Test Stand

ATTACHMENT #1

CERTIFICATE

I, John K. Sillan, hereby certify that this extension request was discussed with Mr. Alavaro A. Linero, Administrator; New Source Review Section of the Florida Department of Environmental Protection and that he has no objection to granting an extension.

By John K. Sillan 5/14/01
John K. Sillan Date
Deputy Manager
EH&S and Facilities

Draft Permit Conditions	Impact / Effects Discussion	Pratt's Proposed Mods
Construction Requirements		
A.1. Test Stand Water cooled silencer – max diam = 20 feet, max length = 80 feet	Dimensions were very preliminary, not based on detailed engineering design	Delete these dimensional restrictions from permit, not relevant to emissions rates
A.2. Oxygen Injection Study - Complete and submit to DEP an engineering and cost study evaluating direct O ₂ injection methods and CO emissions reductions	Major effort to perform this type of research study, Estimated effort = 1.5 person-years and > \$300,000; EPA is proposing no controls for MACT	Delete this from permit, on basis of no emissions control per proposed MACT and potential safety issues
Operating Restrictions		
A.3. Permitted capacity Test duration Test firings Oxidant/Fuel Ratio Fuel usage Quench water	All of these conditions were based strictly on permit application submitted Sufficient margin for operations flexibility? "Quench" water is used for sound absorption only, no effect on emissions. Water used by Russians to hide thermal signatures from spy satellites	As long as parameters provide sufficient operating margin, leave in permit Exception – Quench water rates, delete from permit - there is no effect on emissions per calcs, noise suppression only
A.4. Methods of Operation Fuels = kerosene Oxidants = liquid oxygen	Designed to use liquid oxygen and kerosene only	No changes
A.5. Test Conditions Restricted to Daylight hours and Ambient atmospheric conditions that provide good dispersion Nighttime testing allowed on case by case approval basis	NAAQS not exceeded per modeling including all ambient conditions, no reason for restrictions Will cause test delays if enforced	Modeling results indicate no exceedance is predicted for full range of ambient conditions, no basis for this permit condition exists – therefore delete from permit
A.6. Hours of Operation As limited by A.3 and A.5 conditions described above	Refer to A.3 and A.5 issues	Refer to A.3 and A.5 issues

Draft Permit Conditions	Impact / Effects Discussion	Pratt's Proposed Mods
Emissions Limitations and Standards		
A.7. Visible emissions Limited to 40% opacity	Photographs of Russian tests show no smoke Exceedance due to uncombined water (steam) only is not a violation This test is not really intended for operations of short durations	None proposed
A.8. Carbon Monoxide Emissions CO emissions limited on minute (41.5 tons), 8 hour (83 tons), and annual (1000 tons) basis as determined by NASA-Lewis chemical equilibrium computer program or equivalent approved method	Verified results of NASA-Lewis chemical equilibrium computer program	No changes
A.9. BACT Determination Comply with BACT determination portion of permit (Appendix BD)	Eliminate oxygen injection to control CO emissions study. Based on EPA MACT, no emissions control is being proposed	Pratt & Whitney has fulfilled BACT determination as regulatory requirement. BACT was determined to be combustion design (oxidant/fuel ratio) which is integral to the process design, therefore no additional (add on) controls required. Delete oxygen injection study
Test Methods and Procedures		
A.10. Visible Emissions Monitor per DEP Method 9 for duration of the rocket firing test	Method 9 – requires certified “smoke reader” to conduct visible emissions test Can only be performed with adequate natural light	No changes if reg basis is confirmed. Resolve conflict if nighttime testing is performed.

Draft Permit Conditions	Impact / Effects Discussion	Pratt's Proposed Mods
A.11. Carbon Monoxide Emissions Monitoring Establish CO ambient air quality monitoring program for measuring CO before, during and after rocket test firings consistent with quoted EPA guidelines	Ambient air quality monitoring is costly and results are highly dependent on weather conditions. Usefulness of results would be very limited.	Delete this requirement based on marginal usefulness with respect to costs and very small chance that NAAQS would be exceeded.
Compliance Demonstrations and Periodic Monitoring		
A.12. Initial Compliance Demonstrations Visible emissions – monitor opacity during initial firing and for each new oxidant/fuel ratio per Conditions A.8 and A.11 described above	40% opacity limit for visible emissions.	No changes
A.13. Continuous Compliance Demonstrations Use ambient air quality monitoring program (per Condition A.11) to demonstrate CO compliance	Ambient air quality monitoring will not provide accurate compliance info without excessive costs	Delete this requirement
A.14. Annual Compliance Demonstration Formal compliance test for visible emissions once per Federal fiscal year (Oct 1 to Sept 30)	This visible emissions test requirement is redundant if Permit Condition A.12 is met. No regulatory basis found.	Delete this requirement if A.12 is included in permit. No reg basis.
A.15. Flow Monitors Install and maintain flow monitors for recording oxidant, fuel, and quench water rates during tests	Fuel and oxidant rates will affect emissions rates. Fuel and oxidant rates will be monitored for rocket performance test purposes. Compare maintenance, recordkeeping, and monitoring requirement details of permit vs. rocket tests needs. No regulatory basis for quench water rate measurements exists.	Delete flow monitoring requirements for quench water, no emissions impact.

Draft Permit Conditions	Impact / Effects Discussion	Pratt's Proposed Mods
A.16. Recordkeeping Maintain records for rates, durations, times, test condition summary, ambient CO, etc. as described	Recordkeeping elements directly related to emissions except for ambient CO monitoring.	Delete all ambient air monitoring requirements.
A.17. Reporting Test Notifications – provide 24 hour prior notice to PBCHD for each rocket test, including test details Mishap Reports – submit written notice within 24 hours and written analysis with 30 days (including excess emissions and ambient air quality impacts, if any)	Will require clear understanding, responsibility guidelines, and close communications between Rocket Test Support staff and EHS to ensure timely and adequate reporting details are provided to agency. No reg basis for Mishap Reports found, stated citation did was not consistent with permit condition	Obtain clear details of reporting requirements including methods (fax, phone, email?) for test notifications. Delete requirements regarding ambient air quality impacts – this can only be done via monitoring or modeling, in either case – results are not definitive, i.e., not necessarily representative of actual impacts Report mishaps as an “excursion from intended test conditions” with no reference to emissions.
A.18. Excess Emissions Excess emissions are allowed provided that Pratt demonstrates that no predicted impacts exceeding the NAAQS CO limit adjusted for ambient air monitoring program, significant increase in PSD pollutants, or HAPS	Any excursions from test conditions that increase emissions will create an Excess Emissions condition by permit definitions. Clear demonstration of NAAQS exceedance is difficult/impossible. Similarly for other PSD criteria pollutants and HAPS (results of modeling or ambient air monitoring are not definitive).	Same basis for deletion as described for A.17 above. Pratt & Whitney should report these incidents as an “excursion from intended test conditions” with no reference to excess emissions unless excess emissions were observed or directly measured.

From: Darrel_Graziani@doh.state.fl.us
Sent: Monday, May 21, 2001 12:58 PM
To: Linero, Alvaro
Cc: Jim_Stormer@doh.state.fl.us
Subject: Pratt & Whitney PSD Permit

Al,

Jim and I met with the Pratt people and consultants and agreed to the following changes:

Page TE-13:

The monitoring program shall be established prior to the initial test firing and shall ~~continue for a minimum of 12 valid test runs~~ provide for the collection of data for a minimum of four (4) test firings, one in each calendar quarter. ~~A valid test run shall be deemed one in which the wind direction will position at least one monitoring station downwind.~~ The program will allow the applicant to discontinue monitoring upon approval of the PBCHD during extended periods when testing is not scheduled.

Page 2, AC Permit - Condition A.3.(v).

All rocket engine test firings shall be conducted with ~~a minimum~~ the maximum quench water flow possible. ~~of 3,220 gallons per second.~~

Page 2, AC Permit - Condition A.7.

Al, since you're not setting the limit at 20% opacity you will need to change the rule quote.

Page 3, AC Permit - Condition A.11.

The permittee shall, prior to any rocket engine test firings, establish an approved ambient air quality monitoring program to measure ambient air concentrations of CO before, during, and after a rocket engine test firing. The program shall be approved by the Palm Beach County Health Department (PBCHD) and may be discontinued upon written request and PBCHD approval. ~~completion of consistent with the procedures specified in the Ambient Monitoring Guidelines for Prevention of Significant Deterioration (EPA 450/4-87-007, U. S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, N. C. 27711, May 1987).~~

Page 3, AC Permit - Condition A.12.

The permittee shall have conduct a visible emissions compliance test during the initial rocket engine test firing ~~and each subsequent test firing when a new oxidant/fuel ratio is used.~~ Initial compliance with the CO emission limitations shall be demonstrated through compliance with **Conditions 8 and 11** of this permit.

Page 4, AC Permit - Condition A.14.

Annual Renewal Compliance Demonstrations: The permittee shall have a formal compliance test conducted for visible emissions no earlier than 12 months prior to renewal of the Title V Operating Permit ~~annually during each federal fiscal year (October 1 - September 30), unless otherwise specified by rule, order, or permit.~~

(Al - The rule requires that an annual test be conducted since there is a limit. If it was just the 20% opacity of the General VE Rule it might not be required.)

Page 4, AC Permit - Condition A.15.

The permittee shall install, maintain, operate and calibrate flow monitors to measure the oxidant

and; fuel ~~and quench water~~ flow rates during each rocket engine test firing. All instrumentation shall be properly maintained and functional at all times, except during instrument breakdown, calibration or repair to ensure compliance with **Conditions 3, 4, 5, and 8** of this permit.

Page 4, AC Permit - Condition A.16.(vii).

~~(vii). Quench Water Rate (Planned and Actual);~~

Page 4, AC Permit - Condition A.17.(ii).

Mishap Upset Reports: In the event an ~~upset-a mishap~~ (i.e., test duration > 240 seconds, O/F ratio less than 2.72, fuel usage > 13,250 gpm, a flame out, ect.) occurs during a test, a written report shall be provided to the PBCHD within 24 hours of the test. Within thirty (30) days of ~~an upset-a mishap~~, the permittee shall submit an analysis showing the excess emissions associated ambient air quality impacts, if any.

Darrel

SUBSECTION A: The following specific conditions apply to the following emissions units:

EMISSIONS UNIT NO.	EMISSIONS UNIT DESCRIPTION
075	LOX/Kerosene Rocket Engine Test Stand

EMISSIONS UNIT(S) DETAILS

LOX/Kerosene Rocket Engine Test Stand, designated Emissions Unit 075, consisting of an engine containment can, a water-cooled silencer, and an exhaust gas deflector. Emissions are controlled through the use of a minimum oxidant to fuel ratio and the water-cooled silencer.

{Permitting note(s): The emissions unit has been reviewed under the PSD Program for carbon monoxide (CO). As a new major source of CO, the emissions unit is subject to the Best Available Control Technology (BACT) requirements of Rule 62-212.400(5)(c), F.A.C. Potential emissions of particulate matter (PM and PM10), sulfur dioxide (SO₂), oxides of nitrogen (NO_x), and volatile organic compounds have been estimated at 2.3, 1.4, 1.4, and 2.9 tons per year, respectively. The emissions unit is not subject to any New Source Performance Standards (40 CFR Part 60) or National Emission Standards for Hazardous Air Pollutants (40 CFR Part 61). The emissions unit has been identified as a Source Category for future regulatory action under the National Emission Standards for Hazardous Air Pollutants for Source Categories (40 CFR Part 63). A case-by-case determination of the Maximum Achievable Control Technology (MACT) under 40 CFR Part 63, Subpart B was not required.}

CONSTRUCTION REQUIREMENTS

A.1. **Test Stand:** The test stand shall be constructed in accordance with the design specifications provided within the application and the following minimum and maximum specifications:

(i) **Water Cooled Silencer:** Maximum diameter of 20 feet and a maximum length of 80 feet; and

(ii) **Exhaust Gas Deflector:** Minimum height of 70 feet, maximum distance from Water Cooled Silencer of 100 feet. The surface between the water-cooled silencer and the exhaust gas deflector shall be paved.

[BACT and Rules 62-4.070(3) and 62-296.320(4)(c), F.A.C.]

A.2. **Oxygen Injection Study:** Within one year of initial issuance of this permit, the permittee shall complete and submit to the Department an engineering and cost study evaluating the technical feasibility and cost effectiveness of direct O₂ (Air or Pure Oxygen) injection for reducing CO emissions in the exhausts of rocket engines tested at the permittee's facility. The study shall evaluate possibilities for direct O₂ injection including a heat-shielded, internally cooled oxygen lance for injecting stoichiometric rates of oxygen into the exhaust downstream of the engine. Appropriate kinetic modeling shall be utilized to predict the oxidation reaction rates and overall CO conversion for various configurations of the injection apparatus and various injection locations and methods.

[Rule 62-4.070(3) and BACT]

OPERATING RESTRICTIONS

A.3. **Permitted Capacity:** The permittee shall not allow, cause, suffer or permit the operation of the unit in excess of the following capacities without prior authorization from the Permitting Authority:

(i) **Test Duration:** Rocket engine test firing duration shall not exceed a total of 240 seconds per 8-hour period.

- (ii). **Test Firings:** Rocket engine test firings shall not exceed 2,880 seconds per year (12-month rolling total).
- (iii). **Oxidant/Fuel Ratio:** All rocket engine test firings shall be conducted at a minimum oxidant/fuel ratio of 2.72 pounds of oxygen per pound of fuel.
- (iv). **Fuel Usage:** Rocket engine test firings shall not consume more than 6,625 gallons per minute (4-minute average), 26,500 gallons per 8-hour period, and 318,000 gallons per year (12-month rolling total).
- (v). **Quench Water:** All rocket engine test firings shall be conducted with a minimum quench water flow of 3,220 gallons per second.

[BACT, Rules 62-4.160(2), 62-210.200(228), and 62-210.300, F.A.C.]

{Permitting note: Prior authorization includes the issuance of construction, reconstruction, or modification permits or a determination by the Permitting Authority that the action is not subject to 62-210.300(1), F.A.C.}

A.4. **Methods of Operation:** The permittee shall not allow, cause, suffer or permit any change in the method(s) of operation resulting in increased short-term or long-term potential emissions, without prior authorization from the Permitting Authority. The authorized methods of operation include the following:

- (i) **Fuels:** The permittee is authorized to use kerosene as the rocket engine fuel.
- (ii) **Oxidants:** The permittee is authorized to use liquid oxygen (LOX) as the rocket engine fuel oxidizer.

[BACT, Rules 62-4.160(2), 62-210.200(228) and 62-210.300, F.A.C.]

A.5. **Test Conditions:** Rocket engine test firings shall be restricted to daylight hours (1 hour after sunrise and 1 hour prior to sunset) and only under ambient conditions that provide good dispersion of the exhaust gases in accordance with a Test Plan to be submitted to the Palm Beach County Health Department (PBCHD) for approval prior to the initial test. Non-daylight hour testing may be approved on a case-by-case basis by the Palm Beach County Health Department (PBCHD).

[BACT, Rules 62-4.070(3), F.A.C.]

A.5.6. **Hours of Operation:** The permittee is authorized to operate the unit continuously within the limits of the permitted capacities of **Condition 3** and the test conditions of **Condition 5** of this permit.

[BACT, Rules 62-4.160(2), 62-210.200(228) and 62-210.300, F.A.C.]

EMISSION LIMITATIONS AND STANDARDS

A.5.7. **Visible Emissions:** The permittee shall not allow visible emissions that exceed forty (40) percent opacity from any rocket engine test firing.

[BACT, Rule 62-296.320(4)(b), F.A.C.]

A. ~~78~~. **Carbon Monoxide Emissions:** Rocket engine test firings shall not result in CO emissions greater than 41.5 tons per minute (2-minute average), 83 tons per 8-hour period, and 1,000 tons per year (12-month rolling total) as determined using the NASA-Lewis chemical equilibrium computer program or equivalent method approved by the Department or the Palm Beach County Health Department.

[BACT, Rules 62-4.160(2), 62-210.200(228), and 62-210.300, F.A.C.]

A. ~~89~~. **BACT Determination:** The permittee shall comply with the requirements of Appendix BD of this permit.

[BACT and Rule 62-212.400(5)(c), F.A.C.]

TEST METHODS AND PROCEDURES.

A. ~~94~~. **Visible Emissions:** All visible emissions tests performed pursuant to the requirements of this permit shall comply with the following provisions:

(i). **Test Method:** The test method for visible emissions shall be DEP Method 9, incorporated in Rule 62-297.401(9)(c), F.A.C. The required minimum period of observation for a compliance test shall for operations that are normally completed within less than the minimum observation period and do not recur within that time, the period of observation shall be equal to the duration of the operation completion time. The opacity test observation period shall include the period during which the highest opacity emissions can reasonably be expected to occur.

[BACT, Rule 62-297.310(4)(a)2.a, F.A.C.]

(ii). **Test Procedures:** Test procedures shall meet all applicable requirements of Chapter 62-297, F.A.C.

[Rule 62-296.410(3)(c), F.A.C.]

A. ~~104~~. **Carbon Monoxide Emissions:** The permittee shall, prior to any rocket engine test firings, establish an ambient air quality monitoring program to measure ambient air concentrations of CO before, during, and after a rocket engine test firing. The program shall be consistent with the procedures specified in the Ambient Monitoring Guidelines for Prevention of Significant Deterioration (EPA 450/4-87-007, U. S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, N. C. 27711, May 1987).

COMPLIANCE DEMONSTRATIONS AND PERIODIC MONITORING

A. ~~114~~. **Initial Compliance Demonstrations:** The permittee shall conduct a visible emissions compliance test during the initial rocket engine test firing and each subsequent test firing when a new oxidant/fuel ratio is used. Initial compliance with the CO emission limitations shall be demonstrated through compliance with **Conditions ~~78~~ and ~~104~~** of this permit.

[BACT and Rule 62-297.310(7)(a)1., F.A.C.]

A. ~~124~~. **Continuous Compliance Demonstrations:** The permittee shall demonstrate continuous compliance with the CO emissions limitation by use of the ambient air quality monitoring program required by **Condition ~~104~~** of this permit.

[BACT and Rule 62-4.070(3), F.A.C.]

A. ~~134~~. **Annual Compliance Demonstrations:** The permittee shall have a formal compliance test conducted for visible emissions annually during each federal fiscal year (October 1 – September 30), unless otherwise specified by rule, order, or permit.

[BACT and Rule 62-297.310(7), F.A.C.]

A.15.

Flow Monitors: The permittee shall install, maintain, operate and calibrate flow monitors to measure the oxidant, ~~and~~ fuel and quench water flow rates during each rocket engine test firing. All instrumentation shall be properly maintained and functional at all times, except during instrument breakdown, calibration or repair to ensure compliance with **Conditions 3, 4, 5, and 7 & 8** of this permit.

[Rule 62-4.070(3), F.A.C.]

A.16.

Recordkeeping: The permittee shall maintain the following records:

- (i). Test Identification Number;
- (ii). Test Date and Time (Start and Finish);
- (iii). Test Duration (Planned and Actual);
- (iv). Oxidant and Fuel Types;
- (v). Oxidant/Fuel Ratio (Planned and Actual);
- (vi). Fuel Usage (gallons per minute);
- (vii). Quench Water Rate (Planned and Actual);
- (viii). Test Condition Summary;
- (ix). CO Ambient Concentrations;
- (x). Mishaps; and
- (xi). Daily and Monthly Totals of Test Duration, Test Firings, and Fuel Usage.

[Rule 62-4.070(3), F.A.C.]

A.17.

Reporting: The permittee shall submit the following reports:

- (i). **Test Notifications:** Notification to the PBCHD at least 24 hours prior to a rocket engine test firing. The notification shall include the date and time of the test firing, the expected duration of the test firing, the planned oxidant/fuel ratio, and the planned fuel usage rate.

[BACT and Rule 62-4.070(3), F.A.C.]

- (ii) **Mishap Reports:** In the event a mishap (i.e., test duration > 240 seconds, O/F ratio less than 2.72, fuel usage > 13,250 gpm, a flame out, etc.) occurs during a test, a written report shall be provided to the PBCHD within 24 hours of the test. Within thirty (30) days of a mishap, the permittee shall submit an analysis showing the excess emissions associated ambient air quality impacts, if any.

[Rule 62-4.130, F.A.C.]

A.18.

Excess Emissions: Excess emissions shall be allowed provided the permittee demonstrates that the emissions did not result in a predicted ambient impact greater than the National Ambient Air Quality Standards (NAAQS) for CO adjusted based on the ambient monitoring program; a significant emissions increase in a PSD Pollutant; or result in emissions of a hazardous air pollutant in an amount of 10 tons per year or greater individually or 25 tons per year or greater collectively.

[BACT and Rule 62-4.070(3), F.A.C.]

SUBSECTION B: The following specific conditions apply to the following emissions units:

EMISSIONS UNIT NO.	EMISSIONS UNIT DESCRIPTION
076	NSPS Storage Tank – 36,000 Gallon Capacity

EMISSIONS UNITS DETAILS

Emissions Unit 076 is a stationary storage tanks each having an approximate capacity of 36,000 gallons. The tank is subject to specific recordkeeping requirements of 40 CFR 60 Subpart Kb. The tank will store and handle kerosene, a volatile organic liquid (VOL), for the LOX/Kerosene Rocket Engine Test Stand (E.U. ID No. 075).

{Permitting notes: The unit is classified as new facilities under the New Source Performance Standards (40 CFR 60 Subpart Kb) and subject to the recordkeeping requirement of 40 CFR 60 Subpart Kb.}

The following specific conditions apply to the emissions unit(s) listed above:

OPERATING RESTRICTIONS

- B.1. **Permitted Capacity.** The permittee shall not allow, cause, suffer, or permit the operation of Emissions Unit 076 in excess of 318,000 gallons per year without prior authorization from the Permitting Authority:
[Rules 62-4.160(2), 62-210.200(228), 62-210.300, F.A.C.]
- B.2. **Methods of Operation.** The permittee shall not allow, cause, suffer or permit any change in the method of operation of Emissions Unit 076 without prior authorization from the Permitting Authority. The authorized methods of operation include the following:
 - (i). **VOL Type(s).** The permittee is authorized to store and handle kerosene.
 - (ii). **VOL Vapor Pressure.** The permittee shall not store or handle any fuels within the units with a maximum true vapor pressure greater than 15.0 kPa (2.176 psi).
[Rules 62-4.160(2), 62-210.200(228), 62-210.300, F.A.C., 40 CFR 60.110b(c)]
- B.3. **Hours of Operation.** The permittee is authorized to operate the units continuously.
[Rule 62-4.070(3), F.A.C.]

COMPLIANCE DEMONSTRATIONS AND PERIODIC MONITORING

- B.4. **Compliance Demonstrations.** The permittee shall demonstrate compliance with the operating restriction of Condition B.1. based on record keeping as required by Condition B.5. of this permit.
[Rule 62-297.310(7), F.A.C.]
- B.5. **Records.** The permittee shall implement the following periodic monitoring requirements to ensure compliance with the Specific Conditions B.1 and B.2. of this permit:
 - (i). **Monthly Throughput.** The permittee shall monitor and record the monthly throughput of volatile organic liquids through each tank.
 - (ii). **Volatile Organic Liquid Types.** The permittee shall monitor and record the type (Name and True Vapor Pressure at 80°F) of volatile organic liquids stored and handled in each tank.
[Rule 62-213.440(1)(b), F.A.C.]

APPENDIX BD - BACT DETERMINATION

to evaluate the feasibility of direct O₂ injection into the gas stream downstream of the body of the engine. The study should employ kinetic modeling to determine the practicability and economic feasibility of adding the balance of stoichiometric oxygen required for complete combustion via direct injection at an appropriate point or points in the rocket engine exhaust. A period of one year is provided for completion of the study and submitting it to the Department.

The Department agrees with the applicant's finding that existing oxidation technology is not feasible at this time. As a result, the Department has determined BACT for the rocket engine test stand to be a visible emissions limitation of forty (40) percent opacity and the following work practices:

- Carbon Monoxide (CO) Emissions – Rocket engine test firings shall not result in CO emissions greater than 41.5 tons per minute (2-minute average), 83 tons per 8-hour period, and 1,000 tons per year (12-month rolling total) as determined using the NASA-Lewis chemical equilibrium computer program or equivalent method approved by the Department, *or the Palm Beach County Health Department.*
- Test Stand - The test stand shall be constructed in accordance with the design specifications provided within the application including a Water Cooled Silencer ~~with a maximum diameter of 20 feet and a maximum length of 80 feet~~ and an Exhaust Gas Deflector with a Minimum height of 70 feet, maximum distance from Water Cooled Silencer of 100 feet. The surface between the water-cooled silencer and the exhaust gas deflector shall be paved.
- Test Duration – Rocket engine test firings shall not exceed a total of 240 seconds per 8-hour period.
- Test Firings – Rocket engine test firings shall not exceed 2,880 seconds per year (12-month rolling total).
- Oxidant/Fuel Ratio – All rocket engine test firings shall be conducted at a minimum oxidant/fuel ratio of 2.72 lb. O₂/lb. Fuel.
- Fuel Usage – Rocket engine test firings shall not consume more than 6,625 gallons per minute (4-minute average), 26,500 gallons per 8-hour period, and 318,000 gallons per year (12-month rolling total).
- ~~Quench Water - All rocket engine test firings shall be conducted with sufficient quench water to minimize NO_x formation.~~
- Fuel and Oxidizer Types - Rocket engine test firings shall be limited to the firing of kerosene as the fuel and liquid oxygen (LOX) as the oxidizer.
- Test Conditions – Rocket engine test firings shall be restricted to daylight hours (1 hour after sunrise and 1 hour prior to sunset) and only under ambient conditions that provide good dispersion of the exhaust gases in accordance with a Test Plan to be submitted to the Palm Beach County Health Department (PBCHD) for approval prior to the initial test. Non-daylight hour testing may be approved on a case-by-case basis by the Palm Beach County Health Department (PBCHD).

APPENDIX BD - BACT DETERMINATION

- Test Notifications – At least 24 hours prior to a rocket engine test firing, notification shall be provided to the PBCHD. The notification shall include the date and time of the test firing, the expected duration of the test firing, the planned oxidant/fuel ratio, and the planned fuel usage rate. In the event that an upset occurs during a test (i.e., test duration > 240 seconds, O/F ratio less than 2.72, fuel usage > 13,250 gpm, a flame out, etc.), a written excess emissions report shall be provided to the PBCHD within 24 hours of the test. The report shall identify the upset and impacts.
- Postconstruction Monitoring – The permittee shall, prior to any rocket test firings, establish an approved ambient air quality monitoring program to measure ambient air concentrations of CO before, during, and after a rocket engine test firing. The Program shall be approved by the Palm Beach County Health Department (PBCHD) and may be discontinued upon written request and PBCHD approval. *consistent with the procedures specified in the Ambient Monitoring Guidelines for Prevention of Significant Deterioration (EPA 450/4-87-007 U.S. Environmental Protection Agency Office of Air Quality Planning and Standards, Research Triangle Park, NC 27111, 1978) May 1978*
- Oxygen Injection Study – Within one year of initial issuance of this permit, the permittee shall complete and submit to the Department an engineering and cost study evaluating the technical feasibility and cost effectiveness of direct O₂ (~~Air or Pure Oxygen~~) injection for reducing CO emissions in the exhausts of rocket engines tested at the permittee's facility. The study shall evaluate possibilities for direct O₂ injection including a heat-shielded, internally-cooled oxygen lance for injecting stoichiometric rates of oxygen into the exhaust downstream of the engine. Appropriate kinetic modeling shall be utilized to predict the oxidation reaction rates and overall CO conversion for various configurations of the injection apparatus and various injection locations and methods.
- Compliance Demonstrations – Compliance with the visible emissions limitation shall be demonstrated initially for each new oxidant/fuel ratio and annual thereafter. Compliance with the CO emissions limitation shall be demonstrated initially and continuously thereafter through the use of the NASA Lewis chemical equilibrium computer program or its equivalent as approved by the Department or ~~the~~ Palm Beach County Health Department and the ambient air quality monitoring program.
- Excess Emissions - Excess emissions shall be allowed provided the permittee demonstrates that the emissions did not result in a predicted ambient impact greater than the National Ambient Air Quality Standards (NAAQS) for CO adjusted based on the ambient monitoring program; a significant emissions increase in a PSD Pollutant; or result in emissions of a hazardous air pollutant in an amount of 10 tons per year or greater individually or 25 tons per year or greater collectively.

Draft Permit Conditions	Impact / Effects Discussion	Pratt's Proposed Mods
Construction Requirements		
A.1. Test Stand Water cooled silencer – max diam = 20 feet, max length = 80 feet	Dimensions were very preliminary, not based on detailed engineering design	Delete these dimensional restrictions from permit, not relevant to emissions rates
A.2. Oxygen Injection Study - Complete and submit to DEP an engineering and cost study evaluating direct O ₂ injection methods and CO emissions reductions	Major effort to perform this type of research study, Estimated effort = 1.5 person-years and > \$300,000; EPA is proposing no controls for MACT	Delete this from permit, on basis of no emissions control per proposed MACT and potential safety issues
Operating Restrictions		
A.3. Permitted capacity Test duration Test firings Oxidant/Fuel Ratio Fuel usage Quench water	All of these conditions were based strictly on permit application submitted Sufficient margin for operations flexibility? "Quench" water is used for sound absorption only, no effect on emissions. Water used by Russians to hide thermal signatures from spy satellites	As long as parameters provide sufficient operating margin, leave in permit Exception – Quench water rates, delete from permit - there is no effect on emissions per calcs, noise suppression only
A.4. Methods of Operation Fuels = kerosene Oxidants = liquid oxygen	Designed to use liquid oxygen and kerosene only	No changes
A.5. Test Conditions Restricted to Daylight hours and Ambient atmospheric conditions that provide good dispersion Nighttime testing allowed on case by case approval basis	NAAQS not exceeded per modeling including all ambient conditions, no reason for restrictions Will cause test delays if enforced	Modeling results indicate no exceedance is predicted for full range of ambient conditions, no basis for this permit condition exists – therefore delete from permit
A.6. Hours of Operation As limited by A.3 and A.5 conditions described above	Refer to A.3 and A.5 issues	Refer to A.3 and A.5 issues

*memo
to be
submitted
with this
approach*

*Remove
quench
rates*

*Clarify
2.4 vs. 2.22*

*All consulted
Dorris
(Related
to Sugar cane
industry,
Palm Beach
County)*

Draft Permit Conditions	Impact / Effects Discussion	Pratt's Proposed Mods
Emissions Limitations and Standards		
A.7. Visible emissions Limited to 40% opacity <i>20%?</i>	Photographs of Russian tests show no smoke Exceedance due to uncombined water (steam) only is not a violation This test is not really intended for operations of short durations	None proposed
A.8. Carbon Monoxide Emissions CO emissions limited on minute (41.5 tons), 8 hour (83 tons), and annual (1000 tons) basis as determined by NASA-Lewis chemical equilibrium computer program or equivalent approved method	Verified results of NASA-Lewis chemical equilibrium computer program	No changes
A.9. BACT Determination Comply with BACT determination portion of permit (Appendix BD)	Eliminate oxygen injection to control CO emissions study. Based on EPA MACT, no emissions control is being proposed	Pratt & Whitney has fulfilled BACT determination as regulatory requirement. BACT was determined to be combustion design (oxidant/fuel ratio) which is integral to the process design, therefore no additional (add on) controls required. Delete oxygen injection study
Test Methods and Procedures		
A.10. Visible Emissions Monitor per DEP Method 9 for duration of the rocket firing test	Method 9 – requires certified “smoke reader” to conduct visible emissions test Can only be performed with adequate natural light	No changes if reg basis is confirmed. Resolve conflict if nighttime testing is performed.
A.11. Carbon Monoxide Emissions Monitoring Establish CO ambient air quality monitoring program for measuring CO before, during and after rocket test firings consistent with quoted EPA guidelines	Ambient air quality monitoring is costly and results are highly dependent on weather conditions. Usefulness of results would be very limited.	Delete this requirement based on marginal usefulness with respect to costs and very small chance that NAAQS would be exceeded.

SAME AS A.2.

Consult with Perry

Draft Permit Conditions	Impact / Effects Discussion	Pratt's Proposed Mods
Compliance Demonstrations and Periodic Monitoring		
A.12. Initial Compliance Demonstrations Visible emissions – monitor opacity during initial firing and for each new oxidant/fuel ratio per Conditions A.8 and A.11 described above	40% opacity limit for visible emissions.	No changes
A.13. Continuous Compliance Demonstrations Use ambient air quality monitoring program (per Condition A.11) to demonstrate CO compliance	Ambient air quality monitoring will not provide accurate compliance info without excessive costs	Delete this requirement
A.14. Annual Compliance Demonstration Formal compliance test for visible emissions once per Federal fiscal year (Oct 1 to Sept 30)	This visible emissions test requirement is redundant if Permit Condition A.12 is met. No regulatory basis found.	Delete this requirement if A.12 is included in permit. No reg basis.
A.15. Flow Monitors Install and maintain flow monitors for recording oxidant, fuel, and quench water rates during tests	Fuel and oxidant rates will affect emissions rates. Fuel and oxidant rates will be monitored for rocket performance test purposes. Compare maintenance, recordkeeping, and monitoring requirement details of permit vs. rocket tests needs. No regulatory basis for quench water rate measurements exists.	Delete flow monitoring requirements for quench water, no emissions impact.
A.16. Recordkeeping Maintain records for rates, durations, times, test condition summary, ambient CO, etc. as described	Recordkeeping elements directly related to emissions except for ambient CO monitoring.	Delete all ambient air monitoring requirements.

Discuss w/ Permit

Clarify to not force test

D.K.

*Check
w/ Perry*

Draft Permit Conditions	Impact / Effects Discussion	Pratt's Proposed Mods
<p>A.17. Reporting Test Notifications – provide 24 hour prior notice to PBCHD for each rocket test, including test details Mishap Reports – submit written notice within 24 hours and written analysis with 30 days (including excess emissions and ambient air quality impacts, if any)</p>	<p>Will require clear understanding, responsibility guidelines, and close communications between Rocket Test Support staff and EHS to ensure timely and adequate reporting details are provided to agency.</p> <p>No reg basis for Mishap Reports found, stated citation did was not consistent with permit condition</p>	<p>Obtain clear details of reporting requirements including methods (fax, phone, email?) for test notifications.</p> <p>Delete requirements regarding ambient air quality impacts – this can only be done via monitoring or modeling, in either case – results are not definitive, i.e., not necessarily representative of actual impacts</p> <p>Report mishaps as an “excursion from intended test conditions” with no reference to emissions.</p>
<p>A.18. Excess Emissions Excess emissions are allowed provided that Pratt demonstrates that no predicted impacts exceeding the NAAQS CO limit adjusted for ambient air monitoring program, significant increase in PSD pollutants, or HAPS</p>	<p>Any excursions from test conditions that increase emissions will create an Excess Emissions condition by permit definitions.</p> <p>Clear demonstration of NAAQS exceedance is difficult/impossible. Similarly for other PSD criteria pollutants and HAPS (results of modeling or ambient air monitoring are not definitive).</p>	<p>Same basis for deletion as described for A.17 above. Pratt & Whitney should report these incidents as an “excursion from intended test conditions” with no reference to excess emissions unless excess emissions were observed or directly measured.</p>

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Proposed Changes to Draft Permit Conditions

Applicable to LOx/Kerosene Rocket Engine Test Stand

5/1/01 4:53 PM 05/01/01 4:30 PM – Last Version Saved by Dean

Draft Permit Conditions	Impact / Effects Discussion	Pratt's Proposed Mods
Construction Requirements		
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Draft Permit Conditions	Impact / Effects Discussion	Pratt's Proposed Mods
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A.11. Carbon Monoxide Emissions Monitoring Establish CO ambient air quality monitoring program for measuring CO before, during and after rocket test firings consistent with quoted EPA guidelines	Ambient air quality monitoring is costly and results are highly dependent on weather conditions. Usefulness of results would be very limited.	Delete this requirement based on marginal usefulness with respect to costs and very small chance that NAAQS would be exceeded.

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Proposed Changes to Draft Permit Conditions

Applicable to LOx/Kerosene Rocket Engine Test Stand

5/1/01 4:53 PM 05/01/01 4:30 PM – Last Version Saved by Dean

Draft Permit Conditions	Impact / Effects Discussion	Pratt's Proposed Mods
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A.14. Annual Compliance Demonstration Formal compliance test for visible emissions once per Federal fiscal year (Oct 1 to Sept 30)	This visible emissions test requirement is redundant if Permit Condition A.12 is met. No regulatory basis found.	Delete this requirement if A.12 is included in permit. No reg basis. *
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A.16. Recordkeeping Maintain records for rates, durations, times, test condition summary, ambient CO, etc. as described	Recordkeeping elements directly related to emissions except for ambient CO monitoring.	Delete all ambient air monitoring requirements.

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Proposed Changes to Draft Permit Conditions
Applicable to LOx/Kerosene Rocket Engine Test Stand
5/1/01 4:53 PM 05/01/01 4:30 PM – Last Version Saved by Dean

Draft Permit Conditions	Impact / Effects Discussion	Pratt's Proposed Mods
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A.18. Excess Emissions Excess emissions are allowed provided that Pratt demonstrates that no predicted impacts exceeding the NAAQS CO limit adjusted for ambient air monitoring program, significant increase in PSD pollutants, or HAPS	Any excursions from test conditions that increase emissions will create an Excess Emissions condition by permit definitions. Clear demonstration of NAAQS exceedance is difficult/impossible. Similarly for other PSD criteria pollutants and HAPS (results of modeling or ambient air monitoring are not definitive).	Same basis for deletion as described for A.17 above. Pratt & Whitney should report these incidents as an “excursion from intended test conditions” with no reference to excess emissions unless excess emissions were observed or directly measured.

DRAFT



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION 4
ATLANTA FEDERAL CENTER
61 FORSYTH STREET
ATLANTA, GEORGIA 30303-8960

RECEIVED

MAR 14 2001

BUREAU OF AIR REGULATION

4 APT-ARB

MAR 12 2001

Mr. A. A. Linero, P.E.
Administrator
New Source Review Section
Florida Department of Environmental Protection
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

SUBJ: Prevention of Significant Deterioration (PSD) Preliminary Determination for United Technologies Corporation (UTC) - Pratt & Whitney located in Jupiter (Palm Beach County), Florida
PSD-FL-294

Dear Mr. Linero:

Thank you for submitting the PSD preliminary determination (dated January 29, 2001) for the above referenced facility to the U.S. Environmental Protection Agency (EPA) for comments. The proposed project involves the construction and operation of a test cell for liquid oxygen (LOX)/kerosene-propelled rocket engines at the E-5 rocket test area of the existing West Palm Beach facility. The new test cell will consist of the following systems: LOX and kerosene supply tanks (64,000 and 36,000-gallon capacities, respectively), engine containment can, water-cooled silencer, exhaust gas deflector, lined cooling water retention pond, and elevated water supply tank (1 million-gallon capacity). The total emissions increase of carbon monoxide (CO) from the proposed project is above the significance threshold requiring PSD review.

Based on a review of the preliminary determination, it appears that the Florida Department of Environmental Protection has adequately addressed the concerns detailed in our letter to you dated September 8, 2000; therefore, EPA has no further comments at this time.

Thank you again for the opportunity to comment on the UTC - Pratt & Whitney preliminary determination. If you have further questions or comments, please direct them to either Art Hofmeister at (404) 562-9115 or Jim Little at (404) 562-9118.

Sincerely,

R. Douglas Neeley, Chief
Air and Radiation Technology Branch
Air, Pesticides and Toxics
Management Division

cc: G. Reynolds
C. Holladay
D. Grayson, PSE
J. Goldman, SED
B. Susi, Balder
NPS

Linero, Alvaro

From: McCann, Bob [BMcCann@GOLDER.com]
Sent: Wednesday, May 02, 2001 9:23 AM
To: Reynolds, John; Linero, Alvaro
Cc: Gee, Dean; Susi, Benny; Davis, Jeffrey M.; Alberghini, David; Cires, Miguel A.
Subject: RE: Pratt RD180 permit conditions- Plots of Predicted CO Concentrations

PRATTplots1.xls

John

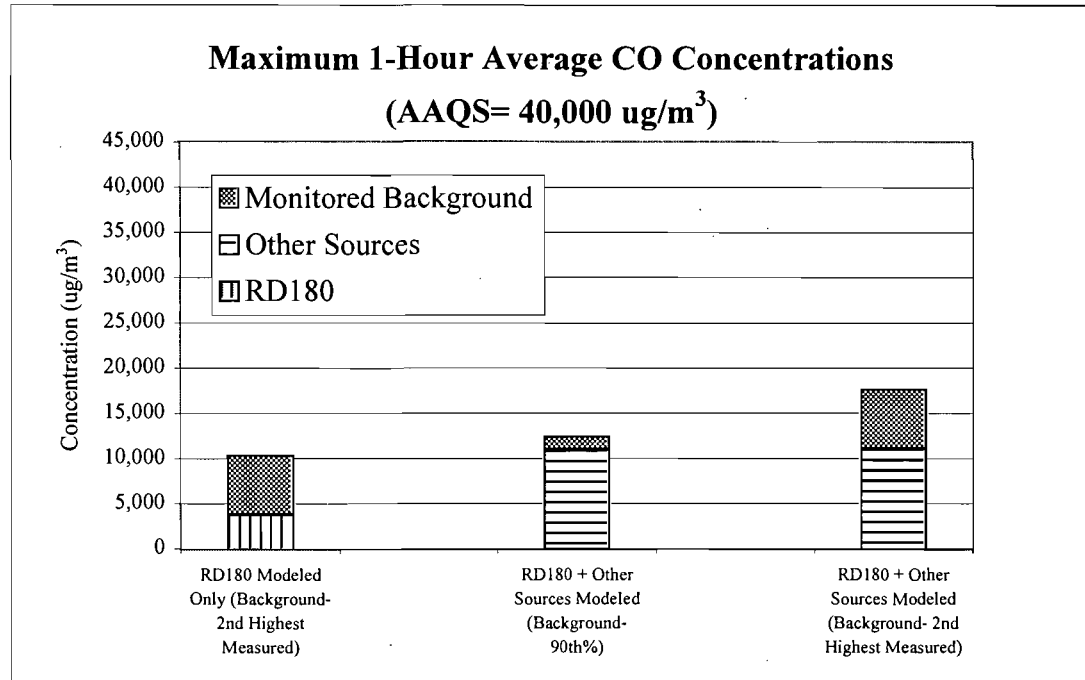
Attached is file with plots of maximum CO concentrations predicted for the project.

Three scenarios are presented.

1. Maximum CO impacts due to project alone added to non-modeled background concentration that was based on second-highest conc. measured in Palm Beach County. These results were presented in original application.
2. Maximum CO impacts due to project added to modeled background concentration due to other emission sources and due to non-modeled background concentration derived from measured concentration using the 90th percentile. These results were presented in followup correspondence.
3. Maximum CO impacts due to project added to modeled background concentration due to other emission sources and due to non-modeled background concentration derived from measured concentration using second-highest concentration (same as scenario 1).

I have also faxed the plots to you.

Bob McCann
Golder Associates Inc.
6241 NW 23rd Street
Gainesville, FL 32653
Tel: (352) 336-5600 x 546
Fax: (352) 336-6603
E-mail: bob_mccann@golder.com



	1-hour Concentrations (ug/m3)				
	Modeled Sources		Monitored Background		AAQS
	RD180	Other Sources	Highest, Second Highest	Total	
RD180 Modeled Only (Background- 2nd Highest Measured)	3,822	0	6,440	10,262	40,000
RD180 + Other Sources Modeled (Background- 90th%)	0	11,009	1,300	12,309	40,000
RD180 + Other Sources Modeled (Background- 2nd Highest Measured)	0	11,099	6,440	17,539	40,000

SENDER: COMPLETE THIS SECTION

- Complete items 1, 2, and 3. Also complete item 4 if Restricted Delivery is desired.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

Mr. John Sillan, Manager Facilities
 Management
 United Technologies Corp.-
 Pratt & Whitney
 P. O. Box 109600
 West Pam Beach, FL 33410-9600

COMPLETE THIS SECTION ON DELIVERY

A. Received by (Please Print Clearly) B. Date of Delivery

C. Signature

 Agent
 Addressee

 D. Is delivery address different from item 1? Yes
 If YES, enter delivery address below: No

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 Certified Mail Express Mail
 Registered Return Receipt for Merchandise
 Insured Mail C.O.D.
4. Restricted Delivery? (Extra Fee) Yes

2. Article Number (Copy from service label)

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PS Form 3811, July 1999

Domestic Return Receipt

102595-99-M-1789

U.S. Postal Service
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 (Domestic Mail Only; No Insurance Coverage Provided)

Article Sent To:

John K. Sillan

Postage	\$
Certified Fee	
Return Receipt Fee (Endorsement Required)	
Restricted Delivery Fee (Endorsement Required)	
Total Postage & Fees	\$

 United Tech.
 Pratt & Whitney
 Postmark
 Here
Name (Please Print Clearly, to be completed by mailer)
Mr. John K. SillanStreet, Apt. No., or PO Box No.
P. O. Box 109600City, State, ZIP+4
West Palm Beach, FL 33410-9600

PS Form 3800, July, 1999

See Reverse for Instructions

7099 3400 0000 1449 4574



Department of Environmental Protection

Jeb Bush
Governor

Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

David B. Struhs
Secretary

P.E. Certification Statement

Permittee:

DEP File No. 0990021-004-AC (PSD-FL-294)

UTC Pratt & Whitney
LOX/Kerosene Rocket Engine Test Stand
Palm Beach County

Project type:

Project is construction of: a liquid oxygen and kerosene-fired rocket test stand with a water-cooled silencer and exhaust gas deflector; a water storage tank; a liquid oxygen tank; and a kerosene tank. The stand will be fired up to 12 times per year for 240 seconds per occurrence.

Carbon monoxide emissions will be controlled by maintaining a 2.72:1 oxygen to fuel ratio (by weight). A CO monitoring program is required largely due to projected concentrations approaching the NAAQS. The Department will require a feasibility study to determine if it is possible to increase the oxygen to fuel ratio to reduce generation of CO.

I HEREBY CERTIFY that the engineering features described in the above referenced application and subject to the proposed permit conditions provide reasonable assurance of compliance with applicable provisions of Chapter 403, Florida Statutes, and Florida Administrative Code Chapters 62-4 and 62-204 through 62-297. However, I have not evaluated and I do not certify aspects of the proposal outside of my area of expertise (including but not limited to the electrical, mechanical, structural, hydrological, and geological features).

1/22/2001

A A. Linero, P.E.

Date

Registration Number: 26032

Department of Environmental Protection
Bureau of Air Regulation
New Source Review Section
111 South Magnolia Drive, Suite 4
Tallahassee, Florida 32301
Phone (850) 921-9523
Fax (850) 922-6979

1/22

"More Protection, Less Process"

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Jeb Bush
Governor

Department of Environmental Protection

Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

David B. Struhs
Secretary

January 29, 2001

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Mr. John K. Sillan, Manager
Facilities Management
United Technologies Corp.-Pratt & Whitney
P.O. Box 109600
West Palm Beach, Florida 33410-9600

Re: DEP File No. 0990021-004-AC (PSD-FL-294)
LOX/Kerosene Rocket Engine Test Stand

Dear Mr. Sillan:

Enclosed is one copy of the draft air construction permit to construct a LOX/Kerosene Rocket Engine Test Stand located at 17900 Beeline Highway, near Jupiter, Palm Beach County, Florida. The Technical Evaluation and Preliminary Determination, the Department's Intent to Issue Air Construction Permit and the "Public Notice of Intent to Issue Air Construction Permit" are also included.

The "Public Notice" must be published one time only, as soon as possible, in the legal advertisement section of a newspaper of general circulation in the area affected, pursuant to the requirements Chapter 50, Florida Statutes. Proof of publication, i.e., newspaper affidavit, must be provided to the Department's Bureau of Air Regulation office within seven days of publication. Failure to publish the notice and provide proof of publication may result in the denial of the permit.

Please submit any written comments you wish to have considered concerning the Department's proposed action to A. A. Linero, P.E., Administrator, New Source Review Section at the above letterhead address. If you have any other questions, please contact Mr. Linero at 850/921-9523.

Sincerely,

C. H. Fancy, P.E., Chief,
Bureau of Air Regulation

CHF/al

Enclosures

"More Protection, Less Process"

Printed on recycled paper.

In the Matter of an
Application for Permit by:

John K. Sillan, Manager Facilities Management
United Technologies Corp.-Pratt & Whitney
P.O. Box 109600
West Palm Beach, Florida 33410-9600

DEP File No. 0990021-004-AC (PSD-FL-294)
LOX/Kerosene Rocket Engine Test Stand
Palm Beach County

INTENT TO ISSUE AIR CONSTRUCTION PERMIT

The Department of Environmental Protection (Department) gives notice of its intent to issue an air construction permit (copy of draft permit attached) for the proposed project, detailed in the application specified above and the enclosed Technical Evaluation and Preliminary Determination, for the reasons stated below.

The applicant, United Technologies Corp.-Pratt & Whitney, initially applied on June 20, 2000 to the Department for an air construction permit to construct a LOX/Kerosene Rocket Engine Test Stand to be located at 17900 Beeline Highway, Jupiter, Palm Beach County.

The Department has permitting jurisdiction under the provisions of Chapter 403, Florida Statutes (F.S.), and Florida Administrative Code (F.A.C.) Chapters 62-4, 62-210, and 62-212. The above actions are not exempt from permitting procedures. The Department has determined that an air construction permit is required to construct the project.

The Department intends to issue this air construction permit based on the belief that reasonable assurances have been provided to indicate that operation of these emission units will not adversely impact air quality, and the emission units will comply with all appropriate provisions of Chapters 62-4, 62-204, 62-210, 62-212, 62-296, and 62-297, F.A.C.

Pursuant to Section 403.815, F.S., and Rule 62-110.106(7)(a)1., F.A.C., you (the applicant) are required to publish at your own expense the enclosed Public Notice of Intent to Issue Air Construction Permit. The notice shall be published one time only in the legal advertisement section of a newspaper of general circulation in the area affected. Rule 62-110.106(7)(b), F.A.C., requires that the applicant cause the notice to be published as soon as possible after notification by the Department of its intended action. For the purpose of these rules, "publication in a newspaper of general circulation in the area affected" means publication in a newspaper meeting the requirements of Sections 50.011 and 50.031, F.S., in the county where the activity is to take place. If you are uncertain that a newspaper meets these requirements, please contact the Department at the address or telephone number listed below. The applicant shall provide proof of publication to the Department's Bureau of Air Regulation, at 2600 Blair Stone Road, Mail Station #5505, Tallahassee, Florida 32399-2400 (Telephone: 850/488-0114; Fax 850/ 922-6979). You must provide proof of publication within seven days of publication, pursuant to Rule 62-110.106(5), F.A.C. No permitting action for which published notice is required shall be granted until proof of publication of notice is made by furnishing a uniform affidavit in substantially the form prescribed in section 50.051, F.S. to the office of the Department issuing the permit. Failure to publish the notice and provide proof of publication may result in the denial of the permit pursuant to Rules 62-110.106(9) & (11), F.A.C.

The Department will issue the final permit with the attached conditions unless a response received in accordance with the following procedures results in a different decision or significant change of terms or conditions.

The Department will accept written comments and requests for public meetings concerning the proposed permit issuance action for a period of thirty (30) days from the date of publication of Public Notice of Intent to Issue Air Permit. Written comments and requests for public meetings should be provided to the Department's Bureau of Air Regulation at 2600 Blair Stone Road, Mail Station #5505, Tallahassee, FL 32399-2400. Any written comments filed shall be made available for public inspection. If written comments received result in a significant change in the proposed agency action, the Department shall revise the proposed permit and require, if applicable, another Public Notice.

The Department will issue the permit with the attached conditions unless a timely petition for an administrative hearing is filed pursuant to sections 120.569 and 120.57 F.S., before the deadline for filing a petition. The procedures for petitioning for a hearing are set forth below.

A person whose substantial interests are affected by the proposed permitting decision may petition for an administrative proceeding (hearing) under sections 120.569 and 120.57 of the Florida Statutes. The petition must contain the information set forth below and must be filed (received) in the Office of General Counsel of the Department at 3900 Commonwealth Boulevard, Mail Station #35, Tallahassee, Florida, 32399-3000. Petitions filed by the permit applicant or any of the parties listed below must be filed within fourteen days of receipt of this notice of intent. Petitions filed by any persons other than those entitled to written notice under section 120.60(3) of the Florida Statutes must be filed within fourteen days of publication of the public notice or within fourteen days of receipt of this notice of intent, whichever occurs first. Under section 120.60(3), however, any person who asked the Department for notice of agency action may file a petition within fourteen days of receipt of that notice, regardless of the date of publication. A petitioner shall mail a copy of the petition to the applicant at the address indicated above at the time of filing. The failure of any person to file a petition within the appropriate time period shall constitute a waiver of that person's right to request an administrative determination (hearing) under sections 120.569 and 120.57 F.S., or to intervene in this proceeding and participate as a party to it. Any subsequent intervention will be only at the approval of the presiding officer upon the filing of a motion in compliance with Rule 28-106.205 of the Florida Administrative Code.

A petition that disputes the material facts on which the Department's action is based must contain the following information: (a) The name and address of each agency affected and each agency's file or identification number, if known; (b) The name, address, and telephone number of the petitioner, the name, address, and telephone number of the petitioner's representative, if any, which shall be the address for service purposes during the course of the proceeding; and an explanation of how the petitioner's substantial interests will be affected by the agency determination; (c) A statement of how and when petitioner received notice of the agency action or proposed action; (d) A statement of all disputed issues of material fact. If there are none, the petition must so indicate; (e) A concise statement of the ultimate facts alleged, including the specific facts the petitioner contends warrant reversal or modification of the agency's proposed action; (f) A statement of the specific rules or statutes the petitioner contends require reversal or modification of the agency's proposed action; and (g) A statement of the relief sought by the petitioner, stating precisely the action petitioner wishes the agency to take with respect to the agency's proposed action.

A petition that does not dispute the material facts upon which the Department's action is based shall state that no such facts are in dispute and otherwise shall contain the same information as set forth above, as required by Rule 28-106.301.

Because the administrative hearing process is designed to formulate final agency action, the filing of a petition means that the Department's final action may be different from the position taken by it in this notice. Persons whose substantial interests will be affected by any such final decision of the Department on the application have the right to petition to become a party to the proceeding, in accordance with the requirements set forth above. Mediation is not available in this proceeding.

In addition to the above, a person subject to regulation has a right to apply for a variance from or waiver of the requirements of particular rules, on certain conditions, under Section 120.542 F.S. The relief provided by this state statute applies only to state rules, not statutes, and not to any federal regulatory requirements. Applying for a variance or waiver does not substitute or extend the time for filing a petition for an administrative hearing or exercising any other right that a person may have in relation to the action proposed in this notice of intent.

The application for a variance or waiver is made by filing a petition with the Office of General Counsel of the Department, 3900 Commonwealth Boulevard, Mail Station #35, Tallahassee, Florida 32399-3000. The petition must specify the following information: (a) The name, address, and telephone number of the petitioner; (b) The name, address, and telephone number of the attorney or qualified representative of the petitioner, if any; (c) Each rule or portion of a rule from which a variance or waiver is requested; (d) The citation to the statute underlying (implemented by) the rule identified in (c) above; (e) The type of action requested; (f) The specific facts that would justify a variance or waiver for the petitioner; (g) The reason why the variance or waiver would serve the purposes of the underlying statute (implemented by the rule); and (h) A statement whether the variance or waiver is permanent or temporary and, if temporary, a statement of the dates showing the duration of the variance or waiver requested.

The Department will grant a variance or waiver when the petition demonstrates both that the application of the rule would create a substantial hardship or violate principles of fairness, as each of those terms is defined in Section 120.542(2) F.S., and that the purpose of the underlying statute will be or has been achieved by other means by the petitioner.

Persons subject to regulation pursuant to any federally delegated or approved air program should be aware that Florida is specifically not authorized to issue variances or waivers from any requirements of any such federally delegated or approved program. The requirements of the program remain fully enforceable by the Administrator of the EPA and by any person under the Clean Air Act unless and until the Administrator separately approves any variance or waiver in accordance with the procedures of the federal program.

Executed in Tallahassee, Florida.



C. H. Fancy, P.E., Chief
Bureau of Air Regulation

CERTIFICATE OF SERVICE

The undersigned duly designated deputy agency clerk hereby certifies that this Intent to Issue Air Construction Permit (including the Public Notice, Technical Evaluation and Preliminary Determination, Draft Best Available Control Technology Determination, and the Draft permit) was sent by certified mail (*) and copies were mailed by U.S. Mail before the close of business on 1/29/01 to the person(s) listed:

John K. Sillan*
Benny Susi, P.E., Golder Associates
Isidore Goldman, SED

Darrel Graziani, PBCHD
Gregg Worley, EPA
John Bunyak, NPS

Clerk Stamp

FILING AND ACKNOWLEDGMENT FILED,
on this date, pursuant to §120.52, Florida Statutes,
with the designated Department Clerk, receipt of
which is hereby acknowledged.

Charlotte J. Hayes 1/29/01
(Clerk) (Date)

PUBLIC NOTICE OF INTENT TO ISSUE AIR CONSTRUCTION PERMIT

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION

DEP File No. 0990021-004-AC (PSD-FL-294)

United Technologies Corp.-Pratt & Whitney
LOX/Kerosene Rocket Engine Test Stand
Palm Beach County

The Department of Environmental Protection (Department) gives notice of its intent to issue an air construction permit to United Technologies Corp.-Pratt & Whitney for construction of a LOX/Kerosene Rocket Engine Test Stand located at 17900 Beeline Highway, near Jupiter, Palm Beach County. A Best Available Control Technology (BACT) determination was required for emissions of carbon monoxide (CO) pursuant to Rule 62-212.400, F.A.C., Prevention of Significant Deterioration (PSD). The applicant's mailing address is: United Technologies Corp.-Pratt & Whitney, Post Office Box 109600, West Palm Beach, Florida 33410-9600.

Emissions of CO are estimated to be approximately 1,000 tons per year. These emissions shall be restricted by limiting fuel usage to 318,000 gallons per year, test firings to 12 per year, and duration of firings to 240 seconds each. The minimum oxidant to fuel ratio will be 2.72 pounds of oxygen per ton of fuel. The Department will require the applicant to establish and operate an ambient air quality monitoring program.

An air quality impact analysis was conducted. Emissions from the facility will not significantly contribute to or cause a violation of any state or federal ambient air quality standards or PSD increment.

The Department will issue the final permit with the attached conditions unless a response received in accordance with the following procedures results in a different decision or significant change of terms or conditions.

The Department will accept written comments and requests for public meetings concerning the proposed permit issuance action for a period of thirty (30) days from the date of publication of this Public Notice of Intent to Issue Air Construction Permit. Written comments and requests for public meetings should be provided to the Department's Bureau of Air Regulation at 2600 Blair Stone Road, Mail Station #5505, Tallahassee, FL 32399-2400. Any written comments filed shall be made available for public inspection. If written comments received result in a significant change in the proposed agency action, the Department shall revise the proposed permit and require, if applicable, another Public Notice.

The Department will issue the permit with the attached conditions unless a timely petition for an administrative hearing is filed pursuant to sections 120.569 and 120.57 F.S., before the deadline for filing a petition. The procedures for petitioning for a hearing are set forth below. Mediation is not available in this proceeding.

A person whose substantial interests are affected by the proposed permitting decision may petition for an administrative proceeding (hearing) under sections 120.569 and 120.57 of the Florida Statutes. The petition must contain the information set forth below and must be filed (received) in the Office of General Counsel of the Department at 3900 Commonwealth Boulevard, Mail Station #35, Tallahassee, Florida, 32399-3000. Petitions filed by the permit applicant or any of the parties listed below must be filed within fourteen days of receipt of this notice of intent. Petitions filed by any persons other than those entitled to written notice under section 120.60(3) of the Florida Statutes must be filed within fourteen days of publication of the public notice or within fourteen days of receipt of this notice of intent, whichever occurs first. Under section 120.60(3), however, any person who asked the Department for notice of agency action may file a petition within fourteen days of receipt of that notice, regardless of the date of

NOTICE TO BE PUBLISHED IN THE NEWSPAPER

publication. A petitioner shall mail a copy of the petition to the applicant at the address indicated above at the time of filing. The failure of any person to file a petition within the appropriate time period shall constitute a waiver of that person's right to request an administrative determination (hearing) under sections 120.569 and 120.57 F.S., or to intervene in this proceeding and participate as a party to it. Any subsequent intervention will be only at the approval of the presiding officer upon the filing of a motion in compliance with Rule 28-106.205 of the Florida Administrative Code.

A petition that disputes the material facts on which the Department's action is based must contain the following information: (a) The name and address of each agency affected and each agency's file or identification number, if known; (b) The name, address, and telephone number of the petitioner, the name, address, and telephone number of the petitioner's representative, if any, which shall be the address for service purposes during the course of the proceeding; and an explanation of how the petitioner's substantial interests will be affected by the agency determination; (c) A statement of how and when petitioner received notice of the agency action or proposed action; (d) A statement of all disputed issues of material fact. If there are none, the petition must so indicate; (e) A concise statement of the ultimate facts alleged, including the specific facts the petitioner contends warrant reversal or modification of the agency's proposed action; (f) A statement of the specific rules or statutes the petitioner contends require reversal or modification of the agency's proposed action; and (g) A statement of the relief sought by the petitioner, stating precisely the action petitioner wishes the agency to take with respect to the agency's proposed action.

A petition that does not dispute the material facts upon which the Department's action is based shall state that no such facts are in dispute and otherwise shall contain the same information as set forth above, as required by rule 28-106.301

Because the administrative hearing process is designed to formulate final agency action, the filing of a petition means that the Department's final action may be different from the position taken by it in this notice. Persons whose substantial interests will be affected by any such final decision of the Department on the application have the right to petition to become a party to the proceeding, in accordance with the requirements set forth above.

A complete project file is available for public inspection during normal business hours, 8:00 a.m. to 5:00 p.m., Monday through Friday, except legal holidays, at:

Dept. of Environmental Protection	Palm Beach County Health Dept.	Dept. of Environmental Protection
Bureau of Air Regulation	Env. Science & Engineering Div.	Southeast District Office
Suite 4, 111 S. Magnolia Drive	901 Evernia Street	400 North Congress Avenue
Tallahassee, FL 32301	West Palm Beach, FL 33401	West Palm Beach, FL 33416-5425
Telephone: 850/488-0114	Telephone: 561/355-3070	Telephone: 561/681-6600
Fax: 850/922-6979	Fax: 561/355-2442	Fax: 561/681-6755

The complete project file includes the application, technical evaluations, draft permit, and the information submitted by the responsible official, exclusive of confidential records under Section 403.111, F.S. Interested persons may contact the Administrator, New Source Review Section at 111 South Magnolia Drive, Suite 4, Tallahassee, FL 32301 or call 850/488-0114 for additional information. The Department's Intent to Issue and related documents can also be viewed at www.dep.state.fl.us/air by clicking on permitting and then "Utilities and other Facility Permits Issued" under the PSD/Construction Permits.

NOTICE TO BE PUBLISHED IN THE NEWSPAPER

TECHNICAL EVALUATION
AND
PRELIMINARY DETERMINATION

United Technologies Corp.-Pratt & Whitney

LOX/Kerosene Rocket Engine Test Stand
Palm Beach County

DEP File No. 0990021-004-AC
PSD-FL-294

Department of Environmental Protection
Division of Air Resources Management
Bureau of Air Regulation

January 29, 2001

TECHNICAL EVALUATION/PRELIMINARY DETERMINATION

1. APPLICATION INFORMATION

Applicant Name and Address

United Technologies Corp.-Pratt & Whitney
17900 Beeline Highway (SR 710)
Jupiter, Florida 33478

Authorized Representative: John K. Sillan, Manager Facilities Management

Application Review Schedule

Date of Receipt of Application	06-20-00
First Request for Additional Information	07-19-00
Final Request for Additional Information	10-01-00
Date Application Complete	10-09-00
Waiver of Processing Clock by 30 days	12-19-00
Intent Issued	01-29-01

2. FACILITY INFORMATION

Facility Location

The existing facility is located at 17900 Beeline Highway (SR 710) near Jupiter, Palm Beach County. The proposed LOX/Kerosene Rocket Test Stand will be located at the E-5 rocket test area. The facility is located more than 100 kilometers (62 miles) from the nearest PSD Class I area, Everglades National Park. The UTM coordinates of the site are Zone 17, 567.3 km East and 2974.4 km North.

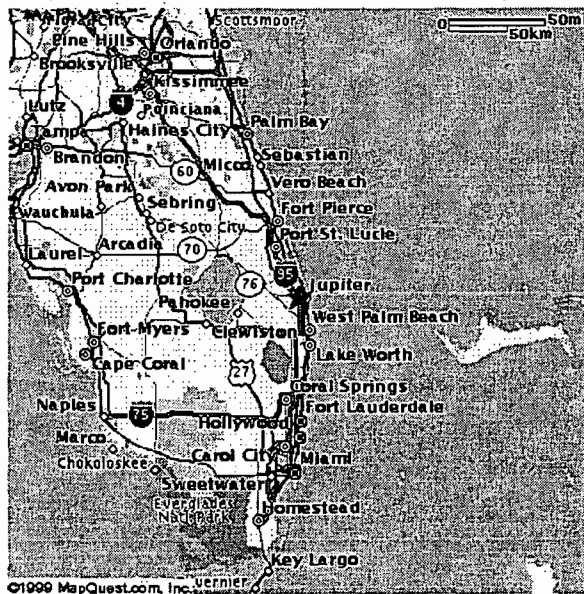


Figure 1 – Jupiter, Florida

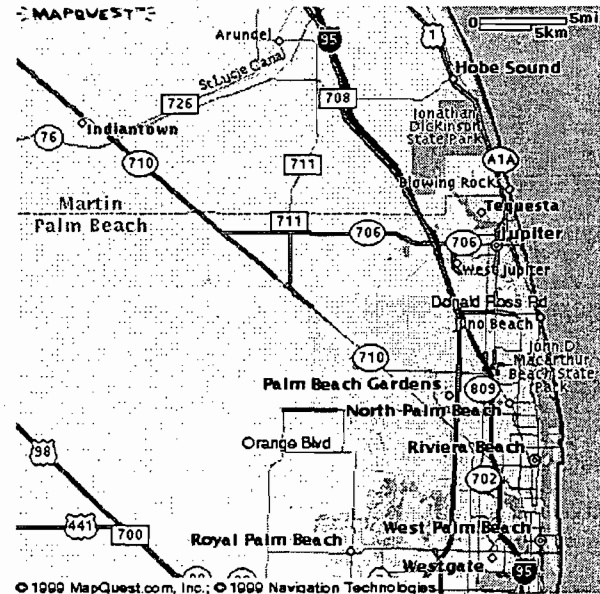


Figure 2 – Site - SR 710 and CR 711

TECHNICAL EVALUATION/PRELIMINARY DETERMINATION

Standard Industrial Classification Codes (SIC)

Major Group Number	37	Transportation Equipment
Group Numbers	372	Aircraft and Parts
	376	Guided Missile and Space Vehicles and Parts
Industry Numbers	3724	Aircraft Engines and Engine Parts
	3764	Guided Missile and Space Vehicle Propulsion Units and Propulsion Unit Parts

Facility Description

The facility is engaged in research and development as well as manufacturing activities associated with gas turbine and rocket engines. Gas turbine engine operations include the engineering, manufacturing, and testing of prototype parts and engines. Rocket engine operations include the engineering, manufacturing, and testing of prototype and commercial engines. A Materials Laboratory that develops and tests new materials supports both engine group operations.

Area Designations

The facility is located within an area that is currently designated as attainment for the pollutant's ozone, carbon monoxide, sulfur dioxide, and nitrogen dioxide; and unclassifiable for the pollutants lead and PM₁₀ (Particulate Matter less than 10 micrometers in diameter). The area is further designated as a maintenance area for the pollutant ozone and a PSD Class II area.

Facility Classifications

Preconstruction Review Programs: The facility is classified as an existing "Major Source" under the Prevention of Significant Deterioration (PSD) program with potential emissions of Carbon Monoxide (CO), Oxides of Nitrogen (NO_x), and Sulfur Dioxide (SO₂) greater than 250 tons per year. The facility is not on the list of the 28 Major Facility Categories (Table 62-212.400-1, F.A.C.).

Hazardous Air Pollutant (HAP) Programs: The facility is classified as an existing "Major Source" under the Section 112 of the Clean Air Act (CAA) with potential emissions of total HAPs greater than 25 tons per year. In addition, the facility includes the following regulated and source category activities:

- 40 CFR Part 63, Subpart T, Halogenated Solvent Cleaners;
- 40 CFR Part 63, Subpart GG, Aerospace Manufacturing and Rework Facilities; and
- Source Categories: Combustion Turbines, Engine Test Firing; Industrial/Commercial/Institutional Boilers; Miscellaneous Metal Parts And Products; Paint Stripping Operations; Reciprocating Internal Combustion Engines; Rocket Engine Test Firing; and Site Remediation.

TECHNICAL EVALUATION/PRELIMINARY DETERMINATION

New Source Performance Standards: The facility operates several emission units subject to the following standards:

- 40 CFR Part 60, Subpart Kb, Standards of Performance for Volatile Organic Liquid Storage Vessels (Including Petroleum Liquid Storage Vessels) for Which Construction, Reconstruction, or Modification Commenced After July 23, 1984; and
- 40 CFR Part 60, Subpart Dc, Standards of Performance for Small Industrial/Commercial/Institutional Boilers.

Title V Operating Permit Program: The facility is classified as a "Major Source" under the Title V program based on potential emissions of CO, NO_x, SO₂, Particulate Matter (PM), and Volatile Organic Compound (VOC) greater than 100 tons per year and total HAP emissions greater than 25 tons per year.

Facility Emissions

The facility's current potential emissions, based on the initial Title V permit application include the following:

Pollutant	PTE (Tons Per Year)
Oxides Of Nitrogen (NO _x)	1,756
Sulfur Dioxide (SO ₂)	571
Carbon Monoxide (CO)	389
Volatile Organic Compounds (VOC)	152
Particulate Matter (PM)	121
Total HAPs	43

3. PROJECT DESCRIPTION

Background

On June 20, 2000, the applicant applied for an air construction permit for the expansion of its existing rocket engine operations. The proposed project includes the construction and operation of a LOX/Kerosene Rocket Engine Stand at its existing facility in West Palm Beach. This project will consist of liquid oxygen and fuel storage tanks (64,000 and 36,000 gallon capacities), an engine containment can, a water-cooled silencer, an exhaust gas deflector, a lined cooling water retention pond, and an elevated 1-million gallon water supply tank.

TECHNICAL EVALUATION/PRELIMINARY DETERMINATION

Emissions Units:

The proposed project includes the addition of the following emissions units at the site:

EMISSION UNIT NO.	EMISSION UNIT DESCRIPTION
075	LOX/Kerosene Rocket Engine Test Stand ⁽¹⁾
076	Kerosene Fuel Storage Tank
Note: ⁽¹⁾ The EPA has determined that emissions from Rocket Firing at Test Stands are considered point source emissions; June 9, 1988	

Emissions

The potential emissions associated with the proposed project were estimated by the applicant using the "NASA Combustion Deck TEP" model and emission factors for flares from AP-42. The predicted short-term and annual emissions associated with 12 test firings per year and a duration of 240 seconds per test are as follows:

Pollutant	CO	CO ₂	H ₂	VOC	PM	SO _x	NO _x
lb/sec	694.4	1,366.0	17.1	2.0	1.6	<1	0.97
TPY	1,000.0	1,967.0	24.7	2.9	2.3	1.4	1.4

Classification

Preconstruction Review Programs: The proposed project is classified as a major modification at an existing major source of air pollution. Based on the potential emissions of CO, the proposed project is subject to the requirements of Rule 62-212.400, F.A.C., Prevention of Significant Deterioration.

Hazardous Air Pollutant (HAP) Programs: The U.S. EPA is currently developing a National Emission Standard for Hazardous Air Pollutants (NESHAP) for Rocket Engine Test Firing under Section 112 of the Clean Air Act and will propose such standards in the future. Until a NESHAP is proposed, the Department is required by its rules to develop a case-by-case determination of Maximum Achievable Control Technology (MACT) determination for new major sources of HAPs.

Potential emissions of HAPs have not been quantified, but are expected to be less than 10 tons per year and total HAPs less than 25 tons per year based on the applicant's estimates of PM and VOC emissions. As such, a case-by-case MACT determination was not required for the project at this time. The Department reserves the right to re-address HAPs should better emissions data become available or upon promulgation of the Rocket Engine Test Firing NESHAP.

New Source Performance Standards: The proposed project is not subject to any standards adopted under Section 111 of the CAA.

Title V Operating Permit Program: The proposed project will require a revision to the Title V operating permit upon completion of construction and a demonstration of compliance.

TECHNICAL EVALUATION/PRELIMINARY DETERMINATION

4. RULE APPLICABILITY

The proposed project is subject to pre-construction review and permitting requirements under the provisions of Chapter 403, Florida Statutes, and Chapters 62-4, 62-204, 62-210, 62-212, 62-296, and 62-297 of the Florida Administrative Code (F.A.C.). This facility is located in Palm Beach County, an area designated as a PSD area for the pollutant Carbon Monoxide in accordance with Rule 62-204.360, F.A.C.

The proposed project is subject to Rule 62-212.400, F.A.C., Prevention of Significant Deterioration (PSD), for CO and is also subject to reporting and record keeping requirements of 40 C.F.R. 60.116b for the kerosene fuel storage tank.

Federal PSD requirements are contained in the CFR, Title 40, Part 52.21. Florida has adopted PSD regulations (Rule 62-212.400, F.A.C.) that are essentially the same as the federal regulations. Florida's State Implementation Plan (SIP), which contains PSD regulations, has been approved by EPA; therefore, PSD approval authority has been granted to DEP. PSD regulations require that all new major stationary facilities or major modifications to existing major facilities, which emit air pollutants regulated under the Clean Air Act (CAA), must be reviewed and a permit issued before the commencement of construction.

The control technology review requirements of the federal and state PSD regulations require that all applicable federal and state emission-limiting standards be met, and that Best Available Control Technology (BACT) be applied to control emissions from the source (Rule 62-212.400, (5)(c), F.A.C.). The BACT requirements are applicable to all regulated pollutants for which the increase in emissions from the facility or modification exceeds the significant emission rate.

BACT is defined in 52.21 (b)(12) and Rule 62-210.200, F.A.C., as: "An emissions limitation (including a visible emission standard) based on the maximum degree of reduction of each pollutant subject to regulation under the Act which would be emitted by any proposed major stationary source or major modification which the Administrator, on a case-by-case basis, taking into account energy, environmental, and economic impacts, and other costs, determines is achievable through application of production processes and available methods, systems, and techniques (including fuel cleaning or treatment or innovative fuel combustion techniques) for control of such pollutant.

In no event shall application of best available control technology result in emissions of any pollutant, which would exceed the emissions allowed by any applicable standard under 40 CFR Parts 60 and 61. If the Administrator determines that technological or economic limitations on the application of measurement methodology to a particular part of a source or facility would make the imposition of an emission standard infeasible, a design, equipment, work practice, operational standard or combination thereof, may be prescribed instead to satisfy the requirement for the application of BACT. Such standard shall, to the degree possible, set forth the emissions reductions achievable by implementation of such design, equipment, work practice, or operation and shall provide for compliance by means which achieve equivalent results."

TECHNICAL EVALUATION/PRELIMINARY DETERMINATION

The postconstruction monitoring requirements (Rule 62-212.400(5)(g), F.A.C.) of the state PSD regulations allow the Department to require the owner to conduct air quality monitoring and provide the data to the Department if the Department finds that such monitoring is necessary to determine the effect that emissions from the project are having on air quality in any area.

The emission units affected by this permit shall comply with all applicable provisions of the Florida Administrative Code (including applicable portions of the Code of Federal Regulations incorporated therein) and, specifically, the following Chapters and Rules:

Chapter 62-4	Permits.
Rule 62-204.220	Ambient Air Quality Protection
Rule 62-204.240	Ambient Air Quality Standards
Rule 62-204.800	Federal Regulations Adopted by Reference (40CFR60 in Particular)
Rule 62-210.300	Permits Required
Rule 62-210.350	Public Notice and Comments
Rule 62-210.370	Reports
Rule 62-210.550	Stack Height Policy
Rule 62-210.650	Circumvention
Rule 62-210.700	Excess Emissions
Rule 62-210.900	Forms and Instructions
Rule 62-212.300	General Pre-construction Review Requirements
Rule 62-212.400	Prevention of Significant Deterioration (including BACT & Postconstruction Monitoring)
Rule 62-213	Operation Permits for Major Sources of Air Pollution
Rule 62-296.320	General Pollutant Emission Limiting Standards
Rule 62-297.310	General Test Requirements
Rule 62-297.401	Compliance Test Methods

5. PROJECT ANALYSIS

The Department's analysis of the proposed project included review of the permit application, the emissions units, the emissions estimates and methodologies, the applicable regulations, the air quality control strategy, and the ambient air quality data and potential impacts of the proposed project. The results of the Department's analyses on the air quality control strategy and ambient air quality impact analyses are presented below.

Air Quality Control Strategy – Carbon Monoxide

The applicant has requested that the Department's BACT determination for CO emissions require no add-on control equipment due to prohibitive cost and impracticability of controlling such a large exhaust stream. Instead, the applicant proposed that the BACT requirements focus on combustion control by way of adjusting the oxygen to fuel ratio to maximize combustion efficiency thus reducing CO emissions, limiting test duration to no longer than 240 seconds per test, and limiting testing to no more than 12 tests per year.

TECHNICAL EVALUATION/PRELIMINARY DETERMINATION

The applicant's BACT evaluation referred to a Russian rocket test stand that employed a water injection and ducting system solely for the purpose of avoiding heat detection by surveillance satellites during the Cold-War era. According to the applicant, the Russian test stand was not designed as an emission control system and should not be considered as any sort of exemplary emission control system. This is the only rocket test stand known to have any equipment that could be construed as add-on controls.

The molar concentration of the rocket engine exhaust gases was estimated to contain approximately 23% CO, 28% CO₂, 8% H₂ and 41% H₂O vapor by the applicant using the TEP model. The applicant reported that kerosene rocket engines fire a fuel rich mixture for heat control flexibility, firing approximately 82% of the theoretical O₂ required for complete combustion. Consequently, CO emissions from engines of this type are very high compared to combustion turbines and other sources that burn fuel for purposes of energy transfer or conversion to steam or power. At the same time, use of liquid oxygen reduces the availability of atmospheric nitrogen for participation in NO_x formation.

Add-on Controls – Incineration: The applicant reported that if CO oxidation technology from the gas turbine industry was considered, differences in exhaust concentrations will affect the design and costs for adaptation to rocket engines. Turbine exhaust oxidation technology applied to a rocket engine test stand will result in greater costs due to the severity of the exhaust conditions. Estimates provided by the applicant indicate that a conventional incinerator would cost about 579 million dollars with an annualized cost of about 68 million. An additional 100 million would be required, according to the applicant, to construct an appropriate infrastructure for a control device designed to withstand the maximum thrust and high temperatures of the rocket engine exhaust.

BACT-Determination: Details of the Department's BACT determination are given in the separate Draft BACT Determination issued concurrently with this evaluation. The Department does not necessarily accept the cost estimates of \$579,000,000 with annualized costs of \$68,000,000 for add-on emissions control or the \$100,000,000 infrastructure cost estimate. However, the Department agrees with the applicants finding that existing oxidation technology is not feasible at this time. As a result, the Department has preliminarily proposed BACT for the rocket engine test stand to be a visible emissions limitation of twenty (40) percent opacity and the following work practices:

- Carbon Monoxide (CO) Emissions – Rocket engine test firings shall not result in CO emissions greater than 41.5 tons per minute (2-minute average), 83 tons per 8-hour period, and 1,000 tons per year (12-month rolling total) as determined using the NASA-Lewis chemical equilibrium computer program or equivalent method approved by the Department.
- Test Stand - The test stand shall be constructed in accordance with the design specifications provided within the application including a Water Cooled Silencer with a maximum diameter of 20 feet and a maximum length of 80 feet and an Exhaust Gas Deflector with a Minimum height of 70 feet, maximum distance from Water Cooled Silencer of 100 feet. The surface between the water-cooled silencer and the exhaust gas deflector shall be paved.

TECHNICAL EVALUATION/PRELIMINARY DETERMINATION

- Test Duration – Rocket engine test firings shall not exceed a total 240 seconds per 8-hour period
- Test Firings – Rocket engine test firings shall not exceed 2,880 seconds per year (12-month rolling total);
- Oxidant/Fuel Ratio – All rocket engine test firings shall be conducted at a minimum oxidant/fuel ratio of 2.72 lb. O₂/lb. Fuel.
- Fuel Usage – Rocket engine test firings shall not consume more than 6,625 gallons per minute (4-minute average), 26,500 gallons per 8-hour period, and 318,000 gallons per year (12-month rolling total).
- Quench Water - All rocket engine test firings shall be conducted at a minimum quench water flow of 3,220 gallons per second.
- Fuel and Oxidizer Types - Rocket engine test firings shall be limited to the firing of kerosene as the fuel and liquid oxygen (LOX) as the oxidizer.
- Test Conditions – Rocket engine test firings shall be restricted to daylight hours (1 hour after sunrise and 1 hour prior to sunset) and only under ambient conditions that provide good dispersion of the exhaust gases in accordance with a Test Plan to be submitted to the Palm Beach County Health Department (PBCHD) for approval prior to the initial test. Non-daylight hour testing maybe approved on a case-by-case basis by the Palm Beach County Health Department (PBCHD).
- Test Notifications – At least 24 hours prior to a rocket engine test firing, notification shall be provided to the PBCHD. The notification shall include the date and time of the test firing, the expected duration of the test firing, the planned oxidant/fuel ratio, and the planned fuel usage rate. In the event a mishap (i.e., test duration > 240 seconds, O/F ratio less than 2.72, fuel usage > 13,250 gpm, a flame out, etc.) occurs during a test, a written excess emissions report shall be provided to the PBCHD within 24 hours of the test. The report shall identify the mishap and impacts.
- Postconstruction Monitoring – The permittee shall, prior to any rocket engine test firings, establish an ambient air quality monitoring program to measure ambient air concentrations of CO before, during, and after a rocket engine test firing. The program shall be consistent with the procedures specified in the Ambient Monitoring Guidelines for Prevention of Significant Deterioration (EPA 450/4-87-007, U. S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, N. C. 27711, May 1987).
- Oxygen Injection Study – Within one year of initial issuance of this permit, the permittee shall complete and submit to the Department an engineering and cost study evaluating the technical feasibility and cost effectiveness of direct O₂ (Air or Pure Oxygen) injection for reducing CO emissions in the exhausts of rocket engines tested at the permittee's facility. The study shall evaluate possibilities for direct O₂ injection including a heat-shielded, internally-cooled oxygen lance for injecting stoichiometric rates of oxygen into the exhaust downstream of the engine. Appropriate kinetic modeling shall be utilized to predict the oxidation reaction rates and overall CO conversion for various configurations of the injection apparatus and various injection locations and methods.

TECHNICAL EVALUATION/PRELIMINARY DETERMINATION

- Compliance Demonstrations – Compliance with the visible emissions limitation shall be demonstrated initially for each new oxidant/fuel ratio and annually thereafter. Compliance with the CO emissions limitation shall be demonstrated initially and continuously thereafter through the use of the NASA Lewis chemical equilibrium computer program or its equivalent as approved by the Department or Palm Beach County Health Department and the ambient air quality monitoring program.
- Excess Emissions - Excess emissions shall be allowed provided the permittee demonstrates that the emissions did not result in any of the following:
 1. a predicted ambient impact greater than the National Ambient Air Quality Standards (NAAQS) for CO after adjustment based on the ambient monitoring program;
 2. a significant emissions increase in a PSD Pollutant; or
 3. emissions of a hazardous air pollutant in an amount of 10 tons per year or greater individually or 25 tons per year or greater collectively.

Air Quality Impacts

The proposed project will increase CO emissions at a level in excess of PSD significant amounts. The air quality impact analyses required by the PSD regulations for this pollutant include:

- An analysis of existing air quality;
- A significant impact analysis;
- An Ambient Air Quality Standards (AAQS) analysis; and
- An analysis of impacts on soils, vegetation, and visibility and of growth-related air quality modeling impacts.

The analysis of existing air quality generally relies on preconstruction monitoring data collected with EPA-approved methods. The significant impact and AAQS analyses depend on air quality dispersion modeling carried out in accordance with EPA guidelines.

Based on the required analyses, the Department has reasonable assurance that the proposed project, as described in this report and subject to the conditions of approval proposed herein, will not cause or significantly contribute to a violation of any AAQS or PSD increment. A discussion of the required analyses follows.

Analysis of Existing Air Quality: Preconstruction ambient air quality monitoring is required for all pollutants subject to PSD review unless otherwise exempted or satisfied. This monitoring requirement may be satisfied by using previously existing representative monitoring data, if available. An exemption to the monitoring requirement may be obtained if either of the following conditions is met: the maximum predicted air quality impact resulting from the projected emissions increase, as determined by air quality modeling, is less than a pollutant-specific de minimus concentration, or the existing ambient concentrations are less than a pollutant-specific de minimus concentration. If preconstruction ambient monitoring is exempted, determination of background concentrations for PSD significant pollutants with established AAQS may still be necessary for use in any required AAQS analysis. These

TECHNICAL EVALUATION/PRELIMINARY DETERMINATION

concentrations may be established from the required preconstruction ambient air quality monitoring analysis or from the existing representative monitoring data. These background ambient air quality concentrations are added to pollutant impacts predicted by modeling.

For this project, the maximum eight-hour CO impacts from the project were predicted to be 627 ug/m³, which is greater than the de minimus level of 575 ug/m³; therefore, preconstruction monitoring is required. However, the applicant requested that the previously existing monitoring data from monitors located in West Palm Beach be considered as representative. The Department agreed with the applicants request and allowed the data to be used to satisfy the preconstruction monitoring requirement and to establish a background concentration for use in the required AAQS analysis.

Models and Meteorological Data Used In Significant Impact, PSD Increment And AAQS Analyses: The applicant used the EPA-approved Industrial Source Complex Short-Term (ISCST3) dispersion model to evaluate the pollutant emissions from the proposed project and other existing major facilities. The model determines ground-level concentrations of inert gases or small particles emitted into the atmosphere by point, area, and volume sources. The model incorporates elements for plume rise, transport by the mean wind, Gaussian dispersion, and pollutant removal mechanisms such as deposition. The ISCST3 model allows for the separation of sources, building wake downwash, and various other input and output features. A series of specific model features, recommended by the EPA, are referred to as the regulatory options. The applicant used the EPA recommended regulatory options in each modeling scenario. Direction-specific downwash parameters were used for all sources for which downwash was considered. The stacks associated with this project all satisfy the good engineering practice (GEP) stack height criteria.

Meteorological data used in the ISCST3 model consisted of a concurrent 5-year period of hourly surface weather observations and twice-daily upper air soundings from the National Weather Service (NWS) station at West Palm Beach, Florida. The 5-year period of meteorological data was from 1987 through 1991. This NWS station was selected for use in the study because it is the closest primary weather station to the study area and is most representative of the project site. The surface observations included wind direction, wind speed, temperature, cloud cover, and cloud ceiling.

For this project, only the impacts of CO emissions are being evaluated. Since the CO standards are based on short-term averages and five years of data were used in ISCST3, the highest-second-high (HSH) short-term predicted concentrations were compared with the appropriate AAQS. For determining the project's significant impact area in the vicinity of the facility, the highest short-term predicted concentrations were compared to their respective significant impact levels.

Significant Impact Analysis: Initially, the applicant conducted modeling to determine whether the proposed project's CO emissions were predicted to have a significant impact in the vicinity of the facility. The applicant placed over 950 receptors along the site boundary and out to 35 km from the facility. The table below shows the results of this modeling. The radius of significant impact is also shown. The EPA has not established PSD Class I or II Area increments.

TECHNICAL EVALUATION/PRELIMINARY DETERMINATION

Maximum Project Air Quality Impact for Comparison With the PSD Class II Significant Impact Level in the Vicinity of the Facility

Averaging Time	Maximum Predicted Impact (ug/m ³)	Significant Impact Level (ug/m ³)	Significant Impact?	Radius of Significant Impact (km)
8-HOUR	627	500	YES	35
1-HOUR	5,012	2,000	YES	35

As shown in the tables the maximum predicted air quality impacts due to CO emissions from the proposed project are greater than the PSD significant impact levels in the vicinity of the facility. Therefore, the applicant was required to do full impact CO modeling in the vicinity of the facility, within the applicable significant impact area, to determine the impacts of the project along with all other sources in the vicinity of the facility. The significant impact area is based upon the predicted radius of significant impact. Full impact modeling is modeling that considers not only the impact of the project but the impacts of the existing facility and other sources, including background concentrations, located within the vicinity of the project to determine whether all increments or AAQS are predicted to be met.

Procedure for Performing AAQS Analyses: For the AAQS analyses, receptor grids normally are based on the size of the significant impact area for each pollutant. The size of the significant impact areas for the required CO analysis were based on a 35 km radius of significant impact. The results of the CO AAQS analysis are summarized in the table below. As shown in this table, emissions from the proposed facility are not expected to cause or significantly contribute to a violation of any AAQS.

Ambient Air Quality Impacts

Averaging Time	Modeled Sources Impact (ug/m ³)	Background Conc. (ug/m ³)	Maximum Predicted Impact (ug/m ³)	AAQS (ug/m ³)	Predicted Impact Greater Than AAQS?
8-hour	5,823	3,450	9,267	10,000	NO
1-hour	11,009	5,777	16,786	40,000	NO

Additional Impacts Analysis - Impacts On Soils, Vegetation, Wildlife, and Visibility: The maximum ground-level concentrations predicted to occur due to CO emissions as a result of the proposed project, including all other nearby sources, will be below the associated AAQS which are designed to protect both the public health and welfare. This project will not have a harmful impact on soils and vegetation in the PSD Class II area in the vicinity of the facility.

TECHNICAL EVALUATION/PRELIMINARY DETERMINATION

Additional Impacts Analysis Growth-Related Air Quality Impacts: There will be no growth associated with this project.

Postconstruction Monitoring: The maximum ground level concentration was predicted to be within 90 percent of the AAQS using the available ambient monitoring data, the existing source inventory, the estimated emissions from the rocket engine test firing, and the ISCST3 dispersion model. Although the ISCST3 dispersion model is the default regulatory model, its application to short-term release scenarios is limited. In addition, the emission estimates for the rocket engine test firing are based on theoretical calculations and may vary significantly. For these reasons and the very high concentration of CO predicted within the rocket engine exhaust gases, the Department will require the applicant to establish an air monitoring program to monitor CO concentrations down wind of the test stand in accordance with Rule 62-212.400(5)(g), F.A.C.

The monitoring program shall be established prior to the initial test firing and shall continue for a minimum of 12 valid test runs. A valid test run shall be deemed one in which the wind direction will position at least one monitoring station downwind. The program will allow the applicant to discontinue monitoring upon approval of the PBCHD during extended periods when testing is not scheduled.

6. CONCLUSION

Based on information provided by the applicant, supplemented by other information available to the Department, the restriction within the draft permit and BACT Determination, the Department has reasonable assurance that the proposed project will not cause a violation of any air quality standard or PSD increment.

PERMITTEE

United Technologies Corp.-Pratt & Whitney
P.O. Box 109600
West Palm Beach, FL 33410-9600

Permit No.	0990021-004-AC PSD-FL-294
Project	LOX/Kerosene Rocket Engine Test Stand
Expires:	March 31, 2003

AUTHORIZED REPRESENTATIVE:

Mr. John K. Sillan, Manager Facilities Management

PROJECT AND LOCATION

This permit authorizes the permittee to construct a LOX/Kerosene Rocket Engine Test Stand at its existing facility at 17900 Beeline Highway (SR 710) in West Palm Beach, Palm Beach County. The test stand shall be limited to firing no more than 318,000 gallons of fuel per year and required to establish an ambient air quality monitoring program. The SIC codes for this facility are 3724 and 3764.

The UTM coordinates of the site are Zone 17; 567.3 km E; 2974.4 km N. The Everglades National Park is approximately 120 km (74.9 miles) from the site.

STATEMENT OF BASIS

This construction/PSD permit is issued under the provisions of Chapter 403 of the Florida Statutes (F.S.), and the Florida Administrative Code (F.A.C.) Chapters 62-4, 62-204, 62-210, 62-212, 62-296, and 62-297. The above named permittee is authorized to construct the emissions units in accordance with the conditions of this permit and as described in the application, approved drawings, plans, and other documents on file with the Department of Environmental Protection (Department).

APPENDICES

The attached appendices are a part of this permit:

Appendix BD	BACT Determination
Appendix GC	General Permit Conditions
Appendix NSPS-Kb	40 CFR 60 Subpart Kb - Standards Of Performance For Volatile Organic Liquid Storage Vessels

Howard L. Rhodes, Director
Division of Air Resources
Management

AIR CONSTRUCTION PERMIT
SECTION I. FACILITY INFORMATION

FACILITY DESCRIPTION

United Technologies Corp.- Pratt & Whitney (UTC-P&W) proposes to construct a Liquid Oxygen (LOX)/Kerosene Rocket Engine Test Stand at the E-5 rocket test area located at 17900 Beeline Highway (SR 710) in West Palm Beach, Palm Beach County.

The proposed project will result in a significant emissions increase of carbon monoxide (CO) according to Table 212.400-2, Florida Administrative Code (F.A.C.). The project is therefore subject to review for Prevention of Significant Deterioration (PSD) and a determination of Best Available Control Technology (BACT) in accordance with Rule 62-212.400, F.A.C.

PROJECT DETAILS

The applicant proposes to construct and operate a LOX/Kerosene Rocket Engine Stand at its existing rocket test facility in West Palm Beach. The applicant also operates a gas turbine testing facility and a helicopter development facility at the existing site. This project will consist of liquid oxygen and fuel storage tanks (64,000 and 36,000 gallon capacities), an engine containment can, a water-cooled silencer, an exhaust gas deflector, a lined cooling water retention pond, and an elevated 1-million gallon water supply tank.

The proposed facility will consist of the following emissions units.

EMISSIONS UNIT NO.	EMISSIONS UNIT DESCRIPTION
075	LOX/Kerosene Rocket Engine Test Stand
076	NSPS Storage Tank – 36,000 Gallon Capacity

REGULATORY CLASSIFICATION

The facility is classified as a Major Source of air pollution under the PSD and Title V programs based on potential emissions of carbon monoxide (CO), volatile organic compounds (VOC), nitrogen oxides (NO_x), sulfur dioxide (SO₂), trichloroethylene, and total combined hazardous air pollutants (HAPs) exceeding 25 tons per year. This facility is not within an industry included in the list of the 28 Major Facility Categories per Table 62-212.400-1, F.A.C. The project permitted herein is subject to the requirements of the federal Prevention of Significant Deterioration air quality rules for CO emissions and New Source Performance Standards for fuel storage tanks as well as state rules cited in the general and specific conditions.

REVIEWING AND PROCESS SCHEDULE

06-20-00	Date of Receipt of Application
07-19-00	First Request for Additional Information
10-01-00	Final Request for Additional Information
10-09-00	Date Application Complete
01-29-01	Intent Issued

RELEVANT DOCUMENTS

The documents listed below constitute the basis for the permit and are on file with the Department.

- Permit application
- Applicant's additional information noted above
- Department's Technical Evaluation and Preliminary Determination and Intent to Issue

United Technologies Corp.-Pratt & Whitney
LOX/Kerosene Rocket Engine Test Stand

DEP File No. 0990021-004-AC
PSD-FL-294

AIR CONSTRUCTION PERMIT

SECTION II. FACILITY-WIDE SPECIFIC CONDITIONS

The following specific conditions apply to all emissions units at this facility addressed by this permit.

ADMINISTRATIVE

1. Regulating Agencies: All documents related to applications for permits to construct, or modify an emissions unit should be submitted to the Bureau of Air Regulation (BAR), Florida Department of Environmental Protection at Mail Station #5505, 2600 Blair Stone Road, Tallahassee, Florida 32399-2400, phone number 850/488-0114. All documents related to reports, tests, operation permit applications, minor modifications and notifications shall be submitted to the Palm Beach County Health Department, post Office Box 29, 901 Evernia Street, West Palm Beach, Florida 33402-0029, Phone 562-355-3136.
2. General Conditions: The permittee is subject to and shall operate under the attached General Permit Conditions G.1 through G.15 listed in Appendix GC of this permit. General Permit Conditions are binding and enforceable pursuant to Chapter 403 of the Florida Statutes. [Rule 62-4.160, F.A.C.]
3. Terminology: The terms used in this permit have specific meanings as defined in the corresponding chapters of the Florida Administrative Code.
4. Applicable Regulations, Forms and Application Procedures: Unless otherwise indicated in this permit, the construction and operation of the subject emissions unit shall be in accordance with the capacities and specifications stated in the application. The facility is subject to all applicable provisions of Chapter 403, F.S. and Florida Administrative Code Chapters 62-4, 62-110, 62-204, 62-212, 62-213, 62-296, 62-297 and the Code of Federal Regulations Title 40, Part 60, adopted by reference in the Florida Administrative Code (F.A.C.) regulations. The permittee shall use the applicable forms listed in Rule 62-210.900, F.A.C. and follow the application procedures in Chapter 62-4, F.A.C. Issuance of this permit does not relieve the facility owner or operator from compliance with any applicable federal, state, or local permitting or regulations. [Rules 62-204.800, 62-210.300 and 62-210.900, F.A.C.]
5. New or Additional Conditions: Pursuant to Rule 62-4.080, F.A.C., for good cause shown and after notice and an administrative hearing, if requested, the Department may require the permittee to conform to new or additional conditions. The Department shall allow the permittee a reasonable time to conform to the new or additional conditions, and on application of the permittee, the Department may grant additional time. [Rule 62-4.080, F.A.C.]
6. Expiration: This air construction permit shall expire on March 31, 2003. The permittee, for good cause, may request that this construction/PSD permit be extended. Such a request shall be submitted to the Department's Bureau of Air Regulation prior to 60 days before the expiration of the permit. [Rules 62-210.300(1), 62-4.070(4), 62-4.080, and 62-4.210, F.A.C.]

PSD Expiration: Approval to construct shall become invalid if construction is not commenced within 18 months after receipt of such approval, or if construction is discontinued for a period of 18 months or more, or if construction is not completed within a reasonable time. The Department may extend the 18-month period upon a satisfactory showing that an extension is justified. [Rules 62-4.070(4), 62-4.210(2) & (3), and 62-210.300(1)(a), F.A.C.]

BACT Determination: In conjunction with extension of the 18 month period to commence or continue construction, or extension of the permit expiration date, the permittee may be required to demonstrate the adequacy of any previous determination of Best Available Control Technology (BACT) for the source as applied to any new or modified emission units. [Rules 62-4.070(4), 62-4.210(2) & (3), 62-210.300(1)(a), and 62-212.400(6)(b), F.A.C.]

AIR CONSTRUCTION PERMIT

SECTION II. FACILITY-WIDE SPECIFIC CONDITIONS

7. Modifications: No emissions unit or facility subject to this permit shall be constructed or modified without obtaining an air construction permit from the Department. Such permit must be obtained prior to the beginning of construction or modification.
[Rules 62-210.300(1) and 62-212.300(1)(a), F.A.C.]
8. Title V Operation Permit Required: This permit authorizes construction and/or installation of the permitted emissions unit and initial operation to determine compliance with Department rules. A revision to the facility's Title V operation permit is required for regular operation of the permitted emissions unit. The owner or operator shall apply for and receive a Title V operation permit or permit modification prior to expiration of this permit. To apply for a Title V operation permit, the applicant shall submit the appropriate application form, compliance test results, and such additional information as the Department may by law require. The application shall be submitted to the Department's appropriate District office.
[Rules 62-4.030, 62-4.050, 62-4.220, and Chapter 62-213, F.A.C.]

GENERAL EMISSIONS LIMITING STANDARDS

9. General Visible Emissions Standard: Except for emissions units that are subject to a particulate matter or opacity limit set forth or established by rule and reflected by conditions in this permit, no person shall cause, let, permit, suffer, or allow to be discharged into the atmosphere the emissions of air pollutants from any activity, the density of which is equal to or greater than that designated as Number 1 on the Ringelmann Chart (20% opacity). The test method for visible emissions shall be EPA Method 9, incorporated and adopted by reference in Chapter 62-297, F.A.C. Test procedures shall meet all applicable requirements of Chapter 62-297, F.A.C. [Rule 62-296.320(4)(b)1, F.A.C.]
10. Unconfined Emissions of Particulate Matter: [Rules 62-296.320(4)(c) and 62-212.400, F.A.C.]
- (i) No person shall cause, let, permit, suffer or allow the emissions of unconfined particulate matter from any activity, including vehicular movement; transportation of materials; construction, alteration, demolition or wrecking; or industrially related activities such as loading, unloading, storing or handling; without taking reasonable precautions to prevent such emissions.
- (ii) Any permit issued to a facility with emissions of unconfined particulate matter shall specify the reasonable precautions to be taken by that facility to control the emissions of unconfined particulate matter.
- (iii) Reasonable precautions include the following:
- Paving and maintenance of roads, parking areas and yards.
 - Application of water or chemicals to control emissions from such activities as demolition of buildings, grading roads, construction, and land clearing.
 - Application of asphalt, water, oil, chemicals or other dust suppressants to unpaved roads, yards, open stock piles and similar activities.
 - Removal of particulate matter from roads and other paved areas under the control of the owner or operator of the facility to prevent re-entrainment, and from buildings or work areas to prevent particulate from becoming airborne.
 - Landscaping or planting of vegetation.
 - Use of hoods, fans, filters, and similar equipment to contain, capture and/or vent particulate matter.
 - Confining abrasive blasting where possible.
 - Enclosure or covering of conveyor systems.

AIR CONSTRUCTION PERMIT

SECTION II. FACILITY-WIDE SPECIFIC CONDITIONS

(iv) In determining what constitutes reasonable precautions for a particular source, the Department shall consider the cost of the control technique or work practice, the environmental impacts of the technique or practice, and the degree of reduction of emissions expected from a particular technique or practice.

11. General Pollutant Emission Limiting Standards: [Rule 62-296.320(1)(a)&(2), F.A.C.]

- (i) No person shall store, pump, handle, process, load, unload or use in any process or installation, volatile organic compounds or organic solvents without applying known and existing vapor emission control devices or systems deemed necessary and ordered by the Department.
- (ii) No person shall cause, suffer, allow or permit the discharge of air pollutants which cause or contribute to an objectionable odor. (Not federally enforceable)

[Note: An objectionable odor is defined in Rule 62-210.200(203), F.A.C., as any odor present in the outdoor atmosphere which by itself or in combination with other odors, is or may be harmful or injurious to human health or welfare, which unreasonably interferes with the comfortable use and enjoyment of life or property, or which creates a nuisance.]

OPERATIONAL REQUIREMENTS

12. Plant Operation - Problems: If temporarily unable to comply with any of the conditions of the permit due to breakdown of equipment or destruction by hazard of fire, wind or by other cause, the permittee shall immediately notify the Department's appropriate district office and the appropriate local program office. The notification shall include pertinent information as to the cause of the problem, and what steps are being taken to correct the problem and to prevent its recurrence, and where applicable, the owner's intent toward reconstruction of destroyed facilities. Such notification does not release the permittee from any liability for failure to comply with Department rules. [Rule 62-4.130, F.A.C.]

13. Circumvention: No person shall circumvent any air pollution control device or allow the emission of air pollutants without the applicable air pollution control device operating properly. [Rule 62-210.650, F.A.C.]

14. Excess Emissions: For purposes of this permit, all limits established pursuant to the State Implementation Plan, including those limits established as BACT, include emissions during periods of startup and shutdown, and are not subject to the provisions of Rule 62-210.700(1), F.A.C.

Excess emissions which are caused entirely or in part by poor maintenance, poor operation, or any other equipment or process failure which may reasonably be prevented during start-up, shutdown or malfunction shall be prohibited pursuant to Rule 62-210.700(4), F.A.C. [Rules 62-4.070(3) and 62-210.700(5), F.A.C.]

COMPLIANCE MONITORING AND TESTING REQUIREMENTS

15. Determination of Process Variables: [Rule 62-297.310(5), F.A.C.]

- (i) Required Equipment. The owner or operator of an emissions unit for which compliance tests are required shall install, operate, and maintain equipment or instruments necessary to determine process variables, such as process weight input or heat input, when such data are needed in conjunction with emissions data to determine the compliance of the emissions unit with applicable emission limiting standards.

AIR CONSTRUCTION PERMIT

SECTION II. FACILITY-WIDE SPECIFIC CONDITIONS

(ii) **Accuracy of Equipment.** Equipment or instruments used to directly or indirectly determine process variables, including devices such as belt scales, weight hoppers, flow meters, and tank scales, shall be calibrated and adjusted to indicate the true value of the parameter being measured with sufficient accuracy to allow the applicable process variable to be determined within 10% of its true value.

16. **Special Compliance Tests:** When the Department, after investigation, has good reason (such as complaints, increased visible emissions or questionable maintenance of control equipment) to believe that any applicable emission standard contained in a Department rule or in a permit issued pursuant to those rules is being violated, it shall require the owner or operator of the facility to conduct compliance tests which identify the nature and quantity of pollutant emissions from the emissions units and to provide a report on the results of said tests to the Department. [Rule 62-297.310(7)(b), F.A.C.]

REPORTING AND RECORD KEEPING REQUIREMENTS

23. **Duration of Record Keeping:** Upon request, the permittee shall furnish all records and plans required under Department rules. During enforcement actions, the retention period for all records will be extended automatically unless otherwise stipulated by the Department. The permittee shall hold at the facility or other location designated by this permit records of all monitoring information (including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation) required by the permit, copies of all reports required by this permit, and records of all data used to complete the application for this permit. These materials shall be retained at least five years from the date of the sample, measurement, report, or application unless otherwise specified by Department rule. [Rules 62-4.160(14)(a)&(b) and 62-213.440(1)(b)2.b., F.A.C.]

24. **Test Reports:** The owner or operator of an emissions unit for which a compliance test is required shall file a report with the Department on the results of each such test. The required test report shall be filed with the Department as soon as practical but no later than 45 days after the last sampling run of each test is completed. The test report shall provide sufficient detail on the emissions unit tested and the test procedures used to allow the Department to determine if the test was properly conducted and the test results properly computed. As a minimum, the test report, other than for an EPA Method 9 test, shall provide the applicable information listed in Rule 62-297.310(8)(c), F.A.C. [Rule 62-297.310(8), F.A.C.]

25. **Excess Emissions Report:** If excess emissions occur, the owner or operator shall notify the appropriate Department District Office and the appropriate local program within one working day of: the nature, extent, and duration of the excess emissions; the cause of the excess emissions; and the actions taken to correct the problem. In addition, the Department may request a written summary report of the incident. [Rule 62-4.130, F.A.C.]

26. **Excess Emissions Report - Malfunctions:** In case of excess emissions resulting from malfunctions, each owner or operator shall notify the appropriate Department District Office and the appropriate local program in accordance with Rule 62-4.130, F.A.C. A full written report on the malfunctions shall be submitted in a quarterly report if requested by the Department. [Rule 62-210.700(6), F.A.C.]

27. **Annual Operating Report for Air Pollutant Emitting Facility:** The Annual Operating Report for Air Pollutant Emitting Facility shall be completed each year and shall be submitted to the appropriate Department District Office and the appropriate local program by March 1 of the following year. [Rule 62-210.370(3), F.A.C.]

AIR CONSTRUCTION PERMIT
SECTION III. EMISSIONS UNIT SPECIFIC CONDITIONS

SUBSECTION A: The following specific conditions apply to the following emissions units:

EMISSIONS UNIT NO.	EMISSIONS UNIT DESCRIPTION
075	LOX/Kerosene Rocket Engine Test Stand

EMISSIONS UNIT(S) DETAILS

LOX/Kerosene Rocket Engine Test Stand, designated Emissions Unit 075, consisting of an engine containment can, a water-cooled silencer, and an exhaust gas deflector. Emissions are controlled through the use of a minimum oxidant to fuel ratio and the water-cooled silencer.

{Permitting note(s): The emissions unit has been reviewed under the PSD Program for carbon monoxide (CO). As a new major source of CO, the emissions unit is subject to the Best Available Control Technology (BACT) requirements of Rule 62-212.400(5)(c), F.A.C. Potential emissions of particulate matter (PM and PM10), sulfur dioxide (SO₂), oxides of nitrogen (NO_x), and volatile organic compounds have been estimated at 2.3, 1.4, 1.4, and 2.9 tons per year, respectively. The emissions unit is not subject to any New Source Performance Standards (40 CFR Part 60) or National Emission Standards for Hazardous Air Pollutants (40 CFR Part 61). The emissions unit has been identified as a Source Category for future regulatory action under the National Emission Standards for Hazardous Air Pollutants for Source Categories (40 CFR Part 63). A case-by-case determination of the Maximum Achievable Control Technology (MACT) under 40 CFR Part 63, Subpart B was not required.}

CONSTRUCTION REQUIREMENTS

- A.1. **Test Stand:** The test stand shall be constructed in accordance with the design specifications provided within the application and the following minimum and maximum specifications:
- (i). **Water Cooled Silencer:** Maximum diameter of 20 feet and a maximum length of 80 feet; and
 - (ii). **Exhaust Gas Deflector:** Minimum height of 70 feet, maximum distance from Water Cooled Silencer of 100 feet. The surface between the water-cooled silencer and the exhaust gas deflector shall be paved.

[BACT and Rules 62-4.070(3) and 62-296.320(4)(c), F.A.C.]

- A.2. **Oxygen Injection Study:** Within one year of initial issuance of this permit, the permittee shall complete and submit to the Department an engineering and cost study evaluating the technical feasibility and cost effectiveness of direct O₂ (Air or Pure Oxygen) injection for reducing CO emissions in the exhausts of rocket engines tested at the permittee's facility. The study shall evaluate possibilities for direct O₂ injection including a heat-shielded, internally cooled oxygen lance for injecting stoichiometric rates of oxygen into the exhaust downstream of the engine. Appropriate kinetic modeling shall be utilized to predict the oxidation reaction rates and overall CO conversion for various configurations of the injection apparatus and various injection locations and methods.

[Rule 62-4.070(3) and BACT]

OPERATING RESTRICTIONS

- A.3. **Permitted Capacity:** The permittee shall not allow, cause, suffer or permit the operation of the unit in excess of the following capacities without prior authorization from the Permitting Authority:

AIR CONSTRUCTION PERMIT

SECTION III. EMISSIONS UNIT SPECIFIC CONDITIONS

- (i). **Test Duration:** Rocket engine test firing duration shall not exceed a total of 240 seconds per 8-hour period.
- (ii). **Test Firings:** Rocket engine test firings shall not exceed 2,880 seconds per year (12-month rolling total).
- (iii). **Oxidant/Fuel Ratio:** All rocket engine test firings shall be conducted at a minimum oxidant/fuel ratio of 2.72 pounds of oxygen per pound of fuel.
- (iv). **Fuel Usage:** Rocket engine test firings shall not consume more than 6,625 gallons per minute (4-minute average), 26,500 gallons per 8-hour period, and 318,000 gallons per year (12-month rolling total)
- (v). **Quench Water:** All rocket engine test firings shall be conducted with a minimum quench water flow of 3,220 gallons per second.

[BACT, Rules 62-4.160(2), 62-210.200(228), and 62-210.300, F.A.C.]

{Permitting note: Prior authorization includes the issuance of construction, reconstruction, or modification permits or a determination by the Permitting Authority that the action is not subject to 62-210.300(1), F.A.C.}

- A.4. **Methods of Operation:** The permittee shall not allow, cause, suffer or permit any change in the method(s) of operation resulting in increased short-term or long-term potential emissions, without prior authorization from the Permitting Authority. The authorized methods of operation include the following:

- (i) **Fuels:** The permittee is authorized to use kerosene as the rocket engine fuel.
- (ii). **Oxidants:** The permittee is authorized to use liquid oxygen (LOX) as the rocket engine fuel oxidizer.

[BACT, Rules 62-4.160(2), 62-210.200(228) and 62-210.300, F.A.C.]

- A.5. **Test Conditions:** Rocket engine test firings shall be restricted to daylight hours (1 hour after sunrise and 1 hour prior to sunset) and only under ambient conditions that provide good dispersion of the exhaust gases in accordance with a Test Plan to be submitted to the Palm Beach County Health Department (PBCHD) for approval prior to the initial test. Non-daylight hour testing maybe approved on a case-by-case basis by the Palm Beach County Health Department (PBCHD).

[BACT, Rules 62-4.070(3), F.A.C.]

- A.6. **Hours of Operation:** The permittee is authorized to operate the unit continuously within the limits of the permitted capacities of **Condition 3** and the test conditions of **Condition 5** of this permit.

[BACT, Rules 62-4.160(2), 62-210.200(228) and 62-210.300, F.A.C.]

EMISSION LIMITATIONS AND STANDARDS

- A.7. **Visible Emissions:** The permittee shall not allow visible emissions that exceed forty (40) percent opacity from any rocket engine test firing.

[BACT, Rule 62-296.320(4)(b), F.A.C.]

AIR CONSTRUCTION PERMIT

SECTION III. EMISSIONS UNIT SPECIFIC CONDITIONS

- A.8. **Carbon Monoxide Emissions:** Rocket engine test firings shall not result in CO emissions greater than 41.5 tons per minute (2-minute average), 83 tons per 8-hour period, and 1,000 tons per year (12-month rolling total) as determined using the NASA-Lewis chemical equilibrium computer program or equivalent method approved by the Department or the Palm Beach County Health Department.

[BACT, Rules 62-4.160(2), 62-210.200(228), and 62-210.300, F.A.C.]

- A.9. **BACT Determination:** The permittee shall comply with the requirements of Appendix BD of this permit.

[BACT and Rule 62-212.400(5)(c), F.A.C.]

TEST METHODS AND PROCEDURES

- A.10. **Visible Emissions:** All visible emissions tests performed pursuant to the requirements of this permit shall comply with the following provisions:

(i). **Test Method:** The test method for visible emissions shall be DEP Method 9, incorporated in Rule 62-297.401(9)(c), F.A.C. The required minimum period of observation for a compliance test shall for operations that are normally completed within less than the minimum observation period and do not recur within that time, the period of observation shall be equal to the duration of the operation completion time. The opacity test observation period shall include the period during which the highest opacity emissions can reasonably be expected to occur.

[BACT, Rule 62-297.310(4)(a)2.a, F.A.C.]

(ii). **Test Procedures:** Test procedures shall meet all applicable requirements of Chapter 62-297, F.A.C.

[Rule 62-296.410(3)(c), F.A.C.]

- A.11. **Carbon Monoxide Emissions:** The permittee shall, prior to any rocket engine test firings, establish an ambient air quality monitoring program to measure ambient air concentrations of CO before, during, and after a rocket engine test firing. The program shall be consistent with the procedures specified in the Ambient Monitoring Guidelines for Prevention of Significant Deterioration (EPA 450/4-87-007, U. S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, N. C. 27711, May 1987).

COMPLIANCE DEMONSTRATIONS AND PERIODIC MONITORING

- A.12. **Initial Compliance Demonstrations:** The permittee shall conduct a visible emissions compliance test during the initial rocket engine test firing and each subsequent test firing when a new oxidant/fuel ratio is used. Initial compliance with the CO emission limitations shall be demonstrated through compliance with **Conditions 8 and 11** of this permit.

[BACT and Rule 62-297.310(7)(a)1., F.A.C.]

- A.13. **Continuous Compliance Demonstrations:** The permittee shall demonstrate continuous compliance with the CO emissions limitation by use of the ambient air quality monitoring program required by **Condition 11** of this permit.

[BACT and Rule 62-4.070(3), F.A.C.]

AIR CONSTRUCTION PERMIT
SECTION III. EMISSIONS UNIT SPECIFIC CONDITIONS

- A.14. **Annual Compliance Demonstrations:** The permittee shall have a formal compliance test conducted for visible emissions annually during each federal fiscal year (October 1 – September 30), unless otherwise specified by rule, order, or permit.

[BACT and Rule 62-297.310(7), F.A.C.]

- A.15. **Flow Monitors:** The permittee shall install, maintain, operate and calibrate flow monitors to measure the oxidant, fuel and quench water flow rates during each rocket engine test firing. All instrumentation shall be properly maintained and functional at all times, except during instrument breakdown, calibration or repair to ensure compliance with **Conditions 3, 4, 5, and 8** of this permit.

[Rule 62-4.070(3), F.A.C.]

- A.16. **Recordkeeping:** The permittee shall maintain the following records:

- (i). Test Identification Number;
- (ii). Test Date and Time (Start and Finish);
- (iii). Test Duration (Planned and Actual);
- (iv). Oxidant and Fuel Types;
- (v). Oxidant/Fuel Ratio (Planned and Actual);
- (vi). Fuel Usage (gallons per minute);
- (vii). Quench Water Rate (Planned and Actual);
- (viii). Test Condition Summary;
- (ix). CO Ambient Concentrations;
- (x). Mishaps; and
- (xi). Daily and Monthly Totals of Test Duration, Test Firings, and Fuel Usage.

[Rule 62-4.070(3), F.A.C.]

- A.17. **Reporting:** The permittee shall submit the following reports:

- (i). **Test Notifications:** Notification to the PBCHD at least 24 hours prior to a rocket engine test firing. The notification shall include the date and time of the test firing, the expected duration of the test firing, the planned oxidant/fuel ratio, and the planned fuel usage rate.

[BACT and Rule 62-4.070(3), F.A.C.]

- (ii) **Mishap Reports:** In the event a mishap (i.e., test duration > 240 seconds, O/F ratio less than 2.72, fuel usage > 13,250 gpm, a flame out, etc.) occurs during a test, a written report shall be provided to the PBCHD within 24 hours of the test. Within thirty (30) days of a mishap, the permittee shall submit an analysis showing the excess emissions associated ambient air quality impacts, if any.

[Rule 62-4.130, F.A.C.]

- A.18. **Excess Emissions:** Excess emissions shall be allowed provided the permittee demonstrates that the emissions did not result in a predicted ambient impact greater than the National Ambient Air Quality Standards (NAAQS) for CO adjusted based on the ambient monitoring program; a significant emissions increase in a PSD Pollutant; or result in emissions of a hazardous air pollutant in an amount of 10 tons per year or greater individually or 25 tons per year or greater collectively.

[BACT and Rule 62-4.070(3), F.A.C.]

AIR CONSTRUCTION PERMIT
SECTION III. EMISSIONS UNIT SPECIFIC CONDITIONS

SUBSECTION B: The following specific conditions apply to the following emissions units:

EMISSIONS UNIT NO.	EMISSIONS UNIT DESCRIPTION
076	NSPS Storage Tank – 36,000 Gallon Capacity

EMISSIONS UNITS DETAILS

Emissions Unit 076 is a stationary storage tanks each having an approximate capacity of 36,000 gallons. The tank is subject to specific recordkeeping requirements of 40 CFR 60 Subpart Kb. The tank will store and handle kerosene, a volatile organic liquid (VOL), for the LOX/Kerosene Rocket Engine Test Stand (E.U. ID No. 075).

{Permitting notes: The unit is classified as new facilities under the New Source Performance Standards (40 CFR 60 Subpart Kb) and subject to the recordkeeping requirement of 40 CFR 60 Subpart Kb.}

The following specific conditions apply to the emissions unit(s) listed above:

OPERATING RESTRICTIONS

- B.1. **Permitted Capacity.** The permittee shall not allow, cause, suffer, or permit the operation of Emissions Unit 076 in excess of 318,000 gallons per year without prior authorization from the Permitting Authority:
[Rules 62-4.160(2), 62-210.200(228), 62-210.300, F.A.C.]
- B.2. **Methods of Operation:** The permittee shall not allow, cause, suffer or permit any change in the method of operation of Emissions Unit 076 without prior authorization from the Permitting Authority. The authorized methods of operation include the following:
- (i). **VOL Type(s):** The permittee is authorized to store and handle kerosene.
 - (ii). **VOL Vapor Pressure:** The permittee shall not store or handle any fuels within the units with a maximum true vapor pressure greater than 15.0 kPa (2.176 psi).
[Rules 62-4.160(2), 62-210.200(228), 62-210.300, F.A.C., 40 CFR 60.110b(c)]
- B.3. **Hours of Operation:** The permittee is authorized to operate the units continuously.
[Rule 62-4.070(3), F.A.C.]

COMPLIANCE DEMONSTRATIONS AND PERIODIC MONITORING

- B.4. **Compliance Demonstrations:** The permittee shall demonstrate compliance with the operating restriction of Condition B.1. based on record keeping as required by Condition B.5. of this permit.
[Rule 62-297.310(7), F.A.C.]
- B.5. **Records:** The permittee shall implement the following periodic monitoring requirements to ensure compliance with the Specific Conditions B.1 and B.2. of this permit:
- (i). **Monthly Throughput:** The permittee shall monitor and record the monthly throughput of volatile organic liquids through each tank.
 - (ii). **Volatile Organic Liquid Types:** The permittee shall monitor and record the type (Name and True Vapor Pressure at 80°F) of volatile organic liquids stored and handled in each tank.
[Rule 62-213.440(1)(b), F.A.C.]

AIR CONSTRUCTION PERMIT
SECTION III. EMISSIONS UNIT SPECIFIC CONDITIONS

New Source Performance Standards (NSPS)

{Permitting note: The unit is subject to the recordkeeping requirements of 40 CFR 60 Subpart Kb provided the permittee complies with the requirements of 40 CFR 60.110b, Applicability.}

E.7. 40 CFR 60 Subpart Kb—Standards of Performance for Volatile Organic Liquid Storage Vessels (Including Petroleum Liquid Storage Vessels) for which Construction, Reconstruction, or Modification Commenced after July 23, 1984: The permittee shall comply with the applicable requirements of 40 CFR 60 Subpart Kb contained in Appendix NSPS-Kb. Specifically:

- (a) 40 CFR 60.110b, Applicability,
- (b) 40 CFR 60.111b, Definitions,
- (c) 40 CFR 60.116b, Monitoring of Operations

[40 CFR 60.40b(a), Rule 62-204.800(7)(b), F.A.C.]

APPENDIX BD - DETERMINATION OF
BEST AVAILABLE CONTROL TECHNOLOGY (BACT)

United Technologies Corp.- Pratt & Whitney
LOX/Kerosene Rocket Engine Stand Project
Palm Beach County

DEP File No. 0990021-004-AC
PSD-FL-294

Department of Environmental Protection
Division of Air Resources Management
Bureau of Air Regulation

Month Day, 2001

APPENDIX BD - BACT DETERMINATION

United Technologies Corp. – Pratt & Whitney LOX/Kerosene Rocket Engine Stand Project Palm Beach County

United Technologies Corp.- Pratt & Whitney (UTC-P&W) proposes to construct a Liquid Oxygen (LOX)/Kerosene Rocket Engine Test Stand at the E-5 rocket test area located at 17900 Beeline Highway (SR 710) near Jupiter, Palm Beach County.

The proposed project will result in a significant emissions increase of carbon monoxide (CO) according to Table 212.400-2, Florida Administrative Code (F.A.C.). The project is therefore subject to review for Prevention of Significant Deterioration (PSD) and a determination of Best Available Control Technology (BACT) in accordance with Rule 62-212.400, F.A.C.

The details of PSD applicability and a description of the process are presented in the separate Technical Evaluation and Preliminary Determination issued concurrently with this determination.

BACT DETERMINATION REQUESTED BY THE APPLICANT:

The applicant requested that the Department's BACT determination for CO emissions require no control equipment due to prohibitive cost and impracticability of controlling such a large exhaust stream. Instead, the applicant proposed that the BACT requirements focus on combustion control by way of adjusting the oxygen to fuel ratio to maximize combustion efficiency thus reducing CO emissions.

BACT DETERMINATION PROCEDURE:

In accordance with Chapter 62-212, F.A.C., a BACT determination is based on the maximum degree of reduction of each pollutant emitted which the Department of Environmental Protection (Department), on a case by case basis, taking into account energy, environmental and economic impacts, and other costs, determines is achievable through application of production processes and available methods, systems, and techniques. In addition, the regulations state that, in making the BACT determination, the Department shall give consideration to:

- Any Environmental Protection Agency determination of BACT pursuant to Section 169, and any emission limitation contained in 40 CFR Part 60 - Standards of Performance for New Stationary Sources or 40 CFR Part 61 - National Emission Standards for Hazardous Air Pollutants.
- All scientific, engineering, and technical material and other information available to the Department.
- The emission limiting standards or BACT determinations of any other state.
- The social and economic impact of the application of such technology.

The EPA currently stresses that BACT should be determined using the "top-down" approach. The first step in this approach is to determine, for the emission unit in question, the most stringent control available for a similar or identical emission unit or emission unit category. If it is shown that this level of control is technically or economically infeasible for the emission unit in question, then the next most stringent level of control is determined and similarly evaluated. This process

APPENDIX BD - BACT DETERMINATION

continues until the BACT level under consideration cannot be eliminated by any substantial or unique technical, environmental, or economic objections.

Under 40 CFR Part 60 - Standards of Performance for New Stationary Sources (NSPS) there is no promulgated emission standard that applies to emissions from rocket engine test facilities.

Under 40 CFR Part 61 - National Emission Standards for Hazardous Air Pollutants (NESHAP) there is a promulgated emission standard that applies to emissions from rocket engine test facilities. The Standard, 40 CFR Part 61, Subpart D applies specifically to Beryllium Rocket Motor Firing. It includes an emission standard based on a time-weighted atmospheric concentration of beryllium and a requirement to monitor ambient air concentrations to ensure compliance with the emission standard. The monitoring program requires prior approval from the Administrator.

Under 40 CFR Part 63 - National Emission Standards for Hazardous Air Pollutants (NESHAP) for Source Categories, Rocket Engine Test Firing is a targeted source category. On December 8, 1998 the EPA workgroup working on this matter, distributed Information Collection Requests to the major companies (including OTC Pratt & Whitney) potentially affected by such a NESHAP. The Department's contacted Mr. Richard A. Copland, the project team leader at EPA. According to Mr. Copland, (based on the information received) it appears at this time that there will be no controls due to the relatively short firing time, remote facility locations, costs, etc. EPA is still researching the matter so Mr. Copland's assessment of the present situation is not considered as final.

BACT DETERMINATIONS BY EPA AND STATES:

The Department's review for any prior BACT determinations for emissions from rocket engine test facilities referred to in the RACT/BACT/LAER Clearinghouse identified the following:

- MS-0019, State of Mississippi, December 1990 BACT Determination for the National Aeronautics and Space Administration's (NASA) Stennis Space Center. The BACT determination required use of a deflector ramp to aid in dispersion and prevent scouring of soil and restrictions on meteorological conditions to prevent possible acid rain formation. Specific numerical limits were not established. The project was associated with the Advanced Solid Rocket Motor (ASRM). The project was later discontinued when Congress suspended funding.

OTHER INFORMATION AVAILABLE TO THE DEPARTMENT

The primary sources of information related to rocket engine test stands included the applicant's data, the MDEQ, and the NESHAP activities. These sources provided information on existing test stands, emissions, permitting requirements and control strategies.

The applicant provided estimates of emissions based on a fuel combustion model developed by NASA. Known as the NASA-Lewis chemical equilibrium computer program, emission estimates were provided by the applicant in supplemental information filed during the application completeness process. The NASA-Lewis chemical equilibrium computer program appears to be the primary source of most emission estimates for rocket engine test operations.

The Department contacted the Mississippi Department of Environmental Quality (MDEQ) regarding the 1990 BACT determination. MDEQ provided additional information as well as

APPENDIX BD - BACT DETERMINATION

identifying a current in-house project for the NASA Stennis Space Center. The project included the establishment of federally enforceable permit conditions on the facility's LOX/hydrocarbon rocket engine test stands. A copy of the draft permit (1000-00005) was provided to the Department for review. The enforceable conditions within the permit included the following:

- Emissions Limitations: PM (10,270 lb/test), PM₁₀ (6,060 lb/test), SO₂ (2,520 lb/test), NO_x (2520 lb/test) CO (558,600 lb/test) and VOC (50 lb/test).
- Fuel Authorizations: Liquid Hydrogen (LH₂)/Liquid Oxygen (LOX) and hydrocarbon fuels.
- Emission Estimates: NASA-Lewis chemical equilibrium computer program or an equivalent version.
- Records: For each test - the duration, the fuels and the calculated emission rates for PM, PM₁₀, SO₂, NO_x, CO, and VOC. Semiannual report showing number of tests per month, total emissions per month, and the highest lb/test emissions rate during the reporting period.

The Department is also aware of the other rocket engine test stands, however, the 1990 MDEQ BACT determination is the only one that included a BACT determination and is thus a BACT floor.

PROPOSED PROJECT AND EMISSIONS

The applicant proposes to construct and operate a LOX/Kerosene Rocket Engine Stand at its existing rocket test facility in West Palm Beach. The applicant also operates a gas turbine testing facility and a helicopter development facility at the existing site. This project will consist of liquid oxygen and fuel storage tanks (64,000 and 36,000 gallon capacities), an engine containment can, a water-cooled silencer, an exhaust gas deflector, a lined cooling water retention pond, and an elevated 1-million gallon water supply tank.

Emissions will be generated from combustion of fuel during 12 test firings per year lasting 240 seconds each. These emissions have been estimated according to the NASA combustion model as indicated next:

Pollutant	CO	CO ₂	H ₂	VOC	PM	SO _x	NO _x
lb/sec	694	1,366	17	2	1.6	<1	1
TPY	1,000	1,967	25	3	2.3	1.4	1.4

As indicated in the table above, the only regulated pollutant believed to be emitted in significant quantities is CO in the amount of 1,000 TPY. No estimates are given for HAPs. In any case, HAPs emissions are believed to be less than 10 TPY of any single HAP or less than 25 TPY of all HAPs combined.

APPENDIX BD - BACT DETERMINATION

BACT CONTROL OPTIONS

The applicant has requested that the Department's BACT determination for CO emissions require no add-on control equipment due to prohibitive cost and impracticability of controlling such a large exhaust stream. Instead, the applicant proposed that the BACT requirements focus on combustion control by way of adjusting the oxygen to fuel ratio to maximize combustion efficiency thus reducing CO emissions, limiting test duration to no longer than 240 seconds per test, and limiting testing to no more than 12 tests per year.

The applicant's BACT evaluation referred to a Russian rocket test stand that employed a water injection and ducting system solely for the purpose of avoiding heat detection by surveillance satellites during the Cold-War era. According to the applicant, the Russian test stand was not designed as an emission control system and should not be considered as any sort of exemplary emission control system. This is the only rocket test stand reported by the applicant that may be construed to have any add-on controls.

BACT DETERMINATION

If the BACT analysis is based on the transfer of CO oxidation technology from the gas turbine industry, differences in exhaust concentrations must be considered. Based on the modeled exhaust flow, the molar concentration of exhaust gases will be about 23% CO, 28% CO₂, 8% H₂ and 41% H₂O vapor. Kerosene rocket engines fire a fuel rich mixture for heat control flexibility, firing at approximately 82% of theoretical O₂ required for complete combustion. Consequently, CO emissions from engines of this type are very high compared to combustion turbines that rarely exceed 150-200 ppm CO even at medium loads.

Turbine exhaust oxidation technology applied to a rocket engine test stand will result in far greater costs. Estimates provided by the applicant indicate that a conventional incinerator would cost about \$579,000,000 with an annualized cost of about \$68,000,000. An additional \$100,000,000 would be required, according to the applicant, to construct an appropriate infrastructure for a control device designed to withstand the maximum thrust and high temperatures of the rocket engine exhaust. The Department does not necessarily accept these figures, but agrees that actual figures can be many millions of dollars.

If a system could be designed to capture the rocket engine exhaust gases and convert the CO to CO₂ catalytically or by thermal oxidation, it would be massive (~ 60 ft. diameter) and have to withstand extreme temperatures and thrust pressures adding significantly to construction and operating costs. Cost effectiveness for catalytic oxidation of natural gas-fired turbine exhausts for the largest sizes of utility turbines ranges from \$5,000 to over \$8,000 per ton of CO removed. When scaled up for the extreme conditions of a rocket engine exhaust and the numerous uncertainties inherent in such a system, the overall cost effectiveness might exceed \$100,000 per ton depending on the safety factors used in the design. Considering these uncertainties, the Department concludes that catalytic oxidation such as employed by turbines would not be practicable or cost-effective and neither would incineration.

Yet, it is conceivable that other means could be used for injecting oxygen into the exhaust gases to create conditions suitable for oxidation of much of the CO. An automobile emission control system with air injection is one example. Since this facility will emit at least 1,000 TPY CO, and since CO is a criteria air pollutant, the Department proposes that a study be done by the applicant

APPENDIX BD - BACT DETERMINATION

to evaluate the feasibility of direct O₂ injection into the gas stream downstream of the body of the engine. The study should employ kinetic modeling to determine the practicability and economic feasibility of adding the balance of stoichiometric oxygen required for complete combustion via direct injection at an appropriate point or points in the rocket engine exhaust. A period of one year is provided for completion of the study and submitting it to the Department.

The Department agrees with the applicant's finding that existing oxidation technology is not feasible at this time. As a result, the Department has determined BACT for the rocket engine test stand to be a visible emissions limitation of forty (40) percent opacity and the following work practices:

- Carbon Monoxide (CO) Emissions – Rocket engine test firings shall not result in CO emissions greater than 41.5 tons per minute (2-minute average), 83 tons per 8-hour period, and 1,000 tons per year (12-month rolling total) as determined using the NASA-Lewis chemical equilibrium computer program or equivalent method approved by the Department.
- Test Stand - The test stand shall be constructed in accordance with the design specifications provided within the application including a Water Cooled Silencer with a maximum diameter of 20 feet and a maximum length of 80 feet and an Exhaust Gas Deflector with a Minimum height of 70 feet, maximum distance from Water Cooled Silencer of 100 feet. The surface between the water-cooled silencer and the exhaust gas deflector shall be paved.
- Test Duration – Rocket engine test firings shall not exceed a total of 240 seconds per 8-hour period
- Test Firings – Rocket engine test firings shall not exceed 2,880 seconds per year (12-month rolling total);
- Oxidant/Fuel Ratio – All rocket engine test firings shall be conducted at a minimum oxidant/fuel ratio of 2.72 lb. O₂/lb. Fuel.
- Fuel Usage – Rocket engine test firings shall not consume more than 6,625 gallons per minute (4-minute average), 26,500 gallons per 8-hour period, and 318,000 gallons per year (12-month rolling total).
- Quench Water - All rocket engine test firings shall be conducted at a minimum quench water flow of 3,220 gallons per second.
- Fuel and Oxidizer Types - Rocket engine test firings shall be limited to the firing of kerosene as the fuel and liquid oxygen (LOX) as the oxidizer.
- Test Conditions – Rocket engine test firings shall be restricted to daylight hours (1 hour after sunrise and 1 hour prior to sunset) and only under ambient conditions that provide good dispersion of the exhaust gases in accordance with a Test Plan to be submitted to the Palm Beach County Health Department (PBCHD) for approval prior to the initial test. Non-daylight hour testing may be approved on a case-by-case basis by the Palm Beach County Health Department (PBCHD).

APPENDIX BD - BACT DETERMINATION

- Test Notifications – At least 24 hours prior to a rocket engine test firing, notification shall be provided to the PBCHD. The notification shall include the date and time of the test firing, the expected duration of the test firing, the planned oxidant/fuel ratio, and the planned fuel usage rate. In the event that a mishap occurs during a test (i.e., test duration > 240 seconds, O/F ratio less than 2.72, fuel usage > 13,250 gpm, a flame out, etc.), a written excess emissions report shall be provided to the PBCHD within 24 hours of the test. The report shall identify the mishap and impacts.
- Postconstruction Monitoring – The permittee shall, prior to any rocket engine test firings, establish an ambient air quality monitoring program to measure ambient air concentrations of CO before, during, and after a rocket engine test firing. The program shall be consistent with the procedures specified in the Ambient Monitoring Guidelines for Prevention of Significant Deterioration (EPA 450/4-87-007, U. S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, N. C. 27711, May 1987).
- Oxygen Injection Study – Within one year of initial issuance of this permit, the permittee shall complete and submit to the Department an engineering and cost study evaluating the technical feasibility and cost effectiveness of direct O₂ (Air or Pure Oxygen) injection for reducing CO emissions in the exhausts of rocket engines tested at the permittee's facility. The study shall evaluate possibilities for direct O₂ injection including a heat-shielded, internally-cooled oxygen lance for injecting stoichiometric rates of oxygen into the exhaust downstream of the engine. Appropriate kinetic modeling shall be utilized to predict the oxidation reaction rates and overall CO conversion for various configurations of the injection apparatus and various injection locations and methods.
- Compliance Demonstrations – Compliance with the visible emissions limitation shall be demonstrated initially for each new oxidant/fuel ratio and annual thereafter. Compliance with the CO emissions limitation shall be demonstrated initially and continuously thereafter through the use of the NASA Lewis chemical equilibrium computer program or its equivalent as approved by the Department or Palm Beach County Health Department and the ambient air quality monitoring program.
- Excess Emissions - Excess emissions shall be allowed provided the permittee demonstrates that the emissions did not result in a predicted ambient impact greater than the National Ambient Air Quality Standards (NAAQS) for CO adjusted based on the ambient monitoring program; a significant emissions increase in a PSD Pollutant; or result in emissions of a hazardous air pollutant in an amount of 10 tons per year or greater individually or 25 tons per year or greater collectively.

APPENDIX BD - BACT DETERMINATION

DETAILS OF THE ANALYSIS MAY BE OBTAINED BY CONTACTING:

A. A. Linero, P.E. Administrator
Bureau of Air Regulation
2600 Blair Stone Road, MS # 5505
Tallahassee, Florida 32399-2400
850/488-0114

Recommended By:

Approved By:

C. H. Fancy, P.E., Chief
Bureau of Air Regulation

Howard L. Rhodes, Director
Division of Air Resources Management

Date:

Date:

APPENDIX GC
GENERAL PERMIT CONDITIONS [F.A.C. 62-4.160]

- G.1 The terms, conditions, requirements, limitations, and restrictions set forth in this permit are "Permit Conditions" and are binding and enforceable pursuant to Sections 403.161, 403.727, or 403.859 through 403.861, Florida Statutes. The permittee is placed on notice that the Department will review this permit periodically and may initiate enforcement action for any violation of these conditions.
- G.2 This permit is valid only for the specific processes and operations applied for and indicated in the approved drawings or exhibits. Any unauthorized deviation from the approved drawings or exhibits, specifications, or conditions of this permit may constitute grounds for revocation and enforcement action by the Department.
- G.3 As provided in Subsections 403.087(6) and 403.722(5), Florida Statutes, the issuance of this permit does not convey any vested rights or any exclusive privileges. Neither does it authorize any injury to public or private property or any invasion of personal rights, nor any infringement of federal, state or local laws or regulations. This permit is not a waiver or approval of any other Department permit that may be required for other aspects of the total project which are not addressed in the permit.
- G.4 This permit conveys no title to land or water, does not constitute State recognition or acknowledgment of title, and does not constitute authority for the use of submerged lands unless herein provided and the necessary title or leasehold interests have been obtained from the State. Only the Trustees of the Internal Improvement Trust Fund may express State opinion as to title.
- G.5 This permit does not relieve the permittee from liability for harm or injury to human health or welfare, animal, or plant life, or property caused by the construction or operation of this permitted source, or from penalties therefore; nor does it allow the permittee to cause pollution in contravention of Florida Statutes and Department rules, unless specifically authorized by an order from the Department.
- G.6 The permittee shall properly operate and maintain the facility and systems of treatment and control (and related appurtenances) that are installed or used by the permittee to achieve compliance with the conditions of this permit, as required by Department rules. This provision includes the operation of backup or auxiliary facilities or similar systems when necessary to achieve compliance with the conditions of the permit and when required by Department rules.
- G.7 The permittee, by accepting this permit, specifically agrees to allow authorized Department personnel, upon presentation of credentials or other documents as may be required by law and at a reasonable time, access to the premises, where the permitted activity is located or conducted to:
- a) Have access to and copy and records that must be kept under the conditions of the permit;
 - b) Inspect the facility, equipment, practices, or operations regulated or required under this permit, and,
 - c) Sample or monitor any substances or parameters at any location reasonably necessary to assure compliance with this permit or Department rules.

Reasonable time may depend on the nature of the concern being investigated.

- G.8 If, for any reason, the permittee does not comply with or will be unable to comply with any condition or limitation specified in this permit, the permittee shall immediately provide the Department with the following information:
- a) A description of and cause of non-compliance; and
 - b) The period of noncompliance, including dates and times; or, if not corrected, the anticipated time the non-compliance is expected to continue, and steps being taken to reduce, eliminate, and prevent recurrence of the non-compliance.

The permittee shall be responsible for any and all damages which may result and may be subject to enforcement action by the Department for penalties or for revocation of this permit.

APPENDIX GC
GENERAL PERMIT CONDITIONS [F.A.C. 62-4.160]

- G.9 In accepting this permit, the permittee understands and agrees that all records, notes, monitoring data and other information relating to the construction or operation of this permitted source which are submitted to the Department may be used by the Department as evidence in any enforcement case involving the permitted source arising under the Florida Statutes or Department rules, except where such use is prescribed by Sections 403.73 and 403.111, Florida Statutes. Such evidence shall only be used to the extent it is consistent with the Florida Rules of Civil Procedure and appropriate evidentiary rules.
- G.10 The permittee agrees to comply with changes in Department rules and Florida Statutes after a reasonable time for compliance, provided, however, the permittee does not waive any other rights granted by Florida Statutes or Department rules.
- G.11 This permit is transferable only upon Department approval in accordance with Florida Administrative Code Rules 62-4.120 and 62-730.300, F.A.C., as applicable. The permittee shall be liable for any non-compliance of the permitted activity until the transfer is approved by the Department.
- G.12 This permit or a copy thereof shall be kept at the work site of the permitted activity.
- G.13 This permit also constitutes:
- a) Determination of Best Available Control Technology (X)
 - b) Determination of Prevention of Significant Deterioration (X); and
 - c) Compliance with New Source Performance Standards (X).
- G.14 The permittee shall comply with the following:
- a) Upon request, the permittee shall furnish all records and plans required under Department rules. During enforcement actions, the retention period for all records will be extended automatically unless otherwise stipulated by the Department.
 - b) The permittee shall hold at the facility or other location designated by this permit records of all monitoring information (including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation) required by the permit, copies of all reports required by this permit, and records of all data used to complete the application or this permit. These materials shall be retained at least three years from the date of the sample, measurement, report, or application unless otherwise specified by Department rule.
 - c) Records of monitoring information shall include:
 - 1. The date, exact place, and time of sampling or measurements;
 - 2. The person responsible for performing the sampling or measurements;
 - 3. The dates analyses were performed;
 - 4. The person responsible for performing the analyses;
 - 5. The analytical techniques or methods used; and
 - 6. The results of such analyses.
- G.15 When requested by the Department, the permittee shall within a reasonable time furnish any information required by law which is needed to determine compliance with the permit. If the permittee becomes aware that relevant facts were not submitted or were incorrect in the permit application or in any report to the Department, such facts or information shall be corrected promptly.



Department of Environmental Protection

Jeb Bush
Governor

Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

David B. Struhs
Secretary

P.E. Certification Statement

Permittee:

DEP File No. 0990021-004-AC (PSD-FL-294)

UTC Pratt & Whitney
LOX/Kerosene Rocket Engine Test Stand
Palm Beach County

Project type:

Project is construction of: a liquid oxygen and kerosene-fired rocket test stand with a water-cooled silencer and exhaust gas deflector; a water storage tank; a liquid oxygen tank; and a kerosene tank. The stand will be fired up to 12 times per year for 240 seconds per occurrence.

Carbon monoxide emissions will be controlled by maintaining a 2.72:1 oxygen to fuel ratio (by weight). A CO monitoring program is required largely due to projected concentrations approaching the NAAQS. The Department will require a feasibility study to determine if it is possible to increase the oxygen to fuel ratio to reduce generation of CO.

I HEREBY CERTIFY that the engineering features described in the above referenced application and subject to the proposed permit conditions provide reasonable assurance of compliance with applicable provisions of Chapter 403, Florida Statutes, and Florida Administrative Code Chapters 62-4 and 62-204 through 62-297. However, I have not evaluated and I do not certify aspects of the proposal outside of my area of expertise (including but not limited to the electrical, mechanical, structural, hydrological, and geological features).

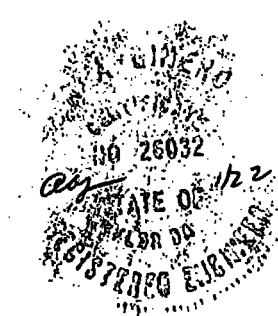
1/22/2001

A A. Linero, P.E.

Date

Registration Number: 26032

Department of Environmental Protection
Bureau of Air Regulation
New Source Review Section
111 South Magnolia Drive, Suite 4
Tallahassee, Florida 32301
Phone (850) 921-9523
Fax (850) 922-6979



"More Protection, Less Process"

Memorandum

Florida Department of Environmental Protection

TO: Clair Fancy

FROM: A. A. Linero *aa* 1/22

DATE: January 22, 2001

SUBJECT: United Technologies Corp.-Pratt & Whitney
DEP File No. 0990021-004-AC (PSD-FL-294)
LOX/Kerosene Rocket Engine Test Stand

Attached for your review and approval is the Intent to Issue for the construction of a LOX/Kerosene Rocket Engine Test Stand at the subject facility near in Palm Beach County.

The project will cause significant emissions of Carbon Monoxide (CO), estimated to be 1,000 tons per year from the test firings of rocket engines. High CO emissions result from the rich fuel /oxygen mixture used. No similar facility has been found anywhere in the world that has any CO pollution control equipment. The applicant estimated that the cost of a conventional incinerator for CO control would be prohibitive (over \$500,000,000).

The U.S. EPA is working on a MACT for Rocket Stands, but so far has developed no useful information. We believe, but are not certain that HAPs will be less than 10 TPY. Therefore we did not conduct a case-by-case MACT determination. We did find a 1990 BACT for a stand at the Stennis Center in Mississippi.

There is quite a bit of uncertainty regarding ground-level CO concentrations that approach the NAAQS. We are requiring post-construction CO monitoring as requested by Palm Beach County. Instead of requiring such expensive treatment we are requiring an engineering and cost study to identify and evaluate options for injecting pure oxygen into the engine exhaust downstream of the engine to oxidize CO. The study will be due one year after the permit is issued.

BACT emission control requirements consist of limiting the amount of fuel fired, the number and duration of test firings, and the minimum fuel/oxygen ratio.

Today is Day 76. I recommend your approval and signature.

AAL/

P.O. Box 109600
West Palm Beach, FL 33410-9600
561-796-2000



CERTIFIED MAIL #7000 0520 0016 2767 7963
(Submitted by Fax: 850-487-4938)

RECEIVED

FEB 22 2001

BUREAU OF AIR REGULATION

February 16, 2001

Ms. Kathy Carter
Agency Clerk
Office of General Counsel
Florida Department of Environmental Protection
3900 Commonwealth Boulevard, MS 35
Tallahassee, Florida 32399-3000

RE: **REQUEST FOR TIME EXTENSION TO FILE PETITION FOR HEARING**
Pratt & Whitney, LOX/Kerosene Rocket Engine
DEP File No. 0990021-004-AC (PSD-FL-294)

Dear Ms. Carter:

The draft permit for the above-referenced facility in West Palm Beach was issued on January 29, 2001, and received on February 2, 2001, by Pratt & Whitney (P&W). P&W has reviewed the specific permit conditions regarding the rocket test stand. Based upon this review, we believe that certain conditions of the draft permit (test stand design, ambient CO monitoring, controls study, fuel rates, mixture ratios, water rates, etc.) could significantly affect project viability, safety, and the performance of rocket testing. Accordingly, P&W believes that these permit conditions must be discussed and resolved with Florida Department of Environmental Protection (FDEP) staff prior to the issuance of the final permit.

As a result, pursuant to Rule 28-106.111, F.A.C., P&W hereby submits a request for a 90-day extension to file a petition for hearing under Sections 120.569 and 120.57, F.S. We believe this request for extension will allow P&W and FDEP to informally evaluate the technical, financial, safety, and logistical ramifications of the draft permit and resolve these issues without the necessity for a hearing. We have attached the certificate required under Rule 28-106.111, F.A.C. See Attachment #1.

Please contact Mr. Dean Gee at 561-796-2108 or Mr. David Alberghini at 561-796-2448 if you have any questions.

Sincerely,


John K. Sillan
Manager
Facilities Management

Attachment

O:\chs\windocs\enviro\ndja\FDEP_LOX-Kerosene_TimeExtension.Doc

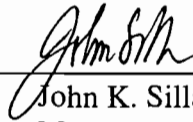
cc: **A.A. Linero, FDEP**
Benny Susi, P.E., Golder Associates
File: B.4.2.2.3 LOX/Kerosene Rocket Test Stand

ATTACHMENT #1

CERTIFICATE

I, John K. Sillan, hereby certify that this extension request was discussed with Mr. A. A. Linero, P.E., Administrator, New Source Review Section of the Florida Department of Environmental Protection and that he has no objection to the granting of an extension.

By



John K. Sillan
Manager
Facilities Management

2/16/01

Date



Jeb Bush
Governor

Department of Environmental Protection

Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

David B. Struhs
Secretary

January 29, 2001

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Mr. John K. Sillan, Manager
Facilities Management
United Technologies Corp.-Pratt & Whitney
P.O. Box 109600
West Palm Beach, Florida 33410-9600

Re: DEP File No. 0990021-004-AC (PSD-FL-294)
LOX/Kerosene Rocket Engine Test Stand

Dear Mr. Sillan:

Enclosed is one copy of the draft air construction permit to construct a LOX/Kerosene Rocket Engine Test Stand located at 17900 Beeline Highway, near Jupiter, Palm Beach County, Florida. The Technical Evaluation and Preliminary Determination, the Department's Intent to Issue Air Construction Permit and the "Public Notice of Intent to Issue Air Construction Permit" are also included.

The "Public Notice" must be published one time only, as soon as possible, in the legal advertisement section of a newspaper of general circulation in the area affected, pursuant to the requirements Chapter 50, Florida Statutes. Proof of publication, i.e., newspaper affidavit, must be provided to the Department's Bureau of Air Regulation office within seven days of publication. Failure to publish the notice and provide proof of publication may result in the denial of the permit.

Please submit any written comments you wish to have considered concerning the Department's proposed action to A. A. Linero, P.E., Administrator, New Source Review Section at the above letterhead address. If you have any other questions, please contact Mr. Linero at 850/921-9523.

Sincerely,

C. H. Fancy, P.E., Chief,
Bureau of Air Regulation

CHF/al

Enclosures

"More Protection, Less Process"

Printed on recycled paper.

In the Matter of an
Application for Permit by:

John K. Sillan, Manager Facilities Management
United Technologies Corp.-Pratt & Whitney
P.O. Box 109600
West Palm Beach, Florida 33410-9600

DEP File No. 0990021-004-AC (PSD-FL-294)
LOX/Kerosene Rocket Engine Test Stand
Palm Beach County

INTENT TO ISSUE AIR CONSTRUCTION PERMIT

The Department of Environmental Protection (Department) gives notice of its intent to issue an air construction permit (copy of draft permit attached) for the proposed project, detailed in the application specified above and the enclosed Technical Evaluation and Preliminary Determination, for the reasons stated below.

The applicant, United Technologies Corp.-Pratt & Whitney, initially applied on June 20, 2000 to the Department for an air construction permit to construct a LOX/Kerosene Rocket Engine Test Stand to be located at 17900 Beeline Highway, Jupiter, Palm Beach County.

The Department has permitting jurisdiction under the provisions of Chapter 403, Florida Statutes (F.S.), and Florida Administrative Code (F.A.C.) Chapters 62-4, 62-210, and 62-212. The above actions are not exempt from permitting procedures. The Department has determined that an air construction permit is required to construct the project.

The Department intends to issue this air construction permit based on the belief that reasonable assurances have been provided to indicate that operation of these emission units will not adversely impact air quality, and the emission units will comply with all appropriate provisions of Chapters 62-4, 62-204, 62-210, 62-212, 62-296, and 62-297, F.A.C.

Pursuant to Section 403.815, F.S., and Rule 62-110.106(7)(a)1., F.A.C., you (the applicant) are required to publish at your own expense the enclosed Public Notice of Intent to Issue Air Construction Permit. The notice shall be published one time only in the legal advertisement section of a newspaper of general circulation in the area affected. Rule 62-110.106(7)(b), F.A.C., requires that the applicant cause the notice to be published as soon as possible after notification by the Department of its intended action. For the purpose of these rules, "publication in a newspaper of general circulation in the area affected" means publication in a newspaper meeting the requirements of Sections 50.011 and 50.031, F.S., in the county where the activity is to take place. If you are uncertain that a newspaper meets these requirements, please contact the Department at the address or telephone number listed below. The applicant shall provide proof of publication to the Department's Bureau of Air Regulation, at 2600 Blair Stone Road, Mail Station #5505, Tallahassee, Florida 32399-2400 (Telephone: 850/488-0114; Fax 850/ 922-6979). You must provide proof of publication within seven days of publication, pursuant to Rule 62-110.106(5), F.A.C. No permitting action for which published notice is required shall be granted until proof of publication of notice is made by furnishing a uniform affidavit in substantially the form prescribed in section 50.051, F.S. to the office of the Department issuing the permit. Failure to publish the notice and provide proof of publication may result in the denial of the permit pursuant to Rules 62-110.106(9) & (11), F.A.C.

The Department will issue the final permit with the attached conditions unless a response received in accordance with the following procedures results in a different decision or significant change of terms or conditions.

The Department will accept written comments and requests for public meetings concerning the proposed permit issuance action for a period of thirty (30) days from the date of publication of Public Notice of Intent to Issue Air Permit. Written comments and requests for public meetings should be provided to the Department's Bureau of Air Regulation at 2600 Blair Stone Road, Mail Station #5505, Tallahassee, FL 32399-2400. Any written comments filed shall be made available for public inspection. If written comments received result in a significant change in the proposed agency action, the Department shall revise the proposed permit and require, if applicable, another Public Notice.

The Department will issue the permit with the attached conditions unless a timely petition for an administrative hearing is filed pursuant to sections 120.569 and 120.57 F.S., before the deadline for filing a petition. The procedures for petitioning for a hearing are set forth below.

A person whose substantial interests are affected by the proposed permitting decision may petition for an administrative proceeding (hearing) under sections 120.569 and 120.57 of the Florida Statutes. The petition must contain the information set forth below and must be filed (received) in the Office of General Counsel of the Department at 3900 Commonwealth Boulevard, Mail Station #35, Tallahassee, Florida, 32399-3000. Petitions filed by the permit applicant or any of the parties listed below must be filed within fourteen days of receipt of this notice of intent. Petitions filed by any persons other than those entitled to written notice under section 120.60(3) of the Florida Statutes must be filed within fourteen days of publication of the public notice or within fourteen days of receipt of this notice of intent, whichever occurs first. Under section 120.60(3), however, any person who asked the Department for notice of agency action may file a petition within fourteen days of receipt of that notice, regardless of the date of publication. A petitioner shall mail a copy of the petition to the applicant at the address indicated above at the time of filing. The failure of any person to file a petition within the appropriate time period shall constitute a waiver of that person's right to request an administrative determination (hearing) under sections 120.569 and 120.57 F.S., or to intervene in this proceeding and participate as a party to it. Any subsequent intervention will be only at the approval of the presiding officer upon the filing of a motion in compliance with Rule 28-106.205 of the Florida Administrative Code.

A petition that disputes the material facts on which the Department's action is based must contain the following information: (a) The name and address of each agency affected and each agency's file or identification number, if known; (b) The name, address, and telephone number of the petitioner, the name, address, and telephone number of the petitioner's representative, if any, which shall be the address for service purposes during the course of the proceeding; and an explanation of how the petitioner's substantial interests will be affected by the agency determination; (c) A statement of how and when petitioner received notice of the agency action or proposed action; (d) A statement of all disputed issues of material fact. If there are none, the petition must so indicate; (e) A concise statement of the ultimate facts alleged, including the specific facts: the petitioner contends warrant reversal or modification of the agency's proposed action; (f) A statement of the specific rules or statutes the petitioner contends require reversal or modification of the agency's proposed action; and (g) A statement of the relief sought by the petitioner, stating precisely the action petitioner wishes the agency to take with respect to the agency's proposed action.

A petition that does not dispute the material facts upon which the Department's action is based shall state that no such facts are in dispute and otherwise shall contain the same information as set forth above, as required by Rule 28-106.301.

Because the administrative hearing process is designed to formulate final agency action, the filing of a petition means that the Department's final action may be different from the position taken by it in this notice. Persons whose substantial interests will be affected by any such final decision of the Department on the application have the right to petition to become a party to the proceeding, in accordance with the requirements set forth above. Mediation is not available in this proceeding.

In addition to the above, a person subject to regulation has a right to apply for a variance from or waiver of the requirements of particular rules, on certain conditions, under Section 120.542 F.S. The relief provided by this state statute applies only to state rules, not statutes, and not to any federal regulatory requirements. Applying for a variance or waiver does not substitute or extend the time for filing a petition for an administrative hearing or exercising any other right that a person may have in relation to the action proposed in this notice of intent.

The application for a variance or waiver is made by filing a petition with the Office of General Counsel of the Department, 3900 Commonwealth Boulevard, Mail Station #35, Tallahassee, Florida 32399-3000. The petition must specify the following information: (a) The name, address, and telephone number of the petitioner; (b) The name, address, and telephone number of the attorney or qualified representative of the petitioner, if any; (c) Each rule or portion of a rule from which a variance or waiver is requested; (d) The citation to the statute underlying (implemented by) the rule identified in (c) above; (e) The type of action requested; (f) The specific facts that would justify a variance or waiver for the petitioner; (g) The reason why the variance or waiver would serve the purposes of the underlying statute (implemented by the rule); and (h) A statement whether the variance or waiver is permanent or temporary and, if temporary, a statement of the dates showing the duration of the variance or waiver requested.

The Department will grant a variance or waiver when the petition demonstrates both that the application of the rule would create a substantial hardship or violate principles of fairness, as each of those terms is defined in Section 120.542(2) F.S., and that the purpose of the underlying statute will be or has been achieved by other means by the petitioner.

Persons subject to regulation pursuant to any federally delegated or approved air program should be aware that Florida is specifically not authorized to issue variances or waivers from any requirements of any such federally delegated or approved program. The requirements of the program remain fully enforceable by the Administrator of the EPA and by any person under the Clean Air Act unless and until the Administrator separately approves any variance or waiver in accordance with the procedures of the federal program.

Executed in Tallahassee, Florida.



C. H. Fancy, P.E., Chief
Bureau of Air Regulation

CERTIFICATE OF SERVICE

The undersigned duly designated deputy agency clerk hereby certifies that this Intent to Issue Air Construction Permit (including the Public Notice, Technical Evaluation and Preliminary Determination, Draft Best Available Control Technology Determination, and the Draft permit) was sent by certified mail (*) and copies were mailed by U.S. Mail before the close of business on 1/29/01 to the person(s) listed:

John K. Sillan*
Benny Susi, P.E., Golder Associates
Isidore Goldman, SED

Darrel Graziani, PBCHD
Gregg Worley, EPA
John Bunyak, NPS

Clerk Stamp

FILING AND ACKNOWLEDGMENT FILED,
on this date, pursuant to §120.52, Florida Statutes,
with the designated Department Clerk, receipt of
which is hereby acknowledged.

Charlatta J. Hayes 1/29/01
(Clerk) (Date)

PUBLIC NOTICE OF INTENT TO ISSUE AIR CONSTRUCTION PERMIT

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION

DEP File No. 0990021-004-AC (PSD-FL-294)

United Technologies Corp.-Pratt & Whitney
LOX/Kerosene Rocket Engine Test Stand
Palm Beach County

The Department of Environmental Protection (Department) gives notice of its intent to issue an air construction permit to United Technologies Corp.-Pratt & Whitney for construction of a LOX/Kerosene Rocket Engine Test Stand located at 17900 Beeline Highway, near Jupiter, Palm Beach County. A Best Available Control Technology (BACT) determination was required for emissions of carbon monoxide (CO) pursuant to Rule 62-212.400, F.A.C., Prevention of Significant Deterioration (PSD). The applicant's mailing address is: United Technologies Corp.-Pratt & Whitney, Post Office Box 109600, West Palm Beach, Florida 33410-9600.

Emissions of CO are estimated to be approximately 1,000 tons per year. These emissions shall be restricted by limiting fuel usage to 318,000 gallons per year, test firings to 12 per year, and duration of firings to 240 seconds each. The minimum oxidant to fuel ratio will be 2.72 pounds of oxygen per ton of fuel. The Department will require the applicant to establish and operate an ambient air quality monitoring program.

An air quality impact analysis was conducted. Emissions from the facility will not significantly contribute to or cause a violation of any state or federal ambient air quality standards or PSD increment.

The Department will issue the final permit with the attached conditions unless a response received in accordance with the following procedures results in a different decision or significant change of terms or conditions.

The Department will accept written comments and requests for public meetings concerning the proposed permit issuance action for a period of thirty (30) days from the date of publication of this Public Notice of Intent to Issue Air Construction Permit. Written comments and requests for public meetings should be provided to the Department's Bureau of Air Regulation at 2600 Blair Stone Road, Mail Station #5505, Tallahassee, FL 32399-2400. Any written comments filed shall be made available for public inspection. If written comments received result in a significant change in the proposed agency action, the Department shall revise the proposed permit and require, if applicable, another Public Notice.

The Department will issue the permit with the attached conditions unless a timely petition for an administrative hearing is filed pursuant to sections 120.569 and 120.57 F.S., before the deadline for filing a petition. The procedures for petitioning for a hearing are set forth below. Mediation is not available in this proceeding.

A person whose substantial interests are affected by the proposed permitting decision may petition for an administrative proceeding (hearing) under sections 120.569 and 120.57 of the Florida Statutes. The petition must contain the information set forth below and must be filed (received) in the Office of General Counsel of the Department at 3900 Commonwealth Boulevard, Mail Station #35, Tallahassee, Florida, 32399-3000. Petitions filed by the permit applicant or any of the parties listed below must be filed within fourteen days of receipt of this notice of intent. Petitions filed by any persons other than those entitled to written notice under section 120.60(3) of the Florida Statutes must be filed within fourteen days of publication of the public notice or within fourteen days of receipt of this notice of intent, whichever occurs first. Under section 120.60(3), however, any person who asked the Department for notice of agency action may file a petition within fourteen days of receipt of that notice, regardless of the date of

NOTICE TO BE PUBLISHED IN THE NEWSPAPER

publication. A petitioner shall mail a copy of the petition to the applicant at the address indicated above at the time of filing. The failure of any person to file a petition within the appropriate time period shall constitute a waiver of that person's right to request an administrative determination (hearing) under sections 120.569 and 120.57 F.S., or to intervene in this proceeding and participate as a party to it. Any subsequent intervention will be only at the approval of the presiding officer upon the filing of a motion in compliance with Rule 28-106.205 of the Florida Administrative Code.

A petition that disputes the material facts on which the Department's action is based must contain the following information: (a) The name and address of each agency affected and each agency's file or identification number, if known; (b) The name, address, and telephone number of the petitioner, the name, address, and telephone number of the petitioner's representative, if any, which shall be the address for service purposes during the course of the proceeding; and an explanation of how the petitioner's substantial interests will be affected by the agency determination; (c) A statement of how and when petitioner received notice of the agency action or proposed action; (d) A statement of all disputed issues of material fact. If there are none, the petition must so indicate; (e) A concise statement of the ultimate facts alleged, including the specific facts the petitioner contends warrant reversal or modification of the agency's proposed action; (f) A statement of the specific rules or statutes the petitioner contends require reversal or modification of the agency's proposed action; and (g) A statement of the relief sought by the petitioner, stating precisely the action petitioner wishes the agency to take with respect to the agency's proposed action.

A petition that does not dispute the material facts upon which the Department's action is based shall state that no such facts are in dispute and otherwise shall contain the same information as set forth above, as required by rule 28-106.301

Because the administrative hearing process is designed to formulate final agency action, the filing of a petition means that the Department's final action may be different from the position taken by it in this notice. Persons whose substantial interests will be affected by any such final decision of the Department on the application have the right to petition to become a party to the proceeding, in accordance with the requirements set forth above.

A complete project file is available for public inspection during normal business hours, 8:00 a.m. to 5:00 p.m., Monday through Friday, except legal holidays, at:

Dept. of Environmental Protection Bureau of Air Regulation Suite 4, 111 S. Magnolia Drive Tallahassee, FL 32301 Telephone: 850/488-0114 Fax: 850/922-6979	Palm Beach County Health Dept. Env. Science & Engineering Div. 901 Evernia Street West Palm Beach, FL 33401 Telephone: 561/355-3070 Fax: 561/355-2442	Dept. of Environmental Protection Southeast District Office 400 North Congress Avenue West Palm Beach, FL 33416-5425 Telephone: 561/681-6600 Fax: 561/681-6755
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The complete project file includes the application, technical evaluations, draft permit, and the information submitted by the responsible official, exclusive of confidential records under Section 403.111, F.S. Interested persons may contact the Administrator, New Source Review Section at 111 South Magnolia Drive, Suite 4, Tallahassee, FL 32301 or call 850/488-0114 for additional information. The Department's Intent to Issue and related documents can also be viewed at www.dep.state.fl.us/air by clicking on permitting and then "Utilities and other Facility Permits Issued" under the PSD/Construction Permits.

NOTICE TO BE PUBLISHED IN THE NEWSPAPER

TECHNICAL EVALUATION
AND
PRELIMINARY DETERMINATION

United Technologies Corp.-Pratt & Whitney

LOX/Kerosene Rocket Engine Test Stand
Palm Beach County

DEP File No. 0990021-004-AC
PSD-FL-294

Department of Environmental Protection
Division of Air Resources Management
Bureau of Air Regulation

January 29, 2001

TECHNICAL EVALUATION/PRELIMINARY DETERMINATION

1. APPLICATION INFORMATION

Applicant Name and Address

United Technologies Corp.-Pratt & Whitney
17900 Beeline Highway (SR 710)
Jupiter, Florida 33478

Authorized Representative: John K. Sillan, Manager Facilities Management

Application Review Schedule

Date of Receipt of Application	06-20-00
First Request for Additional Information	07-19-00
Final Request for Additional Information	10-01-00
Date Application Complete	10-09-00
Waiver of Processing Clock by 30 days	12-19-00
Intent Issued	01-29-01

2. FACILITY INFORMATION

Facility Location

The existing facility is located at 17900 Beeline Highway (SR 710) near Jupiter, Palm Beach County. The proposed LOX/Kerosene Rocket Test Stand will be located at the E-5 rocket test area. The facility is located more than 100 kilometers (62 miles) from the nearest PSD Class I area, Everglades National Park. The UTM coordinates of the site are Zone 17, 567.3 km East and 2974.4 km North.

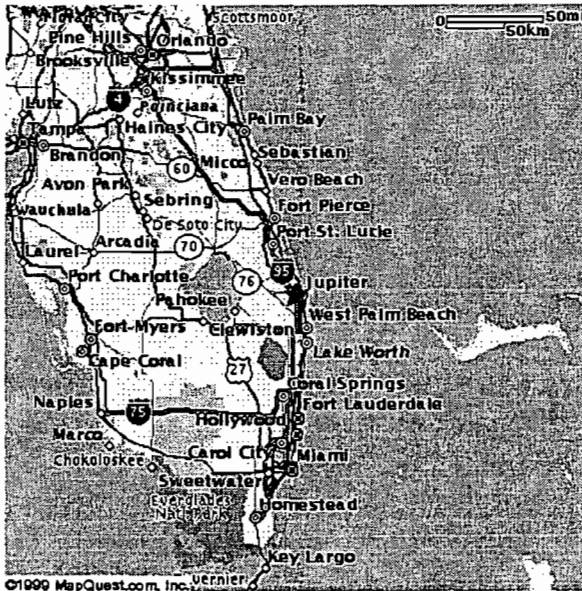


Figure 1 – Jupiter, Florida

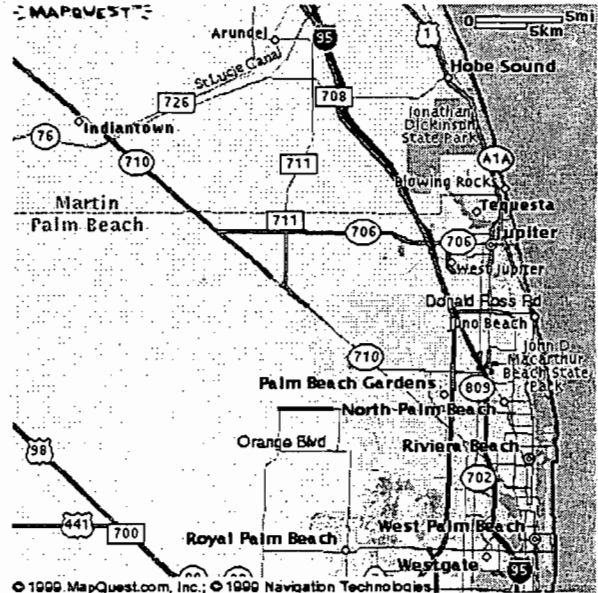


Figure 2 – Site - SR 710 and CR 711

TECHNICAL EVALUATION/PRELIMINARY DETERMINATION

Standard Industrial Classification Codes (SIC)

Major Group Number	37	Transportation Equipment
Group Numbers	372	Aircraft and Parts
	376	Guided Missile and Space Vehicles and Parts
Industry Numbers	3724	Aircraft Engines and Engine Parts
	3764	Guided Missile and Space Vehicle Propulsion Units and Propulsion Unit Parts

Facility Description

The facility is engaged in research and development as well as manufacturing activities associated with gas turbine and rocket engines. Gas turbine engine operations include the engineering, manufacturing, and testing of prototype parts and engines. Rocket engine operations include the engineering, manufacturing, and testing of prototype and commercial engines. A Materials Laboratory that develops and tests new materials supports both engine group operations.

Area Designations

The facility is located within an area that is currently designated as attainment for the pollutant's ozone, carbon monoxide, sulfur dioxide, and nitrogen dioxide; and unclassifiable for the pollutants lead and PM₁₀ (Particulate Matter less than 10 micrometers in diameter). The area is further designated as a maintenance area for the pollutant ozone and a PSD Class II area.

Facility Classifications

Preconstruction Review Programs: The facility is classified as an existing "Major Source" under the Prevention of Significant Deterioration (PSD) program with potential emissions of Carbon Monoxide (CO), Oxides of Nitrogen (NO_x), and Sulfur Dioxide (SO₂) greater than 250 tons per year. The facility is not on the list of the 28 Major Facility Categories (Table 62-212.400-1, F.A.C.).

Hazardous Air Pollutant (HAP) Programs: The facility is classified as an existing "Major Source" under the Section 112 of the Clean Air Act (CAA) with potential emissions of total HAPs greater than 25 tons per year. In addition, the facility includes the following regulated and source category activities:

- 40 CFR Part 63, Subpart T, Halogenated Solvent Cleaners;
- 40 CFR Part 63, Subpart GG, Aerospace Manufacturing and Rework Facilities; and
- Source Categories: Combustion Turbines, Engine Test Firing; Industrial/Commercial/Institutional Boilers; Miscellaneous Metal Parts And Products; Paint Stripping Operations; Reciprocating Internal Combustion Engines; Rocket Engine Test Firing; and Site Remediation.

TECHNICAL EVALUATION/PRELIMINARY DETERMINATION

New Source Performance Standards: The facility operates several emission units subject to the following standards:

- 40 CFR Part 60, Subpart Kb, Standards of Performance for Volatile Organic Liquid Storage Vessels (Including Petroleum Liquid Storage Vessels) for Which Construction, Reconstruction, or Modification Commenced After July 23, 1984; and
- 40 CFR Part 60, Subpart Dc, Standards of Performance for Small Industrial/Commercial/Institutional Boilers.

Title V Operating Permit Program: The facility is classified as a "Major Source" under the Title V program based on potential emissions of CO, NO_x, SO₂, Particulate Matter (PM), and Volatile Organic Compound (VOC) greater than 100 tons per year and total HAP emissions greater than 25 tons per year.

Facility Emissions

The facility's current potential emissions, based on the initial Title V permit application include the following:

Pollutant	PTE (Tons Per Year)
Oxides Of Nitrogen (NO _x)	1,756
Sulfur Dioxide (SO ₂)	571
Carbon Monoxide (CO)	389
Volatile Organic Compounds (VOC)	152
Particulate Matter (PM)	121
Total HAPs	43

3. PROJECT DESCRIPTION

Background

On June 20, 2000, the applicant applied for an air construction permit for the expansion of its existing rocket engine operations. The proposed project includes the construction and operation of a LOX/Kerosene Rocket Engine Stand at its existing facility in West Palm Beach. This project will consist of liquid oxygen and fuel storage tanks (64,000 and 36,000 gallon capacities), an engine containment can, a water-cooled silencer, an exhaust gas deflector, a lined cooling water retention pond, and an elevated 1-million gallon water supply tank.

TECHNICAL EVALUATION/PRELIMINARY DETERMINATION

Emissions Units:

The proposed project includes the addition of the following emissions units at the site:

EMISSION UNIT NO.	EMISSION UNIT DESCRIPTION
075	LOX/Kerosene Rocket Engine Test Stand ⁽¹⁾
076	Kerosene Fuel Storage Tank
Note: ⁽¹⁾ The EPA has determined that emissions from Rocket Firing at Test Stands are considered point source emissions; June 9, 1988	

Emissions

The potential emissions associated with the proposed project were estimated by the applicant using the "NASA Combustion Deck TEP" model and emission factors for flares from AP-42. The predicted short-term and annual emissions associated with 12 test firings per year and a duration of 240 seconds per test are as follows:

Pollutant	CO	CO ₂	H ₂	VOC	PM	SO _x	NO _x
lb/sec	694.4	1,366.0	17.1	2.0	1.6	<1	0.97
TPY	1,000.0	1,967.0	24.7	2.9	2.3	1.4	1.4

Classification

Preconstruction Review Programs: The proposed project is classified as a major modification at an existing major source of air pollution. Based on the potential emissions of CO, the proposed project is subject to the requirements of Rule 62-212.400, F.A.C., Prevention of Significant Deterioration.

Hazardous Air Pollutant (HAP) Programs: The U.S. EPA is currently developing a National Emission Standard for Hazardous Air Pollutants (NESHAP) for Rocket Engine Test Firing under Section 112 of the Clean Air Act and will propose such standards in the future. Until a NESHAP is proposed, the Department is required by its rules to develop a case-by-case determination of Maximum Achievable Control Technology (MACT) determination for new major sources of HAPs.

Potential emissions of HAPs have not been quantified, but are expected to be less than 10 tons per year and total HAPs less than 25 tons per year based on the applicant's estimates of PM and VOC emissions. As such, a case-by-case MACT determination was not required for the project at this time. The Department reserves the right to re-address HAPs should better emissions data become available or upon promulgation of the Rocket Engine Test Firing NESHAP.

New Source Performance Standards: The proposed project is not subject to any standards adopted under Section 111 of the CAA.

Title V Operating Permit Program: The proposed project will require a revision to the Title V operating permit upon completion of construction and a demonstration of compliance.

TECHNICAL EVALUATION/PRELIMINARY DETERMINATION

4. RULE APPLICABILITY

The proposed project is subject to pre-construction review and permitting requirements under the provisions of Chapter 403, Florida Statutes, and Chapters 62-4, 62-204, 62-210, 62-212, 62-296, and 62-297 of the Florida Administrative Code (F.A.C.). This facility is located in Palm Beach County, an area designated as a PSD area for the pollutant Carbon Monoxide in accordance with Rule 62-204.360, F.A.C.

The proposed project is subject to Rule 62-212.400, F.A.C., Prevention of Significant Deterioration (PSD), for CO and is also subject to reporting and record keeping requirements of 40 C.F.R. 60.116b for the kerosene fuel storage tank.

Federal PSD requirements are contained in the CFR, Title 40, Part 52.21. Florida has adopted PSD regulations (Rule 62-212.400, F.A.C.) that are essentially the same as the federal regulations. Florida's State Implementation Plan (SIP), which contains PSD regulations, has been approved by EPA; therefore, PSD approval authority has been granted to DEP. PSD regulations require that all new major stationary facilities or major modifications to existing major facilities, which emit air pollutants regulated under the Clean Air Act (CAA), must be reviewed and a permit issued before the commencement of construction.

The control technology review requirements of the federal and state PSD regulations require that all applicable federal and state emission-limiting standards be met, and that Best Available Control Technology (BACT) be applied to control emissions from the source (Rule 62-212.400, (5)(c), F.A.C.). The BACT requirements are applicable to all regulated pollutants for which the increase in emissions from the facility or modification exceeds the significant emission rate.

BACT is defined in 52.21 (b)(12) and Rule 62-210.200, F.A.C., as: "An emissions limitation (including a visible emission standard) based on the maximum degree of reduction of each pollutant subject to regulation under the Act which would be emitted by any proposed major stationary source or major modification which the Administrator, on a case-by-case basis, taking into account energy, environmental, and economic impacts, and other costs, determines is achievable through application of production processes and available methods, systems, and techniques (including fuel cleaning or treatment or innovative fuel combustion techniques) for control of such pollutant.

In no event shall application of best available control technology result in emissions of any pollutant, which would exceed the emissions allowed by any applicable standard under 40 CFR Parts 60 and 61. If the Administrator determines that technological or economic limitations on the application of measurement methodology to a particular part of a source or facility would make the imposition of an emission standard infeasible, a design, equipment, work practice, operational standard or combination thereof, may be prescribed instead to satisfy the requirement for the application of BACT. Such standard shall, to the degree possible, set forth the emissions reductions achievable by implementation of such design, equipment, work practice, or operation and shall provide for compliance by means which achieve equivalent results."

TECHNICAL EVALUATION/PRELIMINARY DETERMINATION

The postconstruction monitoring requirements (Rule 62-212.400(5)(g), F.A.C.) of the state PSD regulations allow the Department to require the owner to conduct air quality monitoring and provide the data to the Department if the Department finds that such monitoring is necessary to determine the effect that emissions from the project are having on air quality in any area.

The emission units affected by this permit shall comply with all applicable provisions of the Florida Administrative Code (including applicable portions of the Code of Federal Regulations incorporated therein) and, specifically, the following Chapters and Rules:

Chapter 62-4	Permits.
Rule 62-204.220	Ambient Air Quality Protection
Rule 62-204.240	Ambient Air Quality Standards
Rule 62-204.800	Federal Regulations Adopted by Reference (40CFR60 in Particular)
Rule 62-210.300	Permits Required
Rule 62-210.350	Public Notice and Comments
Rule 62-210.370	Reports
Rule 62-210.550	Stack Height Policy
Rule 62-210.650	Circumvention
Rule 62-210.700	Excess Emissions
Rule 62-210.900	Forms and Instructions
Rule 62-212.300	General Pre-construction Review Requirements
Rule 62-212.400	Prevention of Significant Deterioration (including BACT & Postconstruction Monitoring)
Rule 62-213	Operation Permits for Major Sources of Air Pollution
Rule 62-296.320	General Pollutant Emission Limiting Standards
Rule 62-297.310	General Test Requirements
Rule 62-297.401	Compliance Test Methods

5. PROJECT ANALYSIS

The Department's analysis of the proposed project included review of the permit application, the emissions units, the emissions estimates and methodologies, the applicable regulations, the air quality control strategy, and the ambient air quality data and potential impacts of the proposed project. The results of the Department's analyses on the air quality control strategy and ambient air quality impact analyses are presented below.

Air Quality Control Strategy – Carbon Monoxide

The applicant has requested that the Department's BACT determination for CO emissions require no add-on control equipment due to prohibitive cost and impracticability of controlling such a large exhaust stream. Instead, the applicant proposed that the BACT requirements focus on combustion control by way of adjusting the oxygen to fuel ratio to maximize combustion efficiency thus reducing CO emissions, limiting test duration to no longer than 240 seconds per test, and limiting testing to no more than 12 tests per year.

TECHNICAL EVALUATION/PRELIMINARY DETERMINATION

The applicant's BACT evaluation referred to a Russian rocket test stand that employed a water injection and ducting system solely for the purpose of avoiding heat detection by surveillance satellites during the Cold-War era. According to the applicant, the Russian test stand was not designed as an emission control system and should not be considered as any sort of exemplary emission control system. This is the only rocket test stand known to have any equipment that could be construed as add-on controls.

The molar concentration of the rocket engine exhaust gases was estimated to contain approximately 23% CO, 28% CO₂, 8% H₂ and 41% H₂O vapor by the applicant using the TEP model. The applicant reported that kerosene rocket engines fire a fuel rich mixture for heat control flexibility, firing approximately 82% of the theoretical O₂ required for complete combustion. Consequently, CO emissions from engines of this type are very high compared to combustion turbines and other sources that burn fuel for purposes of energy transfer or conversion to steam or power. At the same time, use of liquid oxygen reduces the availability of atmospheric nitrogen for participation in NO_x formation.

Add-on Controls – Incineration: The applicant reported that if CO oxidation technology from the gas turbine industry was considered, differences in exhaust concentrations will affect the design and costs for adaptation to rocket engines. Turbine exhaust oxidation technology applied to a rocket engine test stand will result in greater costs due to the severity of the exhaust conditions. Estimates provided by the applicant indicate that a conventional incinerator would cost about 579 million dollars with an annualized cost of about 68 million. An additional 100 million would be required, according to the applicant, to construct an appropriate infrastructure for a control device designed to withstand the maximum thrust and high temperatures of the rocket engine exhaust.

BACT-Determination: Details of the Department's BACT determination are given in the separate Draft BACT Determination issued concurrently with this evaluation. The Department does not necessarily accept the cost estimates of \$579,000,000 with annualized costs of \$68,000,000 for add-on emissions control or the \$100,000,000 infrastructure cost estimate. However, the Department agrees with the applicants finding that existing oxidation technology is not feasible at this time. As a result, the Department has preliminarily proposed BACT for the rocket engine test stand to be a visible emissions limitation of twenty (40) percent opacity and the following work practices:

- Carbon Monoxide (CO) Emissions – Rocket engine test firings shall not result in CO emissions greater than 41.5 tons per minute (2-minute average), 83 tons per 8-hour period, and 1,000 tons per year (12-month rolling total) as determined using the NASA-Lewis chemical equilibrium computer program or equivalent method approved by the Department.
- Test Stand - The test stand shall be constructed in accordance with the design specifications provided within the application including a Water Cooled Silencer with a maximum diameter of 20 feet and a maximum length of 80 feet and an Exhaust Gas Deflector with a Minimum height of 70 feet, maximum distance from Water Cooled Silencer of 100 feet. The surface between the water-cooled silencer and the exhaust gas deflector shall be paved.

TECHNICAL EVALUATION/PRELIMINARY DETERMINATION

- Test Duration – Rocket engine test firings shall not exceed a total 240 seconds per 8-hour period
- Test Firings – Rocket engine test firings shall not exceed 2,880 seconds per year (12-month rolling total);
- Oxidant/Fuel Ratio – All rocket engine test firings shall be conducted at a minimum oxidant/fuel ratio of 2.72 lb. O₂/lb. Fuel.
- Fuel Usage – Rocket engine test firings shall not consume more than 6,625 gallons per minute (4-minute average), 26,500 gallons per 8-hour period, and 318,000 gallons per year (12-month rolling total).
- Quench Water - All rocket engine test firings shall be conducted at a minimum quench water flow of 3,220 gallons per second.
- Fuel and Oxidizer Types - Rocket engine test firings shall be limited to the firing of kerosene as the fuel and liquid oxygen (LOX) as the oxidizer.
- Test Conditions – Rocket engine test firings shall be restricted to daylight hours (1 hour after sunrise and 1 hour prior to sunset) and only under ambient conditions that provide good dispersion of the exhaust gases in accordance with a Test Plan to be submitted to the Palm Beach County Health Department (PBCHD) for approval prior to the initial test. Non-daylight hour testing maybe approved on a case-by-case basis by the Palm Beach County Health Department (PBCHD).
- Test Notifications – At least 24 hours prior to a rocket engine test firing, notification shall be provided to the PBCHD. The notification shall include the date and time of the test firing, the expected duration of the test firing, the planned oxidant/fuel ratio, and the planned fuel usage rate. In the event a mishap (i.e., test duration > 240 seconds, O/F ratio less than 2.72, fuel usage > 13,250 gpm, a flame out, etc.) occurs during a test, a written excess emissions report shall be provided to the PBCHD within 24 hours of the test. The report shall identify the mishap and impacts.
- Postconstruction Monitoring – The permittee shall, prior to any rocket engine test firings, establish an ambient air quality monitoring program to measure ambient air concentrations of CO before, during, and after a rocket engine test firing. The program shall be consistent with the procedures specified in the Ambient Monitoring Guidelines for Prevention of Significant Deterioration (EPA 450/4-87-007, U. S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, N. C. 27711, May 1987).
- Oxygen Injection Study – Within one year of initial issuance of this permit, the permittee shall complete and submit to the Department an engineering and cost study evaluating the technical feasibility and cost effectiveness of direct O₂ (Air or Pure Oxygen) injection for reducing CO emissions in the exhausts of rocket engines tested at the permittee's facility. The study shall evaluate possibilities for direct O₂ injection including a heat-shielded, internally-cooled oxygen lance for injecting stoichiometric rates of oxygen into the exhaust downstream of the engine. Appropriate kinetic modeling shall be utilized to predict the oxidation reaction rates and overall CO conversion for various configurations of the injection apparatus and various injection locations and methods.

TECHNICAL EVALUATION/PRELIMINARY DETERMINATION

- Compliance Demonstrations – Compliance with the visible emissions limitation shall be demonstrated initially for each new oxidant/fuel ratio and annually thereafter. Compliance with the CO emissions limitation shall be demonstrated initially and continuously thereafter through the use of the NASA Lewis chemical equilibrium computer program or its equivalent as approved by the Department or Palm Beach County Health Department and the ambient air quality monitoring program.
- Excess Emissions - Excess emissions shall be allowed provided the permittee demonstrates that the emissions did not result in any of the following:
 1. a predicted ambient impact greater than the National Ambient Air Quality Standards (NAAQS) for CO after adjustment based on the ambient monitoring program;
 2. a significant emissions increase in a PSD Pollutant; or
 3. emissions of a hazardous air pollutant in an amount of 10 tons per year or greater individually or 25 tons per year or greater collectively.

Air Quality Impacts

The proposed project will increase CO emissions at a level in excess of PSD significant amounts. The air quality impact analyses required by the PSD regulations for this pollutant include:

- An analysis of existing air quality;
- A significant impact analysis;
- An Ambient Air Quality Standards (AAQS) analysis; and
- An analysis of impacts on soils, vegetation, and visibility and of growth-related air quality modeling impacts.

The analysis of existing air quality generally relies on preconstruction monitoring data collected with EPA-approved methods. The significant impact and AAQS analyses depend on air quality dispersion modeling carried out in accordance with EPA guidelines.

Based on the required analyses, the Department has reasonable assurance that the proposed project, as described in this report and subject to the conditions of approval proposed herein, will not cause or significantly contribute to a violation of any AAQS or PSD increment. A discussion of the required analyses follows.

Analysis of Existing Air Quality: Preconstruction ambient air quality monitoring is required for all pollutants subject to PSD review unless otherwise exempted or satisfied. This monitoring requirement may be satisfied by using previously existing representative monitoring data, if available. An exemption to the monitoring requirement may be obtained if either of the following conditions is met: the maximum predicted air quality impact resulting from the projected emissions increase, as determined by air quality modeling, is less than a pollutant-specific de minimus concentration, or the existing ambient concentrations are less than a pollutant-specific de minimus concentration. If preconstruction ambient monitoring is exempted, determination of background concentrations for PSD significant pollutants with established AAQS may still be necessary for use in any required AAQS analysis. These

TECHNICAL EVALUATION/PRELIMINARY DETERMINATION

concentrations may be established from the required preconstruction ambient air quality monitoring analysis or from the existing representative monitoring data. These background ambient air quality concentrations are added to pollutant impacts predicted by modeling.

For this project, the maximum eight-hour CO impacts from the project were predicted to be 627 ug/m^3 , which is greater than the de minimus level of 575 ug/m^3 ; therefore, preconstruction monitoring is required. However, the applicant requested that the previously existing monitoring data from monitors located in West Palm Beach be considered as representative. The Department agreed with the applicants request and allowed the data to be used to satisfy the preconstruction monitoring requirement and to establish a background concentration for use in the required AAQS analysis.

Models and Meteorological Data Used In Significant Impact, PSD Increment And AAQS Analyses: The applicant used the EPA-approved Industrial Source Complex Short-Term (ISCST3) dispersion model to evaluate the pollutant emissions from the proposed project and other existing major facilities. The model determines ground-level concentrations of inert gases or small particles emitted into the atmosphere by point, area, and volume sources. The model incorporates elements for plume rise, transport by the mean wind, Gaussian dispersion, and pollutant removal mechanisms such as deposition. The ISCST3 model allows for the separation of sources, building wake downwash, and various other input and output features. A series of specific model features, recommended by the EPA, are referred to as the regulatory options. The applicant used the EPA recommended regulatory options in each modeling scenario. Direction-specific downwash parameters were used for all sources for which downwash was considered. The stacks associated with this project all satisfy the good engineering practice (GEP) stack height criteria.

Meteorological data used in the ISCST3 model consisted of a concurrent 5-year period of hourly surface weather observations and twice-daily upper air soundings from the National Weather Service (NWS) station at West Palm Beach, Florida. The 5-year period of meteorological data was from 1987 through 1991. This NWS station was selected for use in the study because it is the closest primary weather station to the study area and is most representative of the project site. The surface observations included wind direction, wind speed, temperature, cloud cover, and cloud ceiling.

For this project, only the impacts of CO emissions are being evaluated. Since the CO standards are based on short-term averages and five years of data were used in ISCST3, the highest-second-high (HSH) short-term predicted concentrations were compared with the appropriate AAQS. For determining the project's significant impact area in the vicinity of the facility, the highest short-term predicted concentrations were compared to their respective significant impact levels.

Significant Impact Analysis: Initially, the applicant conducted modeling to determine whether the proposed project's CO emissions were predicted to have a significant impact in the vicinity of the facility. The applicant placed over 950 receptors along the site boundary and out to 35 km from the facility. The table below shows the results of this modeling. The radius of significant impact is also shown. The EPA has not established PSD Class I or II Area increments.

TECHNICAL EVALUATION/PRELIMINARY DETERMINATION

Maximum Project Air Quality Impact for Comparison With the PSD Class II Significant Impact Level in the Vicinity of the Facility

Averaging Time	Maximum Predicted Impact (ug/m3)	Significant Impact Level (ug/m3)	Significant Impact?	Radius of Significant Impact (km)
8-HOUR	627	500	YES	35
1-HOUR	5,012	2,000	YES	35

As shown in the tables the maximum predicted air quality impacts due to CO emissions from the proposed project are greater than the PSD significant impact levels in the vicinity of the facility. Therefore, the applicant was required to do full impact CO modeling in the vicinity of the facility, within the applicable significant impact area, to determine the impacts of the project along with all other sources in the vicinity of the facility. The significant impact area is based upon the predicted radius of significant impact. Full impact modeling is modeling that considers not only the impact of the project but the impacts of the existing facility and other sources, including background concentrations, located within the vicinity of the project to determine whether all increments or AAQS are predicted to be met.

Procedure for Performing AAQS Analyses: For the AAQS analyses, receptor grids normally are based on the size of the significant impact area for each pollutant. The size of the significant impact areas for the required CO analysis were based on a 35 km radius of significant impact. The results of the CO AAQS analysis are summarized in the table below. As shown in this table, emissions from the proposed facility are not expected to cause or significantly contribute to a violation of any AAQS.

Ambient Air Quality Impacts

Averaging Time	Modeled Sources Impact (ug/m ³)	Background Conc. (ug/m ³)	Maximum Predicted Impact (ug/m ³)	AAQS (ug/m ³)	Predicted Impact Greater Than AAQS?
8-hour	5,823	3,450	9,267	10,000	NO
1-hour	11,009	5,777	16,786	40,000	NO

Additional Impacts Analysis - Impacts On Soils, Vegetation, Wildlife, and Visibility: The maximum ground-level concentrations predicted to occur due to CO emissions as a result of the proposed project, including all other nearby sources, will be below the associated AAQS which are designed to protect both the public health and welfare. This project will not have a harmful impact on soils and vegetation in the PSD Class II area in the vicinity of the facility.

TECHNICAL EVALUATION/PRELIMINARY DETERMINATION

Additional Impacts Analysis Growth-Related Air Quality Impacts: There will be no growth associated with this project.

Postconstruction Monitoring: The maximum ground level concentration was predicted to be within 90 percent of the AAQS using the available ambient monitoring data, the existing source inventory, the estimated emissions from the rocket engine test firing, and the ISCST3 dispersion model. Although the ISCST3 dispersion model is the default regulatory model, its application to short-term release scenarios is limited. In addition, the emission estimates for the rocket engine test firing are based on theoretical calculations and may vary significantly. For these reasons and the very high concentration of CO predicted within the rocket engine exhaust gases, the Department will require the applicant to establish an air monitoring program to monitor CO concentrations down wind of the test stand in accordance with Rule 62-212.400(5)(g), F.A.C.

The monitoring program shall be established prior to the initial test firing and shall continue for a minimum of 12 valid test runs. A valid test run shall be deemed one in which the wind direction will position at least one monitoring station downwind. The program will allow the applicant to discontinue monitoring upon approval of the PBCHD during extended periods when testing is not scheduled.

6. CONCLUSION

Based on information provided by the applicant, supplemented by other information available to the Department, the restriction within the draft permit and BACT Determination, the Department has reasonable assurance that the proposed project will not cause a violation of any air quality standard or PSD increment.

PERMITTEE

United Technologies Corp.-Pratt & Whitney
P.O. Box 109600
West Palm Beach, FL 33410-9600

Permit No.	0990021-004-AC PSD-FL-294
Project	LOX/Kerosene Rocket Engine Test Stand
Expires:	March 31, 2003

AUTHORIZED REPRESENTATIVE:

Mr. John K. Sillan, Manager Facilities Management

PROJECT AND LOCATION

This permit authorizes the permittee to construct a LOX/Kerosene Rocket Engine Test Stand at its existing facility at 17900 Beeline Highway (SR 710) in West Palm Beach, Palm Beach County. The test stand shall be limited to firing no more than 318,000 gallons of fuel per year and required to establish an ambient air quality monitoring program. The SIC codes for this facility are 3724 and 3764.

The UTM coordinates of the site are Zone 17; 567.3 km E; 2974.4 km N. The Everglades National Park is approximately 120 km (74.9 miles) from the site.

STATEMENT OF BASIS

This construction/PSD permit is issued under the provisions of Chapter 403 of the Florida Statutes (F.S.), and the Florida Administrative Code (F.A.C.) Chapters 62-4, 62-204, 62-210, 62-212, 62-296, and 62-297. The above named permittee is authorized to construct the emissions units in accordance with the conditions of this permit and as described in the application, approved drawings, plans, and other documents on file with the Department of Environmental Protection (Department).

APPENDICES

The attached appendices are a part of this permit:

- Appendix BD BACT Determination
- Appendix GC General Permit Conditions
- Appendix NSPS-Kb 40 CFR 60 Subpart Kb - Standards Of Performance For Volatile Organic Liquid Storage Vessels

Howard L. Rhodes, Director
Division of Air Resources
Management

AIR CONSTRUCTION PERMIT
SECTION I. FACILITY INFORMATION

FACILITY DESCRIPTION

United Technologies Corp.- Pratt & Whitney (UTC-P&W) proposes to construct a Liquid Oxygen (LOX)/Kerosene Rocket Engine Test Stand at the E-5 rocket test area located at 17900 Beeline Highway (SR 710) in West Palm Beach, Palm Beach County.

The proposed project will result in a significant emissions increase of carbon monoxide (CO) according to Table 212.400-2, Florida Administrative Code (F.A.C.). The project is therefore subject to review for Prevention of Significant Deterioration (PSD) and a determination of Best Available Control Technology (BACT) in accordance with Rule 62-212.400, F.A.C.

PROJECT DETAILS

The applicant proposes to construct and operate a LOX/Kerosene Rocket Engine Stand at its existing rocket test facility in West Palm Beach. The applicant also operates a gas turbine testing facility and a helicopter development facility at the existing site. This project will consist of liquid oxygen and fuel storage tanks (64,000 and 36,000 gallon capacities), an engine containment can, a water-cooled silencer, an exhaust gas deflector, a lined cooling water retention pond, and an elevated 1-million gallon water supply tank.

The proposed facility will consist of the following emissions units.

EMISSIONS UNIT NO.	EMISSIONS UNIT DESCRIPTION
075	LOX/Kerosene Rocket Engine Test Stand
076	NSPS Storage Tank – 36,000 Gallon Capacity

REGULATORY CLASSIFICATION

The facility is classified as a Major Source of air pollution under the PSD and Title V programs based on potential emissions of carbon monoxide (CO), volatile organic compounds (VOC), nitrogen oxides (NOx), sulfur dioxide (SO₂), trichloroethylene, and total combined hazardous air pollutants (HAPs) exceeding 25 tons per year. This facility is not within an industry included in the list of the 28 Major Facility Categories per Table 62-212.400-1, F.A.C. The project permitted herein is subject to the requirements of the federal Prevention of Significant Deterioration air quality rules for CO emissions and New Source Performance Standards for fuel storage tanks as well as state rules cited in the general and specific conditions.

REVIEWING AND PROCESS SCHEDULE

06-20-00	Date of Receipt of Application
07-19-00	First Request for Additional Information
10-01-00	Final Request for Additional Information
10-09-00	Date Application Complete
01-29-01	Intent Issued

RELEVANT DOCUMENTS

The documents listed below constitute the basis for the permit and are on file with the Department.

- Permit application
- Applicant's additional information noted above
- Department's Technical Evaluation and Preliminary Determination and Intent to Issue

United Technologies Corp.-Pratt & Whitney
LOX/Kerosene Rocket Engine Test Stand

DEP File No. 0990021-004-AC
PSD-FL-294

AIR CONSTRUCTION PERMIT
SECTION II. FACILITY-WIDE SPECIFIC CONDITIONS

The following specific conditions apply to all emissions units at this facility addressed by this permit.

ADMINISTRATIVE

1. Regulating Agencies: All documents related to applications for permits to construct, or modify an emissions unit should be submitted to the Bureau of Air Regulation (BAR), Florida Department of Environmental Protection at Mail Station #5505, 2600 Blair Stone Road, Tallahassee, Florida 32399-2400, phone number 850/488-0114. All documents related to reports, tests, operation permit applications, minor modifications and notifications shall be submitted to the Palm Beach County Health Department, post Office Box 29, 901 Evernia Street, West Palm Beach, Florida 33402-0029, Phone 562-355-3136.
2. General Conditions: The permittee is subject to and shall operate under the attached General Permit Conditions G.1 through G.15 listed in Appendix GC of this permit. General Permit Conditions are binding and enforceable pursuant to Chapter 403 of the Florida Statutes. [Rule 62-4.160, F.A.C.]
3. Terminology: The terms used in this permit have specific meanings as defined in the corresponding chapters of the Florida Administrative Code.
4. Applicable Regulations, Forms and Application Procedures: Unless otherwise indicated in this permit, the construction and operation of the subject emissions unit shall be in accordance with the capacities and specifications stated in the application. The facility is subject to all applicable provisions of Chapter 403, F.S. and Florida Administrative Code Chapters 62-4, 62-110, 62-204, 62-212, 62-213, 62-296, 62-297 and the Code of Federal Regulations Title 40, Part 60, adopted by reference in the Florida Administrative Code (F.A.C.) regulations. The permittee shall use the applicable forms listed in Rule 62-210.900, F.A.C. and follow the application procedures in Chapter 62-4, F.A.C. Issuance of this permit does not relieve the facility owner or operator from compliance with any applicable federal, state, or local permitting or regulations. [Rules 62-204.800, 62-210.300 and 62-210.900, F.A.C.]
5. New or Additional Conditions: Pursuant to Rule 62-4.080, F.A.C., for good cause shown and after notice and an administrative hearing, if requested, the Department may require the permittee to conform to new or additional conditions. The Department shall allow the permittee a reasonable time to conform to the new or additional conditions, and on application of the permittee, the Department may grant additional time. [Rule 62-4.080, F.A.C.]
6. Expiration: This air construction permit shall expire on March 31, 2003. The permittee, for good cause, may request that this construction/PSD permit be extended. Such a request shall be submitted to the Department's Bureau of Air Regulation prior to 60 days before the expiration of the permit. [Rules 62-210.300(1), 62-4.070(4), 62-4.080, and 62-4.210, F.A.C.]

PSD Expiration: Approval to construct shall become invalid if construction is not commenced within 18 months after receipt of such approval, or if construction is discontinued for a period of 18 months or more, or if construction is not completed within a reasonable time. The Department may extend the 18-month period upon a satisfactory showing that an extension is justified. [Rules 62-4.070(4), 62-4.210(2) & (3), and 62-210.300(1)(a), F.A.C.]

BACT Determination: In conjunction with extension of the 18 month period to commence or continue construction, or extension of the permit expiration date, the permittee may be required to demonstrate the adequacy of any previous determination of Best Available Control Technology (BACT) for the source as applied to any new or modified emission units. [Rules 62-4.070(4), 62-4.210(2) & (3), 62-210.300(1)(a), and 62-212.400(6)(b), F.A.C.]

AIR CONSTRUCTION PERMIT

SECTION II. FACILITY-WIDE SPECIFIC CONDITIONS

7. Modifications: No emissions unit or facility subject to this permit shall be constructed or modified without obtaining an air construction permit from the Department. Such permit must be obtained prior to the beginning of construction or modification.
[Rules 62-210.300(1) and 62-212.300(1)(a), F.A.C.]
8. Title V Operation Permit Required: This permit authorizes construction and/or installation of the permitted emissions unit and initial operation to determine compliance with Department rules. A revision to the facility's Title V operation permit is required for regular operation of the permitted emissions unit. The owner or operator shall apply for and receive a Title V operation permit or permit modification prior to expiration of this permit. To apply for a Title V operation permit, the applicant shall submit the appropriate application form, compliance test results, and such additional information as the Department may by law require. The application shall be submitted to the Department's appropriate District office.
[Rules 62-4.030, 62-4.050, 62-4.220, and Chapter 62-213, F.A.C.]

GENERAL EMISSIONS LIMITING STANDARDS

9. General Visible Emissions Standard: Except for emissions units that are subject to a particulate matter or opacity limit set forth or established by rule and reflected by conditions in this permit, no person shall cause, let, permit, suffer, or allow to be discharged into the atmosphere the emissions of air pollutants from any activity, the density of which is equal to or greater than that designated as Number 1 on the Ringelmann Chart (20% opacity). The test method for visible emissions shall be EPA Method 9, incorporated and adopted by reference in Chapter 62-297, F.A.C. Test procedures shall meet all applicable requirements of Chapter 62-297, F.A.C. [Rule 62-296.320(4)(b)1, F.A.C.]
10. Unconfined Emissions of Particulate Matter: [Rules 62-296.320(4)(c) and 62-212.400, F.A.C.]
 - (i) No person shall cause, let, permit, suffer or allow the emissions of unconfined particulate matter from any activity, including vehicular movement; transportation of materials; construction, alteration, demolition or wrecking; or industrially related activities such as loading, unloading, storing or handling; without taking reasonable precautions to prevent such emissions.
 - (ii) Any permit issued to a facility with emissions of unconfined particulate matter shall specify the reasonable precautions to be taken by that facility to control the emissions of unconfined particulate matter.
 - (iii) Reasonable precautions include the following:
 - Paving and maintenance of roads, parking areas and yards.
 - Application of water or chemicals to control emissions from such activities as demolition of buildings, grading roads, construction, and land clearing.
 - Application of asphalt, water, oil, chemicals or other dust suppressants to unpaved roads, yards, open stock piles and similar activities.
 - Removal of particulate matter from roads and other paved areas under the control of the owner or operator of the facility to prevent re-entrainment, and from buildings or work areas to prevent particulate from becoming airborne.
 - Landscaping or planting of vegetation.
 - Use of hoods, fans, filters, and similar equipment to contain, capture and/or vent particulate matter.
 - Confining abrasive blasting where possible.
 - Enclosure or covering of conveyor systems.

AIR CONSTRUCTION PERMIT
SECTION II. FACILITY-WIDE SPECIFIC CONDITIONS

(iv) In determining what constitutes reasonable precautions for a particular source, the Department shall consider the cost of the control technique or work practice, the environmental impacts of the technique or practice, and the degree of reduction of emissions expected from a particular technique or practice.

11. General Pollutant Emission Limiting Standards: [Rule 62-296.320(1)(a)&(2), F.A.C.]

(i) No person shall store, pump, handle, process, load, unload or use in any process or installation, volatile organic compounds or organic solvents without applying known and existing vapor emission control devices or systems deemed necessary and ordered by the Department.

(ii) No person shall cause, suffer, allow or permit the discharge of air pollutants which cause or contribute to an objectionable odor. (Not federally enforceable)

[Note: An objectionable odor is defined in Rule 62-210.200(203), F.A.C., as any odor present in the outdoor atmosphere which by itself or in combination with other odors, is or may be harmful or injurious to human health or welfare, which unreasonably interferes with the comfortable use and enjoyment of life or property, or which creates a nuisance.]

OPERATIONAL REQUIREMENTS

12. Plant Operation - Problems: If temporarily unable to comply with any of the conditions of the permit due to breakdown of equipment or destruction by hazard of fire, wind or by other cause, the permittee shall immediately notify the Department's appropriate district office and the appropriate local program office. The notification shall include pertinent information as to the cause of the problem, and what steps are being taken to correct the problem and to prevent its recurrence, and where applicable, the owner's intent toward reconstruction of destroyed facilities. Such notification does not release the permittee from any liability for failure to comply with Department rules. [Rule 62-4.130, F.A.C.]

13. Circumvention: No person shall circumvent any air pollution control device or allow the emission of air pollutants without the applicable air pollution control device operating properly. [Rule 62-210.650, F.A.C.]

14. Excess Emissions: For purposes of this permit, all limits established pursuant to the State Implementation Plan, including those limits established as BACT, include emissions during periods of startup and shutdown, and are not subject to the provisions of Rule 62-210.700(1), F.A.C.

Excess emissions which are caused entirely or in part by poor maintenance, poor operation, or any other equipment or process failure which may reasonably be prevented during start-up, shutdown or malfunction shall be prohibited pursuant to Rule 62-210.700(4), F.A.C. [Rules 62-4.070(3) and 62-210.700(5), F.A.C.]

COMPLIANCE MONITORING AND TESTING REQUIREMENTS

15. Determination of Process Variables: [Rule 62-297.310(5), F.A.C.]

(i) Required Equipment. The owner or operator of an emissions unit for which compliance tests are required shall install, operate, and maintain equipment or instruments necessary to determine process variables, such as process weight input or heat input, when such data are needed in conjunction with emissions data to determine the compliance of the emissions unit with applicable emission limiting standards.

AIR CONSTRUCTION PERMIT

SECTION II. FACILITY-WIDE SPECIFIC CONDITIONS

(ii) Accuracy of Equipment. Equipment or instruments used to directly or indirectly determine process variables, including devices such as belt scales, weight hoppers, flow meters, and tank scales, shall be calibrated and adjusted to indicate the true value of the parameter being measured with sufficient accuracy to allow the applicable process variable to be determined within 10% of its true value.

16. Special Compliance Tests: When the Department, after investigation, has good reason (such as complaints, increased visible emissions or questionable maintenance of control equipment) to believe that any applicable emission standard contained in a Department rule or in a permit issued pursuant to those rules is being violated, it shall require the owner or operator of the facility to conduct compliance tests which identify the nature and quantity of pollutant emissions from the emissions units and to provide a report on the results of said tests to the Department. [Rule 62-297.310(7)(b), F.A.C.]

REPORTING AND RECORD KEEPING REQUIREMENTS

23. Duration of Record Keeping: Upon request, the permittee shall furnish all records and plans required under Department rules. During enforcement actions, the retention period for all records will be extended automatically unless otherwise stipulated by the Department. The permittee shall hold at the facility or other location designated by this permit records of all monitoring information (including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation) required by the permit, copies of all reports required by this permit, and records of all data used to complete the application for this permit. These materials shall be retained at least five years from the date of the sample, measurement, report, or application unless otherwise specified by Department rule. [Rules 62-4.160(14)(a)&(b) and 62-213.440(1)(b)2.b., F.A.C.]
24. Test Reports: The owner or operator of an emissions unit for which a compliance test is required shall file a report with the Department on the results of each such test. The required test report shall be filed with the Department as soon as practical but no later than 45 days after the last sampling run of each test is completed. The test report shall provide sufficient detail on the emissions unit tested and the test procedures used to allow the Department to determine if the test was properly conducted and the test results properly computed. As a minimum, the test report, other than for an EPA Method 9 test, shall provide the applicable information listed in Rule 62-297.310(8)(c), F.A.C. [Rule 62-297.310(8), F.A.C.]
25. Excess Emissions Report: If excess emissions occur, the owner or operator shall notify the appropriate Department District Office and the appropriate local program within one working day of: the nature, extent, and duration of the excess emissions; the cause of the excess emissions; and the actions taken to correct the problem. In addition, the Department may request a written summary report of the incident. [Rule 62-4.130, F.A.C.]
26. Excess Emissions Report - Malfunctions: In case of excess emissions resulting from malfunctions, each owner or operator shall notify the appropriate Department District Office and the appropriate local program in accordance with Rule 62-4.130, F.A.C. A full written report on the malfunctions shall be submitted in a quarterly report if requested by the Department. [Rule 62-210.700(6), F.A.C.]
27. Annual Operating Report for Air Pollutant Emitting Facility: The Annual Operating Report for Air Pollutant Emitting Facility shall be completed each year and shall be submitted to the appropriate Department District Office and the appropriate local program by March 1 of the following year. [Rule 62-210.370(3), F.A.C.]

AIR CONSTRUCTION PERMIT
SECTION III. EMISSIONS UNIT SPECIFIC CONDITIONS

SUBSECTION A: The following specific conditions apply to the following emissions units:

EMISSIONS UNIT NO.	EMISSIONS UNIT DESCRIPTION
075	LOX/Kerosene Rocket Engine Test Stand

EMISSIONS UNIT(S) DETAILS

LOX/Kerosene Rocket Engine Test Stand, designated Emissions Unit 075, consisting of an engine containment can, a water-cooled silencer, and an exhaust gas deflector. Emissions are controlled through the use of a minimum oxidant to fuel ratio and the water-cooled silencer.

{Permitting note(s): The emissions unit has been reviewed under the PSD Program for carbon monoxide (CO). As a new major source of CO, the emissions unit is subject to the Best Available Control Technology (BACT) requirements of Rule 62-212.400(5)(c), F.A.C. Potential emissions of particulate matter (PM and PM10), sulfur dioxide (SO₂), oxides of nitrogen (NO_x), and volatile organic compounds have been estimated at 2.3, 1.4, 1.4, and 2.9 tons per year, respectively. The emissions unit is not subject to any New Source Performance Standards (40 CFR Part 60) or National Emission Standards for Hazardous Air Pollutants (40 CFR Part 61). The emissions unit has been identified as a Source Category for future regulatory action under the National Emission Standards for Hazardous Air Pollutants for Source Categories (40 CFR Part 63). A case-by-case determination of the Maximum Achievable Control Technology (MACT) under 40 CFR Part 63, Subpart B was not required.}

CONSTRUCTION REQUIREMENTS

- A.1. **Test Stand:** The test stand shall be constructed in accordance with the design specifications provided within the application and the following minimum and maximum specifications:
- (i). **Water Cooled Silencer:** Maximum diameter of 20 feet and a maximum length of 80 feet; and
 - (ii). **Exhaust Gas Deflector:** Minimum height of 70 feet, maximum distance from Water Cooled Silencer of 100 feet. The surface between the water-cooled silencer and the exhaust gas deflector shall be paved.

[BACT and Rules 62-4.070(3) and 62-296.320(4)(c), F.A.C.]

- A.2. **Oxygen Injection Study:** Within one year of initial issuance of this permit, the permittee shall complete and submit to the Department an engineering and cost study evaluating the technical feasibility and cost effectiveness of direct O₂ (Air or Pure Oxygen) injection for reducing CO emissions in the exhausts of rocket engines tested at the permittee's facility. The study shall evaluate possibilities for direct O₂ injection including a heat-shielded, internally cooled oxygen lance for injecting stoichiometric rates of oxygen into the exhaust downstream of the engine. Appropriate kinetic modeling shall be utilized to predict the oxidation reaction rates and overall CO conversion for various configurations of the injection apparatus and various injection locations and methods.

[Rule 62-4.070(3) and BACT]

OPERATING RESTRICTIONS

- A.3. **Permitted Capacity:** The permittee shall not allow, cause, suffer or permit the operation of the unit in excess of the following capacities without prior authorization from the Permitting Authority:

United Technologies Corp.-Pratt & Whitney
LOX/Kerosene Rocket Engine Test Stand

DEP File No. 0990021-004-AC
PSD-FL-294

AIR CONSTRUCTION PERMIT

SECTION III. EMISSIONS UNIT SPECIFIC CONDITIONS

- (i). **Test Duration:** Rocket engine test firing duration shall not exceed a total of 240 seconds per 8-hour period.
- (ii). **Test Firings:** Rocket engine test firings shall not exceed 2,880 seconds per year (12-month rolling total).
- (iii). **Oxidant/Fuel Ratio:** All rocket engine test firings shall be conducted at a minimum oxidant/fuel ratio of 2.72 pounds of oxygen per pound of fuel.
- (iv). **Fuel Usage:** Rocket engine test firings shall not consume more than 6,625 gallons per minute (4-minute average), 26,500 gallons per 8-hour period, and 318,000 gallons per year (12-month rolling total)
- (v). **Quench Water:** All rocket engine test firings shall be conducted with a minimum quench water flow of 3,220 gallons per second.

[BACT, Rules 62-4.160(2), 62-210.200(228), and 62-210.300, F.A.C.]

{Permitting note: Prior authorization includes the issuance of construction, reconstruction, or modification permits or a determination by the Permitting Authority that the action is not subject to 62-210.300(1), F.A.C.}

- A.4. **Methods of Operation:** The permittee shall not allow, cause, suffer or permit any change in the method(s) of operation resulting in increased short-term or long-term potential emissions, without prior authorization from the Permitting Authority. The authorized methods of operation include the following:

- (i) **Fuels:** The permittee is authorized to use kerosene as the rocket engine fuel.
- (ii) **Oxidants:** The permittee is authorized to use liquid oxygen (LOX) as the rocket engine fuel oxidizer.

[BACT, Rules 62-4.160(2), 62-210.200(228) and 62-210.300, F.A.C.]

- A.5. **Test Conditions:** Rocket engine test firings shall be restricted to daylight hours (1 hour after sunrise and 1 hour prior to sunset) and only under ambient conditions that provide good dispersion of the exhaust gases in accordance with a Test Plan to be submitted to the Palm Beach County Health Department (PBCHD) for approval prior to the initial test. Non-daylight hour testing maybe approved on a case-by-case basis by the Palm Beach County Health Department (PBCHD).

[BACT, Rules 62-4.070(3), F.A.C.]

- A.6. **Hours of Operation:** The permittee is authorized to operate the unit continuously within the limits of the permitted capacities of **Condition 3** and the test conditions of **Condition 5** of this permit.

[BACT, Rules 62-4.160(2), 62-210.200(228) and 62-210.300, F.A.C.]

EMISSION LIMITATIONS AND STANDARDS

- A.7. **Visible Emissions:** The permittee shall not allow visible emissions that exceed forty (40) percent opacity from any rocket engine test firing.

[BACT, Rule 62-296.320(4)(b), F.A.C.]

AIR CONSTRUCTION PERMIT
SECTION III. EMISSIONS UNIT SPECIFIC CONDITIONS

A.8. **Carbon Monoxide Emissions**: Rocket engine test firings shall not result in CO emissions greater than 41.5 tons per minute (2-minute average); 83 tons per 8-hour period, and 1,000 tons per year (12-month rolling total) as determined using the NASA-Lewis chemical equilibrium computer program or equivalent method approved by the Department or the Palm Beach County Health Department.

[BACT, Rules 62-4.160(2), 62-210.200(228), and 62-210.300, F.A.C.]

A.9. **BACT Determination**: The permittee shall comply with the requirements of Appendix BD of this permit.

[BACT and Rule 62-212.400(5)(c), F.A.C.]

TEST METHODS AND PROCEDURES.

A.10. **Visible Emissions**: All visible emissions tests performed pursuant to the requirements of this permit shall comply with the following provisions:

(i). **Test Method**: The test method for visible emissions shall be DEP Method 9, incorporated in Rule 62-297.401(9)(c), F.A.C. The required minimum period of observation for a compliance test shall for operations that are normally completed within less than the minimum observation period and do not recur within that time, the period of observation shall be equal to the duration of the operation completion time. The opacity test observation period shall include the period during which the highest opacity emissions can reasonably be expected to occur.

[BACT, Rule 62-297.310(4)(a)2.a, F.A.C.]

(ii). **Test Procedures**: Test procedures shall meet all applicable requirements of Chapter 62-297, F.A.C.

[Rule 62-296.410(3)(c), F.A.C.]

A.11. **Carbon Monoxide Emissions**: The permittee shall, prior to any rocket engine test firings, establish an ambient air quality monitoring program to measure ambient air concentrations of CO before, during, and after a rocket engine test firing. The program shall be consistent with the procedures specified in the Ambient Monitoring Guidelines for Prevention of Significant Deterioration (EPA 450/4-87-007, U. S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, N. C. 27711, May 1987).

COMPLIANCE DEMONSTRATIONS AND PERIODIC MONITORING

A.12. **Initial Compliance Demonstrations**: The permittee shall conduct a visible emissions compliance test during the initial rocket engine test firing and each subsequent test firing when a new oxidant/fuel ratio is used. Initial compliance with the CO emission limitations shall be demonstrated through compliance with **Conditions 8 and 11** of this permit.

[BACT and Rule 62-297.310(7)(a)1., F.A.C.]

A.13. **Continuous Compliance Demonstrations**: The permittee shall demonstrate continuous compliance with the CO emissions limitation by use of the ambient air quality monitoring program required by **Condition 11** of this permit.

[BACT and Rule 62-4.070(3), F.A.C.]

AIR CONSTRUCTION PERMIT
SECTION III. EMISSIONS UNIT SPECIFIC CONDITIONS

- A.14. **Annual Compliance Demonstrations:** The permittee shall have a formal compliance test conducted for visible emissions annually during each federal fiscal year (October 1 – September 30), unless otherwise specified by rule, order, or permit.
[BACT and Rule 62-297.310(7), F.A.C.]
- A.15. **Flow Monitors:** The permittee shall install, maintain, operate and calibrate flow monitors to measure the oxidant, fuel and quench water flow rates during each rocket engine test firing. All instrumentation shall be properly maintained and functional at all times, except during instrument breakdown, calibration or repair to ensure compliance with **Conditions 3, 4, 5, and 8** of this permit.
[Rule 62-4.070(3), F.A.C.]
- A.16. **Recordkeeping:** The permittee shall maintain the following records:
- (i). Test Identification Number;
 - (ii). Test Date and Time (Start and Finish);
 - (iii). Test Duration (Planned and Actual);
 - (iv). Oxidant and Fuel Types;
 - (v). Oxidant/Fuel Ratio (Planned and Actual);
 - (vi). Fuel Usage (gallons per minute);
 - (vii). Quench Water Rate (Planned and Actual);
 - (viii). Test Condition Summary;
 - (ix). CO Ambient Concentrations;
 - (x). Mishaps; and
 - (xi). Daily and Monthly Totals of Test Duration, Test Firings, and Fuel Usage.
- [Rule 62-4.070(3), F.A.C.]
- A.17. **Reporting:** The permittee shall submit the following reports:
- (i). **Test Notifications:** Notification to the PBCHD at least 24 hours prior to a rocket engine test firing. The notification shall include the date and time of the test firing, the expected duration of the test firing, the planned oxidant/fuel ratio, and the planned fuel usage rate.
[BACT and Rule 62-4.070(3), F.A.C.]
 - (ii) **Mishap Reports:** In the event a mishap (i.e., test duration > 240 seconds, O/F ratio less than 2.72, fuel usage > 13,250 gpm, a flame out, etc.) occurs during a test, a written report shall be provided to the PBCHD within 24 hours of the test. Within thirty (30) days of a mishap, the permittee shall submit an analysis showing the excess emissions associated ambient air quality impacts, if any.
[Rule 62-4.130, F.A.C.]
- A.18. **Excess Emissions:** Excess emissions shall be allowed provided the permittee demonstrates that the emissions did not result in a predicted ambient impact greater than the National Ambient Air Quality Standards (NAAQS) for CO adjusted based on the ambient monitoring program; a significant emissions increase in a PSD Pollutant; or result in emissions of a hazardous air pollutant in an amount of 10 tons per year or greater individually or 25 tons per year or greater collectively.
[BACT and Rule 62-4.070(3), F.A.C.]

AIR CONSTRUCTION PERMIT

SECTION III. EMISSIONS UNIT SPECIFIC CONDITIONS

SUBSECTION B: The following specific conditions apply to the following emissions units:

EMISSIONS UNIT NO.	EMISSIONS UNIT DESCRIPTION
076	NSPS Storage Tank – 36,000 Gallon Capacity

EMISSIONS UNITS DETAILS

Emissions Unit 076 is a stationary storage tanks each having an approximate capacity of 36,000 gallons. The tank is subject to specific recordkeeping requirements of 40 CFR 60 Subpart Kb. The tank will store and handle kerosene, a volatile organic liquid (VOL), for the LOX/Kerosene Rocket Engine Test Stand (E.U. ID No. 075).

{Permitting notes: The unit is classified as new facilities under the New Source Performance Standards (40 CFR 60 Subpart Kb) and subject to the recordkeeping requirement of 40 CFR 60 Subpart Kb.}

The following specific conditions apply to the emissions unit(s) listed above:

OPERATING RESTRICTIONS

B.1. **Permitted Capacity.** The permittee shall not allow, cause, suffer, or permit the operation of Emissions Unit 076 in excess of 318,000 gallons per year without prior authorization from the Permitting Authority:

[Rules 62-4.160(2), 62-210.200(228), 62-210.300, F.A.C.]

B.2. **Methods of Operation.** The permittee shall not allow, cause, suffer or permit any change in the method of operation of Emissions Unit 076 without prior authorization from the Permitting Authority. The authorized methods of operation include the following:

(i). **VOL Type(s).** The permittee is authorized to store and handle kerosene.

(ii). **VOL Vapor Pressure.** The permittee shall not store or handle any fuels within the units with a maximum true vapor pressure greater than 15.0 kPa (2.176 psi).

[Rules 62-4.160(2), 62-210.200(228), 62-210.300, F.A.C., 40 CFR 60.110b(c)]

B.3. **Hours of Operation.** The permittee is authorized to operate the units continuously.

[Rule 62-4.070(3), F.A.C.]

COMPLIANCE DEMONSTRATIONS AND PERIODIC MONITORING

B.4. **Compliance Demonstrations.** The permittee shall demonstrate compliance with the operating restriction of Condition B.1. based on record keeping as required by Condition B.5. of this permit.

[Rule 62-297.310(7), F.A.C.]

B.5. **Records.** The permittee shall implement the following periodic monitoring requirements to ensure compliance with the Specific Conditions B.1 and B.2. of this permit:

(i). **Monthly Throughput.** The permittee shall monitor and record the monthly throughput of volatile organic liquids through each tank.

(ii). **Volatile Organic Liquid Types.** The permittee shall monitor and record the type (Name and True Vapor Pressure at 80°F) of volatile organic liquids stored and handled in each tank.

[Rule 62-213.440(1)(b), F.A.C.]

AIR CONSTRUCTION PERMIT

SECTION III. EMISSIONS UNIT SPECIFIC CONDITIONS

New Source Performance Standards (NSPS)

{Permitting note: The unit is subject to the recordkeeping requirements of 40 CFR 60 Subpart Kb provided the permittee complies with the requirements of 40 CFR 60.110b, Applicability.}

E.7. 40 CFR 60 Subpart Kb—Standards of Performance for Volatile Organic Liquid Storage Vessels (Including Petroleum Liquid Storage Vessels) for which Construction, Reconstruction, or Modification Commenced after July 23, 1984: The permittee shall comply with the applicable requirements of 40 CFR 60 Subpart Kb contained in Appendix NSPS-Kb. Specifically:

- (a) 40 CFR 60.110b, Applicability,
- (b) 40 CFR 60.111b, Definitions,
- (c) 40 CFR 60.116b, Monitoring of Operations

[40 CFR 60.40b(a), Rule 62-204.800(7)(b), F.A.C.]

APPENDIX BD - DETERMINATION OF
BEST AVAILABLE CONTROL TECHNOLOGY (BACT)

United Technologies Corp.- Pratt & Whitney
LOX/Kerosene Rocket Engine Stand Project
Palm Beach County

DEP File No. 0990021-004-AC
PSD-FL-294

Department of Environmental Protection
Division of Air Resources Management
Bureau of Air Regulation

Month Day, 2001

APPENDIX BD - BACT DETERMINATION

United Technologies Corp. – Pratt & Whitney LOX/Kerosene Rocket Engine Stand Project Palm Beach County

United Technologies Corp.- Pratt & Whitney (UTC-P&W) proposes to construct a Liquid Oxygen (LOX)/Kerosene Rocket Engine Test Stand at the E-5 rocket test area located at 17900 Beeline Highway (SR 710) near Jupiter, Palm Beach County.

The proposed project will result in a significant emissions increase of carbon monoxide (CO) according to Table 212.400-2, Florida Administrative Code (F.A.C.). The project is therefore subject to review for Prevention of Significant Deterioration (PSD) and a determination of Best Available Control Technology (BACT) in accordance with Rule 62-212.400, F.A.C.

The details of PSD applicability and a description of the process are presented in the separate Technical Evaluation and Preliminary Determination issued concurrently with this determination.

BACT DETERMINATION REQUESTED BY THE APPLICANT:

The applicant requested that the Department's BACT determination for CO emissions require no control equipment due to prohibitive cost and impracticability of controlling such a large exhaust stream. Instead, the applicant proposed that the BACT requirements focus on combustion control by way of adjusting the oxygen to fuel ratio to maximize combustion efficiency thus reducing CO emissions.

BACT DETERMINATION PROCEDURE:

In accordance with Chapter 62-212, F.A.C., a BACT determination is based on the maximum degree of reduction of each pollutant emitted which the Department of Environmental Protection (Department), on a case by case basis, taking into account energy, environmental and economic impacts, and other costs, determines is achievable through application of production processes and available methods, systems, and techniques. In addition, the regulations state that, in making the BACT determination, the Department shall give consideration to:

- Any Environmental Protection Agency determination of BACT pursuant to Section 169, and any emission limitation contained in 40 CFR Part 60 - Standards of Performance for New Stationary Sources or 40 CFR Part 61 - National Emission Standards for Hazardous Air Pollutants.
- All scientific, engineering, and technical material and other information available to the Department.
- The emission limiting standards or BACT determinations of any other state.
- The social and economic impact of the application of such technology.

The EPA currently stresses that BACT should be determined using the "top-down" approach. The first step in this approach is to determine, for the emission unit in question, the most stringent control available for a similar or identical emission unit or emission unit category. If it is shown that this level of control is technically or economically infeasible for the emission unit in question, then the next most stringent level of control is determined and similarly evaluated. This process

APPENDIX BD - BACT DETERMINATION

continues until the BACT level under consideration cannot be eliminated by any substantial or unique technical, environmental, or economic objections.

Under 40 CFR Part 60 - Standards of Performance for New Stationary Sources (NSPS) there is no promulgated emission standard that applies to emissions from rocket engine test facilities.

Under 40 CFR Part 61 - National Emission Standards for Hazardous Air Pollutants (NESHAP) there is a promulgated emission standard that applies to emissions from rocket engine test facilities. The Standard, 40 CFR Part 61, Subpart D applies specifically to Beryllium Rocket Motor Firing. It includes an emission standard based on a time-weighted atmospheric concentration of beryllium and a requirement to monitor ambient air concentrations to ensure compliance with the emission standard. The monitoring program requires prior approval from the Administrator.

Under 40 CFR Part 63 - National Emission Standards for Hazardous Air Pollutants (NESHAP) for Source Categories, Rocket Engine Test Firing is a targeted source category. On December 8, 1998 the EPA workgroup working on this matter, distributed Information Collection Requests to the major companies (including OTC Pratt & Whitney) potentially affected by such a NESHAP. The Department's contacted Mr. Richard A. Copland, the project team leader at EPA. According to Mr. Copland, (based on the information received) it appears at this time that there will be no controls due to the relatively short firing time, remote facility locations, costs, etc. EPA is still researching the matter so Mr. Copland's assessment of the present situation is not considered as final.

BACT DETERMINATIONS BY EPA AND STATES:

The Department's review for any prior BACT determinations for emissions from rocket engine test facilities referred to in the RACT/BACT/LAER Clearinghouse identified the following:

- MS-0019, State of Mississippi, December 1990 BACT Determination for the National Aeronautics and Space Administration's (NASA) Stennis Space Center. The BACT determination required use of a deflector ramp to aid in dispersion and prevent scouring of soil and restrictions on meteorological conditions to prevent possible acid rain formation. Specific numerical limits were not established. The project was associated with the Advanced Solid Rocket Motor (ASRM). The project was later discontinued when Congress suspended funding.

OTHER INFORMATION AVAILABLE TO THE DEPARTMENT

The primary sources of information related to rocket engine test stands included the applicant's data, the MDEQ, and the NESHAP activities. These sources provided information on existing test stands, emissions, permitting requirements and control strategies.

The applicant provided estimates of emissions based on a fuel combustion model developed by NASA. Known as the NASA-Lewis chemical equilibrium computer program, emission estimates were provided by the applicant in supplemental information filed during the application completeness process. The NASA-Lewis chemical equilibrium computer program appears to be the primary source of most emission estimates for rocket engine test operations.

The Department contacted the Mississippi Department of Environmental Quality (MDEQ) regarding the 1990 BACT determination. MDEQ provided additional information as well as

APPENDIX BD - BACT DETERMINATION

identifying a current in-house project for the NASA Stennis Space Center. The project included the establishment of federally enforceable permit conditions on the facility's LOX/hydrocarbon rocket engine test stands. A copy of the draft permit (1000-00005) was provided to the Department for review. The enforceable conditions within the permit included the following:

- Emissions Limitations: PM (10,270 lb/test), PM₁₀ (6,060 lb/test), SO₂ (2,520 lb/test), NO_x (2520 lb/test) CO (558,600 lb/test) and VOC (50 lb/test).
- Fuel Authorizations: Liquid Hydrogen (LH₂)/Liquid Oxygen (LOX) and hydrocarbon fuels.
- Emission Estimates: NASA-Lewis chemical equilibrium computer program or an equivalent version.
- Records: For each test - the duration, the fuels and the calculated emission rates for PM, PM₁₀, SO₂, NO_x, CO, and VOC. Semiannual report showing number of tests per month, total emissions per month, and the highest lb/test emissions rate during the reporting period.

The Department is also aware of the other rocket engine test stands, however, the 1990 MDEQ BACT determination is the only one that included a BACT determination and is thus a BACT floor.

PROPOSED PROJECT AND EMISSIONS

The applicant proposes to construct and operate a LOX/Kerosene Rocket Engine Stand at its existing rocket test facility in West Palm Beach. The applicant also operates a gas turbine testing facility and a helicopter development facility at the existing site. This project will consist of liquid oxygen and fuel storage tanks (64,000 and 36,000 gallon capacities), an engine containment can, a water-cooled silencer, an exhaust gas deflector, a lined cooling water retention pond, and an elevated 1-million gallon water supply tank.

Emissions will be generated from combustion of fuel during 12 test firings per year lasting 240 seconds each. These emissions have been estimated according to the NASA combustion model as indicated next:

Pollutant	CO	CO ₂	H ₂	VOC	PM	SO _x	NO _x
lb/sec	694	1,366	17	2	1.6	<1	1
TPY	1,000	1,967	25	3	2.3	1.4	1.4

As indicated in the table above, the only regulated pollutant believed to be emitted in significant quantities is CO in the amount of 1,000 TPY. No estimates are given for HAPs. In any case, HAPs emissions are believed to be less than 10 TPY of any single HAP or less than 25 TPY of all HAPs combined.

APPENDIX BD - BACT DETERMINATION

BACT CONTROL OPTIONS

The applicant has requested that the Department's BACT determination for CO emissions require no add-on control equipment due to prohibitive cost and impracticability of controlling such a large exhaust stream. Instead, the applicant proposed that the BACT requirements focus on combustion control by way of adjusting the oxygen to fuel ratio to maximize combustion efficiency thus reducing CO emissions, limiting test duration to no longer than 240 seconds per test, and limiting testing to no more than 12 tests per year.

The applicant's BACT evaluation referred to a Russian rocket test stand that employed a water injection and ducting system solely for the purpose of avoiding heat detection by surveillance satellites during the Cold-War era. According to the applicant, the Russian test stand was not designed as an emission control system and should not be considered as any sort of exemplary emission control system. This is the only rocket test stand reported by the applicant that may be construed to have any add-on controls.

BACT DETERMINATION

If the BACT analysis is based on the transfer of CO oxidation technology from the gas turbine industry, differences in exhaust concentrations must be considered. Based on the modeled exhaust flow, the molar concentration of exhaust gases will be about 23% CO, 28% CO₂, 8% H₂ and 41% H₂O vapor. Kerosene rocket engines fire a fuel rich mixture for heat control flexibility, firing at approximately 82% of theoretical O₂ required for complete combustion. Consequently, CO emissions from engines of this type are very high compared to combustion turbines that rarely exceed 150-200 ppm CO even at medium loads.

Turbine exhaust oxidation technology applied to a rocket engine test stand will result in far greater costs. Estimates provided by the applicant indicate that a conventional incinerator would cost about \$579,000,000 with an annualized cost of about \$68,000,000. An additional \$100,000,000 would be required, according to the applicant, to construct an appropriate infrastructure for a control device designed to withstand the maximum thrust and high temperatures of the rocket engine exhaust. The Department does not necessarily accept these figures, but agrees that actual figures can be many millions of dollars.

If a system could be designed to capture the rocket engine exhaust gases and convert the CO to CO₂ catalytically or by thermal oxidation, it would be massive (~ 60 ft. diameter) and have to withstand extreme temperatures and thrust pressures adding significantly to construction and operating costs. Cost effectiveness for catalytic oxidation of natural gas-fired turbine exhausts for the largest sizes of utility turbines ranges from \$5,000 to over \$8,000 per ton of CO removed. When scaled up for the extreme conditions of a rocket engine exhaust and the numerous uncertainties inherent in such a system, the overall cost effectiveness might exceed \$100,000 per ton depending on the safety factors used in the design. Considering these uncertainties, the Department concludes that catalytic oxidation such as employed by turbines would not be practicable or cost-effective and neither would incineration.

Yet, it is conceivable that other means could be used for injecting oxygen into the exhaust gases to create conditions suitable for oxidation of much of the CO. An automobile emission control system with air injection is one example. Since this facility will emit at least 1,000 TPY CO, and since CO is a criteria air pollutant, the Department proposes that a study be done by the applicant

APPENDIX BD - BACT DETERMINATION

to evaluate the feasibility of direct O₂ injection into the gas stream downstream of the body of the engine. The study should employ kinetic modeling to determine the practicability and economic feasibility of adding the balance of stoichiometric oxygen required for complete combustion via direct injection at an appropriate point or points in the rocket engine exhaust. A period of one year is provided for completion of the study and submitting it to the Department.

The Department agrees with the applicant's finding that existing oxidation technology is not feasible at this time. As a result, the Department has determined BACT for the rocket engine test stand to be a visible emissions limitation of forty (40) percent opacity and the following work practices:

- Carbon Monoxide (CO) Emissions – Rocket engine test firings shall not result in CO emissions greater than 41.5 tons per minute (2-minute average), 83 tons per 8-hour period, and 1,000 tons per year (12-month rolling total) as determined using the NASA-Lewis chemical equilibrium computer program or equivalent method approved by the Department.
- Test Stand - The test stand shall be constructed in accordance with the design specifications provided within the application including a Water Cooled Silencer with a maximum diameter of 20 feet and a maximum length of 80 feet and an Exhaust Gas Deflector with a Minimum height of 70 feet, maximum distance from Water Cooled Silencer of 100 feet. The surface between the water-cooled silencer and the exhaust gas deflector shall be paved.
- Test Duration – Rocket engine test firings shall not exceed a total of 240 seconds per 8-hour period
- Test Firings – Rocket engine test firings shall not exceed 2,880 seconds per year (12-month rolling total);
- Oxidant/Fuel Ratio – All rocket engine test firings shall be conducted at a minimum oxidant/fuel ratio of 2.72 lb. O₂/lb. Fuel.
- Fuel Usage – Rocket engine test firings shall not consume more than 6,625 gallons per minute (4-minute average), 26,500 gallons per 8-hour period, and 318,000 gallons per year (12-month rolling total).
- Quench Water - All rocket engine test firings shall be conducted at a minimum quench water flow of 3,220 gallons per second.
- Fuel and Oxidizer Types - Rocket engine test firings shall be limited to the firing of kerosene as the fuel and liquid oxygen (LOX) as the oxidizer.
- Test Conditions – Rocket engine test firings shall be restricted to daylight hours (1 hour after sunrise and 1 hour prior to sunset) and only under ambient conditions that provide good dispersion of the exhaust gases in accordance with a Test Plan to be submitted to the Palm Beach County Health Department (PBCHD) for approval prior to the initial test. Non-daylight hour testing may be approved on a case-by-case basis by the Palm Beach County Health Department (PBCHD).

APPENDIX BD - BACT DETERMINATION

- Test Notifications – At least 24 hours prior to a rocket engine test firing, notification shall be provided to the PBCHD. The notification shall include the date and time of the test firing, the expected duration of the test firing, the planned oxidant/fuel ratio, and the planned fuel usage rate. In the event that a mishap occurs during a test (i.e., test duration > 240 seconds, O/F ratio less than 2.72, fuel usage > 13,250 gpm, a flame out, etc.), a written excess emissions report shall be provided to the PBCHD within 24 hours of the test. The report shall identify the mishap and impacts.
- Postconstruction Monitoring – The permittee shall, prior to any rocket engine test firings, establish an ambient air quality monitoring program to measure ambient air concentrations of CO before, during, and after a rocket engine test firing. The program shall be consistent with the procedures specified in the Ambient Monitoring Guidelines for Prevention of Significant Deterioration (EPA 450/4-87-007, U. S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, N. C. 27711, May 1987).
- Oxygen Injection Study – Within one year of initial issuance of this permit, the permittee shall complete and submit to the Department an engineering and cost study evaluating the technical feasibility and cost effectiveness of direct O₂ (Air or Pure Oxygen) injection for reducing CO emissions in the exhausts of rocket engines tested at the permittee's facility. The study shall evaluate possibilities for direct O₂ injection including a heat-shielded, internally-cooled oxygen lance for injecting stoichiometric rates of oxygen into the exhaust downstream of the engine. Appropriate kinetic modeling shall be utilized to predict the oxidation reaction rates and overall CO conversion for various configurations of the injection apparatus and various injection locations and methods.
- Compliance Demonstrations – Compliance with the visible emissions limitation shall be demonstrated initially for each new oxidant/fuel ratio and annual thereafter. Compliance with the CO emissions limitation shall be demonstrated initially and continuously thereafter through the use of the NASA Lewis chemical equilibrium computer program or its equivalent as approved by the Department or Palm Beach County Health Department and the ambient air quality monitoring program.
- Excess Emissions - Excess emissions shall be allowed provided the permittee demonstrates that the emissions did not result in a predicted ambient impact greater than the National Ambient Air Quality Standards (NAAQS) for CO adjusted based on the ambient monitoring program; a significant emissions increase in a PSD Pollutant; or result in emissions of a hazardous air pollutant in an amount of 10 tons per year or greater individually or 25 tons per year or greater collectively.

APPENDIX BD - BACT DETERMINATION

DETAILS OF THE ANALYSIS MAY BE OBTAINED BY CONTACTING:

A. A. Linero, P.E. Administrator
Bureau of Air Regulation
2600 Blair Stone Road, MS # 5505
Tallahassee, Florida 32399-2400
850/488-0114

Recommended By:

Approved By:

C. H. Fancy, P.E., Chief
Bureau of Air Regulation

Howard L. Rhodes, Director
Division of Air Resources Management

Date:

Date:

APPENDIX GC
GENERAL PERMIT CONDITIONS [F.A.C. 62-4.160]

- G.1 The terms, conditions, requirements, limitations, and restrictions set forth in this permit are "Permit Conditions" and are binding and enforceable pursuant to Sections 403.161, 403.727, or 403.859 through 403.861, Florida Statutes. The permittee is placed on notice that the Department will review this permit periodically and may initiate enforcement action for any violation of these conditions.
- G.2 This permit is valid only for the specific processes and operations applied for and indicated in the approved drawings or exhibits. Any unauthorized deviation from the approved drawings or exhibits, specifications, or conditions of this permit may constitute grounds for revocation and enforcement action by the Department.
- G.3 As provided in Subsections 403.087(6) and 403.722(5), Florida Statutes, the issuance of this permit does not convey any vested rights or any exclusive privileges. Neither does it authorize any injury to public or private property or any invasion of personal rights, nor any infringement of federal, state or local laws or regulations. This permit is not a waiver or approval of any other Department permit that may be required for other aspects of the total project which are not addressed in the permit.
- G.4 This permit conveys no title to land or water, does not constitute State recognition or acknowledgment of title, and does not constitute authority for the use of submerged lands unless herein provided and the necessary title or leasehold interests have been obtained from the State. Only the Trustees of the Internal Improvement Trust Fund may express State opinion as to title.
- G.5 This permit does not relieve the permittee from liability for harm or injury to human health or welfare, animal, or plant life, or property caused by the construction or operation of this permitted source, or from penalties therefore; nor does it allow the permittee to cause pollution in contravention of Florida Statutes and Department rules, unless specifically authorized by an order from the Department.
- G.6 The permittee shall properly operate and maintain the facility and systems of treatment and control (and related appurtenances) that are installed or used by the permittee to achieve compliance with the conditions of this permit, as required by Department rules. This provision includes the operation of backup or auxiliary facilities or similar systems when necessary to achieve compliance with the conditions of the permit and when required by Department rules.
- G.7 The permittee, by accepting this permit, specifically agrees to allow authorized Department personnel, upon presentation of credentials or other documents as may be required by law and at a reasonable time, access to the premises, where the permitted activity is located or conducted to:
- a) Have access to and copy records that must be kept under the conditions of the permit;
 - b) Inspect the facility, equipment, practices, or operations regulated or required under this permit, and,
 - c) Sample or monitor any substances or parameters at any location reasonably necessary to assure compliance with this permit or Department rules.

Reasonable time may depend on the nature of the concern being investigated.

- G.8 If, for any reason, the permittee does not comply with or will be unable to comply with any condition or limitation specified in this permit, the permittee shall immediately provide the Department with the following information:
- a) A description of and cause of non-compliance; and
 - b) The period of noncompliance, including dates and times; or, if not corrected, the anticipated time the non-compliance is expected to continue, and steps being taken to reduce, eliminate, and prevent recurrence of the non-compliance.

The permittee shall be responsible for any and all damages which may result and may be subject to enforcement action by the Department for penalties or for revocation of this permit.

APPENDIX GC
GENERAL PERMIT CONDITIONS [F.A.C. 62-4.160]

- G.9 In accepting this permit, the permittee understands and agrees that all records, notes, monitoring data and other information relating to the construction or operation of this permitted source which are submitted to the Department may be used by the Department as evidence in any enforcement case involving the permitted source arising under the Florida Statutes or Department rules, except where such use is prescribed by Sections 403.73 and 403.111, Florida Statutes. Such evidence shall only be used to the extent it is consistent with the Florida Rules of Civil Procedure and appropriate evidentiary rules.
- G.10 The permittee agrees to comply with changes in Department rules and Florida Statutes after a reasonable time for compliance, provided, however, the permittee does not waive any other rights granted by Florida Statutes or Department rules.
- G.11 This permit is transferable only upon Department approval in accordance with Florida Administrative Code Rules 62-4.120 and 62-730.300, F.A.C., as applicable. The permittee shall be liable for any non-compliance of the permitted activity until the transfer is approved by the Department.
- G.12 This permit or a copy thereof shall be kept at the work site of the permitted activity.
- G.13 This permit also constitutes:
- a) Determination of Best Available Control Technology (X)
 - b) Determination of Prevention of Significant Deterioration (X); and
 - c) Compliance with New Source Performance Standards (X).
- G.14 The permittee shall comply with the following:
- a) Upon request, the permittee shall furnish all records and plans required under Department rules. During enforcement actions, the retention period for all records will be extended automatically unless otherwise stipulated by the Department.
 - b) The permittee shall hold at the facility or other location designated by this permit records of all monitoring information (including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation) required by the permit, copies of all reports required by this permit, and records of all data used to complete the application or this permit. These materials shall be retained at least three years from the date of the sample, measurement, report, or application unless otherwise specified by Department rule.
 - c) Records of monitoring information shall include:
 - 1. The date, exact place, and time of sampling or measurements;
 - 2. The person responsible for performing the sampling or measurements;
 - 3. The dates analyses were performed;
 - 4. The person responsible for performing the analyses;
 - 5. The analytical techniques or methods used; and
 - 6. The results of such analyses.
- G.15 When requested by the Department, the permittee shall within a reasonable time furnish any information required by law which is needed to determine compliance with the permit. If the permittee becomes aware that relevant facts were not submitted or were incorrect in the permit application or in any report to the Department, such facts or information shall be corrected promptly.

Large Military Engines

P.O. Box 109600
West Palm Beach, FL 33410-9600
561-796-2000



Pratt & Whitney

A United Technologies Company

December 19, 2000

Mr. Al Linero, P.E. Administrator
Department of Environmental Protection
2600 Blairstone Rd.
Tallahassee, Florida 32399

RECEIVED

DEC 22 2000

BUREAU OF AIR REGULATION

Re: Air Permit Application for LOX/Kerosene Rocket Test Cell

Dear Mr. Linero:

UTC – Pratt & Whitney agrees to grant a waiver extending the 90-day permit-processing clock for the subject permit application. We agree to a 30-day extension.

We understand that the Department of Environmental Protection will issue an intent regarding this project by January 20, 2001 and that final action would occur approximately 30 days following publication of the Public Notice of Intent to Issue Air Construction Permit.

The 30-day extension is reflected in the above date.

If you have any questions that would help process this permit please call Dean Gee at 561-796-2108.

Sincerely,

John Sillan, Manager
Facilities Management

Copies to: D. Alberghini
D. Gee

File: B.4.2.2.3 Lox / Kerosene Rocket Test Cell

file

Facsimile Transmission Form



Pratt & Whitney

A United Technologies Company

FACILITIES MANAGEMENT

Pratt & Whitney
Florida Plant Site
P.O. Box 109600
West Palm Beach, FL 33410-9600

Date: 12/19/00

Deliver the following pages to:

Name AZ LINERO Facsimile No.: 850 922-6979

Location: FDEP AIR From DEAN GEE

Ext.: 361 796 2108 M/S: _____ Dept. ENVI

Total Number of pages 2 including cover sheet

If you did not receive all the pages, please call ASAP 561-796-5299
Facsimile Number: 561-796-2787 Technet 8-796-5299

Message:

AZ,
HERE IS FAX OF 30 DAY
EXTENSION LETTER.
HARDCOPY TO ARRIVE US MAIL.
BEST REGARDS,
DEAN GEE

Large Military Engines

P.O. Box 109600
West Palm Beach, FL 33410-9600
561-796-2000

**Pratt & Whitney**

A United Technologies Company

December 19, 2000

Mr. Al Linero, P.E. Administrator
Department of Environmental Protection
2600 Blairstone Rd.
Tallahassee, Florida 32399

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Sincerely,

John Sillan, Manager
Facilities Management

Copies to: D. Alberghini
D. Gee

File: B.4.2.2.3 Lox / Kerosene Rocket Test Cell

Golder Associates Inc.

6241 NW 23rd Street, Suite 500
Gainesville, FL 32653-1500
Telephone (352) 336-5600
Fax (352) 336-6603



November 10, 2000

9939571

Florida Department of Environmental Protection
New Source Review Section
2600 Blair Stone Road
Tallahassee, FL, 32399-2400

RECEIVED

NOV 13 2000

BUREAU OF AIR REGULATION

Attention: A. A. Linero, P.E.

RE: PRATT & WHITNEY'S RESEARCH & DEVELOPMENT FACILITY
LOX/KEROSENE ROCKET ENGINE STAND PROJECT
DEP FILE NO. 0990021-004-AC (PSD-FL-294)

Dear Mr. Linero:

Golder Associates Inc. (Golder), on behalf of Pratt & Whitney, has prepared the following replacement tables to our response letter dated October 6, 2000 to the Florida Department of Environmental Protection (DEP).

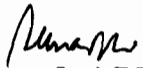
Table 4 has been revised to show the maximum allowable hourly emission rates of sources modeled. In the original analysis, several sources were inadvertently modeled with annual emission and, for one facility (Sugar Cane Growers) the sources were modeled with higher emission rates than the maximum allowable rates. Based on these corrected emission rates, the air dispersion model was rerun with the revised rates. The results of the screening modeling indicate similar or that slightly lower impacts were produced than previously reported. The revised maximum CO concentrations from the screening analysis impacts are presented in Table 5.

Similarly refined modeling was performed with the revised emission rates. However, the results from the refined analysis show that the maximum CO concentrations did not change from those reported earlier. A copy of Table 6 from the previous report showing the maximum CO concentrations predicted in the refined analysis is presented for your convenience.

Please call if you have any questions concerning this information.

Sincerely,

GOLDER ASSOCIATES INC.


Benny Susi, P.E.
Principal Engineer
Florida P.E. #35042

BS/jkw
Enclosures

cc: Dale Francke, Pratt & Whitney
Darrel Graziani, PBCHD
Bob McCann, Golder

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Table 4. Summary of CO Sources Included in the Air Modeling Analyses for the Pratt & Whitney Facility (Revised 11/4/00)

Facility ID	Facility Name	Emission Units	Modeling ID Name	Stack Parameters				Emission Rate (g/s)
				Height (m)	Diameter (m)	Temper. (K)	Velocity (m/s)	
0990185	SIKORSKY AIRCRAFT CORP. - JUPITER	Paint spray booth (PS-13-SIK) with drying oven	SIK10	11.89	1.83	302.6	5.9	0.01
0990234	SOLID WASTE AUTH OF PBC/NO CO RRF	412.5MMBTU/HR RDF BOILER NO.1 (324,000 lb/hr STEAM)	SWPBC1	76.20	2.04	505.4	24.7	22.46
		412.5MMBTU/HR RDF BOILER NO.2 (324,000 lb./hr. steam)	SWPBC2	76.20	2.04	505.4	24.7	22.46
		Landfill Gas Coll Sys class I	SWPBC3	7.01	0.21	1033.2	24.4	1.96
		Landfill Gas Coll Sys class III	SWPBC4	7.01	0.15	1033.2	46.6	1.96
0990349	SFWMD PUMP STATION #S-5A	Six 1600 hp diesel engines powering flood control pumps	S5A1	4.88	0.99	685.9	5.3	10.57
0990019	OSCEOLA FARMS	BOILER #2 WITH SCRUBBERS AND 2 STACKS	OSBLR2	27.43	1.52	338.7	18.6	317.52
		BOILER #3 WITH SCRUBBER	OSBLR3	27.43	1.92	344.3	14.3	128.77
		BAGASSE BOILER #4 UNIT #5, 10000 LBS/HR STEAM MAX	OSBLR4	27.43	1.83	344.3	16.5	317.52
		165,000 LB/HR BAGASSE BOILER # 5 WITH 2 SCRUBBERS & 2 STACKS	OSBLR5	27.43	1.52	344.3	17.9	374.22
		BOILER #6 WITH SCRUBBER PSD	OSBLR6	27.43	1.92	338.7	18.3	310.40
0990331	OSCEOLA COGENERATION PLANT	760 MMBTU/HR BIOMASS/OIL/COAL FIRED BOILER	OSCOG1	60.96	3.05	419.3	15.9	33.52
		760 MMBTU/HR COGENERATION BOILER NO. 2	OSCOG2	60.96	3.05	419.3	15.9	33.52
0990333	FGT STATION NO. 21 (WPB)	COMPRESSOR #2101, 6500 BHP NATURAL GAS FIRED TURBINE	FGT1	15.24	1.01	763.7	56.4	0.81
		COMPRESSOR #2102, 6500 BHP NATURAL GAS FIRED TURBINE	FGT2	15.24	1.01	763.7	56.4	0.81
0990344	PARKWAY ASPHALT (RIVIERA)	Asphalt rotary drum dryer (400 TPH); counterflow	PARK1	12.80	1.42	422.0	18.5	0.32
0850102	INDIANTOWN COGENERATION PLANT	Pulverized Coal Main Boiler	INDCG1	150.88	4.88	333.2	28.4	47.38
		(2) Auxiliary Boilers	INDCG3	64.01	1.52	449.8	26.7	6.05
0850002	CAULKINS INDIANTOWN CITRUS	PEEL DRYER #1 WASTE HEAT EVAPORATOR (54,000 LB/HR CAPACITY)	CAULK4	28.65	0.98	343.2	11.6	0.16
		30 T/HR CITRUS PEEL DRYER #2	CAULK5	32.92	1.52	255.4	0.0	0.05
0990123	PHYSICAL DISTRIBUTION CENTER & OSF	12.5 mmBTU/hr boiler #1 (Unit A) burning No.6 fuel oil	PHYD1	9.14	0.52	491.5	10.1	0.05
		12.5 mmBTU/hr boiler #2 (Unit B) burning No.6 fuel oil	PHYD2	9.14	0.52	491.5	10.1	0.05
0990583	MAGNUM ENV. SERVICES, INC. - WPB	Soil thermal treatment facility	MAGN1	9.75	0.98	1144.3	31.6	0.71

Table 4. Summary of CO Sources Included in the Air Modeling Analyses for the Pratt & Whitney Facility (Revised 11/4/00)

Facility ID	Facility Name	Emission Units	Modeling ID/Name	Stack Parameters				Emission Rate (g/s)
				Height (m)	Diameter (m)	Temper. (K)	Velocity (m/s)	
0990087	WEST PALM PLANT	Double drum dryer (250 TPH) burning low sulfur residual oil	WPP4	10.97	1.01	394.3	41.1	1.13
0990188	ANIMAL RESCUE LEAGUE	ANIMAL CREMATION INCINERATOR; CRAWFORD #C-1000S; 250 LB/HR	ARL3	6.10	0.52	733.2	8.8	0.08
		ANIMAL CREMATION INCINERATOR; CRAWFORD #C-500P; 75 LB/HR	ARL4	6.10	0.52	788.7	3.4	0.03
0990056	ST. MARY'S HOSPITAL, INC.	Two identical process steam boilers; natural gas fired	STMAR2	24.38	1.22	505.4	0.1	0.03
0990325	ROYAL PALM MEMORIAL GARDENS, INC.	HUMAN CREMATION INCINERATOR, IEE CO. #IE 43-PPII (100 LB/HR)	RPMG1	6.10	0.55	865.9	4.9	0.04
0990061	U.S. SUGAR CORP. BRYANT MILL	BOILERS #1,#2,#3 WITH SCRUBBERS	USSBM123	19.81	1.65	338.7	36.4	1309.77
		BOILER #5 WITH TWO SCRUBBERS.	USSBM5	45.72	2.90	338.7	18.0	760.91
0990042	RIVIERA POWER PLANT	Fossil Fuel Steam Generator, Unit 3 -Phase II Acid Rain Unit	RIVP3	90.83	4.88	401.5	26.9	16.63
		Fossil Fuel Steam Generator, Unit 4 -Phase II Acid Rain Unit	RIVP4	90.83	4.88	401.5	26.6	16.63
0850001	FPL MARTIN POWER PLANT	Units 1 & 2	MART12	152.1	7.99	420.9	21.03	38.92
		Aux Blr PSD	MARTAUX	18.3	1.10	535.4	15.24	0.00
		Diesel Gens PSD	MARTGEN	7.6	0.30	785.9	39.62	0
		Units 3 & 4 PSD	MART34	64.9	6.10	410.9	18.90	26.66
0990016	ATLANTIC SUGAR MILL	BOILER #1 WITH SCRUBBER	ATLSM1	27.43	1.83	346.0	18.0	242.68
		BOILER #2 WITH 1 JOY TURBULAIRE TYPE D-40 IMPINGEMNT SCRUBBE	ATLSM2	27.43	1.83	350.0	23.4	242.68
		BOILER #3 WITH 2 JOY TURBULAIRE IMPINGEMENT SCRUBBERS	ATLSM3	27.43	1.83	350.0	21.6	294.84
		BOILER # 4	ATLSM4	27.43	1.83	344.0	25.2	311.85
		253 MM BTU/HR BAGASSE BOILER #5 W/SUPP FUEL OIL #6	ATLSM5	27.43	1.68	339.0	19.2	209.11
0850015	AYCOCK FUNERAL HOME	IND. EQUIP. & ENGR. MODEL IE43-PPII CREMATOR	AYCK2	7.32	0.52	865.9	5.5	0.04
0850006	MARTIN MEMORIAL HEALTH SYSTEMS	CLEAVER BROOKS MODEL CB 150 HP BOILER - UNIT #1	MMHS1	5.79	0.40	499.8	8.2	0.02
		CLEAVER BROOKS MODEL CB-150 HP STEAM BOILER #2	MMHS5	5.79	0.40	499.8	8.2	0.02
0850108	OUTBOARD MARINE/RALPH EVINRUDE TEST CTR	Engine Testing Cells (02), 2 Test tanks and 2 Cooling towers	OUT1	12.19	0.61	310.9	9.7	12.29
0990026	SUGAR CANE GROWERS CO-OP	BOILERS #1 AND #2 WITH 2 SCRUBBERS AND 1 STACK	SCGC12	45.72	1.87	339.0	21.8	505.15

Table 4. Summary of CO Sources Included in the Air Modeling Analyses for the Pratt & Whitney Facility (Revised 11/4/00)

Facility ID	Facility Name	Emission Units	Modeling ID Name	Stack Parameters				Emission Rate (g/s)
				Height (m)	Diameter (m)	Temper. (K)	Velocity (m/s)	
		BOILER #3 WITH SCRUBBER	SCGC3	27.43	1.52	339.0	22.3	172.85
		BOILER #4 WITH CYCLONES AND 3 SCRUBBERS WITH ONE STACK	SCGC4	54.90	2.44	339.0	21.7	432.19
		BOILER #5 WITH CYCLONES, TWO SCRUBBERS, AND ONE STACK	SCGC5	45.72	2.30	339.0	15.9	331.96
		504 MMBTU/HR BOILER # 8 RESIDUE/BAGASSE/OIL	SCGC8	47.24	2.90	339.0	13.6	349.27
0990045	T G SMITH PLANT							
		2000 KW DIESEL GENERATOR # 1 PEAKING UNIT	TGSM01	5.18	0.56	625.9	37.1	2.14
		2000 KW DIESEL GENERATOR # 2 PEAKING UNIT	TGSM02	5.18	0.56	625.9	37.1	2.14
		2000 KW DIESEL GENERATOR # 3 PEAKING UNIT	TGSM03	5.18	0.56	625.9	37.1	2.14
		2000 KW DIESEL GENERATOR # 4 PEAKING UNIT	TGSM04	5.18	0.56	625.9	37.1	2.14
		2000 KW DIESEL GENERATOR # 5 PEAKING UNIT	TGSM05	5.18	0.56	625.9	37.1	2.14
		GAS TURBINE # 1	TGSM06	14.02	4.88	720.4	24.8	2.65
		7.5 MW FOSSIL FUEL STEAM GENERATING UNIT I	TGSM07	18.29	1.52	422.0	10.5	0.50
		FOSSIL FUEL STEAM GENERATOR #3 (Phase II, Acid Rain Unit)	TGSM09	34.44	2.13	418.2	15.7	1.64
		FOSSIL FUEL STEAM GENERATOR #4 (Phase II, Acid Rain Unit)	TGSM10	35.05	2.29	418.2	17.0	2.02
		COMBINED CYCLE UNIT (GT-2/S-5)	TGSM11	22.86	3.05	479.8	26.7	4.41
0990568	LWG PLANT							
		186 MW combined cycle gas turbine, GE Frame 7FA	LWG1	45.72	5.49	377.6	24.3	9.36
0990332	OKEELANTA COGENERATION PLANT							
		715 MMBTU/HR COGENERATION BOILER NOS. 1,2,3	OKCOGEN	60.60	3.05	438.7	17.5	94.61
0510003	U.S. SUGAR CLEWISTON MILL AND REFINERY							
		BOILER #1 WITH SCRUBBER	USSCM01	64.92	2.44	347.0	15.4	811.79
		BOILER #2 WITH SCRUBBER	USSCM02	64.92	2.44	338.7	13.9	732.19
		BOILER #3 WITH SCRUBBER	USSCM03	64.92	2.44	333.2	6.8	334.28
		BOILER #5 WITH SCRUBBER	USSCM04	45.72	2.51	344.3	20.3	518.43
		Boiler #7	USSCM07	68.58	2.59	405.4	20.8	71.62
0510015	SOUTHERN GARDENS CITRUS PROCESSING CORP.							
		Peel Dryer	SGARDDRY	38.1	7.45	1.16	353.0	65.69
		Boilers 1-3	SGARDBLR	16.8	14.23	1.22	478.0	0.23

Source: Florida Department of Environmental Protection (9/2000)

Table 5. Maximum CO Impacts Predicted for Sources at the Pratt & Whitney Facility Including Other Facilities - Screening Analysis (Revised 11/4/00)

Averaging Time, Rank	Concentration ^a ($\mu\text{g}/\text{m}^3$)	Receptor Location ^b		Time Period (YYMMDDHH)
		Direction (degree)	Distance (m)	
8-Hour, Highest	2,667	260	30,000	87090516
	5,178	260	30,000	88060816
	3,222	250	25,000	89012116
	3,082	250	25,000	90041216
	2,783	260	30,000	91051416
8-Hour, HSH	2,581	260	30,000	87011916
	2,694	260	30,000	88022016
	2,484	250	25,000	89102216
	2,246	260	30,000	90062316
	2,613	260	30,000	91082416
1-Hour, Highest	9,440	260	30,000	87090509
	10,198	260	30,000	88042411
	9,274	260	30,000	89072009
	10,089	260	30,000	90062310
	10,148	260	30,000	91082412
1-Hour, HSH	9,382	260	30,000	87041514
	10,090	260	30,000	88090711
	8,616	260	30,000	89080210
	9,563	260	30,000	90010613
	9,405	260	30,000	91082010

^a Based on 5-year meteorological record, West Palm Beach, 1987-91

^b Relative to engine discharge location
YYMMDDHH = Year, Month, Day, Hour Ending
HSH = Highest, Second-Highest

Table 6. Maximum CO Impacts Predicted for Comparison to AAQS, Refined Analysis

Averaging Time, Rank	Concentration ($\mu\text{g}/\text{m}^3$)			Receptor Location ^b		Time Period (YYMMDDHH)	Florida AAQS ($\mu\text{g}/\text{m}^3$)
	Total	Modeled ^a	Background	Distance X (m)	Distance Y (m)		
<u>From PSD Application</u>							
8-Hour, HSH	3,927.8	477.8 ^a	3,450 ^c	-951	1,409	90082912	10,000
1-Hour, HSH	10,262	3,822 ^a	6,440 ^c	-951	1,409	90082912	40,000
<u>Additional Modeling With Other Sources</u>							
8-Hour, HSH	6,973	5,823 ^d	1,150 ^e	-30,300	-5,960	89051916	10,000
1-Hour, HSH	12,309	11,009 ^d	1,300 ^e	-30,050	-5,460	90083113	40,000

^a Based on the HSH concentration predicted for the project's emissions with 5-year meteorological record of 1987 to 1991 from West Palm Beach

^b Relative to Engine Discharge Location.

^c Based on the second highest measured concentrations from January 1998 to June 1999 at West Palm Beach

^d Based on the HSH concentrations predicted for all modeled sources with the 5-year meteorological record of 1987 to 1991 from West Palm Beach

^e Based on the 90th percentile of measured concentrations from 1998 to 1999 at West Palm Beach

YYMMDDHH = Year, Month, Day, Hour Ending.

HSH = Highest, Second-Highest Concentration in 5 years.



CERTIFIED MAIL

June 9, 2000

A. A. Linero, P.E., Administrator
Florida Department of Environmental Protection
New Source Review
111 South Magnolia Drive, Suite 4
Tallahassee, FL 32301

RECEIVED

JUN 20 2000

BUREAU OF AIR REGULATION

Re: Air Construction Permit Application and
Prevention of Significant Deterioration Analysis

Dear Mr. Linero:

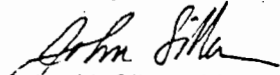
Please find enclosed seven (7) copies of an Air Construction Permit Application and Prevention of Significant Deterioration Analysis for a new LOX (liquid oxygen)/kerosene rocket engine test stand. This test stand is planned for the Pratt & Whitney facility in Palm Beach County. The test stand will be used for testing Pratt & Whitney's latest space vehicle propulsion product, a LOX/kerosene powered rocket engine.

Also enclosed is Pratt & Whitney check number 726873 for \$7,500 to cover the application fee.

A copy of this application has also been sent to Darrel Graziani, Palm Beach County Health Unit, for his use and records.

If you have any questions about the permit application please call our contact person Dale Francke, phone 561-796-3733, e-mail frncked@pwfl.com. Dale will be glad to answer any questions or get the information to you.

Sincerely,


John K. Sillan, Manager
Facilities Management

Copies: Darrel Graziani, Palm Beach County Health Unit, (1 copy of application)

Miguel Cires (1 copy of application)

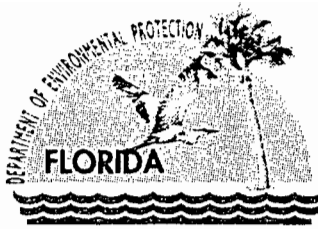
File: B.4.2.2.3 - LOX/Kerosene Rocket Test Stand, (1 copy of application)

SED

EPA

NPS

J. Reynolds



Jeb Bush
Governor

Department of Environmental Protection

Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

David B. Struhs
Secretary

June 21, 2000

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Mr. Gregg Worley, Chief
Air, Radiation Technology Branch
Preconstruction/HAP Section
U.S. EPA - Region 4
61 Forsyth Street
Atlanta, GA 30303

Re: United Technologies-Pratt & Whitney
Project: LOX/Kerosene Rocket Engine Stand
PSD-FL-294
Facility ID No. 0990021-004-AC

Dear Mr. Worley:

Enclosed for your review and comment is an application for construction of a LOX/kerosene rocket engine stand at the existing Pratt & Whitney research and development facility in Palm Beach County, Florida. The proposed project will require a PSD review for carbon monoxide.

Your comments may be forwarded to my attention at the letterhead address or faxed to the Bureau of Air Regulation at 850/922-6979. If you have any questions, please contact the project engineer, John Reynolds, at 850/921-9536.

Sincerely,

for Al Linero, P.E.

Administrator

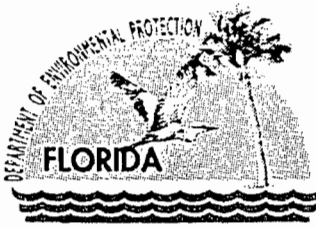
New Source Review Section

AAL/jra

Enclosures

"More Protection, Less Process"

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Jeb Bush
Governor

Department of Environmental Protection

Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

David B. Struhs
Secretary

June 21, 2000

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Mr. John Bunyak, Chief
Policy, Planning & Permit Review Branch
NPS - Air Quality Division
P.O. Box 25287
Denver, CO 80225

Re: United Technologies-Pratt & Whitney
Project: LOX/Kerosene Rocket Engine Stand
PSD-FL-294
Facility ID No. 0990021-004-AC

Dear Mr. Bunyak:

Enclosed for your review and comment is an application for construction of a LOX/kerosene rocket engine stand at the existing Pratt & Whitney research and development facility in Palm Beach County, Florida. The proposed project will require a PSD review for carbon monoxide.

Your comments may be forwarded to my attention at the letterhead address or faxed to the Bureau of Air Regulation at 850/922-6979. If you have any questions, please contact the project engineer, John Reynolds, at 850/921-9536.

Sincerely,

for Al Linero, P.E.
Administrator
New Source Review Section

AAL/jra

Enclosures

"More Protection, Less Process"

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CERTIFIED MAIL

June 9, 2000

A. A. Linero, P.E., Administrator
Florida Department of Environmental Protection
New Source Review
111 South Magnolia Drive, Suite 4
Tallahassee, FL 32301

RECEIVED

JUN 20 2000

BUREAU OF AIR REGULATION

Re: Air Construction Permit Application and
Prevention of Significant Deterioration Analysis

Dear Mr. Linero:

Please find enclosed seven (7) copies of an Air Construction Permit Application and Prevention of Significant Deterioration Analysis for a new LOX (liquid oxygen)/kerosene rocket engine test stand. This test stand is planned for the Pratt & Whitney facility in Palm Beach County. The test stand will be used for testing Pratt & Whitney's latest space vehicle propulsion product, a LOX/kerosene powered rocket engine.

Also enclosed is Pratt & Whitney check number 726873 for \$7,500 to cover the application fee.

A copy of this application has also been sent to Darrel Graziani, Palm Beach County Health Unit, for his use and records.

If you have any questions about the permit application please call our contact person Dale Francke, phone 561-796-3733, e-mail frncked@pwfl.com. Dale will be glad to answer any questions or get the information to you.

Sincerely,

John K. Sillan, Manager
Facilities Management

Copies: Darrel Graziani, Palm Beach County Health Unit, (1 copy of application)

Miguel Cires (1 copy of application)

File: B.4.2.2.3 - LOX/Kerosene Rocket Test Stand, (1 copy of application)

SED

EPA

NPS

J. Reynolds

Golder Associates Inc.

6241 NW 23rd Street, Suite 500
Gainesville, FL 32653-1500
Telephone (352) 336-5600
Fax (352) 336-6603



RECEIVED

AUG 29 2000

9939571

BUREAU OF AIR REGULATION

August 22, 2000

Florida Department of Environmental Protection
New Source Review Section
2600 Blair Stone Road
Tallahassee, FL 32399-2400

Attention: A. A. Linero, P.E.

RE: PRATT & WHITNEY'S RESEARCH & DEVELOPMENT FACILITY
LOX/KEROSENE ROCKET ENGINE STAND PROJECT
DEP FILE NO. 0990021-004-AC (PSD-FL-294)

Dear Mr. Linero:

Golder Associates Inc. (Golder), on behalf of Pratt & Whitney has prepared the following responses to the Palm Beach County Health Department (PBCHD) letter dated July 13, 2000 and the Florida Department of Environmental Protection's (DEP) letter dated July 19, 2000.

PBCHD Question 1 - Emission estimates for the criteria pollutants are not adequately documented. Please request the applicant to supply documentation on the expected emissions. If a combustion model was used, please have them submit a copy. Particulate matter (PM) emissions need to include solids within the cooling water, volatile organic compound (VOC) also need to be documented given the high carbon dioxide (CO) numbers.

For your information, some of my work at NASA's Stennis Space Center dealt with the testing of similar engine. For that project, the combustion model predicted high CO rates at the engine exhaust. However, when the exhaust gases mix with air, the model predicted overall lower CO emissions and an increase rate of NO_x.

Response PBCHD 1 - The combustion model used to determine the pollutants expected from the rocket test stand is the "NASA Combustion Deck (TEP)". This model is a modified version of the original NASA combustion model. A description of the model is attached as part of the response to this question. An overview of the model can be found at <http://www2.ari.net/ahsystems/tep.html>.

The emissions provided in the application are those provided from the model simulations. Because liquid oxygen is used as a propellant there is no atmospheric nitrogen that will form NO_x. When the exhaust enters the silencer, about 2,700 pounds per second (lb/sec) of air will mix with the rocket exhaust and 27,800 lb/sec of water will be used to quench the exhaust. As provided in the application, the final exhaust will angled at 45 degree toward vertical and

consist of steam at 230 degrees Fahrenheit (°F) within an estimated 60-foot-diameter plume. Since the quenching will occur very rapidly, NO_x formation from the air entering the silencer is expected to be low. As a conservative estimate of the NO_x emissions using the AP-42 emission factor for flares has been calculated (see attached AP-42 Table 13.5-1, revise September 1998). The total heat input from the kerosene is 14.3 million Btu/sec (741.1 lb/sec x 19,300 Btu/lb). The estimated NO_x emissions are 0.97 lb/sec or 233.4 lb/test. The model simulations did not predict emission of VOCs. The information presented in Section 2.3 regarding exhaust gas concentrations account for all the carbon and hydrogen in the kerosene. Again, as a conservative estimate of the VOC emissions, the AP-42 emission factor for flares was used. The calculated emissions are 2 lb/hr and 480 lb/test.

The PM emissions from the cooling water were estimated based on the amount of water required to reduce the exhaust temperature to 230°F. The reduction was assumed for the combined flow of the rocket exhaust and entrained air (i.e., 5,600 lb/sec). The amount of water evaporated is estimated at 5,400 lb/sec. The water used for cooling has 300-parts per million (ppm) total dissolved solids, which can become PM emissions. The calculated emissions are 1.6 lb/sec or 389 lb/test.

Based on the above calculations, the maximum estimated emissions of NO_x, VOC, and PM emissions are 1.4 tons/year, 2.9 tons/year, and 2.3 tons/year, respectively. These emissions rates are less than the PSD significant emission rates for these pollutants.

PBCHD Question 2 - Emission estimates for HAPs have not been provided. The activity is a listed source category under Section 112 of the Clean Air Act and the applicant should specify PM and VOC emissions, if possible. A case-by-case MACT determination may be required.

Response PBCHD 2 - The PM emissions would be from evaporated water primarily containing common dissolved minerals. These would typically be non-HAPs such as calcium. Any HAPs generated from the combustion will likely be VOCs. As noted in the response to PBCHD-1, the estimate amount of VOCs is 2.9 tons/year. Kerosene has low amounts of other contaminants in the fuel. Using AP-42 emission factors (see attached Table 1.3-10, rev 9/98) for trace elements in the fuel the maximum calculated emissions of HAPs are 0.05 lb/test (0.0003 TPY) for a single HAP (i.e., selenium) and 0.16 lb/test (0.00097 TPY) for all trace element HAPs (arsenic, beryllium, cadmium, chromium, lead, mercury, manganese, nickel, and selenium). These emissions are much less than the MACT criteria in 40 Code of Federal Regulation Part 63.

PBCHD Question 3 - There are a number of unregulated activities with significant allowable emissions. The source needs to include these activities with the modeling analyses.

Response PBCHD 3 - As noted by the above responses and the information contained in the application, modeling of unregulated activities is not considered necessary. The very short nature of these tests, together with the conservative nature of the modeling, does not suggest that AAQS would be violated by the tests together with other unregulated facilities.

PBCHD Question 4 - The applicant's BACT analysis is not correct. There are controls on the Russian Test Stand, which go beyond BACT. My understanding is that the controls were implemented (Cold War Stuff) to hide research activities. The NASA people at SSC are aware of the controls and unless the Department of Defense is funding, the controls would be cost prohibited.

Response PBCHD 4 - Although the Russian Test Stand does contain an exhaust "ducting" which injects water, the device was initially installed in an attempt to remove or reduce the heat signature of the test firings so that Cold War surveillance by satellite would not identify the testing being conducted. The device was not a pollutant control device and there is no evidence to indicate that any significant pollutant reduction was realized. Even so, if it could be shown that there was a pollutant reduction to be realized, the cost of the Russian Test Stand exhaust system would be cost prohibited at a cost in excess of \$100 million.

PBCHD Question 5 - I disagree with the modeling approach. Use of the puff model is more appropriate given the nature of the activity. NASA used such a modeling approach to support the ARSM PSD Permit application. The applicant needs to submit a revised modeling analysis.

Response PBCHD 5 - The ISCST3 model, a steady state model, was used for the modeling analysis. It is our opinion that the steady state modeling analysis is a conservative procedure for this application. The assumptions used in the model to evaluate impacts included the assumption that the test emissions are continuous over an entire hour. This assumption resulted in a prediction of 1-hour impacts for comparison to the CO ambient air quality standard.

The PUFF model is a non-regulatory model. Currently, no Guideline model exists that is capable of simulating instantaneous or short duration releases. Appendix B of the Guideline lists several accidental release models that simulate a short-term release, but these models have not been designed for CO emissions. In any event, use of a non-guideline model would require prior written approval from EPA. However, to address PBCHD's concern, an evaluation of impacts was performed using the PUFF model. The PUFF model assumes that all of the CO test mass is released instantaneously. Because the actual emission has a 4-minute release duration, this analysis would tend to over-predict very short-term concentrations (i.e., 4-minute duration). The PUFF model evaluated a combination of stability classes and wind speeds. A summary of the Puff model results is presented in Table 1. Only the Puff model results for stable stability and very light wind speeds approached the magnitude of the presented ISCST3 model concentrations. This meteorological condition occurs less than 3 percent of the time (based on 5 years of weather data from Palm Beach International Airport, 1987-1991). Both models predicted maximum impacts well below the AAQS. Based on the nature of the 4-minute test, and the assumptions used for the PUFF modeling, it is Golder's opinion that the steady state analysis resulted in a conservative assessment.

DEP Question 1 - The receptors used to model impacts at the site boundary were not spaced at 100 m. Please re-evaluate impacts at the site boundary by using a fence line receptor network that has a 100-m resolution. Also in the receptor grid used for the screening analysis contained a 7-kilometer gap between the site boundary receptors and the nearest ring polar receptors. Please update the screening analysis to include a receptor grid that contains a denser mid-field receptor network.

Response DEP 1 - A revised modeling analysis has been performed. The modeling files to this response will be provided separately. The revised screening modeling results, Table 6-3, is attached. The screening results indicate no changes in the magnitude and location of the highest and highest, second highest predicted 1-hour concentrations.

DEP Question 2 - In the application it is assumed that all land enclosed by the site boundary is non-ambient. However, if there is no physical barrier about this property, the assumption is not valid. Please confirm the existence of a physical barrier that prevents public access onto the land that is enclosed by the site boundary that was used in the modeling.

Response DEP 2 - There is a fence around the property.

DEP Question 3 - Please prepare a CO emission inventory for the NAAQS. The inclusion of only monitored background data does not sufficiently demonstrate compliance with NAAQS.

Response DEP 3 - The air modeling analysis was designed to produce conservative air quality impacts. To determine compliance with the 1-hour CO AAQS, the following criteria was used for the test burn analysis:

- a. The emission release is for 4 minutes and will occur only 12 times per year.
- b. The only significant CO emission sources in the vicinity of Pratt & Whitney are road vehicles. The nearest non-mobile emissions are in 20 kilometers away in Belle Glade.
- c. The background CO values considered in the analysis were obtained from Palm Beach, an area that has a high traffic density. The area in the vicinity of the test does not have a high traffic density, and in fact, it is located in the extreme remote area of the Pratt & Whitney campus.

It is Golder's opinion that the use of the Palm Beach CO data produces a highly conservative impact assessment, which considering the transient nature of the test emissions, compensates for the added affect of other distance continuous emission sources.

Please call if you have any questions concerning this information.

Sincerely,

GOLDER ASSOCIATES INC.



Benny Susi, P.E.
Principal Engineer
Florida P.E. #35042

BS/jkw

Enclosures

cc: Dale Francke, Pratt & Whitney
Darrel Graziani, PBCHD
Ken Kosky, Golder

G. Reynolds
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SED

EPA

NPS

C. Holladay

Table 1. Summary of PUFF and ISCST3 1-Hour Model Results

Stability Class	Wind Speed (m/s)	Mixing Height (m)	Concentration (ug/m3)
<u>ISCST3</u>	High		5,012
	High, 2nd-High		3,822
.....			
<u>PUFF</u>			
Unstable	1	500	23
	1	1000	12
	2	1000	12
	3	1000	12
Neutral	1	1000	66
	2	1000	65
	3	1000	65
	4	1000	63
	5	1000	62
	6	1000	60
Stable	1	1000	5,633
	2	1000	4,800
	3	1000	3,856
.....			
<u>AAQS</u>			40,000

Table 6-2. Summary of CO Emissions and Stack Parameters for Engine Test Burn

Emissions (a)		Release Height		Diameter		Velocity (b)		Temperature	
lb/hr	g/s	ft	m	ft	m	fps	m/s	F	K
166656	20,999	70	21.3	60.00	18.3	40.0	12.20	230	383.2

(a) Based on 694.4 lb/sec for 240 seconds

(b). Maximum 45-degree discharge velocity times sine (38 degrees)

Table 6-3. Predicted CO Impacts From Proposed Project - Screening Analysis

Averaging Time	Concentration ^a (ug/m ³)	Receptor Location ^b		Time Period (YYMMDDHH)
		Direction (degree)	Distance (m)	
High 8-Hour ^c	351	318	5000	87090711
	533	204	1500	88060411
	480	200	1500	89081511
	623	140	1500	90082412
	374	246	4000	91061913
HSH 8-Hour ^c	336	4106	3561	87071211
	376	284	4000	88091101
	323	236	5000	89070311
	443	326	2000	90082119
	344	244	5000	91083007
High 1-Hour	2811	318	5000	87090613
	4264	204	1500	88032713
	3840	200	1500	89070114
	4982	140	1500	90072212
	2990	246	4000	91082611
HSH 1-Hour	2685	4106	3561	87071211
	3008	284	4000	88091712
	2585	236	5000	89082611
	3543	326	2000	90082912
	2749	244	5000	91092012

^a Based on 5-year meteorological record, West Palm Beach, 1987-91

^b Relative to engine discharge location

^c Because no test emissions occur for the additional 7 hours of the period, 8-hour concentrations are set equal to 1/8 of 1-hour concentrations.

YYMMDDHH = Year, Month, Day, Hour Ending

HSH = Highest, Second-Highest

Table 6-4. Maximum Predicted CO Impacts Due to the Proposed Project Only, Refined Analysis

Averaging Time	Concentration ^a (ug/m ³)	Receptor Location ^b		Time Period (YYMMDDHH)	EPA Significant Impact Level (ug/m ³)	<i>de Minimis</i> Air Monitoring Concentration (ug/m ³)
		Direction (degree)	Distance (m)			
High 8-Hour	627 ^c	140	1,600	90082412	500	575
High 1-Hour	5,012	140	1,600	90082412	2,000	NA

^a Based on highest predicted with 5-year meteorological record, West Palm Beach, 1987-91

^b Relative to Engine Discharge Location

^c Because no test emissions occur for the additional 7 hours of the period, set equal to 1/8 of 1-hour concentrations

YYMMDDHH = Year, Month, Day, Hour Ending

Table 6-5. Maximum Predicted CO Impacts Due to the Test Burn For Comparison to AAQS, Refined Analysis

Averaging Time	Concentration (ug/m ³)			Receptor Location ^b		Time Period (YYMMDDHH)	Florida AAQS (ug/m ³)
	Total	Modeled ^a	Background ^c	Direction (degree)	Distance (m)		
HSH 8-Hour ^d	3,928	478	3,450	326	1700	90082912	10,000
HSH 1-Hour	10,262	3,822	6,440	326	1700	90082912	40,000

^a Based on predicted HSH 1-hour concentration with 5-year meteorological record, West Palm Beach, 1987-91

^b Relative to Engine Discharge Location

^c Based on the HSH measured concentrations from 1/98-6/99 at West Palm Beach.

^d Because no test emissions occur for the additional 7 hours of the period, set equal to 1/8 of 1-hour concentrations

YYMMDDHH = Year, Month, Day, Hour Ending

HSH = Highest, Second-Highest Concentration in 5 years.

Table 1.3-10. EMISSION FACTORS FOR TRACE ELEMENTS FROM DISTILLATE FUEL OIL COMBUSTION SOURCES^a

EMISSION FACTOR RATING: E

Firing Configuration (SCC)	Emission Factor (lb/10 ¹² Btu)										
	As	Be	Cd	Cr	Cu	Pb	Hg	Mn	Ni	Se	Zn
Distillate oil fired (1-01-005-01, 1-02-005-01, 1-03-005-01)	4	3	3	3	6	9	3	6	3	15	4

^a Data are for distillate oil fired boilers, SCC codes 1-01-005-01, 1-02-005-01, and 1-03-005-01. References 29-32, 40-44 and 83. To convert from lb/10¹² Btu to pg/J, multiply by 0.43.

Since flares do not lend themselves to conventional emission testing techniques, only a few attempts have been made to characterize flare emissions. Recent EPA tests using propylene as flare gas indicated that efficiencies of 98 percent can be achieved when burning an offgas with at least 11,200 kJ/m³ (300 Btu/ft³). The tests conducted on steam-assisted flares at velocities as low as 39.6 meters per minute (m/min) (130 ft/min) to 1140 m/min (3750 ft/min), and on air-assisted flares at velocities of 180 m/min (617 ft/min) to 3960 m/min (13,087 ft/min) indicated that variations in incoming gas flow rates have no effect on the combustion efficiency. Flare gases with less than 16,770 kJ/m³ (450 Btu/ft³) do not smoke.

Table 13.5-1 presents flare emission factors, and Table 13.5-2 presents emission composition data obtained from the EPA tests.¹ Crude propylene was used as flare gas during the tests. Methane was a major fraction of hydrocarbons in the flare emissions, and acetylene was the dominant intermediate hydrocarbon species. Many other reports on flares indicate that acetylene is always formed as a stable intermediate product. The acetylene formed in the combustion reactions may react further with hydrocarbon radicals to form polyacetylenes followed by polycyclic hydrocarbons.²

In flaring waste gases containing no nitrogen compounds, NO is formed either by the fixation of atmospheric nitrogen (N) with oxygen (O) or by the reaction between the hydrocarbon radicals present in the combustion products and atmospheric nitrogen, by way of the intermediate stages, HCN, CN, and OCN.² Sulfur compounds contained in a flare gas stream are converted to SO₂ when burned. The amount of SO₂ emitted depends directly on the quantity of sulfur in the flared gases.

Table 13.5-1 (English Units). EMISSION FACTORS FOR FLARE OPERATIONS^a

EMISSION FACTOR RATING: B

Component	Emission Factor (lb/10 ⁶ Btu)
Total hydrocarbons ^b	0.14
Carbon monoxide	0.37
Nitrogen oxides	0.068
Soot ^c	0 - 274

^a Reference 1. Based on tests using crude propylene containing 80% propylene and 20% propane.

^b Measured as methane equivalent.

^c Soot in concentration values: nonsmoking flares, 0 micrograms per liter (μg/L); lightly smoking flares, 40 μg/L; average smoking flares, 177 μg/L; and heavily smoking flares, 274 μg/L.

Golder Associates Inc.

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October 6, 2000

Florida Department of Environmental Protection
New Source Review Section
2600 Blair Stone Road
Tallahassee, FL, 32399-2400

993-9571
RECEIVED

OCT 09 2000

BUREAU OF AIR REGULATION

Attention: A. A. Linero, P.E.

RE: PRATT & WHITNEY'S RESEARCH & DEVELOPMENT FACILITY
LOX/KEROSENE ROCKET ENGINE STAND PROJECT
DEP FILE NO. 0990021-004-AC (PSD-FL-294)
ADDITIONAL CARBON MONOXIDE AIR QUALITY IMPACT ANALYSES

Dear Mr. Linero:

Golder Associates Inc. (Golder), on behalf of Pratt & Whitney, has performed additional air quality impact analyses for carbon monoxide (CO) emissions to further address Comment No. 3 made in the Department of Environmental Protection's (DEP) letter dated July 19, 2000. These analyses were based on modeling the Project's CO emissions together with CO emissions of other sources within the Project's modeling and screening areas. The Project's modeling area extended out to 35 km at which distance the Project's impacts are predicted to be below the 1-hour and 8-hour significant impact levels of 2,000 and 500 $\mu\text{g}/\text{m}^3$, respectively. The Project's screening area is predicted to extend out to 85 km that is 50 km beyond the modeling area. As shown in these analyses, the Project's CO impacts, together with those from background CO emission sources, are predicted to be well below the national and state ambient air quality standards (AAQS). The following summary provides descriptions of the methods and assumptions used to estimate total air quality CO concentrations for the Project and other sources.

Air Modeling Methods and Approach

The air modeling analyses were based on using the same methods and assumptions that were in the PSD permit application for the Project. The CO concentrations were predicted with the Industrial Source Complex Short-term (ISCST3, Version 00101) dispersion model (EPA, 1995) and five years of meteorological data from the National Weather Service (NWS) office at Palm Beach International Airport, which were used in the modeling presented in the PSD application. The 5-year period of meteorological data was from 1987 through 1991. Similarly, concentrations were predicted using the same screening receptor grid, and refinements were performed based on the results obtained from the screening grid.

Emission Inventory

The CO emission and operating data for the proposed engine test were presented in the PSD application. For this analysis, the CO emissions, stack parameters, and locations for the existing sources at the Pratt & Whitney facility were developed and are presented in Tables 1 and 2. The CO emission data were obtained by using emission factors from the USEPA document, *Compilation of Air Pollutant Emission Factors, Volume I*, referred to as AP-42, or from the annual operating report (AOR) prepared in 1999. Stack and operating data were obtained from the Title V permit application.

The emission inventories for background facilities were developed from data bases obtained from the DEP, previous air modeling studies performed by Golder Associates, and air permit data. All background sources that were in these inventories and located within the Project's modeling area (defined as the significant impact area for the Project) were included in the modeling.

For sources located in the screening area (defined as 50 km beyond the modeling area), a technique was used for eliminating sources in the modeling analyses if the source's emissions do not meet an emission criterion. This technique, which is approved for use by the DEP and the USEPA, is the *Screening Threshold* method, developed by the North Carolina Department of Natural Resources and Community Development. The method is designed to objectively eliminate from the emission inventory those sources that are unlikely to have a significant interaction with the source undergoing evaluation. In general, sources that should be considered in the modeling analyses are those with emissions greater than a screening threshold value (in TPY) that is calculated by the following criteria:

$$Q = 20 \times D$$

- where Q = the screening threshold value (TPY), and
D = The distance (km) from the proposed facility to the source undergoing evaluation for short-term analysis, or
The distance (km) from the edge of the proposed facility's significant impact area to the source undergoing evaluation for long-term (annual) analysis.

For this analysis, the long-term criterion was used since fewer facilities would be eliminated than with the short-term criterion. Also, the total emissions from a facility were used rather than emissions from individual sources for comparison to the screening threshold value. These methods result in a more conservative approach to produce higher-than-expected concentrations. Those facilities with maximum allowable emissions that are below the calculated *screening threshold* were eliminated from further consideration in the AAQS modeling analyses.

A summary of the facilities considered for inclusion in the modeling analyses is presented in Table 3. This summary identifies those facilities located within the Project's modeling area and screening area. The facilities that were not included in the modeling analyses because

their CO emissions were less than the *screening threshold* criteria are also identified. A summary of the stack, operating, and emission data for sources used in the modeling analyses is presented in Table 4.

Background Concentrations

To estimate the total CO air quality concentrations, 1-hour and 8-hour background concentrations were added to the modeling results. The background concentration is considered to be the air quality concentration contributed by sources not included in the modeling evaluation. Because other background sources were modeled, a background value was used that was considered to be realistic but still conservative. In this analysis, background concentrations were assumed to be represented by the 90th percentile of concentrations measured from the nearest monitors.

The CO monitors nearest to the site are the DEP monitor, number 12-057-1006, located at 50 South Military Trail in West Palm Beach, and monitor number 12-057-1004, 3700 Beveledere Road in Palm Beach. For 1998 and 1999, the highest 90th percentile of the 1-hour and 8-hour measured concentrations at these monitors were 1.1 parts per million (ppm) (1,300 microgram per cubic meter ($\mu\text{g}/\text{m}^3$)) and 1.0 ppm (approximately 1,150 $\mu\text{g}/\text{m}^3$), respectively. These background levels were added to the refined model-predicted concentrations to estimate total CO air quality levels for comparison to the AAQS.

Summary of Results

A summary of the maximum 1-hour and 8-hour average CO concentrations predicted in the screening analysis is presented in Table 5. Based on the screening results, modeling refinements were performed for both the 1-hour and 8-hour averaging times. The results of the refined modeling analyses from the PSD application and this analysis are summarized in Table 6. For this analysis, the maximum 1-hour and 8-hour average CO concentrations due to all sources, including background concentrations, are 12,309 and 6,973 $\mu\text{g}/\text{m}^3$, respectively. These concentrations are 31 and 70 percent of the AAQS of 40,000 and 10,000 $\mu\text{g}/\text{m}^3$, respectively. These results are comparable to those presented in the PSD application.

Based on these air modeling results, the maximum CO concentrations from the Project and other CO emission sources will comply with the AAQS.

The air modeling output files which contain the results of the CO concentrations predicted for the Pratt & Whitney facility and background sources have been forwarded to the DEP using Golder's ftp site.

Department of Environmental Protection
Mr. A.A. Linero

- 4 -

October 6, 2000
Project No.993-9571

Please call if you have any questions concerning this information.

Sincerely,
GOLDER ASSOCIATES INC.

Handwritten signature: Benny Sust
Benny Sust, P.E.
Principal Engineer
Florida P.E. #35042

BS/jkw

cc: Dale Francke, Pratt & Whitney
K. Kosky, Golder
R. McCann, Golder

Handwritten:
J. Reynolds
C. Walladay
D. Grayson, PBCKD
SED
EPA
NPS

Table 1. Emission Calculations for Air Emission Sources at the Pratt & Whitney Facility

Emission		Emission Factor ^a	Maximum		CO Emission Rate		
Unit	Source		Heat Input	Maxium Fuel Use			
Number	Description		(mmBTU/hr)	(gal/hr)	(ft ³ /hr)	(lb/hr)	(g/s)
1	Slave Engine	6.72 lb/1000 gal	264	1,927	NA	12.95	1.63
16	Boiler BO-12-E6	84 lb/MMSCF	42	NA	40,777	3.43	0.43
22	Boilers BO-1-MBH and BO-2-MBH	84 lb/MMSCF	108	NA	104,854	8.81	1.11
40	Furnaces FU-3-MHT and FU-4-MHT	84 lb/MMSCF	12	NA	11,650	0.98	0.12
45	Evaporator EV-1-MW	84 lb/MMSCF	195	NA	189,320	15.90	2.01
59	Miscellaneous heaters	84 lb/MMSCF	62	NA	60,194	5.06	0.64
66	Boiler, BO-14-E8	1.9 lb/1000 gal	6.7	NA	6,505	0.01	0.00
68	Emergency Elect Gen Facility	1 lb/MMBTU	245	1,788	NA	1.79	0.23
69	Jet Engine Test Stands (all)	Average lb/hr	NA	NA	NA	47.40	5.98

NA = not applicable

^a Emission factors based on EPA factors from Compilation of Air Pollutant Emission Factors, Volume I, AP-42 (7/1998), or Annual Operating Report (AOR) data from Pratt & Whitney (P&W)

EU 1- from P&W AOR 99

EU 16, 22, 40, 45,59- AP-42 Table 1.4.1

EU 66- AP-42 1.5.1

EU 68- AP-42 Table 3.4.1

EU 69- See P&W AOR 99 for specific CO emission factors for various jet engines

Table 2. Summary of Stack Parameters for Air Emission Sources at the Pratt & Whitney Facility

Emission Unit Number	Source Description ^a	Release Height		Diameter		Velocity		Temperature	
		(ft)	(m)	(ft)	(m)	(fps)	(m/s)	(°F)	(°K)
1	Slave Engine	50	15.2	3.0	0.9	471.6	143.7	1000	810.9
16	Boiler BO-12-E6	15	4.6	2.5	0.8	22.7	6.9	500	533.2
22	Boilers BO-1-MBH, BO-2-MBH	66	20.1	7.6	2.3	33.4	10.2	750	672.0
40	Furnaces FU-3-MHT, FU-4-MHT	49	14.9	4.0	1.2	0.1	0.04	77	298.2
45	Evaporator EV-1-MW	12	3.7	0.5	0.2	8.5	2.6	77	298.2
59	Miscellaneous heaters	20	6.1	1.5	0.5	16.0	4.9	500	533.2
68	Emergency Elect Gen Facility	12	3.7	0.8	0.2	496.7	151.4	1200	922.0
69	Jet Engine Test Stands (all)	18	5.5	12.0	3.7	0.3	0.08	300	422.0

^a See Table 1; Boiler, BO-14-E8 (No. 66) not included in modeling analyses due to low emission rate.

Table 3. Summary of Facilities With CO Emissions (>1 TPY) Considered for Inclusion in the AAQS Air Modeling Analyses for the Pratt & Whitney Facility

Facility ID	Facility Name	Source Location		Relative Location*				CO Emissions Rate (TPY)	Q Emissions Threshold ^b ((Dist. - SIA) X 20)	Include in Modeling Analysis?
		North (km)	East (km)	X (km)	Y (km)	Distance (km)	Direction (deg)			
0990185	SIKORSKY AIRCRAFT CORP. - JUPITER	2975.0	567.5	0.0	0.0	0.0	0	0.5	SIA	Yes
0990234	SOLID WASTE AUTH OF PBC/NO CO RRP	2961.3	584.5	17.0	-13.7	21.9	129	1,733.3	SIA	Yes
0990304	VETERANS AFFAIRS MEDICAL CENTER	2963.0	588.0	20.5	-12.0	23.8	120	5.0	SIA	Yes
0990349	SPWMD PUMP STATION #S-5A	2951.3	562.6	-5.0	-23.7	24.2	192	367.3	SIA	Yes
0850129	AMERICAN POWER TECH/INDIANTOWN	2990.8	549.1	-18.4	15.8	24.3	311	3.8	SIA	Yes
0990019	OSCEOLA FARMS ^c	2968.0	544.2	-23.3	-7.0	24.3	253	25,175.0	SIA	Yes
0990331	OSCEOLA COGENERATION PLANT ^d	2968.0	544.0	-23.5	-7.0	24.5	253	1,436.4	SIA	Yes
0990333	PCT STATION NO. 21 (WPB)	2957.1	584.4	16.9	-17.9	24.6	137	56.6	SIA	Yes
0990344	PARKWAY ASPHALT (RIVIERA)	2962.1	588.5	21.0	-12.9	24.6	122	14.1	SIA	Yes
0850102	INDIANTOWN COGENERATION PLANT	2990.7	547.7	-19.9	15.7	25.3	308	1,673.0	SIA	Yes
0850002	CAULKINS INDIANTOWN CITRUS	2991.5	548.0	-19.5	16.5	25.5	310	9.3	SIA	Yes
0990123	PHYSICAL DISTRIBUTION CENTER & OSF	2961.2	589.7	22.2	-13.8	26.1	122	4.0	SIA	Yes
0990583	MAGNUM ENV. SERVICES, INC. - WPB	2952.0	580.2	12.7	-23.0	26.3	151	22.1	SIA	Yes
0990087	WEST PALM PLANT	2951.7	579.9	12.4	-23.3	26.4	152	11.7	SIA	Yes
0990056	ST. MARY'S HOSPITAL, INC.	2959.7	593.0	25.5	-15.3	29.7	121	3.7	SIA	Yes
0990325	ROYAL PALM MEMORIAL GARDENS, INC.	2960.2	593.4	25.9	-14.8	29.8	120	1.4	SIA	Yes
0990061	U.S. SUGAR CORP. BRYANT MILL ^e	2969.1	537.8	-29.7	-5.9	30.2	259	2,071.0	SIA	Yes
0990042	RIVIERA POWER PLANT	2960.6	594.3	26.8	-14.4	30.4	118	1,156.0	SIA	Yes
0850001	FPL MARTIN POWER PLANT ^f	2992.7	542.7	-24.8	17.7	30.5	305	1,816.0	SIA	Yes
0990016	ATLANTIC SUGAR MILL ^g	2945.2	552.4	-15.1	-29.8	33.4	207	25,065.0	SIA	Yes
0850015	AYCOCK FUNERAL HOME	3008.4	573.5	6.0	33.4	33.9	10	1.5	SIA	Yes
0850006	MARTIN MEMORIAL HEALTH SYSTEMS	3008.7	574.2	6.7	33.7	34.3	11	2.0	SIA	Yes
0850108	OUTBOARD MARINE/RALPH EVINRUDE TEST CTR	3009.4	572.5	5.0	34.4	34.7	8	97.5	SIA	Yes
0990562	SOUTH FLORIDA SHAVINGS CO.	2941.1	579.2	11.7	-33.9	35.9	161	1.5	17	No
0990026	SUGAR CANE GROWERS CO-OP ^h	2953.3	534.9	-32.6	-21.7	39.2	236	33,771.0	83	Yes
0990045	T G SMITH PLANT	2943.7	592.8	25.3	-31.3	40.2	141	762.5	105	Yes
0990568	LWG PLANT ⁱ	2943.7	592.8	25.3	-31.3	40.2	141	204.5	105	Yes
0990322	TREASURE COAST CREMATORY	2941.0	594.0	26.5	-34.0	43.1	142	6.6	162	No
0990350	SPWMD PUMP STATION #S-6	2927.8	556.2	-11.3	-47.2	48.5	194	107.9	270	No
0990095	BETHESDA MEMORIAL HOSPITAL	2931.8	592.6	-5.1	-43.2	50.0	150	5.3	299	No
1110040	RANGER/PT PIERCE/PLNT#129	3030.2	561.7	25.8	55.2	55.5	354	9.9	410	No
0990332	OKELANTA COGENERATION PLANT ^{d4}	2940.0	524.1	-43.4	-35.0	55.8	231	3,289.0	415	Yes
1110003	PT PIERCE UTIL/H D KING PWR PLNT	3036.4	566.1	-1.4	61.3	61.4	359	416.8	527	No
1110060	FLORIDA GAS TRANSMISSION/ST LUCIE/STA 20	3035.8	557.2	-10.3	60.8	61.6	350	214.4	533	No
0510001	EVERGLADES SUGAR REFINERY	2954.0	509.5	-58.0	-21.0	61.7	250	16.3	534	No
0990119	BOCA RATON COMMUNITY HOSPITAL	2915.5	589.5	22.0	-59.5	63.4	160	4.3	569	No
0510003	U.S. SUGAR CLEWISTON MILL AND REFINERY ⁴	2956.9	506.1	-61.4	-18.1	64.0	254	108,259.2	580	Yes
0990015	BOCA RATON RESORT AND CLUB	2913.7	592.0	24.5	-61.3	66.0	158	13.8	620	No
0110045	HARDIVES ASPHALT(DEERFIELD PLANT)	2910.0	584.8	17.3	-65.0	67.3	165	11.4	645	No
0112094	WASTE MGMT-CENTRAL SANIT L F & RECYCLING	2908.0	583.2	15.7	-67.0	68.8	167	150.8	676	No
0112120	WHEELABRATOR NORTH BROWARD	2907.6	583.9	16.4	-67.4	69.4	166	357.7	687	No
0112103	SUN GRAPHIC, INC.	2904.3	585.2	17.7	-70.7	72.9	166	2.2	758	No
0110351	SPWMD PUMP STATION #S-8	2912.2	522.3	-45.2	-62.8	77.3	216	245.0	847	No
0610080	AMERICAN POWER TECH	3051.1	550.7	-16.8	76.1	77.9	348	1.1	859	No
0610021	OCEAN SPRAY CRANBERRIES/VERO BEACH	3051.3	550.6	-16.9	76.3	78.1	348	3.6	863	No
0430008	SOUTH FLORIDA THERMAL SERVICES, INC.	2966.6	489.2	-78.3	-8.4	78.7	264	10.5	875	No
0112146	ATLANTIC BURIAL CASKET CO. DBA ABCCO	2897.7	584.3	16.8	-77.3	79.1	168	1.9	882	No
0112152	GOLD COAST CREMATORY	2897.6	584.6	17.1	-77.4	79.3	168	2.1	885	No
0610029	CITY OF VERO BEACH MUNICIPAL UTILITIES	3056.5	561.4	-6.1	81.5	81.7	356	348.1	935	No
0510015	SOUTHERN GARDENS CITRUS PROCESSING CORP. ^h	2957.6	487.5	-80.0	-17.4	81.9	258	2,891.2	937	Yes

Source: Florida Department of Environmental Protection (9/2000)

* Relative location is with respect to the Pratt Whitney facility, which is located at UTM Coordinates: North 2975 km, East 567.5 km

^b The significant impact area (SIA) for the project determined by modeling is 35 km

^c Facilities or sources with facilities that operate only during the November 1 through April 30 crop season.

^d Facility has sugar mill sources that operate all year

^e Emissions and parameters taken from Title V Permit (3/21/1996)

^f Parameters taken from Title V Permit (6/10/1996)

^g Emissions and parameters taken from Atlantic Sugar PSD Application (10/99)

^h Emissions and parameters taken from Title V Permit Application (6/15/1996)

ⁱ Emissions and parameters taken from Special Land Use and Site Plan Application (8/1999)

^j Emissions and parameters taken from PSD Application (8/2000)

^k Emissions and parameters taken from PSD Application (8/2000)

Table 4. Summary of CO Sources Included in the Air Modeling Analyses for the Pratt & Whitney Facility

Facility ID	Facility Name	Emission Units	Modeling ID Name	Stack Parameters				Emission Rate (g/s)
				Height (m)	Diameter (m)	Temper. (K)	Velocity (m/s)	
0990185	SIKORSKY AIRCRAFT CORP. - JUPITER	Paint spray booth (PS-13-SIK) with drying oven	SIK10	11.89	1.83	302.6	5.9	0.01
0990234	SOLID WASTE AUTH OF PBC/NO CO RRF	412.5MMBTU/HR RDF BOILER NO.1 (324,000 lb/hr STEAM)	SWPBC1	76.20	2.04	505.4	24.7	17.80
		412.5MMBTU/HR RDF BOILER NO.2 (324,000 lb/hr. steam)	SWPBC2	76.20	2.04	505.4	24.7	17.80
		Landfill Gas Coll Sys class I	SWPBC3	7.01	0.21	1033.2	24.4	1.96
		Landfill Gas Coll Sys class III	SWPBC4	7.01	0.15	1033.2	46.6	1.96
0990349	SFWMD PUMP STATION #S-5A	Six 1600 hp diesel engines powering flood control pumps	S5A1	4.88	0.99	685.9	5.3	8.37
0990019	OSCEOLA FARMS	BOILER #2 WITH SCRUBBERS AND 2 STACKS	OSBLR2	27.43	1.52	338.7	18.6	317.52
		BOILER #3 WITH SCRUBBER	OSBLR3	27.43	1.92	344.3	14.3	128.77
		BAGASSE BOILER #4 UNIT #5, 100000 LBS/HR STEAM MAX	OSBLR4	27.43	1.83	344.3	16.5	317.52
		165,000 LB/HR BAGASSE BOILER # 5 WITH 2 SCRUBBERS & 2 STACKS	OSBLR5	27.43	1.52	344.3	17.9	374.22
		BOILER #6 WITH SCRUBBER PSD	OSBLR6	27.43	1.92	338.7	18.3	310.40
0990331	OSCEOLA COGENERATION PLANT	760 MMBTU/HR BIOMASS/OIL/COAL FIRED BOILER	OSCOG1	60.96	3.05	419.3	15.9	16.37
		760 MMBTU/HR COGENERATION BOILER NO. 2	OSCOG2	60.96	3.05	419.3	15.9	16.37
0990333	FGT STATION NO. 21 (WPB)	COMPRESSOR #2101, 6500 BHP NATURAL GAS FIRED TURBINE	FGT1	15.24	1.01	763.7	56.4	0.65
		COMPRESSOR #2102, 6500 BHP NATURAL GAS FIRED TURBINE	FGT2	15.24	1.01	763.7	56.4	0.65
0990344	PARKWAY ASPHALT (RIVIERA)	Asphalt rotary drum dryer (400 TPH); counterflow	PARK1	12.80	1.42	422.0	18.5	0.32
0850102	INDIANTOWN COGENERATION PLANT	Pulverized Coal Main Boiler	INDCG1	150.88	4.88	333.2	28.4	37.60
		(2) Auxiliary Boilers	INDCG3	64.01	1.52	449.8	26.7	0.55
0850002	CAULKINS INDIANTOWN CITRUS	PEEL DRYER #1 WASTE HEAT EVAPORATOR (54,000 LB/HR CAPACITY)	CAULK4	28.65	0.98	343.2	11.6	0.16
		30 T/HR CITRUS PEEL DRYER #2	CAULK5	32.92	1.52	255.4	0.0	0.05
0990123	PHYSICAL DISTRIBUTION CENTER & OSF	12.5 mmBTU/hr boiler #1 (Unit A) burning No.6 fuel oil	PHYD1	9.14	0.52	491.5	10.1	0.05
		12.5 mmBTU/hr boiler #2 (Unit B) burning No.6 fuel oil	PHYD2	9.14	0.52	491.5	10.1	0.05
0990583	MAGNUM ENV. SERVICES, INC. - WPB	Soil thermal treatment facility	MAGN1	9.75	0.98	1144.3	31.6	0.50

Table 4. Summary of CO Sources Included in the Air Modeling Analyses for the Pratt & Whitney Facility

Facility ID	Facility Name	Emission Units	Modeling ID Name	Stack Parameters				Emission Rate (g/s)
				Height (m)	Diameter (m)	Temper. (K)	Velocity (m/s)	
0990087	WEST PALM PLANT	Double drum dryer (250 TPH) burning low sulfur residual oil	WPP4	10.97	1.01	394.3	41.1	0.27
0990188	ANIMAL RESCUE LEAGUE	ANIMAL CREMATION INCINERATOR; CRAWFORD #C-1000S; 250 LB/HR	ARL3	6.10	0.52	733.2	8.8	0.01
		ANIMAL CREMATION INCINERATOR; CRAWFORD #C-500P; 75 LB/HR	ARL4	6.10	0.52	788.7	3.4	0.004
0990056	ST. MARY'S HOSPITAL, INC.	Two identical process steam boilers; natural gas fired	STMAR2	24.38	1.22	505.4	0.1	0.03
0990325	ROYAL PALM MEMORIAL GARDENS, INC.	HUMAN CREMATION INCINERATOR, IEE CO. #IE 43-PPII (100 LB/HR)	RPMG1	6.10	0.55	865.9	4.9	0.03
0990061	U.S. SUGAR CORP. BRYANT MILL	BOILERS #1,#2,#3 WITH SCRUBBERS	USSBM123	19.81	1.65	338.7	36.4	1309.77
		BOILER #5 WITH TWO SCRUBBERS.	USSBM5	45.72	2.90	338.7	18.0	760.91
0990042	RIVIERA POWER PLANT	Fossil Fuel Steam Generator, Unit 3 -Phase II Acid Rain Unit	RIVP3	90.83	4.88	401.5	26.9	13.18
		Fossil Fuel Steam Generator, Unit 4 -Phase II Acid Rain Unit	RIVP4	90.83	4.88	401.5	26.6	13.18
0850001	FPL MARTIN POWER PLANT	Units 1 & 2	MART12	152.1	7.99	420.9	21.03	38.92
		Aux Blr PSD	MARTAUX	18.3	1.10	535.4	15.24	0
		Diesel Gens PSD	MARTGEN	7.6	0.30	785.9	39.62	0
		Units 3 & 4 PSD	MART34	64.9	6.10	410.9	18.90	26.66
0990016	ATLANTIC SUGAR MILL	BOILER #1 WITH SCRUBBER	ATLSM1	27.43	1.83	346.0	18.0	242.68
		BOILER #2 WITH 1 JOY TURBULAIRE TYPE D-40 IMPINGEMNT SCRUBBE	ATLSM2	27.43	1.83	350.0	23.4	242.68
		BOILER #3 WITH 2 JOY TURBULAIRE IMPINGEMENT SCRUBBERS	ATLSM3	27.43	1.83	350.0	21.6	294.84
		BOILER # 4	ATLSM4	27.43	1.83	344.0	25.2	311.85
		253 MM BTU/HR BAGASSE BOILER #5 W/SUPP FUEL OIL #6	ATLSM5	27.43	1.68	339.0	19.2	209.11
0850015	AYCOCK FUNERAL HOME	IND. EQUIP. & ENGR. MODEL IE43-PPII CREMATOR	AYCK2	7.32	0.52	865.9	5.5	0.03
0850006	MARTIN MEMORIAL HEALTH SYSTEMS	CLEAVER BROOKS MODEL CB 150 HP BOILER - UNIT #1	MMHS1	5.79	0.40	499.8	8.2	0.02
		CLEAVER BROOKS MODEL CB-150 HP STEAM BOILER #2	MMHS5	5.79	0.40	499.8	8.2	0.02
0850108	OUTBOARD MARINE/RALPH EVINRUDE TEST CTR	Engine Testing Cells (02), 2 Test tanks and 2 Cooling towers	OUT1	12.19	0.61	310.9	9.7	2.22
0990026	SUGAR CANE GROWERS CO-OP	BOILERS #1 AND #2 WITH 2 SCRUBBERS AND 1 STACK	SCGC12	45.72	1.87	339.0	21.8	547.09

Table 4. Summary of CO Sources Included in the Air Modeling Analyses for the Pratt & Whitney Facility

Facility ID	Facility Name	Emission Units	Modeling ID Name	Stack Parameters				Emission Rate (g/s)
				Height (m)	Diameter (m)	Temper. (K)	Velocity (m/s)	
		BOILER #3 WITH SCRUBBER	SCGC3	27.43	1.52	339.0	22.3	187.61
		BOILER #4 WITH CYCLONES AND 3 SCRUBBERS WITH ONE STACK	SCGC4	54.90	2.44	339.0	21.7	467.71
		BOILER #5 WITH CYCLONES, TWO SCRUBBERS, AND ONE STACK	SCGC5	45.72	2.30	339.0	15.9	359.60
		504 MMBTU/HR BOILER # 8 RESIDUE/BAGASSE/OIL	SCGC8	47.24	2.90	339.0	13.6	381.02
0990045	T G SMITH PLANT	2000 KW DIESEL GENERATOR # 1 PEAKING UNIT	TGSM01	5.18	0.56	625.9	37.1	1.70
		2000 KW DIESEL GENERATOR # 2 PEAKING UNIT	TGSM02	5.18	0.56	625.9	37.1	1.70
		2000 KW DIESEL GENERATOR # 3 PEAKING UNIT	TGSM03	5.18	0.56	625.9	37.1	1.70
		2000 KW DIESEL GENERATOR # 4 PEAKING UNIT	TGSM04	5.18	0.56	625.9	37.1	1.70
		2000 KW DIESEL GENERATOR # 5 PEAKING UNIT	TGSM05	5.18	0.56	625.9	37.1	1.70
		GAS TURBINE # 1	TGSM06	14.02	4.88	720.4	24.8	2.07
		7.5 MW FOSSIL FUEL STEAM GENERATING UNIT I	TGSM07	18.29	1.52	422.0	10.5	0.43
		FOSSIL FUEL STEAM GENERATOR #3 (Phase II, Acid Rain Unit)	TGSM09	34.44	2.13	418.2	15.7	1.25
		FOSSIL FUEL STEAM GENERATOR #4 (Phase II, Acid Rain Unit)	TGSM10	35.05	2.29	418.2	17.0	1.64
		COMBINED CYCLE UNIT (GT-2/S-5)	TGSM11	22.86	3.05	479.8	26.7	3.49
0990568	LWG PLANT	186 MW combined cycle gas turbine, GE Frame 7FA	LWG1	45.72	5.49	377.6	24.3	5.48
0990332	OKEELANTA COGENERATION PLANT	715 MMBTU/HR COGENERATION BOILER NOS. 1,2,3	OKCOGEN	60.60	3.05	438.7	17.5	94.61
0510003	U.S. SUGAR CLEWISTON MILL AND REFINERY	BOILER #1 WITH SCRUBBER	USSCM01	64.92	2.44	347.0	15.4	811.79
		BOILER #2 WITH SCRUBBER	USSCM02	64.92	2.44	338.7	13.9	732.19
		BOILER #3 WITH SCRUBBER	USSCM03	64.92	2.44	333.2	6.8	334.28
		BOILER #5 WITH SCRUBBER	USSCM04	45.72	2.51	344.3	20.3	518.43
		Boiler #7	USSCM07	68.58	2.59	405.4	20.8	71.62
0510015	SOUTHERN GARDENS CITRUS PROCESSING CORP.	Peel Dryer	SGARDDRY	38.1	7.45	1.16	353.0	65.69
		Boilers 1-3	SGARDBLR	16.8	14.23	1.22	478.0	0.23

Source: Florida Department of Environmental Protection (9/2000)

Table 5. Maximum CO Impacts Predicted for Sources at the Pratt & Whitney Facility Including Other Facilities - Screening Analysis

Averaging Time, Rank	Concentration ^a ($\mu\text{g}/\text{m}^3$)	Receptor Location ^b		Time Period (YYMMDDHH)
		Direction (degree)	Distance (m)	
8-Hour, Highest	2,670	260	30,000	87090516
	5,186	260	30,000	88060816
	3,221	250	25,000	89012116
	3,079	250	25,000	90041216
	2,788	260	30,000	91051416
8-Hour, HSH	2,591	260	30,000	87011916
	2,702	260	30,000	88022016
	2,479	250	25,000	89102216
	2,248	260	30,000	90062316
	2,615	260	30,000	91082416
1-Hour, Highest	9,458	260	30,000	87090509
	10,204	260	30,000	88042411
	9,285	260	30,000	89072009
	10,098	260	30,000	90062310
	10,155	260	30,000	91082412
1-Hour, HSH	9,387	260	30,000	87041514
	10,096	260	30,000	88090711
	8,626	260	30,000	89080210
	9,570	260	30,000	90010613
	9,415	260	30,000	91082010

^a Based on 5-year meteorological record, West Palm Beach, 1987-91

^b Relative to engine discharge location
YYMMDDHH = Year, Month, Day, Hour Ending
HSH = Highest, Second-Highest

Table 6. Maximum CO Impacts Predicted for Comparison to AAQS, Refined Analysis

Averaging Time, Rank	Concentration ($\mu\text{g}/\text{m}^3$)			Receptor Location ^o		Time Period (YYMMDDHH)	Florida AAQS ($\mu\text{g}/\text{m}^3$)
	Total	Modeled ^a	Background	Distance X (m)	Distance Y (m)		
<u>From PSD Application</u>							
8-Hour, HSH	3,927.8	477.8 ^a	3,450 ^c	-951	1,409	90082912	10,000
1-Hour, HSH	10,262	3,822 ^a	6,440 ^c	-951	1,409	90082912	40,000
<u>Additional Modeling With Other Sources</u>							
8-Hour, HSH	6,973	5,823 ^a	1,150 ^e	-30,300	-5,960	89051916	10,000
1-Hour, HSH	12,309	11,009 ^a	1,300 ^e	-30,050	-5,460	90083113	40,000

^a Based on the HSH concentration predicted for the project's emissions with 5-year meteorological record of 1987 to 1991 from West Palm Beach

^o Relative to Engine Discharge Location.

^c Based on the second highest measured concentrations from January 1998 to June 1999 at West Palm Beach

^a Based on the HSH concentrations predicted for all modeled sources with the 5-year meteorological record of 1987 to 1991 from West Palm Beach

^e Based on the 90th percentile of measured concentrations from 1998 to 1999 at West Palm Beach

YYMMDDHH = Year, Month, Day, Hour Ending.

HSH = Highest, Second-Highest Concentration in 5 years.

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 United Technologies Corp -
 Pratt & Whitney
 P.O. Box 109600
 West Palm Beach, FL 33410-9600

2. Article Number (Copy from service label)
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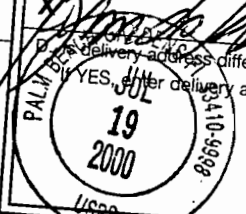
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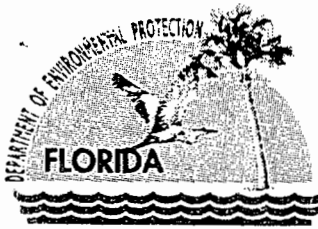


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Jeb Bush
Governor

Department of Environmental Protection

Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

David B. Struhs
Secretary

July 13, 2000

CERTIFIED MAIL – RETURN RECEIPT REQUESTED

Mr. John K. Silan
Manager Facilities Management
United Technologies Corp – Pratt & Whitney
P.O. Box 109600
West Palm Beach, Florida 33410-9600

Re: DEP File No. 0990021-004-AC (PSD-FL-294) – LOX/Kerosine Rocket Engine Stand Project
at Pratt & Whitney's Research & Development Facility in West Palm Beach

Dear Mr. Silan:

The Bureau of Air Regulation received the enclosed comments from the Palm Beach County Health Department concerning the referenced permit application. Please address the issues raised in the County's letter. Also, please provide an estimate of the current actual annual CO emissions for the referenced facility.

If there are any questions regarding the above, please call John Reynolds at 850/921-9536.

Sincerely,

A. A. Linero, P.E. Administrator
New Source Review Section

Enclosure

AAL/JR

cc: Gregg Worley, EPA
John Bunyak, NPS
Isidore Goldman, SED
Darrel Graziani, PBCHD
Benny Susi, Golder Assoc.

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INTEROFFICE MEMORANDUM

Date: 10-Jul-2000 09:34am
From: Darrel_Graziani
Darrel_Graziani@doh.state.fl.us
Dept:
Tel No:

To: John.Reynolds (John.Reynolds@dep.state.fl.us)
CC: Jim_Stormer (Jim_Stormer@doh.state.fl.us)
CC: Ajaya_Satyal (Ajaya_Satyal@doh.state.fl.us)
CC: Larry.George (Larry.George@dep.state.fl.us)

Subject: P&W PSD Application

John,

Comments on the application for the new rocket engine test stand at Pratt & Whitney's Palm Beach operations.

1. Emission estimates for the criteria pollutants are not adequately documented. Please request the applicant to supply documentation on the expected emissions. If a combustion model was used, please have them submit a copy. PM emissions need to include solids within the cooling water. VOC emissions also need to be documented given the high CO numbers.

For your information, some of my work at NASA's Stennis Space Center dealt with the testing of a similar engine. For that project, the combustion model predicted initial high CO rates at the engine exhaust. However, when the exhaust gases mix with the air, the model predicted overall lower CO emissions and an increased rate of NOx.

2. Emission estimates for HAPs have not been provided. The activity is a listed source category under Section 112 of the Clean Air Act and the applicant should specify PM and VOC emissions, if possible. A case-by-case MACT determination may be required.

3. There are a number of unregulated activities with significant allowable emissions. The source needs to include these activities within the modeling analyses.

4. The applicant's BACT analysis is not correct. There are controls on a Russian Test Stand which go beyond BACT. My understanding is that the controls were implemented (Cold War Stuff) to hide research activities. The NASA people at SSC are aware of the controls and unless DOD is funding the controls would be cost prohibited.

5. I disagree with the modeling approach. Use of the a puff model is more appropriate given the nature of the activity. NASA used such modeling to support the ARSM PSD Permit application. The applicant needs to submit a revised modeling analysis.

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<p>1. Article Addressed to:</p> <p><i>Mr. John K. Silan Manager Facilities Mgt. United Technologies Corp Pratt & Whitney P.O. Box 109600 West Palm Beach, FL 33410</i></p>	<p>3. Service Type</p> <input checked="" type="checkbox"/> Certified Mail <input type="checkbox"/> Express Mail <input type="checkbox"/> Registered <input type="checkbox"/> Return Receipt for Merchandise <input type="checkbox"/> Insured Mail <input type="checkbox"/> C.O.D.	
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Department of Environmental Protection

Jeb Bush
Governor

Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

David B. Struhs
Secretary

July 19, 2000

CERTIFIED MAIL – RETURN RECEIPT REQUESTED

Mr. John K. Silan
Manager Facilities Management
United Technologies Corp – Pratt & Whitney
P.O. Box 109600
West Palm Beach, Florida 33410-9600

Re: DEP File No. 0990021-004-AC (PSD-FL-294) – LOX/Kerosine Rocket Engine Stand Project at Pratt & Whitney's Research & Development Facility in West Palm Beach

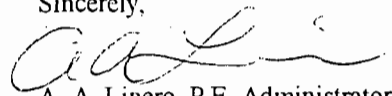
Dear Mr. Silan:

Based on our review of the proposed project, we have determined that the following additional information is needed in order to continue processing this application package:

1. The receptors used to model impacts at the site boundary were not spaced at 100 m. Please re-evaluate impacts at the site boundary by using a fence line receptor network that has a 100 m resolution. Also, in the receptor grid used for the screening analysis contained a 7 kilometer gap between the site boundary receptors and the nearest ring of polar receptors. Please update the screening analysis to include a receptor grid that contains a denser mid field receptor network.
2. In the application, it is assumed that all land enclosed by the site boundary is non-ambient air. However, if there is no physical barrier about this property, the assumption is not valid. Please confirm the existence of a physical barrier that prevents public access onto the land that is enclosed by the site boundary that was utilized in the modeling.
3. Please prepare a CO emission inventory for the NAAQS compliance analysis. The inclusion of only monitored background data does not sufficiently demonstrate compliance with the NAAQS.

If there are any questions regarding the above, please call John Reynolds at 850/921-9536.

Sincerely,


A. A. Linero, P.E. Administrator
New Source Review Section

7/19

AAL/JR

cc: Gregg Worley, EPA
John Bunyak, NPS
Isidore Goldman, SED
Darrel Graziani, PBCHD
Benny Susi, Golder Assoc.

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6241 NW 23rd Street, Suite 500
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Telephone (352) 336-5600
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TRANSMITTAL LETTER

To:
Mr. Dale Franke
Pratt & Whitney
Jupiter, Florida

Date: August 22, 2000
Project No: 9939571-0100

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Per: Benny Susi

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Mr. Franke,

Please forward 4 copies of the letter with official P.E. signature to FDEP.
Please forward 1 copy of the letter to Darrel Graziani, PBCHD.
One copy is for your files.

Thank you.

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BUREAU OF AIR REGULATION

**AIR PERMIT APPLICATION AND PREVENTION
OF SIGNIFICANT DETERIORATION ANALYSIS
FOR LOX/KEROSENE ROCKET ENGINE STAND PROJECT
PRATT & WHITNEY**

Prepared For:

**United Technologies-Pratt & Whitney
17900 Beeline Highway.
Jupiter, Florida 33478**

Prepared By:

**Golder Associates Inc.
1801 Clint Moore Road, Suite 200
Boca Raton, Florida 33487**

June 2000

9939571Y/F1

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APPENDIX A DETAILED SUMMARY OF ISCST MODEL RESULTS

LIST OF ACROYNMS AND ABBREVIATIONS

AAQS	ambient air quality standards
BACT	best available control technology
°C	degrees Celsius
CAA	Clean Air Act
CFR	Code of Federal Regulations
CO	carbon monoxide
DEP	Department of Environmental Protection
EPA	U.S. Environmental Protection Agency
F.A.C.	Florida Administrative Code
ft	foot
ft/sec	feet per second
GEP	good engineering practice
Golder	Golder Associates Inc.
HSH	highest, second-highest
ISCST3	Industrial Source Complex Short-term
kg	kilogram
kgf	kilogram force
kg/sec	kilograms per second
km	kilometer
lbm/sec	pound mass per second
m	meter
m ³	cubic meters
m/s	meters per second
NESHAP	National Emission Standards for Hazardous Air Pollutants
NO ₂	nitrogen dioxide
NO _x	nitrogen oxide
NPS	National Park Service
NSPS	New Source Performance Standards
NSR	new source review
NWA	National Wilderness Area

LIST OF ACROYNMS AND ABBREVIATIONS

NWS	National Weather Service
O ₃	ozone
PM	particulate matter
PM ₁₀	particulate matter with aerodynamic diameter of 10 microns or less
ppm	parts per million
PSD	prevention of significant deterioration
psia	pound per square inch atmospheric
SCRAM	Support Center for Regulatory Air Models
SIP	State Implementation Plan
SO ₂	sulfur dioxide
TPY	tons per year
TSP	total suspended particulate matter
TTN	Technical Transfer Network
µg/m ³	micrograms per cubic meter
USC	United States Code
VOC	volatile organic compound

PART A

AIR PERMIT APPLICATION



Department of Environmental Protection

Division of Air Resources Management

APPLICATION FOR AIR PERMIT - TITLE V SOURCE

See Instructions for Form No. 62-210.900(1)

I. APPLICATION INFORMATION

Identification of Facility

1. Facility Owner/Company Name: United Technologies Corporation/Pratt & Whitney	
2. Site Name: Pratt & Whitney	
3. Facility Identification Number: 0990021 [] Unknown	
4. Facility Location: Pratt & Whitney Street Address or Other Locator: 17900 Beeline Highway (SR 710) City: Jupiter County: Palm Beach Zip Code: 33478	
5. Relocatable Facility? [] Yes [X] No	6. Existing Permitted Facility? [X] Yes [] No

Application Contact

1. Name and Title of Application Contact: Dale Francke, Environmental Project Engineer	
2. Application Contact Mailing Address: Organization/Firm: UTC/Pratt & Whitney Street Address: 17900 Beeline Highway (SR 710) City: Jupiter State: FL Zip Code: 33478	
3. Application Contact Telephone Numbers: Telephone: (561) 796-3733 Fax: (561) 796-2787	

Application Processing Information (DEP Use)

1. Date of Receipt of Application:	6-20-00
2. Permit Number:	0990021-004-AC
3. PSD Number (if applicable):	PSD-FL-294
4. Siting Number (if applicable):	

Purpose of Application

Air Operation Permit Application

This Application for Air Permit is submitted to obtain: (Check one)

- Initial Title V air operation permit for an existing facility which is classified as a Title V source.
- Initial Title V air operation permit for a facility which, upon start up of one or more newly constructed or modified emissions units addressed in this application, would become classified as a Title V source.

Current construction permit number: _____

- Title V air operation permit revision to address one or more newly constructed or modified emissions units addressed in this application.

Current construction permit number: _____

Operation permit number to be revised: _____

- Title V air operation permit revision or administrative correction to address one or more proposed new or modified emissions units and to be processed concurrently with the air construction permit application. (Also check Air Construction Permit Application below.)

Operation permit number to be revised/corrected: _____

- Title V air operation permit revision for reasons other than construction or modification of an emissions unit. Give reason for the revision; e.g., to comply with a new applicable requirement or to request approval of an "Early Reductions" proposal.

Operation permit number to be revised: _____

Reason for revision: _____

Air Construction Permit Application

This Application for Air Permit is submitted to obtain: (Check one)

- Air construction permit to construct or modify one or more emissions units.
- Air construction permit to make federally enforceable an assumed restriction on the potential emissions of one or more existing, permitted emissions units.
- Air construction permit for one or more existing, but unpermitted, emissions units.

Owner/Authorized Representative or Responsible Official

1. Name and Title of Owner/Authorized Representative or Responsible Official: John K. Sillan, Manager Facilities Management
2. Owner/Authorized Representative or Responsible Official Mailing Address: Organization/Firm: United Technologies Corp – Pratt & Whitney Street Address: P.O. Box 109600 City: West Palm Beach State: FL Zip Code: 33410-9600
3. Owner/Authorized Representative or Responsible Official Telephone Numbers: Telephone: (561) 796-2626 Fax: (561) 796-2787
4. Owner/Authorized Representative or Responsible Official Statement: <i>I, the undersigned, am the owner or authorized representative*(check here [X], if so) or the responsible official (check here [], if so) of the Title V source addressed in this application, whichever is applicable. I hereby certify, based on information and belief formed after reasonable inquiry, that the statements made in this application are true, accurate and complete and that, to the best of my knowledge, any estimates of emissions reported in this application are based upon reasonable techniques for calculating emissions. The air pollutant emissions units and air pollution control equipment described in this application will be operated and maintained so as to comply with all applicable standards for control of air pollutant emissions found in the statutes of the State of Florida and rules of the Department of Environmental Protection and revisions thereof. I understand that a permit, if granted by the Department, cannot be transferred without authorization from the Department, and I will promptly notify the Department upon sale or legal transfer of any permitted emissions unit.</i> Signature <u>John Sillan</u> Date <u>JUNE 9, 2000</u>

* Attach letter of authorization if not currently on file.

Professional Engineer Certification

1. Professional Engineer Name: Benny Susi Registration Number: 35042
2. Professional Engineer Mailing Address: Organization/Firm: Golder Associates Inc. Street Address: 1801 Clint Moore Rd, Suite 200 City: Boca Raton State: FL Zip Code: 33487
3. Professional Engineer Telephone Numbers: Telephone: (561) 994 - 9910 Fax: (561) 994 - 9393

4. Professional Engineer Statement:

I, the undersigned, hereby certify, except as particularly noted herein, that:*

(1) To the best of my knowledge, there is reasonable assurance that the air pollutant emissions unit(s) and the air pollution control equipment described in this Application for Air Permit, when properly operated and maintained, will comply with all applicable standards for control of air pollutant emissions found in the Florida Statutes and rules of the Department of Environmental Protection; and

(2) To the best of my knowledge, any emission estimates reported or relied on in this application are true, accurate, and complete and are either based upon reasonable techniques available for calculating emissions or, for emission estimates of hazardous air pollutants not regulated for an emissions unit addressed in this application, based solely upon the materials, information and calculations submitted with this application.

If the purpose of this application is to obtain a Title V source air operation permit (check here [], if so), I further certify that each emissions unit described in this Application for Air Permit, when properly operated and maintained, will comply with the applicable requirements identified in this application to which the unit is subject, except those emissions units for which a compliance schedule is submitted with this application.

If the purpose of this application is to obtain an air construction permit for one or more proposed new or modified emissions units (check here [X], if so), I further certify that the engineering features of each such emissions unit described in this application have been designed or examined by me or individuals under my direct supervision and found to be in conformity with sound engineering principles applicable to the control of emissions of the air pollutants characterized in this application.

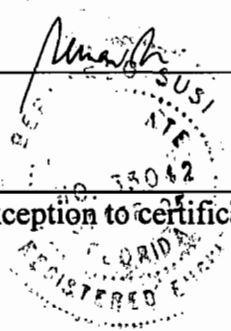
If the purpose of this application is to obtain an initial air operation permit or operation permit revision for one or more newly constructed or modified emissions units (check here [], if so), I further certify that, with the exception of any changes detailed as part of this application, each such emissions unit has been constructed or modified in substantial accordance with the information given in the corresponding application for air construction permit and with all provisions contained in such permit.

Signature

6-6-2000

Date

(seal)



* Attach any exception to certification statement.

Scope of Application

Emissions Unit ID	Description of Emissions Unit	Permit Type	Processing Fee
--	LOX/kerosene Rocket Engine Stand	AC1A	7,500

Application Processing Fee

Check one: Attached - Amount: \$: 7,500 Not Applicable

Construction/Modification Information

1. Description of Proposed Project or Alterations:

Addition of a new LOX/kerosene Rocket Engine Stand.

2. Projected or Actual Date of Commencement of Construction: **1 Apr 01**

3. Projected Date of Completion of Construction: **1 Apr 03**

Application Comment

II. FACILITY INFORMATION

A. GENERAL FACILITY INFORMATION

Facility Location and Type

1. Facility UTM Coordinates: Zone: 17 East (km): 567.3 North (km): 2974.4			
2. Facility Latitude/Longitude: Latitude (DD/MM/SS): 26 / 53 / 28 Longitude (DD/MM/SS): 80 / 19 / 20			
3. Governmental Facility Code: 0	4. Facility Status Code: C	5. Facility Major Group SIC Code: 37	6. Facility SIC(s): 3724
7. Facility Comment (limit to 500 characters): See Attachment A			

Facility Contact

1. Name and Title of Facility Contact: Dale Francke, Environmental Project Manager			
2. Facility Contact Mailing Address: Organization/Firm: UTC/Pratt & Whitney Street Address: P.O. Box 109600 City: West Palm Beach State: FL Zip Code: 33410-9600			
3. Facility Contact Telephone Numbers: Telephone: (561) 796-3733 Fax: (561) 796-2787			

Facility Regulatory Classifications

Check all that apply:

1. <input type="checkbox"/> Small Business Stationary Source?	<input type="checkbox"/> Unknown
2. <input checked="" type="checkbox"/> Major Source of Pollutants Other than Hazardous Air Pollutants (HAPs)?	
3. <input type="checkbox"/> Synthetic Minor Source of Pollutants Other than HAPs?	
4. <input checked="" type="checkbox"/> Major Source of Hazardous Air Pollutants (HAPs)?	
5. <input type="checkbox"/> Synthetic Minor Source of HAPs?	
6. <input checked="" type="checkbox"/> One or More Emissions Units Subject to NSPS?	
7. <input checked="" type="checkbox"/> One or More Emission Units Subject to NESHAP?	
8. <input type="checkbox"/> Title V Source by EPA Designation?	
9. Facility Regulatory Classifications Comment (limit to 200 characters):	

List of Applicable Regulations

Not Applicable	

B. FACILITY POLLUTANTS

List of Pollutants Emitted

1. Pollutant Emitted	2. Pollutant Classif.	3. Requested Emissions Cap		4. Basis for Emissions Cap	5. Pollutant Comment
		lb/hour	tons/year		
CO	A				Carbon Monoxide

C. FACILITY SUPPLEMENTAL INFORMATION

Supplemental Requirements

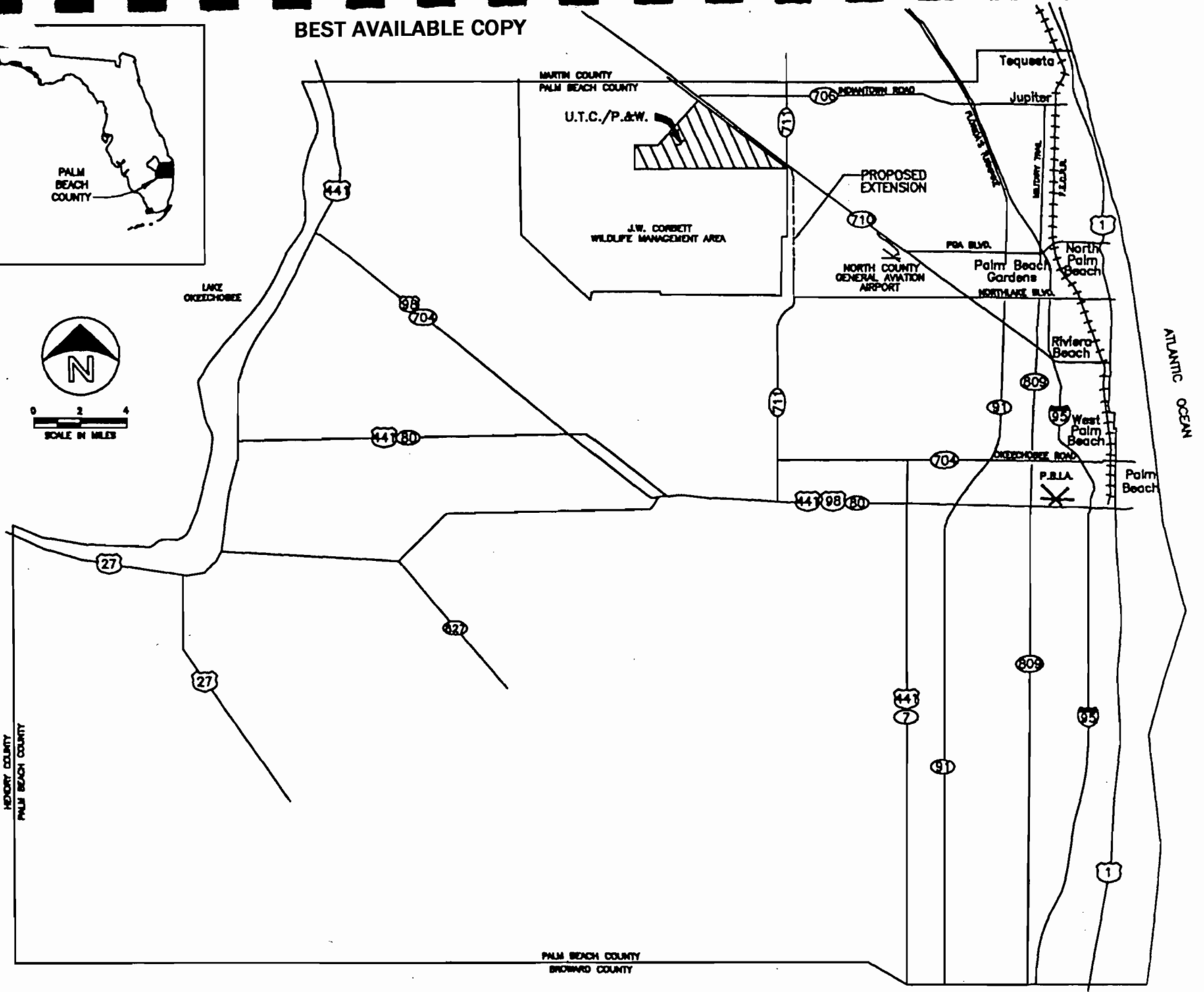
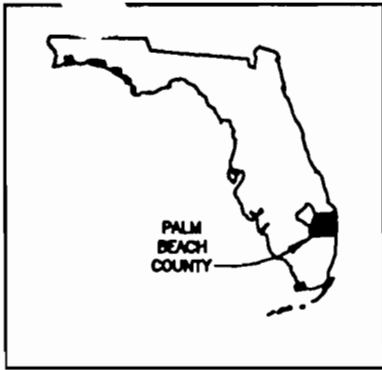
1. Area Map Showing Facility Location: [<input checked="" type="checkbox"/>] Attached, Document ID: <u> PW-FI-C1 </u> [<input type="checkbox"/>] Not Applicable [<input type="checkbox"/>] Waiver Requested
2. Facility Plot Plan: [<input checked="" type="checkbox"/>] Attached, Document ID: <u> PW-FI-C2 </u> [<input type="checkbox"/>] Not Applicable [<input type="checkbox"/>] Waiver Requested
3. Process Flow Diagram(s): [<input checked="" type="checkbox"/>] Attached, Document ID: <u> PW-FI-C3 </u> [<input type="checkbox"/>] Not Applicable [<input type="checkbox"/>] Waiver Requested
4. Precautions to Prevent Emissions of Unconfined Particulate Matter: [<input type="checkbox"/>] Attached, Document ID: _____ [<input checked="" type="checkbox"/>] Not Applicable [<input type="checkbox"/>] Waiver Requested
5. Fugitive Emissions Identification: [<input type="checkbox"/>] Attached, Document ID: _____ [<input checked="" type="checkbox"/>] Not Applicable [<input type="checkbox"/>] Waiver Requested
6. Supplemental Information for Construction Permit Application: [<input type="checkbox"/>] Attached, Document ID: _____ [<input checked="" type="checkbox"/>] Not Applicable
7. Supplemental Requirements Comment:

Additional Supplemental Requirements for Title V Air Operation Permit Applications

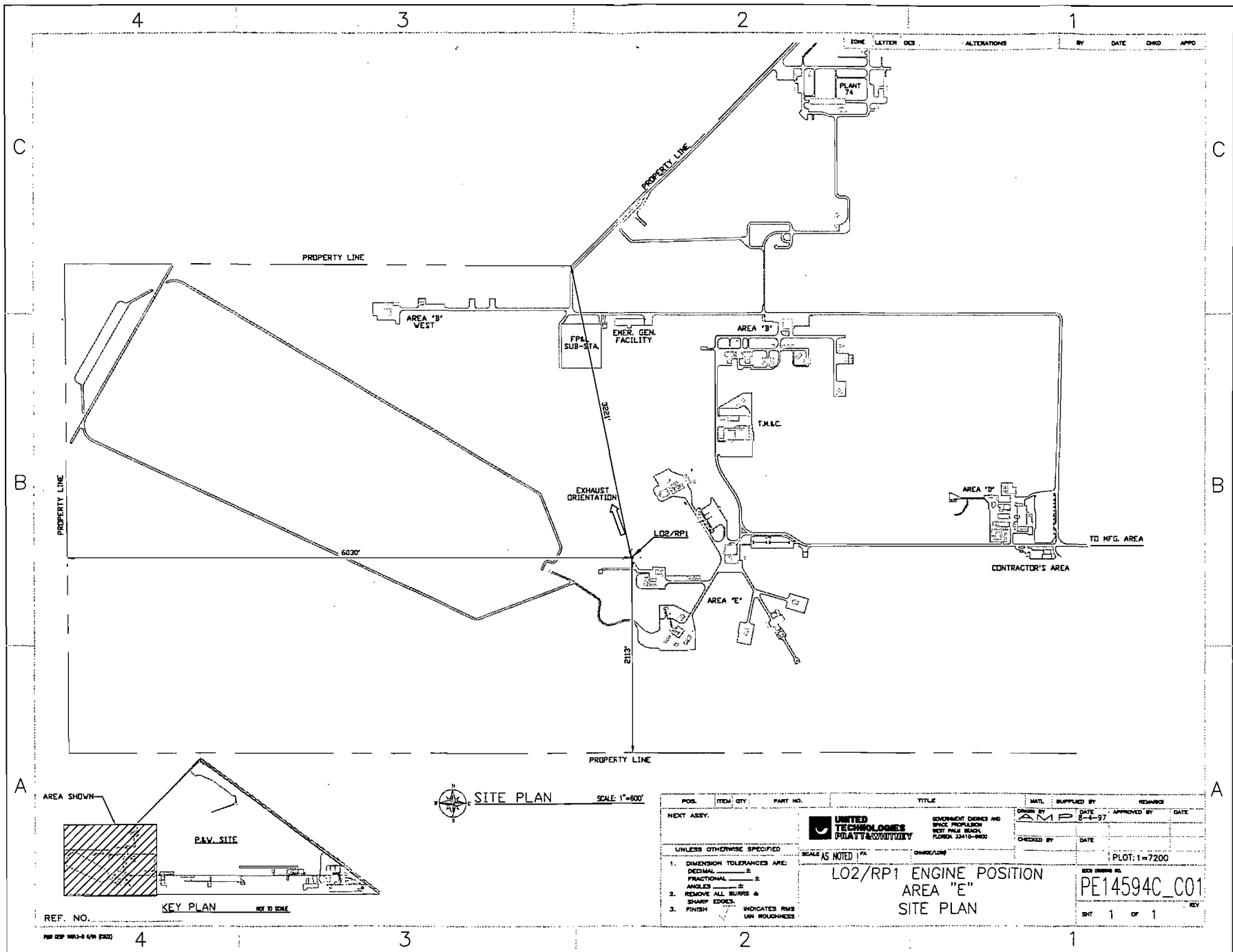
8. List of Proposed Insignificant Activities: <input type="checkbox"/> Attached, Document ID: _____ <input type="checkbox"/> Not Applicable
9. List of Equipment/Activities Regulated under Title VI: <input type="checkbox"/> Attached, Document ID: _____ <input type="checkbox"/> Equipment/Activities On site but Not Required to be Individually Listed <input type="checkbox"/> Not Applicable
10. Alternative Methods of Operation: <input type="checkbox"/> Attached, Document ID: _____ <input type="checkbox"/> Not Applicable
11. Alternative Modes of Operation (Emissions Trading): <input type="checkbox"/> Attached, Document ID: _____ <input type="checkbox"/> Not Applicable
12. Identification of Additional Applicable Requirements: <input type="checkbox"/> Attached, Document ID: _____ <input type="checkbox"/> Not Applicable
13. Risk Management Plan Verification: <input type="checkbox"/> Plan previously submitted to Chemical Emergency Preparedness and Prevention Office (CEPPO). Verification of submittal attached (Document ID: _____) or previously submitted to DEP (Date and DEP Office: _____) <input type="checkbox"/> Plan to be submitted to CEPPO (Date required: _____) <input type="checkbox"/> Not Applicable
14. Compliance Report and Plan: <input type="checkbox"/> Attached, Document ID: _____ <input type="checkbox"/> Not Applicable
15. Compliance Certification (Hard-copy Required): <input type="checkbox"/> Attached, Document ID: _____ <input type="checkbox"/> Not Applicable

ATTACHMENT PW-FI-C1
AREA MAP

BEST AVAILABLE COPY

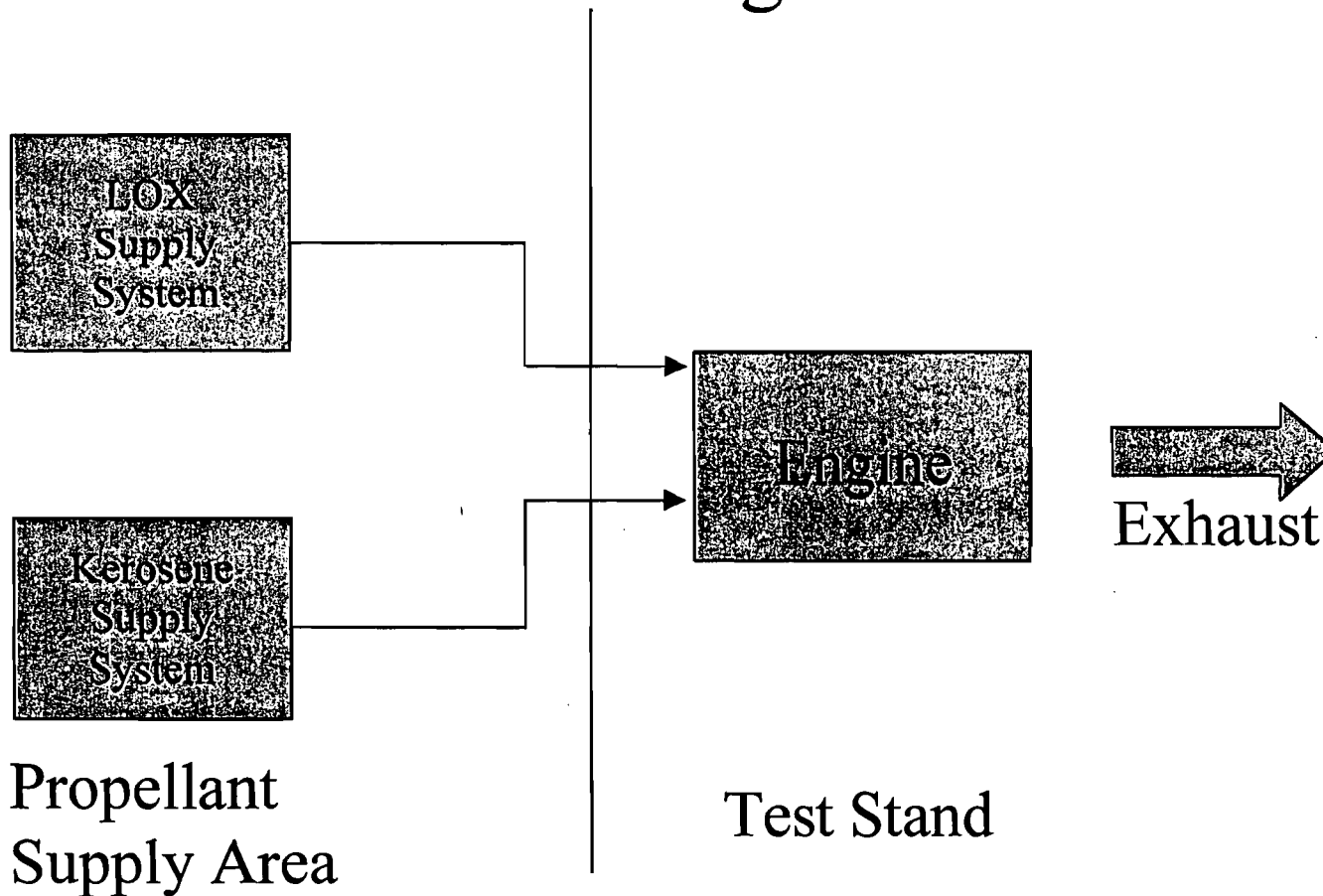


ATTACHMENT PW-FI-C2
FACILITY PLOT PLAN



**ATTACHMENT PW-FI-C3
PROCESS FLOW DIAGRAM**

LOX/Kerosene Engine Stand Process Diagram



III. EMISSIONS UNIT INFORMATION

A separate Emissions Unit Information Section (including subsections A through J as required) must be completed for each emissions unit addressed in this Application for Air Permit. If submitting the application form in hard copy, indicate, in the space provided at the top of each page, the number of this Emissions Unit Information Section and the total number of Emissions Unit Information Sections submitted as part of this application.

**A. GENERAL EMISSIONS UNIT INFORMATION
(All Emissions Units)**

Emissions Unit Description and Status

<p>1. Type of Emissions Unit Addressed in This Section: (Check one)</p> <p><input type="checkbox"/> This Emissions Unit Information Section addresses, as a single emissions unit, a single process or production unit, or activity, which produces one or more air pollutants and which has at least one definable emission point (stack or vent).</p> <p><input type="checkbox"/> This Emissions Unit Information Section addresses, as a single emissions unit, a group of process or production units and activities which has at least one definable emission point (stack or vent) but may also produce fugitive emissions.</p> <p><input checked="" type="checkbox"/> This Emissions Unit Information Section addresses, as a single emissions unit, one or more process or production units and activities which produce fugitive emissions only.</p>			
<p>2. Regulated or Unregulated Emissions Unit? (Check one)</p> <p><input type="checkbox"/> The emissions unit addressed in this Emissions Unit Information Section is a regulated emissions unit.</p> <p><input checked="" type="checkbox"/> The emissions unit addressed in this Emissions Unit Information Section is an unregulated emissions unit.</p>			
<p>3. Description of Emissions Unit Addressed in This Section (limit to 60 characters):</p> <p style="text-align: center;">LOX/kerosene rocket engine stand</p>			
<p>4. Emissions Unit Identification Number: <input checked="" type="checkbox"/> No ID</p> <p>ID: <input type="checkbox"/> ID Unknown</p>			
<p>5. Emissions Unit Status Code:</p> <p style="text-align: center;">C</p>	<p>6. Initial Startup Date:</p>	<p>7. Emissions Unit Major Group SIC Code:</p> <p style="text-align: center;">37</p>	<p>8. Acid Rain Unit? <input type="checkbox"/></p>
<p>9. Emissions Unit Comment: (Limit to 500 Characters)</p> <p style="text-align: center;">This emission unit consists of a LOX/kerosene rocket engine stand used for testing rocket engines that use liquid oxygen (LOX) and kerosene propellants. Exhaust is directed through a water-cooled silencer and a deflector.</p>			

Emissions Unit Control Equipment

1. Control Equipment/Method Description (Limit to 200 characters per device or method):

2. Control Device or Method Code(s):

Emissions Unit Details

1. Package Unit:

Manufacturer:

Model Number:

2. Generator Nameplate Rating:

MW

3. Incinerator Information:

Dwell Temperature:

°F

Dwell Time:

seconds

Incinerator Afterburner Temperature:

°F

**B. EMISSIONS UNIT CAPACITY INFORMATION
(Regulated Emissions Units Only)**

Emissions Unit Operating Capacity and Schedule

1. Maximum Heat Input Rate:		mmBtu/hr
2. Maximum Incineration Rate:	lb/hr	tons/day
3. Maximum Process or Throughput Rate:		
4. Maximum Production Rate:	318,000	gal
5. Requested Maximum Operating Schedule:		
	24 hours/day	7 days/week
	52 weeks/year	8,760 hours/year
6. Operating Capacity/Schedule Comment (limit to 200 characters):		
<p>Throughput relates to fuel consumption per year. For 12 rocket tests kerosene = 318,000 gal.</p>		

**C. EMISSIONS UNIT REGULATIONS
(Regulated Emissions Units Only)**

List of Applicable Regulations

62-210.300(1) – Air construction permits
62-210.300(2) – Air operation permits

D. EMISSION POINT (STACK/VENT) INFORMATION
(Regulated Emissions Units Only)

Emission Point Description and Type

1. Identification of Point on Plot Plan or Flow Diagram? EU1		2. Emission Point Type Code: 4	
3. Descriptions of Emission Points Comprising this Emissions Unit for VE Tracking (limit to 100 characters per point):			
4. ID Numbers or Descriptions of Emission Units with this Emission Point in Common:			
5. Discharge Type Code:	6. Stack Height: feet	7. Exit Diameter: feet	
8. Exit Temperature: °F	9. Actual Volumetric Flow Rate: acfm	10. Water Vapor: %	
11. Maximum Dry Standard Flow Rate: dscfm		12. Nonstack Emission Point Height: feet	
13. Emission Point UTM Coordinates: Zone: East (km): North (km):			
14. Emission Point Comment (limit to 200 characters): See Attachment A			

**E. SEGMENT (PROCESS/FUEL) INFORMATION
(All Emissions Units)**

Segment Description and Rate: Segment 1 of 1

1. Segment Description (Process/Fuel Type) (limit to 500 characters): Internal combustion engines – engine testing. Rocket engine.		
2. Source Classification Code (SCC): 2-04-002-02		3. SCC Units: tons of fuel
4. Maximum Hourly Rate: 1,334	5. Maximum Annual Rate: 1067	6. Estimated Annual Activity Factor:
7. Maximum % Sulfur:	8. Maximum % Ash:	9. Million Btu per SCC Unit:
10. Segment Comment (limit to 200 characters): Maximum hourly rate is based on a maximum annual fuel consumption of 1067 tons of kerosene.		

Segment Description and Rate: Segment of

1. Segment Description (Process/Fuel Type) (limit to 500 characters):		
2. Source Classification Code (SCC):		3. SCC Units:
4. Maximum Hourly Rate:	5. Maximum Annual Rate:	6. Estimated Annual Activity Factor:
7. Maximum % Sulfur:	8. Maximum % Ash:	9. Million Btu per SCC Unit:
10. Segment Comment (limit to 200 characters):		

F. EMISSIONS UNIT POLLUTANTS
(All Emissions Units)

1. Pollutant Emitted	2. Primary Control Device Code	3. Secondary Control Device Code	4. Pollutant Regulatory Code
CO			NS

**G. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION
(Regulated Emissions Units -
Emissions-Limited and Preconstruction Review Pollutants Only)**

Potential/Fugitive Emissions

1. Pollutant Emitted: CO		2. Total Percent Efficiency of Control: %	
3. Potential Emissions: 2.5 million lb/hour		4. Synthetically Limited? [<input checked="" type="checkbox"/>]	
		1000 tons/year	
5. Range of Estimated Fugitive Emissions: [] 1 [] 2 [] 3 _____ to _____ tons/year			
6. Emission Factor: See Attachment A		7. Emissions Method Code: 2	
Reference:			
8. Calculation of Emissions (limit to 600 characters): $CO = 694.4 \text{ lb/sec} \times 240 \text{ sec/test} \times 12 \text{ test/year} \times \text{ton}/2000 \text{ lb} = 1000 \text{ TPY}$ $CO = 1000 \text{ TPY} \times 2000 \text{ lb/ton} \times \text{year}/12 \text{ tests} \times \text{test}/240 \text{ sec} \times 60 \text{ sec/min} \times 60 \text{ min/hr} = 2.5 \text{ million lb/hr}$			
9. Pollutant Potential/Fugitive Emissions Comment (limit to 200 characters): Potential emissions are based on throughput of 1067 tons of fuel per year.			

Allowable Emissions Allowable Emissions _____ of _____

1. Basis for Allowable Emissions Code:		2. Future Effective Date of Allowable Emissions:	
3. Requested Allowable Emissions and Units:		4. Equivalent Allowable Emissions: lb/hour tons/year	
5. Method of Compliance (limit to 60 characters):			
6. Allowable Emissions Comment (Desc. of Operating Method) (limit to 200 characters):			

H. VISIBLE EMISSIONS INFORMATION
 (Only Regulated Emissions Units Subject to a VE Limitation)

Visible Emissions Limitation: Visible Emissions Limitation _____ of _____

1. Visible Emissions Subtype:	2. Basis for Allowable Opacity: <input type="checkbox"/> Rule <input type="checkbox"/> Other
3. Requested Allowable Opacity: Normal Conditions: _____ % Exceptional Conditions: _____ % Maximum Period of Excess Opacity Allowed: _____ min/hour	
4. Method of Compliance:	
5. Visible Emissions Comment (limit to 200 characters):	

I. CONTINUOUS MONITOR INFORMATION
 (Only Regulated Emissions Units Subject to Continuous Monitoring)

Continuous Monitoring System: Continuous Monitor _____ of _____

1. Parameter Code:	2. Pollutant(s):
3. CMS Requirement:	<input type="checkbox"/> Rule <input type="checkbox"/> Other
4. Monitor Information: Manufacturer: Model Number: _____ Serial Number: _____	
5. Installation Date:	6. Performance Specification Test Date:
7. Continuous Monitor Comment (limit to 200 characters):	

**J. EMISSIONS UNIT SUPPLEMENTAL INFORMATION
(Regulated Emissions Units Only)**

Supplemental Requirements

1. Process Flow Diagram [<input checked="" type="checkbox"/>] Attached, Document ID: <u> PW-FI-C3 </u> [<input type="checkbox"/>] Not Applicable [<input type="checkbox"/>] Waiver Requested
2. Fuel Analysis or Specification [<input type="checkbox"/>] Attached, Document ID: _____ [<input checked="" type="checkbox"/>] Not Applicable [<input type="checkbox"/>] Waiver Requested
3. Detailed Description of Control Equipment [<input type="checkbox"/>] Attached, Document ID: _____ [<input checked="" type="checkbox"/>] Not Applicable [<input type="checkbox"/>] Waiver Requested
4. Description of Stack Sampling Facilities [<input type="checkbox"/>] Attached, Document ID: _____ [<input checked="" type="checkbox"/>] Not Applicable [<input type="checkbox"/>] Waiver Requested
5. Compliance Test Report [<input type="checkbox"/>] Attached, Document ID: _____ [<input type="checkbox"/>] Previously submitted, Date: _____ [<input checked="" type="checkbox"/>] Not Applicable
6. Procedures for Startup and Shutdown [<input type="checkbox"/>] Attached, Document ID: _____ [<input checked="" type="checkbox"/>] Not Applicable [<input type="checkbox"/>] Waiver Requested
7. Operation and Maintenance Plan [<input type="checkbox"/>] Attached, Document ID: _____ [<input checked="" type="checkbox"/>] Not Applicable [<input type="checkbox"/>] Waiver Requested
8. Supplemental Information for Construction Permit Application [<input checked="" type="checkbox"/>] Attached, Document ID: <u> Attachment A </u> [<input type="checkbox"/>] Not Applicable
9. Other Information Required by Rule or Statute [<input type="checkbox"/>] Attached, Document ID: _____ [<input checked="" type="checkbox"/>] Not Applicable
10. Supplemental Requirements Comment:

Additional Supplemental Requirements for Title V Air Operation Permit Applications

11. Alternative Methods of Operation <input type="checkbox"/> Attached, Document ID: _____ <input checked="" type="checkbox"/> Not Applicable
12. Alternative Modes of Operation (Emissions Trading) <input type="checkbox"/> Attached, Document ID: _____ <input checked="" type="checkbox"/> Not Applicable
13. Identification of Additional Applicable Requirements <input type="checkbox"/> Attached, Document ID: _____ <input checked="" type="checkbox"/> Not Applicable
14. Compliance Assurance Monitoring Plan <input type="checkbox"/> Attached, Document ID: _____ <input checked="" type="checkbox"/> Not Applicable
15. Acid Rain Part Application (Hard-copy Required) <input type="checkbox"/> Acid Rain Part - Phase II (Form No. 62-210.900(1)(a)) Attached, Document ID: _____ <input type="checkbox"/> Repowering Extension Plan (Form No. 62-210.900(1)(a)1.) Attached, Document ID: _____ <input type="checkbox"/> New Unit Exemption (Form No. 62-210.900(1)(a)2.) Attached, Document ID: _____ <input type="checkbox"/> Retired Unit Exemption (Form No. 62-210.900(1)(a)3.) Attached, Document ID: _____ <input type="checkbox"/> Phase II NOx Compliance Plan (Form No. 62-210.900(1)(a)4.) Attached, Document ID: _____ <input type="checkbox"/> Phase NOx Averaging Plan (Form No. 62-210.900(1)(a)5.) Attached, Document ID: _____ <input checked="" type="checkbox"/> Not Applicable

PART B

**ATTACHMENT PSD-SPC
PSD ANALYSIS**

1.0 INTRODUCTION

United Technologies Corporation (UTC)-Pratt & Whitney located at 17900 Beeline Highway (SR 710), Jupiter, Palm Beach County, Florida is proposing to construct and operate LOX/kerosene rocket engine stand at the E-5 rocket test area in West Palm Beach, Florida (see Figure 1-1). Pratt & Whitney is a research and development facility that designs gas turbines and rocket engines for the Department of Defense and the National Aeronautics and Space Administration. Gas turbine engine operations include engineering, manufacturing, and testing of prototype engines and parts. Rocket engine operations include engineering, manufacturing, and testing prototype and commercial engines. A Materials Laboratory that develops and tests materials supports both operations.

The project requires an air construction permit and prevention of significant deterioration (PSD) review. To assist in performing the necessary licensing activities, Pratt & Whitney contracted Golder Associates Inc. (Golder) to perform the necessary air quality assessments for determining the project's compliance with state and federal new source review (NSR) regulation. The critical aspects of these assessments include the air quality impact analyses performed using an air dispersion model and the best available control technology (BACT) analyses performed to evaluate the selected emission control technology.

The proposed project is located at a major emitting facility and will be an air pollution source that will result in increases in potential air emissions. The U.S. Environmental Protection Agency (EPA) has implemented regulations for facilities requiring a PSD review. The PSD regulations are promulgated under 10 Code of Federal Regulations (CFR) Part 52.21 and implemented through delegation to the Florida Department of Environmental Protection (DEP). Florida's PSD regulations are codified in Rules 62-212.400, Florida Administrative Code (F.A.C.). Florida's regulations incorporate the EPA PSD regulations.

Based on the emissions from the proposed project, a PSD review is required for carbon monoxide (CO), a regulated pollutant.

Palm Beach County has been designated as an attainment or unclassifiable area for all criteria pollutants [i.e., attainment: ozone (O_3), particulate matter with aerodynamic diameter of 10 microns or less (PM_{10}), sulfur dioxide (SO_2), CO, and nitrogen dioxide (NO_2), and unclassifiable: lead] and is classified as a PSD Class II area for PM_{10} , SO_2 , and NO_2 ; therefore, the PSD review will follow the regulations pertaining to such designations.

The air permit application is divided into seven major sections.

- Section 2.0 presents a description of the new rocket test cell, including exhaust characteristics and stack parameters.
- Section 3.0 summarizes and reviews the PSD requirements applicable to the proposed project.
- Section 4.0 includes the control technology review with discussions on BACT.
- Section 5.0 discusses the ambient air monitoring analysis (pre-construction monitoring) required by PSD regulations.
- Section 6.0 presents a summary of the air modeling approach and results used in assessing compliance of the proposed project with ambient air quality standards (AAQS), PSD increments, and good engineering practice (GEP) stack height regulations.
- Section 7.0 provides the additional impact analyses for soils, vegetation, and visibility.

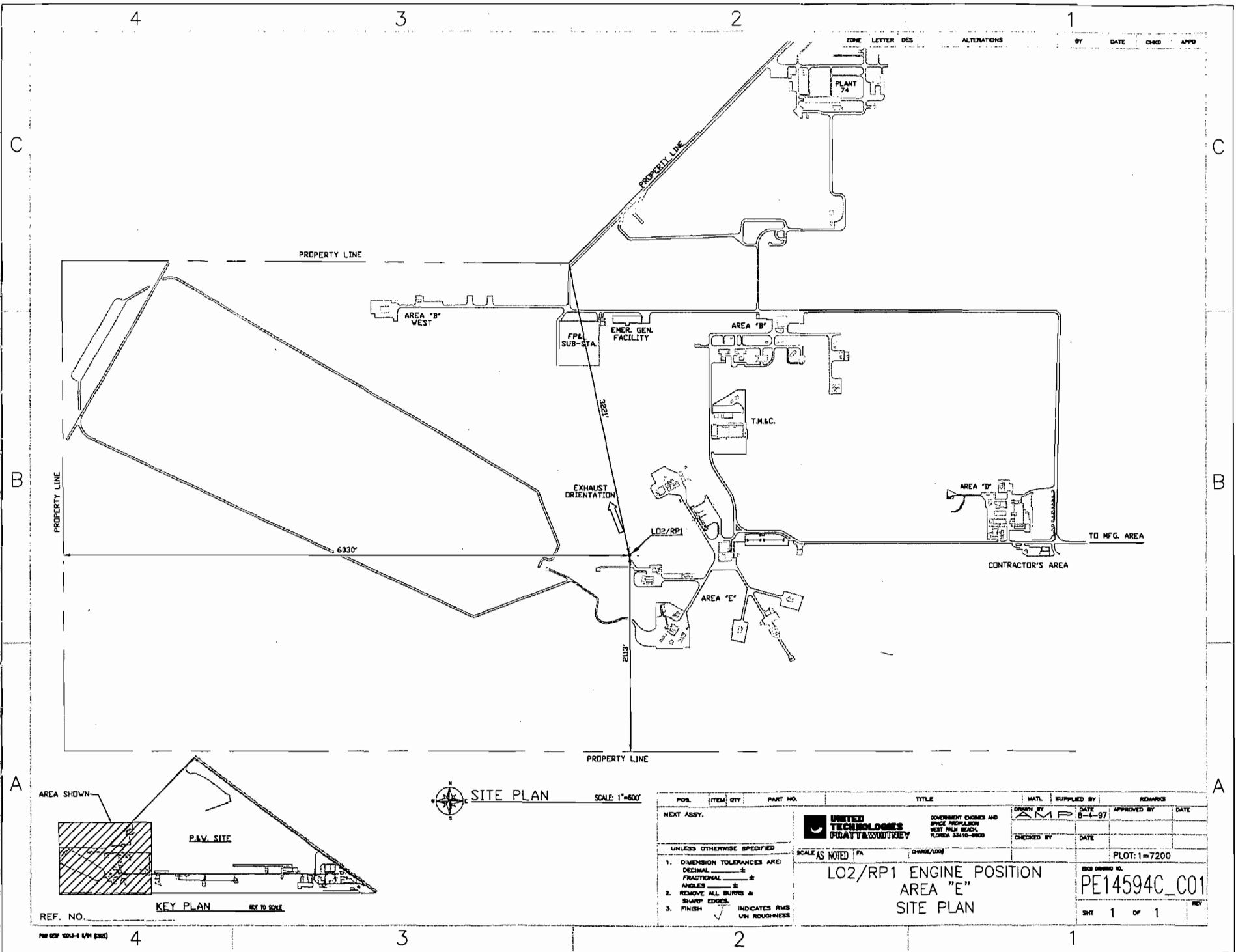
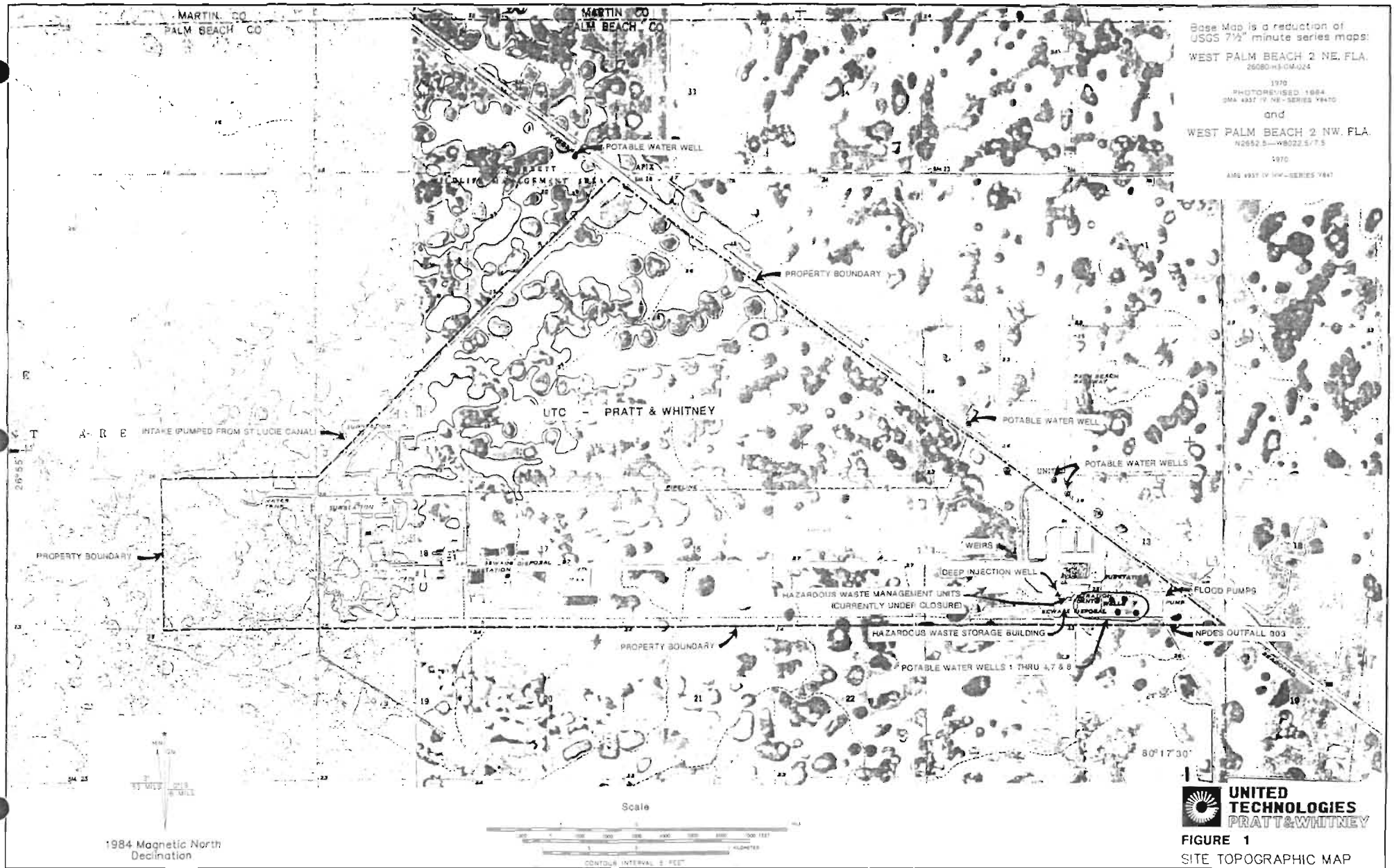


Figure 1-1. General Location

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2.0 PROJECT DESCRIPTION

2.1 EXISTING SITE DESCRIPTION

Pratt & Whitney operates a research and development facility that designs gas turbines and rocket engines for the Department of Defense and the National Aeronautics and Space Administration in West Palm Beach, Florida. The existing Pratt & Whitney facility consists of the manufacturing, testing, and Sikorsky helicopter areas in which the potential air pollutants are likely to be emitted. These areas which are designed to serve aircraft and rocket engine research and development, have received permits from Florida DEP to operate air pollution sources. Jet engine testing currently involves JP-8 fueled jet engines while rocket engine testing is currently only on liquid oxygen (LOX) and liquid hydrogen fueled rocket engines.

The project site, shown in Figures 2-1 and 2-2, consists of a portion of the 7,000-acre site that includes the Pratt & Whitney and Sikorsky. The project elevation will be approximately 5 ft above sea level. The terrain surrounding the site is flat.

Pratt & Whitney is proposing to construct a test cell that will be used for testing rocket engines that use LOX and kerosene propellants. The test cell will consist of the following systems:

- LOX and kerosene (RP1) supply tanks and distribution systems
- Engine containment can,
- Water cooled silencer,
- Exhaust gas deflector,
- Lined cooling water retention pond, and
- Elevated 1-million-gallon water supply tank.

Engines that will be tested will be situated inside the engine containment can. Fuel consisting of LOX and kerosene will be supplied to the engine from a 64,000-gallon LOX tank and a 36,000-gallon kerosene tank. The temperature and pressure of the LOX and kerosene must be able to operate within the range described below during the start and run of the test.

LOX Propellant

The inlet temperature of the LOX will be controlled through propellant conditioning and the inlet pressure of LOX will be dropped to a minimum of 40 pounds per square inch atmospheric (psia) during the run of the test.

Kerosene (RP1) Propellants

The inlet temperature of the kerosene (RP1) will be controlled through propellant conditioning. The kerosene consumption will be 1667 lbm during the start of the test with a maximum flow of 741.1 lbm/sec.

Once the engine starts, the exhaust is directed through the 20-ft diameter water-cooled silencer. The silencer is designed in a way to allow ambient air into the air stream to provide sufficient oxygen for complete combustion in case unburned fuel is present. Water from the elevated reservoir is pumped into the silencer cooling water jacket and injected into the gas stream to cool the gases and to aid in silencing. Water is used at a rate of 200,000 gallon per minute to cool the 6,000 °F exhaust gases. The gases are diverted upward using a deflector (see Figure 2-3) to avoid vegetation impacts. Unevaporated water in the silencer is directed to the retention pond where the water is analyzed. If the water is free of unburned fuel oil it is pumped into the elevated tank and re-used. If the water is contaminated, skimmers will be utilized to remove unburned fuel oils. Make-up water will be added to the elevated tank as needed.

2.2 CURRENT AIR EMISSIONS

The existing Pratt & Whitney facility consists of the manufacturing, testing and the Sikorsky helicopter areas. Both Pratt & Whitney and Sikorsky have received permits from Florida DEP to operate air pollution sources. The permit numbers for Pratt & Whitney and Sikorsky are: 099-0021-002-AV and 009-0815-001-AF, respectively. These permits were issued on January 6, 1999 and March 13, 1997 for Pratt & Whitney and Sikorsky and will expire on January 5, 2004 and March 2002.

The permitted pollution sources at the Pratt & Whitney facility consists of:

- 1 air compressors,
- 7 air heaters,
- 5 Small Boilers,
- 3 Vapor degreaser,
- 1 solvent still,
- 21 diesel storage tanks,
- 18 jet propulsion fuel storage tanks,
- 3 gasoline storage tanks,
- 5 spray booth,
- 2 acid scrubbers,
- 2 furnaces,
- 1 evaporator, and
- 2 dust collectors.

The permitted sources at Sikorsky include:

- 3 spray booths, and
- 1 downdraft work table with dust collector.

Based on information presented in the Title V permit application, the sources covered by these permits with an emission limited pollutant have a potential to emit the following amounts of pollutants:

<u>Pollutant</u>	<u>Amount (tons/yr)</u>
SO ₂	505.2
NO _x	2,342

Actual emissions for the site, in tons/year, have been:

<u>Pollutant</u>	<u>1998</u>	<u>1999</u>
SO ₂	14.2	9.8
NO _x	204.2	84.2

The above-referenced emissions indicate that Pratt & Whitney is a major source facility.

2.3 FUTURE MAXIMUM AIR EMISSIONS

The estimated maximum emissions and exhaust information for the rocket test cell is based on a LOX to fuel mix ratio of 2.72, a test run duration of 240 seconds, and 12 tests per year. The combustion process is expected to produce CO and trace amounts of SO₂ and nitrogen oxide (NO_x). Pratt & Whitney propose to monitor and maintain records of fuel use to demonstrate compliance.

The exhaust constituents at 105% power without afterburning and at a 2.72 fuel mixture ration are as follows:

Pollutant	Flow (lbm/sec)	Flow (kg/sec)
CO	694.4	315.0
CO ₂	1366.0	619.6
H	0.035	0.016
H ₂	17.12	7.765
H ₂ O	823.3	373.4
O	0.0	0.0
OH	0.293	0.133
O ₂	0.003	0.001
SO _x	<1	<1
NO _x	Trace	Trace

Source: Pratt & Whitney 1999

Based on a 2.72 fuel mixture, the emission rates presented above, and 12 test runs per year, the maximum potential annual emissions for the proposed facility for the regulated air pollutant CO is 1,000 tons per year (TPY) or 83.3 tons per tests run.

As discussed in Section 6.0, the air modeling analyses that addressed compliance with ambient standards were based on modeling the rocket tests in the mode, which produced the maximum impacts.

2.4 SITE LAYOUT, STRUCTURES, AND STACK SAMPLING FACILITIES

A plot plan of the proposed facility is presented in Figure 2-2. The dimensions of the buildings and structures are presented in Section 6.0.

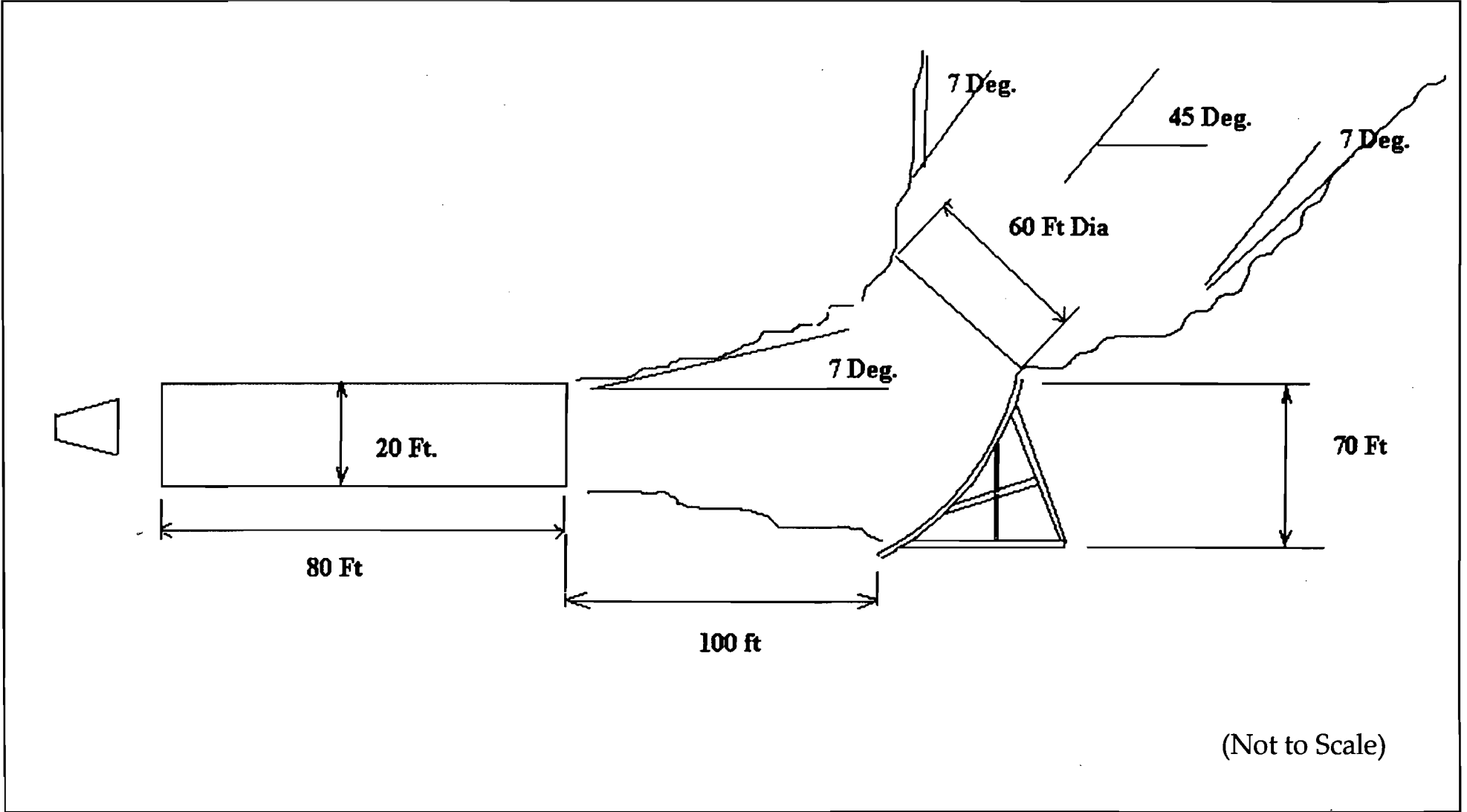


Figure 2-3
Simplified LOX/Kerosene Rocket Engine Stand Schematic

Source: Pratt & Whitney, 2000



3.0 AIR QUALITY REVIEW REQUIREMENTS AND APPLICABILITY

The following discussion pertains to the federal and state air regulatory requirements and their applicability to the proposed project.

3.1 NATIONAL AND STATE AAQS

The existing national and Florida AAQS are presented in Table 3-1. Primary AAQS were promulgated to protect the public health with an adequate margin of safety [42 United States Code (USC) Section 7409(b)(1)]. The primary AAQS are designed to protect children, the elderly, and those with respiratory diseases. Secondary AAQS were promulgated to protect the public welfare from any known or anticipated adverse effects associated with the presence of pollutants in the ambient air [42 USC Section 7409(b)(2)]. Areas of the country in violation of AAQS are designated as nonattainment areas, and new sources to be located in or near these areas may be subject to more stringent air permitting requirements.

3.2 PSD REQUIREMENTS

3.2.1 GENERAL REQUIREMENTS

Federal PSD requirements are contained in the CFR, Title 40, Part 52.21, and PSD of air quality. The state of Florida has adopted PSD regulations (Rule 62-212.400) that are essentially identical to the federal regulations. Florida's State Implementation Plan (SIP), which contains PSD regulations, has been approved by EPA; therefore, PSD approval authority has been granted to DEP.

PSD regulations require that all new major stationary facilities or major modifications to existing major facilities which emits air pollutants regulated under Clean Air Act (CAA) must be reviewed and a permit issued before the commencement of construction.

A "major facility" is defined as any one of 28 named source categories that have the potential to emit 100 TPY or more, or any other stationary facility that has the potential to emit 250 TPY or more, of any pollutant regulated under CAA. "Potential to emit" means the capability, at maximum design capacity, to emit a pollutant after the application of control equipment.

Subject to certain exceptions, a "major modification" is defined under PSD regulations as a physical or operational change at an existing major facility that increases the facility's emissions by an amount that is greater than the defined significant emission rates. PSD significant emission rates are shown in Table 3-2.

EPA's regulations identify certain increases above an air quality baseline concentration level of SO₂, PM₁₀, and NO₂ concentrations that would constitute significant deterioration. The EPA class designations and allowable PSD increments are presented in Table 3-1. The State of Florida has adopted the EPA class designations and allowable PSD increments for SO₂, PM₁₀, and NO₂ increments.

PSD review is used to determine whether significant air quality deterioration will result from the new or modified facility. Federal PSD requirements are contained in 40 CFR 52.21, *Prevention of Significant Deterioration of Air Quality*. The State of Florida has adopted PSD regulations which have been approved by EPA [Rule 62-212.400 F.A.C.]. Major facilities and major modifications are required to undergo the following analysis related to PSD for each pollutant emitted in significant amounts:

1. Control technology review,
2. Source impact analysis,
3. Air quality analysis (monitoring),
4. Source information, and
5. Additional impact analyses.

In addition to these analyses, a new facility also must be reviewed with respect to GEP stack height regulations. Discussions concerning each of these requirements are presented in the following sections.

3.2.2 CONTROL TECHNOLOGY REVIEW

The control technology review requirements of the federal and state PSD regulations require that all applicable federal and state emission-limiting standards be met, and that BACT be applied to control emissions from the source (Rule 62-212.410, F.A.C.). The BACT

requirements are applicable to all regulated pollutants for which the increase in emissions from the facility or modification exceeds the significant emission rate (see Table 3-2).

BACT is defined in 52.21 (b)(12) and Rule 62-210.200(40), F.A.C., as:

An emissions limitation (including a visible emission standard) based on the maximum degree of reduction of each pollutant subject to regulation under the Act which would be emitted by any proposed major stationary source or major modification which the Administrator, on a case-by-case basis, taking into account energy, environmental, and economic impacts, and other costs, determines is achievable through application of production processes and available methods, systems, and techniques (including fuel cleaning or treatment or innovative fuel combustion techniques) for control of such pollutant. In no event shall application of best available control technology result in emissions of any pollutant which would exceed the emissions allowed by any applicable standard under 40 CFR Parts 60 and 61. If the Administrator determines that technological or economic limitations on the application of measurement methodology to a particular part of a source or facility would make the imposition of an emission standard infeasible, a design, equipment, work practice, operational standard or combination thereof, may be prescribed instead to satisfy the requirement for the application of BACT. Such standard shall, to the degree possible, set forth the emissions reductions achievable by implementation of such design, equipment, work practice, or operation and shall provide for compliance by means which achieve equivalent results.

BACT was promulgated within the framework of the PSD requirements in the 1977 amendments of the CAA [Public Law 95-95; Part C, Section 165(a)(4)]. The primary purpose of BACT is to optimize consumption of PSD air quality increments and thereby enlarge the potential for future economic growth without significantly degrading air quality (EPA, 1978; 1980). Guidelines for the evaluation of BACT can be found in EPA's *Guidelines for Determining Best Available Control Technology (BACT)* (EPA, 1978) and in the *PSD Workshop Manual* (EPA, 1980). These guidelines were promulgated by EPA to provide a consistent approach to BACT and to ensure that the impacts of alternative emission control systems are measured by the same set of parameters. In addition, through implementation of these guidelines, BACT in one area may not be identical to BACT in another area. According to EPA (1980), "BACT analyses for the same types of emissions unit and the same pollutants in different locations or situations may determine that different control strategies should be

applied to the different sites, depending on site-specific factors. Therefore, BACT analyses must be conducted on a case-by-case basis."

The BACT requirements are intended to ensure that the control systems incorporated in the design of a proposed facility reflect the latest in control technologies used in a particular industry and take into consideration existing and future air quality in the vicinity of the proposed facility. BACT must, as a minimum, demonstrate compliance with New Source Performance Standards (NSPS) for a source (if applicable). An evaluation of the air pollution control techniques and systems, including a cost-benefit analysis of alternative control technologies capable of achieving a higher degree of emission reduction than the proposed control technology, is required. The cost-benefit analysis requires the documentation of the materials, energy, and economic penalties associated with the proposed and alternative control systems, as well as the environmental benefits derived from these systems. A decision on BACT is to be based on sound judgment, balancing environmental benefits with energy, economic, and other impacts (EPA, 1978).

Historically, a "bottom-up" approach consistent with the BACT Guidelines and PSD Workshop Manual has been used. With this approach, an initial control level, which is usually NSPS, is evaluated against successively more stringent controls until a BACT level is selected. However, EPA became concerned that the bottom-up approach was not providing the level of BACT decisions originally intended. As a result, in December 1987, the EPA Assistant Administrator for Air and Radiation mandated changes in the implementation of the PSD program, including the adoption of a new "top-down" approach to BACT decision making.

The top-down BACT approach essentially starts with the most stringent (or top) technology and emissions limit that have been applied elsewhere to the same or a similar source category. The applicant must next provide a basis for rejecting this technology in favor of the next most stringent technology or propose to use it. Rejection of control alternatives may be based on technical or economic infeasibility. Such decisions are made on the basis of physical differences (e.g., fuel type), locational differences (e.g., availability of water), or

significant differences that may exist in the environmental, economic, or energy impacts. The differences between the proposed facility and the facility on which the control technique was applied previously must be justified. EPA has issued a draft guidance document on the top-down approach entitled *Top-Down Best Available Control Technology Guidance Document* (EPA, 1990).

3.2.3 SOURCE IMPACT ANALYSIS

A source impact analysis must be performed for a proposed major source subject to PSD review for each pollutant for which the increase in emissions exceeds the significant emission rate (Table 3-2). The PSD regulations specifically provide for the use of atmospheric dispersion models in performing impact analyses, estimating baseline and future air quality levels, and determining compliance with AAQS and allowable PSD increments. Designated EPA models normally must be used in performing the impact analysis. Specific applications for other than EPA-approved models require EPA's consultation and prior approval.

Guidance for the use and application of dispersion models is presented in the EPA publication *Guideline on Air Quality Models (Revised)*. The source impact analysis for criteria pollutants that addresses compliance with AAQS and PSD Class II increments may be limited to the new or modified source if the net increase in impacts as a result of the new or modified source is below the significance levels, as presented in Table 3-1.

Various lengths of record for meteorological data can be used for impact analysis. A 5-year period can be used with corresponding evaluation of highest, second-highest short-term concentrations for comparison to AAQS or PSD increments. The term "HSH" refers to the highest of the second-highest concentrations at all receptors (i.e., the highest concentration at each receptor is discarded). The second-highest concentration is significant because short-term AAQS specify that the standard should not be exceeded at any location more than once a year. If fewer than 5 years of meteorological data are used in the modeling analysis, the highest concentration at each receptor normally must be used for comparison to air quality standards.

3.2.4 AIR QUALITY MONITORING REQUIREMENTS

In accordance with requirements of 40 CFR 52.21(m) and Rule 62-212.400(5)(f), F.A.C., any application for a PSD permit must contain an analysis of continuous ambient air quality data in the area affected by the proposed major stationary facility or major modification. For a new major facility, the affected pollutants are those that the facility potentially would emit in significant amounts. For a major modification, the pollutants are those for which the net emissions increase exceeds the significant emission rate (see Table 3-2).

Ambient air monitoring for a period of up to 1 year generally is appropriate to satisfy the PSD monitoring requirements. A minimum of 4 months of data is required. Existing data from the vicinity of the proposed source may be used if the data meet certain quality assurance requirements; otherwise, additional data may need to be gathered. Guidance in designing a PSD monitoring network is provided in EPA's *Ambient Monitoring Guidelines for Prevention of Significant Deterioration* (EPA, 1987a).

The regulations include an exemption that excludes or limits the pollutants for which an air quality analysis must be conducted. This exemption states that Florida DEP exempts a proposed major stationary facility or major modification from the monitoring requirements with respect to a particular pollutant if the emissions increase of the pollutant from the facility or modification would cause, in any area, air quality impacts less than the *de minimis* levels presented in Table 3-2 (Rule 62-212.400-3, F.A.C.).

3.2.5 SOURCE INFORMATION/GEP STACK HEIGHT

Source information must be provided to adequately describe the proposed project. The general type of information required for this project is presented in Section 2.0.

The 1977 CAA Amendments require that the degree of emission limitation required for control of any pollutant not be affected by a stack height that exceeds GEP or any other dispersion technique. On July 8, 1985, EPA promulgated final stack height regulations (EPA, 1985a). Identical regulations have been adopted by Florida DEP (Rule 62-210.550, F.A.C.). GEP stack height is defined as the highest of:

1. 65 m; or
2. A height established by applying the formula:
$$H_g = H + 1.5L$$
where: H_g = GEP stack height,
 H = Height of the structure or nearby structure, and
 L = Lesser dimension (height or projected width) of nearby structure(s); or
3. A height demonstrated by a fluid model or field study.

"Nearby" is defined as a distance up to five times the lesser of the height or width dimensions of a structure or terrain feature, but not greater than 0.8 kilometer (km). Although GEP stack height regulations require that the stack height used in modeling for determining compliance with AAQS and PSD increments not exceed the GEP stack height, the actual stack height may be greater.

The stack height regulations also allow increased GEP stack height beyond that resulting from the above formula in cases where plume impaction occurs. Plume impaction is defined as concentrations measured or predicted to occur when the plume interacts with elevated terrain. Elevated terrain is defined as terrain that exceeds the height calculated by the GEP stack height formula.

3.2.6 ADDITIONAL IMPACT ANALYSIS

In addition to air quality impact analyses, federal and State of Florida PSD regulations require analyses of the impairment to visibility and the impacts on soils and vegetation that would occur as a result of the proposed source [40 CFR 52.21(o); Rule 62-212.400(5)(e), F.A.C.]. These analyses are to be conducted primarily for PSD Class I areas. Impacts as a result of general commercial, residential, industrial, and other growth associated with the source also must be addressed. These analyses are required for each pollutant emitted in significant amounts (see Table 3-2).

3.3 NONATTAINMENT RULES

Based on the current nonattainment provisions (Rule 62-212.500, F.A.C.), all major new facilities and modifications to existing major facilities located in a nonattainment area must undergo nonattainment review. A new major facility is required to undergo this review if the proposed pieces of equipment have the potential to emit 100 TPY or more of the nonattainment pollutant. A major modification at a major facility is required to undergo review if it results in a significant net emission increase of 40 TPY or more of the nonattainment pollutant or if the modification is major (i.e., 100 TPY or more).

For major facilities or major modifications that locate in an attainment or unclassifiable area, the nonattainment review procedures apply if the source or modification is located within the area of influence of a nonattainment area. The area of influence is defined as an area that is outside the boundary of a nonattainment area but within the locus of all points that are 50 km outside the boundary of the nonattainment area. Based on Rule 62-2.500(2)(c)2.a., F.A.C., all VOC sources that are located within an area of influence are exempt from the provisions of NSR for nonattainment areas. Sources that emit other nonattainment pollutants and are located within the area of influence are subject to nonattainment review unless the maximum allowable emissions from the proposed source do not have a significant impact within the nonattainment area.

3.4 EMISSION STANDARDS

3.4.1 NEW SOURCE PERFORMANCE STANDARDS

The NSPS are a set of national emission standards that apply to specific categories of new sources. As stated in the CAA Amendments of 1977, these standards "shall reflect the degree of emission limitation and the percentage reduction achievable through application of the best technological system of continuous emission reduction the Administrator determines has been adequately demonstrated."

The proposed project will not be subject to NSPS. The proposed 36,000-gallon kerosene tank is exempt from 40 CFR Part 60, Subpart Kb.

3.4.2 FLORIDA AIR PERMITTING REQUIREMENTS

The Florida DEP regulations require any new source to obtain an air permit prior to construction. Major new sources must meet the appropriate PSD and nonattainment requirements as discussed previously. Required permits and approvals for air pollution sources include NSR for nonattainment areas, PSD, NSPS, National Emission Standards for Hazardous Air Pollutants (NESHAP), Permit to Construct, and Permit to Operate. The requirements for construction permits and approvals are contained in Rules 62-4.030, 62-4.050, 62-4.052, 62-4.210, and 62-210.300(1), F.A.C. Specific emission standards are set forth in Chapter 62-296, F.A.C.

3.4.3 LOCAL AIR REGULATIONS

Palm Beach County has not adopted its own air regulations.

3.5 SOURCE APPLICABILITY

3.5.1 AREA CLASSIFICATION

The project site is located in Palm Beach County, which has been designated by EPA and DEP as an attainment area for all criteria pollutants. Palm Beach County and surrounding counties are designated as PSD Class II areas for SO₂, particulate matter (PM) [total suspended particulate matter (TSP)], and NO₂. The nearest Class I areas to the site is the Everglades National Park (NP) which is about 120km (74.9 miles) from the site.

3.5.2 PSD REVIEW

3.5.2.1 Pollutant Applicability

The proposed project is considered to be a modification of a major facility because the potential emissions exceed the PSD major threshold and that potential emissions from at least one regulated pollutant emitted by the new project is estimated to exceed the TPY significant emission rate. Therefore, PSD review is required for each pollutant for which the emissions are considered major or exceed the PSD significant emission rates. As shown in Table 3-3, potential emissions for CO exceed the PSD significant emission rate. Because the proposed project's impacts for this pollutant is predicted to be below the significant impact levels, a modeling analysis incorporating the impacts from other sources is not required.

As part of the PSD review, a PSD Class I increment analysis is required if the proposed project's impacts are greater than the proposed EPA Class I significant impact levels. The nearest Class I areas to the plant site is about 120 km from the site. A PSD Class I increment-consumption analysis is not required because the project's CO impacts have no designated applicable EPA Class I significant impact levels.

3.5.2.2 Ambient Monitoring

Based on the estimated pollutant emissions from the proposed project (see Table 3-4), a pre-construction ambient air quality monitoring analysis is required for CO. If the net increase in impact of the pollutant is less than the applicable *de minimis* monitoring concentration (575 TPY in the case of CO), then an exemption from the pre-construction ambient monitoring requirement may be obtained [52.21(i)(8)]. In addition, if an acceptable ambient monitoring method for the pollutant has not been established by EPA, monitoring is not required.

If pre-construction monitoring data are required to be submitted, data collected at or near the project site can be submitted, based on existing air quality data or the collection of onsite data.

As shown in Table 3-4, the proposed project's impacts are predicted to be above the applicable *de minimis* monitoring concentration levels and criteria. Therefore, the project is required to comply with the preconstruction ambient air quality monitoring requirements.

3.5.2.3 GEP Stack Height Impact Analysis

The GEP stack height regulations allow any stack to be at least 65 m [213 feet (ft)] high. The proposed test cell stack for the project will not exceed the GEP stack height. However, as discussed in Section 6.0, Air Quality Modeling Approach, since the stack height is less than GEP, building downwash effects must be considered in the modeling analysis. As a result, the potential for downwash of the test cell's emissions caused by nearby structures are included in the modeling analysis.

3.5.3 NONATTAINMENT REVIEW

The project site is located in Palm Beach County, which is classified as an attainment area for all criteria pollutants. Therefore, nonattainment requirements are not applicable.

Table 3-1. National and State AAQS, Allowable PSD Increments, and Significant Impact Levels

Pollutant	Averaging Time	AAQS ($\mu\text{g}/\text{m}^3$)			PSD Increments ($\mu\text{g}/\text{m}^3$)		Significant Impact Levels ($\mu\text{g}/\text{m}^3$) ^b
		Primary Standard	Secondary Standard	Florida	Class I	Class II	
Particulate Matter ^c (PM ₁₀)	Annual Arithmetic Mean	50	50	50	4	17	1
	24-Hour Maximum	150	150	150	8	30	5
Sulfur Dioxide	Annual Arithmetic Mean	80	NA	60	2	20	1
	24-Hour Maximum ^a	365	NA	260	5	91	5
	3-Hour Maximum ^a	NA	1,300	1,300	25	512	25
Carbon Monoxide	8-Hour Maximum ^a	10,000	10,000	10,000	NA	NA	500
	1-Hour Maximum ^a	40,000	40,000	40,000	NA	NA	2,000
Nitrogen Dioxide	Annual Arithmetic Mean	100	100	100	2.5	25	1
Ozone ^c	8-Hour Maximum ^d	157	157	157	NA	NA	NA
Lead	Calendar Quarter Arithmetic Mean	1.5	1.5	1.5	NA	NA	NA

Note: Particulate matter (PM₁₀) = particulate matter with aerodynamic diameter less than or equal to 10 micrometers.

NA = Not applicable, i.e., no standard exists.

^a Short-term maximum concentrations are not to be exceeded more than once per year.

^b Maximum concentrations are not to be exceeded.

^c On July 18, 1997, EPA promulgated revised AAQS for PM and O₃. For particulate matter, PM_{2.5} standards were introduced with a 24-hour standard of 65 $\mu\text{g}/\text{m}^3$ (3-year average of 98th percentile) and an annual standard of 15 $\mu\text{g}/\text{m}^3$ (3-year average at community monitors). These standards have been stayed by a court case against EPA; implementation of these standards appears to be years away.

^d 0.08 parts per million (ppm); achieved when 3-year average of 99th percentile is 0.08 ppm or less. These have been stayed by a court case against EPA. EPA is appealing. The 1-hour standard of 0.12 ppm is still applicable. Florida DEP has not yet adopted the new standards.

Sources: Federal Register, Vol. 43, No. 118, June 19, 1978.; 40 CFR 50; 40 CFR 52.21.; Chapter 62-204, F.A.C.

Table 3-2. PSD Significant Emission Rates and *De Minimis* Monitoring Concentrations

Pollutant	Regulated Under	Significant Emission Rate (TPY)	<i>De Minimis</i> Monitoring Concentration ^a (µg/m ³)
Sulfur Dioxide	NAAQS, NSPS	40	13, 24-hour
Particulate Matter [PM (TSP)]	NSPS	25	10, 24-hour
Particulate Matter (PM ₁₀)	NAAQS	15	10, 24-hour
Nitrogen Dioxide	NAAQS, NSPS	40	14, annual
Carbon Monoxide	NAAQS, NSPS	100	575, 8-hour
Volatile Organic Compounds (Ozone)	NAAQS, NSPS	40	100 TPY ^b
Lead	NAAQS	0.6	0.1, 3-month
Sulfuric Acid Mist	NSPS	7	NM
Total Fluorides	NSPS	3	0.25, 24-hour
Total Reduced Sulfur	NSPS	10	10, 1-hour
Reduced Sulfur Compounds	NSPS	10	10, 1-hour
Hydrogen Sulfide	NSPS	10	0.2, 1-hour
Mercury	NESHAP	0.1	0.25, 24-hour
MWC Organics	NSPS	3.5x10 ⁻⁶	NM
MWC Metals	NSPS	15	NM
MWC Acid Gases	NSPS	40	NM
MSW Landfill Gases	NSPS	50	NM

Note: Ambient monitoring requirements for any pollutant may be exempted if the impact of the increase in emissions is below *de minimis* monitoring concentrations.

NAAQS = National Ambient Air Quality Standards.

NM = No ambient measurement method established; therefore, no *de minimis* concentration has been established.

NSPS = New Source Performance Standards.

NESHAP = National Emission Standards for Hazardous Air Pollutants.

µg/m³ = micrograms per cubic meter.

MWC = Municipal waste combustor

MSW = Municipal solid waste

^a Short-term concentrations are not to be exceeded.

^b No *de minimis* concentration; an increase in volatile organic compound (VOC) emissions of 100 TPY or more will require monitoring analysis for O₃.

^c Any emission rate of these pollutants.

Sources: 40 CFR 52.21.

Rule 62-212.400

Table 3-3. Maximum Emissions Due to the Proposed LOX/Kerosene Rocket Engine Stand Compared to the PSD Significant Emission Rates

Pollutant	Pollutant Emissions (TPY)		PSD Review
	Potential Emissions from Proposed Facility	Significant Emission Rate	
Sulfur Dioxide	NEG	40	No
Particulate Matter [PM (TSP)]	NEG	25	No
Particulate Matter (PM ₁₀)	NEG	15	No
Nitrogen Dioxide	NEG	40	No
Carbon Monoxide	1,000	100	Yes
Volatile Organic Compounds	NEG	40	No

Note: NEG = Negligible.

Table 3-4. Predicted Net Increase in Impacts Due to the Proposed LOX/Kerosene Rocket Engine Stand Project Compared to PSD *De Minimis* Monitoring Concentrations

Pollutant	Concentration ($\mu\text{g}/\text{m}^3$)	
	Predicted Increase in Impacts ^a	<i>De Minimis</i> Monitoring Concentration; Averaging Period
Sulfur Dioxide	NEG	13; 24-hour
Particulate Matter (PM_{10})	NEG	10; 24-hour
Nitrogen Dioxide	NEG	14; annual
Carbon Monoxide	627	575; 8-hour
Ozone	NEG	100 tons/year of VOCs

Note: NA = not applicable.
 NM = no ambient measurement method.
 TPY = tons per year.
 NEG = negligible

4.0 CONTROL TECHNOLOGY REVIEW

4.1 APPLICABILITY

The PSD regulations require new major stationary sources to undergo a control technology review for each pollutant that may potentially be emitted in amounts that are greater than the PSD significant emission rates shown in Table 3-2. In this case, the control technology review requirements of the PSD regulations are applicable to emissions of CO (see Section 3.0). The maximum potential annual emissions for CO is 1,000 TPY.

This section presents the applicable NSPS and the proposed BACT for this pollutant. The approach to the BACT analysis is based on the regulatory definitions of BACT, as well as EPA's current policy guidelines requiring a top-down approach. A BACT determination requires an analysis of the economic, environmental, and energy impacts of the proposed and alternative control technologies [see 40 CFR 52.21(b)(12); and Rule 62-210.200(42), and Rule 62-214.410, F.A.C.]. The analysis must, by definition, be specific to the project (i.e., case-by-case).

4.2 NEW SOURCE PERFORMANCE STANDARDS

No applicable NSPS for exists for rocket testing

4.3 BEST AVAILABLE CONTROL TECHNOLOGY

Emissions of CO are dependent upon the combustion design, which is a result of the operating specifications, including the air-to-fuel ratio, staging of combustion, and the amount of water injected. Where possible, such pollution prevention controls, such as combustion controls are preferred since they can be both cost effective and eliminate other environmental and energy impacts of add-on controls. Additionally to control the CO emissions effectively the emissions must be captured. This will be difficult with the large size and thrust of the exhaust stream.

The rockets to be tested in the proposed test cell have designs to optimize combustion efficiency and minimize CO by the introduction of air to the combustion process. The silencer has been designed with open ports around the silencer near the rocket test cell. The

test burns will also be limited to 240 seconds which should also minimized the amount of CO emissions.

4.3.1 PROPOSED BACT AND RATIONALE

Combustion design is proposed as BACT, as there are adverse technical and economic consequences of using control on the emissions from 1 million lb thrust of the LOX/kerosene rocket engine stand. The proposed BACT emission rates for CO will be controlled by introducing and controlling the air-fuel ratio to allow for efficient combustion. Control is considered unreasonable for the following reasons:

1. Control is not feasible due to the short duration of the tests, the exhaust temperature, and the volume flow rate. Control has never been preformed on this scale which has flow rates approaching 3 to 4 times the size of the largest combustion turbine.
2. Hypothetically if control could be achieved, the economic impacts would be significant. A massive infrastructure would be required to capture the exhaust stream from the rocket and the control device would be required to withstand a maximum thrust force of 1 million pounds of force and high temperatures. The capital cost to construct the infrastructure is estimated at about 100 million,
3. Hypothetical if one could be install a control device such as an incinerator, the capital cost for a conventional incinerator would be about \$579 million with an annualized cost of \$68 million.

Combustion design is proposed as BACT as a result of the technical and economic consequences of control equipment on a rocket exhaust are not feasible.

The air quality impacts from the LOX/kerosene rocket engine stand are slightly above the significant impact levels for CO but well below the applicable AAQS. The maximum CO impacts are less than 0.05 percent of the applicable AAQS for each test run. Therefore, no significant environmental benefit would be realized by the installation of CO control equipment. There would also be no secondary benefits, such as reductions in acidic deposition, to reducing CO.

The evaluation clearly indicates that the use of control equipment is not cost effective and is inappropriate as BACT. The control of the CO emissions from the entire 1 million lb thrust of the LOX/kerosene rocket engine stand is considered unfeasible from the ability to construct control equipment capable to withstand the temperature and thrust.

Moreover, the uncertainty associated with CO capture for such a large exhaust stream with a large thrust force suggests that such an option is unreasonable as BACT. Indeed, no rocket test exhaust of this scale has been required in any state to meet a BACT requirement with the cost and uncertainties associated with control emissions from the firing of the test rockets. The add-on control options are rejected as BACT.

Economic and energy considerations were not addressed due to the unfeasible nature of providing control equipment as described above.

5.0 AMBIENT MONITORING ANALYSIS

The CAA requires that an air quality analysis be conducted for each criteria and noncriteria pollutant subject to regulation under the Act before a major stationary source is constructed. Criteria pollutants are those pollutants for which AAQS have been established. Noncriteria pollutants are those pollutants that may be regulated by emission standards, but no AAQS have been established. This analysis may be performed by the use of modeling and/or by monitoring the air quality.

The project's maximum impacts are compared to *de minimis* air monitoring levels to determine whether it would be necessary to submit continuous monitoring data to DEP prior to construction. For all applicable pollutants that have emission increases that will exceed the PSD significant emission rate due for a proposed project, a *de minimis* impact analysis is performed to determine whether the project's maximum predicted impacts alone will exceed the EPA *de minimis* levels at any off-plant property areas in the vicinity of the plant. Current Florida DEP policies stipulate that the highest annual average and highest short-term concentrations are to be compared to the applicable *de minimis* monitoring levels.

A proposed major stationary facility or major modification may be exempt from the monitoring requirements with respect to a particular pollutant if the emissions increase of the pollutant from the facility or modification would result in maximum air quality impacts below the *de minimis* levels.

For this project, the proposed project's maximum CO impacts were calculated in the vicinity of the plant for comparison to *de minimis* levels following Florida DEP policies. The maximum predicted 8-hour CO concentration of $627 \mu\text{g}/\text{m}^3$ is greater than the CO *de minimis* concentration of $575 \mu\text{g}/\text{m}^3$. Therefore, the project is subject to preconstruction ambient monitoring requirements.

A major source can waive the ambient monitoring analysis requirement if existing ambient air quality data representative of the project site location can be used in lieu of the air monitoring requirement. For this analysis, existing CO air monitoring data collected from West Palm Beach are provided to satisfy this requirement. The CO monitoring data are

summarized in Table 5-1. Based on these data, the highest, second-highest measured 1-hour and 8-hour concentrations were selected as background concentrations. These concentrations are 5.6 part per million ($6,440 \mu\text{g}/\text{m}^3$) and 3.0 ppm ($3,450 \mu\text{g}/\text{m}^3$), respectively, for the 1-hour and 8-hour averaging times. These background concentrations were added to the modeled HSH concentrations to estimate total air quality for comparison to AAQS.

Table 5-1. Summary of CO Ambient Monitoring Data from West Palm Beach

Year	County	Station ID	Monitor Location	Number of Observations	Concentration (ppm)			
					Maximum 1-Hour	2nd-High 1-Hour	Maximum 8-Hour	2nd-High 8-Hour
1998	Palm Beach	12-099-1004	Belevedere Road	8,280	6.0	5.6	2.7	2.5
1999	Palm Beach	12-099-1004	Belevedere Road	4,073	4.2	3.6	2.6	2.1
1998	Palm Beach	12-009-1006	S. Military Trail	8,476	5.4	5.3	3.0	3.0
1999	Palm Beach	12-009-1006	S. Military Trail	4,262	5.5	5.2	2.3	2.3

Note: Concentrations in bold are selected as background for the AAQS analysis

ppm = parts per million.

1 ppm = 1,150 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$)

6.0 AIR QUALITY IMPACT ANALYSIS

6.1 GENERAL MODELING APPROACH

The general modeling approach followed EPA and Florida DEP modeling guidelines for determining compliance with AAQS and PSD increments. For all applicable pollutants whose emission's increase exceed the PSD significant emission rate, a significant impact analysis is performed to determine whether the project alone will result in predicted impacts that will exceed the EPA significant impact levels at any off-plant property areas in the vicinity of the plant.

If the project's impacts are above the significant impact levels, then a more detailed air modeling analysis that includes background sources is performed. Current Florida DEP policies stipulate that the highest annual average and highest short-term (i.e., 24 hours or less) concentrations are to be compared to the applicable significant impact levels. Based on the screening analysis modeling results, refinements are generally performed in the vicinity of the maximum concentration from the screening analysis. The refinements are performed with denser receptor grid to obtain the maximum concentrations with a receptor grid spacing of 100 meters (m) or less.

Because the proposed project's emissions will exceed the EPA significant emission rate for only CO, a significant impacts analysis was performed for that pollutant in the vicinity of the project site following Florida DEP policies.

Generally, if a project also is within 150-200 km of a PSD Class I area, then a significant impact analysis is also performed for that PSD Class I area. However, because allowable PSD increments have not been promulgated for CO, a PSD Class I significant impact analysis is not required.

6.1.1 SIGNIFICANT IMPACT ANALYSIS

For each pollutant that is emitted by the project in amounts greater than the EPA significant emission rate, a significant impact analysis is required to determine if the maximum predicted impacts from the proposed project alone are greater than the significant impact levels and the *de minimis* monitoring levels. The maximum concentrations are predicted

using 5 years of hourly meteorological data and by selecting the highest annual and the highest short-term concentrations for comparison to the significant impact levels and the *de minimis* levels.

6.1.2 AAQS ANALYSIS

If the project's impacts are greater than the significant impact levels, the air modeling analyses must consider other nearby sources and background concentrations, and calculate the cumulative impact of these sources for comparison to ambient standards. In general, when 5 years of meteorological data are used in the analysis, the highest annual and the highest, second-highest (HSH) concentrations are compared to the applicable AAQS. The HSH concentration is calculated for a receptor field by:

1. Eliminating the highest concentration predicted at each receptor,
2. Identifying the second-highest concentration at each receptor, and
3. Selecting the highest concentration among these second-highest concentrations.

This approach is consistent with the method used to determine compliance with AAQS and allowable PSD increments, which permit a short-term average concentration to be exceeded once per year at each receptor.

An air quality modeling analysis was performed to determine if the CO emissions released during a 240-second test burn of a LOX/kerosene rocket engine stand would comply with the AAQS. CO has two AAQS: an 8-hour averaging time standard of $10,000 \mu\text{g}/\text{m}^3$ and a 1-hour averaging time standard of $40,000 \mu\text{g}/\text{m}^3$. Compliance with both the 8-hour and 1-hour AAQS was evaluated in this study.

To develop the maximum short-term concentrations for the proposed project, the modeling approach was divided into screening and refined phases to reduce the computation time required to perform the modeling analysis. For this study, the only difference between the two modeling phases is the density of the receptor grid spacing employed when predicting concentrations. A screening receptor grid is a coarse resolution receptor grid that covers a wide area in the vicinity of the project site. Once all areas of maximum concentrations are identified on the screening grid, one or more refined receptor grids are placed over the

area(s) of the predicted maximum screening grid concentration(s) to obtain a refined maximum concentration that is compared to the AAQS. Concentrations are predicted for the screening phase using a coarse receptor grid and a 5-year meteorological data record.

Refinements of the maximum predicted concentrations from the screening grid are typically performed in the vicinity of the receptors of the screening receptor grid that produced the HSH concentrations over the 5-year period. However, if other second-highest concentrations from other years in the screening analysis are within 10 percent of the HSH concentration, those other concentrations are also refined as well. The domain of the refined receptor grid typically extends to all adjacent screening receptors surrounding the screening receptor with the maximum predicted concentration. The air dispersion model is then executed with the refined grid for the entire year of meteorology during which the screening concentration occurred. This approach is used to ensure that a valid HSH concentration is obtained. A more detailed description of the model used, along with the emission inventory, meteorological data, and screening receptor grids used in the analysis, are presented in the following sections.

6.1.3 MODEL SELECTION

The Industrial Source Complex Short-term (ISCST3, Version 99155) dispersion model (EPA, 1997) was used to evaluate the pollutant impacts due to the proposed LOX/kerosene rocket engine standproject. The model is maintained by the EPA on its internet website, Support Center for Regulatory Air Models (SCRAM), within the Technical Transfer Network (TTN). A listing of ISCST3 model features is presented in Table 6-1. The ISCST3 model is designed to calculate hourly concentrations based on hourly meteorological data (i.e., wind direction, wind speed, atmospheric stability, ambient temperature, and mixing heights). The ISCST3 model is applicable to sources located in either flat or rolling terrain where terrain heights do not exceed stack heights. These areas are referred to as simple terrain. The model can also be applied in areas where the terrain exceeds the stack heights. These areas are referred to as complex terrain.

Since the terrain within 50 km of the site can be described as simple, i.e., flat to gently rolling, a simple terrain model was selected to predict maximum ground-level concentrations.

In this analysis, the EPA regulatory default options were used to predict all maximum impacts. The ISCST3 model can run in the rural or urban land use mode which affects stability dispersion coefficients, wind speed profiles, and mixing heights. Land use can be characterized based on a scheme recommended by EPA (Auer, 1978). If more than 50 percent of the land use within a 3-km radius around a project is classified as industrial or commercial, or high-density residential, then the urban option should be selected. Otherwise, the rural option is appropriate. Based on the land-use within a 3-km radius of the Pratt & Whitney site are largely undeveloped lands(see Figure 2-1), the rural dispersion coefficients were used in the modeling analysis.

6.1.4 METEOROLOGICAL DATA

Meteorological data used in the ISCST3 model to determine CO air quality impacts consisted of a concurrent 5-year period of hourly surface weather observations and twice-daily upper air soundings from the National Weather Service (NWS) station at the Palm Beach International Airport at West Palm Beach, Florida. The 5-year period of meteorological data was from 1987 through 1991. These data are the most recent 5-year period of meteorological data that have been approved by DEP for use in the modeling. The NWS station at West Palm Beach is located approximately 39 km (24 miles) southeast of the Pratt & Whitney site. The meteorological data from West Palm Beach are assumed to be representative of the project site because both the project site and the weather station are located in similar topographical areas and are situated in southern Florida to experience similar weather conditions, such as frontal passages.

The wind speed, cloud cover, and cloud ceiling values were used in the ISCST3 meteorological preprocessor program, PCRAMMET, to determine atmospheric stability using the Turner stability scheme. Based on the temperature measurements at morning and afternoon, mixing heights were calculated with the radiosonde data from PBI using the Holzworth approach (1972). Hourly mixing heights were derived from the morning and

afternoon mixing heights using the interpolation method developed by EPA (Holzworth, 1972). The hourly surface data and mixing heights were used to develop a sequential series of hourly meteorological data for use in the ISCST3 model (i.e., wind direction, wind speed, temperature, stability, and mixing heights). Because the observed hourly wind directions were classified into one of 36 10-degree sectors, the wind directions were randomized within each 10-degree sector to account for the expected variability in air flow.

6.1.5 SOURCE INFORMATION

A schematic diagram of the engine's discharged CO emissions is presented in Figure 1. Upon discharge from the engine, the gases travel through a tube-shaped water-cooled silencer that is 100-ft long and has a diameter of 20 ft. The gases are then directed to an exhaust deflector that is located 100 ft beyond the end of the silencer. Upon leaving the top of the deflector, the gases are re-directed at a 45-degree angle relative to the ground and are assumed contained within a 60-ft diameter circular area. The outer parts of this area are assumed deflected up to 7 degrees from the mean 45-degree discharge angle of the gases by air entrainment and frictional forces.

Although the engine emissions would be characterized as fugitive in nature, the CO emissions were simulated as a point source in the modeling to account for the emissions' exit temperature and exit velocity as well as the limited area of emission. The design of the point sources was based on the following additional information provided by Pratt & Whitney staff engineers.

1. The height of the top of the deflector is 70 ft. This height was assumed as the effective stack release height for the air modeling analysis.
2. The diameter of the exhaust gases was modeled as 60 ft, which is equal to the effective gas column diameter as it is leaving the top of the deflector.
3. The minimum speed and temperature of the exhaust gases leaving the deflector are estimated to be 65 feet per second (ft/sec), and 230°F (at ambient pressure), respectively. The velocity is calculated by assuming a density of 0.05 pound-mass per cubic feet, based on the gas stream comprised of steam that is used for cooling and the engine exhaust, the latter of which is comprised of mostly kerosene and oxygen.

4. Because the ISCST3 model does not account for non-vertical stacks, the vertical component of the exit gas was determined based on the lowest discharge angle. For the modeling analysis, a reduced velocity was used that is equal to the full speed times a factor of 0.616 (i.e., the sine of 38 degrees). This represents the vertical component of the angled velocity, calculated at the lowest mean discharge angle (45 minus 7 degrees) of the gas stream as it leaves the top of the deflector.

CO emissions were calculated based on a maximum power level of 100 percent for 240 seconds. The maximum emission rate is 694.4 pounds CO per second or approximately 83.2 tons CO per test. A maximum hourly emission rate was determined by dividing the total emissions from a test over an hour. A summary of the modeled emission rates and stack parameters used in the air modeling analysis is presented in Table 6-2.

6.1.6 RECEPTOR LOCATIONS

Concentrations were predicted at receptors located on and beyond Pratt & Whitney's restricted property boundary. To estimate maximum CO concentrations due to the project, a screening receptor grid comprised of 956 receptors in polar coordinates was used. The screening receptor grid considered of 740 receptors on 180 radials, spaced at 2-degree intervals, extending from the jet engine discharge location, which was selected as the origin of the grid for the air modeling analysis. Along each radial, receptors were located at the site property boundary and at offsite distances of 1.0, 1.5, 2.0, 2.5, and 3.0 km. An additional 216 receptors were located along 36 radials, spaced at 10-degree intervals, at distances of 10.0, 15.0, 20.0, 25.0 and 30.0 km from the engine discharge location.

Refinements were performed, as necessary, by using an interval angle between radials of 1.0 to 2.0 degrees in the vicinity of the maximum high or HSH concentrations produced by the screening analysis. Along each radial, receptors are located 100 m apart up to and including the adjacent screening grid receptors. The refined interval angle was selected, so that refined receptor spacing at the maximum concentrations would be no greater than 100 m.

6.1.7 BACKGROUND CONCENTRATIONS

To estimate total CO air quality concentrations for the AAQS analysis, both 8-hour and 1-hour background concentrations were added to the maximum HSH modeling results. The background concentration is considered to be the air quality concentration contributed by sources not included in the modeling evaluation. Because of the very brief and intermittent nature of the project emissions, background facilities with continuous emission were not included in the modeling analysis. Instead, a conservative background concentration from West Palm Beach was selected to represent the maximum air quality impacts due to non-modeled sources in the area of the project location.

A summary of the air quality data and selected background concentrations is presented in Section 5.0.

6.1.8 BUILDING DOWNWASH EFFECTS

The engine test burn is conducted in a area of the Pratt & Whitney site that is clear of building structures and other obstructions. Because there are no building structures in the vicinity of the engine test burn, building downwash effects on the test emissions are not likely to occur and were not accounted for in the air modeling

6.2 AIR MODELING RESULTS

6.2.1 SIGNIFICANT IMPACT ANALYSIS

A summary of the maximum predicted 8-hour and 1-hour CO concentrations due to the proposed project only is presented in Table 6-3. Because there are no emissions for the 7 hours after the test hour, the 8-hour averaged concentrations were set equal to the peak 1-hour concentrations divided by eight. Based on the screening results, modeling refinements were performed. The results of the refined modeling analyses are summarized in Table 6-4. The maximum predicted 8-hour and 1-hour CO concentrations are 627 and 5,012 $\mu\text{g}/\text{m}^3$, respectively, which are above the significant impact levels of 500 and 2,000 $\mu\text{g}/\text{m}^3$, respectively. Therefore, an AAQS analysis was performed.

6.2.2 AAQS ANALYSIS

Because the proposed project's emissions only last for 240 seconds, other background facilities with continuous emissions were not included in the air modeling analysis. Instead, conservative CO background concentrations measured in West Palm Beach were added to the modeled HSH 8-hour and 1-hour CO concentrations to produce the total CO air quality concentrations. A summary of the maximum predicted 8-hour and 1-hour CO concentrations due to all sources is presented in table 6-5. The total CO concentrations are 3,928 and 10,262 $\mu\text{g}/\text{m}^3$. These concentrations are 39 and 26 percent of the AAQS of 10,000 and 40,000 $\mu\text{g}/\text{m}^3$, respectively. Based on the air modeling results, it is concluded that the 240-second engine test burn will result in compliance of the AAQS.

Table 6-1. Major Features of the ISCST3 Model, Version 99155

ISCST3 Model Features

- Polar or Cartesian coordinate systems for receptor locations
 - Rural or one of three urban options which affect wind speed profile exponent, dispersion rates, and mixing height calculations
 - Plume rise due to momentum and buoyancy as a function of downwind distance for stack emissions (Briggs, 1969, 1971, 1972, and 1975; Bowers, et al., 1979).
 - Procedures suggested by Huber and Snyder (1976); Huber (1977); and Schulman and Scire (1980) for evaluating building wake effects
 - Procedures suggested by Briggs (1974) for evaluating stack-tip downwash
 - Separation of multiple emission sources
 - Consideration of the effects of gravitational settling and dry deposition on ambient particulate concentrations
 - Capability of simulating point, line, volume, area, and open pit sources
 - Capability to calculate dry and wet deposition, including both gaseous and particulate precipitation scavenging for wet deposition
 - Variation of wind speed with height (wind speed-profile exponent law)
 - Concentration estimates for 1-hour to annual average times
 - Terrain-adjustment procedures for elevated terrain including a terrain truncation algorithm for ISCST3; a built-in algorithm for predicting concentrations in complex terrain
 - Consideration of time-dependent exponential decay of pollutants
 - The method of Pasquill (1976) to account for buoyancy-induced dispersion
 - A regulatory default option to set various model options and parameters to EPA recommended values (see text for regulatory options used)
 - Procedure for calm-wind processing including setting wind speeds less than 1 meters per second(m/s) to 1 m/s.
-

Note: ISCST3 = Industrial Source Complex Short-Term.
Source: EPA, 1999.

Table 6-2. Summary of CO Emissions and Stack Parameters for Engine Test Burn

Emissions ^a		Release Height		Diameter		Velocity ^b		Temperature	
(lb/hr)	(g/s)	(ft)	(m)	(ft)	(m)	(fps)	(m/s)	(°F)	(°K)
166656	20,999	70	21.3	60.00	18.3	40.0	12.20	230	383.2

^a Based on 694.4 lb/sec for 240 seconds.

^b Maximum 45-degree discharge velocity times sine (38 degrees).

Table 6-3. Predicted CO Impacts from Proposed Project - Screening Analysis

Averaging Time	Concentration ^a ($\mu\text{g}/\text{m}^3$)	Receptor Location ^b		Time Period (YYMMDDHH)
		Direction (degree)	Distance (m)	
High 8-Hour ^c	347	50	5454	87090711
	286	54	5557	88060411
	292	96	6246	89081511
	446	314	1395	90082412
	276	66	6076	91061913
HSH 8-Hour ^c	332	50	5454	87071211
	263	280	20000	88091101
	283	40	5322	89070311
	263	10	25000	90082119
	261	150	25000	91083007
High 1-Hour	2774	50	5454	87090711
	2288	54	5557	88060411
	2340	96	6246	89081511
	3565	314	1395	90082412
	2211	66	6076	91061913
HSH 1-Hour	2660	50	5454	87071211
	2102	280	20000	88091101
	2267	40	5322	89070311
	2106	10	25000	90082119
	2085	150	25000	91083007

^a Based on 5-year meteorological record, West Palm Beach, 1987-91

^b Relative to engine discharge location

^c Because no test emissions occur for the additional 7 hours of the period,
8-hour concentrations are set equal to 1/8 of 1-hour concentrations.

YYMMDDHH = Year, Month, Day, Hour Ending

HSH = Highest, Second-Highest

Table 6-4. Maximum Predicted CO Impacts Due to the Proposed Project Only, Refined Analysis

Averaging Time	Concentration ^a ($\mu\text{g}/\text{m}^3$)	Receptor Location ^b		Time Period (YYMMDDHH)	EPA Significant Impact Level ($\mu\text{g}/\text{m}^3$)	<i>de Minimis</i> Air Monitoring Concentration ($\mu\text{g}/\text{m}^3$)
		Direction (degree)	Distance (m)			
High 8-Hour	627 ^c	140	1,600	90082412	500	575
High 1-Hour	5,012	140	1,600	90082412	2,000	NA

^a Based on highest predicted with 5-year meteorological record, West Palm Beach, 1987-91

^b Relative to Engine Discharge Location

^c Because no test emissions occur for the additional 7 hours of the period, set equal to 1/8 of 1-hour concentrations
YYMMDDHH = Year, Month, Day, Hour Ending

Table 6-5. Maximum Predicted CO Impacts Due to the Test Burn for Comparison to AAQS, Refined Analysis

Averaging Time	Concentration ($\mu\text{g}/\text{m}^3$)			Receptor Location ^b		Time Period (YYMMDDHH)	Florida AAQS ($\mu\text{g}/\text{m}^3$)
	Total	Modeled ^a	Background ^c	Direction (degree)	Distance (m)		
HSH 8-Hour ^d	3,928	478	3,450	326	1700	90082912	10,000
HSH 1-Hour	10,262	3,822	6,440	326	1700	90082912	40,000

^a Based on predicted HSH 1-hour concentration with 5-year meteorological record, West Palm Beach, 1987-91.

^b Relative to Engine Discharge Location.

^c Based on the HSH measured concentrations from 1/98-6/99 at West Palm Beach.

^d Because no test emissions occur for the additional 7 hours of the period, set equal to 1/8 of 1-hour concentrations.

YYMMDDHH = Year, Month, Day, Hour Ending.

HSH = Highest, Second-Highest Concentration in 5 years.

7.0 ADDITIONAL IMPACT ANALYSIS

7.1 INTRODUCTION

The additional impact analysis addresses the potential impacts of the new rocket tests cell on vegetation, soils, and wildlife of the surrounding area and the nearest Class I area. The nearest Class I area is the Everglades NP, located approximately 120 km south of the proposed project. Because the facility is subject to the PSD NSR requirements for CO emissions, the additional impact analysis were performed for this pollutant.

According to the modeling results presented in Section 6.0, the maximum air quality impacts predicted for the project are slightly greater than the EPA's significant impact levels of 500 and 2,000 $\mu\text{g}/\text{m}^3$ for 8 hour and 1-hour maximum, respectively, and below the AAQS. As a result, regardless of the existing conditions in the vicinity of the site or in the Class I areas, the proposed project will not result in any significant adverse effects upon these areas.

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APPENDIX A

DETAILED SUMMARY OF ISCST MODEL RESULTS

ISCB0B3 RELEASE 98056

ISCST3 OUTPUT FILE NUMBER 1 :ENGTEST.087
 ISCST3 OUTPUT FILE NUMBER 2 :ENGTEST.088
 ISCST3 OUTPUT FILE NUMBER 3 :ENGTEST.089
 ISCST3 OUTPUT FILE NUMBER 4 :ENGTEST.090
 ISCST3 OUTPUT FILE NUMBER 5 :ENGTEST.091

First title for last output file is: 1987 PRATT & WHITTNEY L02/RP1 ENGINE, CO IMPACTS
 Second title for last output file is: 38 DEGREE DISCHARGE, 230 SECOND BURN

4/18/00

AVERAGING TIME	YEAR	CONC (ug/m3)	DIR (deg) or X (m)	DIST (m) or Y (m)	PERIOD ENDING (YYMMDDHH)

SOURCE GROUP ID: ALL					
HIGH 1-Hour					
	1987	2773.7	50.	5454.	87090711
	1988	4263.6	204.	1500.	88032713
	1989	3840.1	200.	1500.	89070114
	1990	4982.3	140.	1500.	90072212
	1991	2604.3	340.	3000.	91032913
HSH 1-Hour					
	1987	2659.9	50.	5454.	87071211
	1988	2394.7	284.	3000.	88091712
	1989	2266.8	40.	5322.	89070311
	1990	3543.2	326.	2000.	90082912
	1991	2085.2	150.	25000.	91083007
All receptor computations reported with respect to a user-specified origin					
GRID	0.00	0.00			
DISCRETE	0.00	0.00			

CO STARTING
 CO TITLEONE 1987 PRATT & WHITNEY LO2/RP1 ENGINE, CO IMPACTS 4/18/00
 CO TITLETWO 38 DEGREE DISCHARGE, 230 SECOND BURN
 CO MODELOPT DFAULT CONC RURAL NOCMPL
 CO AVERTIME 1
 CO POLLUTID CO
 CO DCAYCOEF .000000
 CO RUNORNOT RUN
 CO FINISHED

SO STARTING

** Source Location Cards:
 ** SRCID SRCTYP XS YS ZS
 ** MODELING ORIGIN IS ROCKET ENGINE DISCHARGE LOCATION
 ** Source Location Cards:
 ** SRCID SRCTYP XS YS ZS
 ** UTM
 SO LOCATION ENGINE POINT 0.0 0.0 0.0
 ** Source Parameter Cards:
 ** POINT: SRCID QS HS TS VS DS
 ** (g/s) (m) (K) (m/s) (m)
 SO SRCPARAM ENGINE 21000. 21.3 383.2 12.20 18.3

SO EMISUNIT .100000E+07 (GRAMS/SEC) (MICROGRAMS/CUBIC-METER)
 SO SRCGROUP ALL
 SO FINISHED

RE STARTING

RE GRIDPOLR POL STA
 RE GRIDPOLR POL ORIG 0.0 0.0
 RE GRIDPOLR POL DIST 10000 12000 15000 20000 25000 30000
 RE GRIDPOLR POL GDIR 36 10.00 10.00
 RE GRIDPOLR POL END
 RE DISCPOLR ENGINE 1215. 2
 RE DISCPOLR ENGINE 1500. 2
 RE DISCPOLR ENGINE 2000. 2
 RE DISCPOLR ENGINE 2500. 2
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 RE DISCPOLR ENGINE 1266. 4
 RE DISCPOLR ENGINE 1500. 4
 RE DISCPOLR ENGINE 2000. 4
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 RE DISCPOLR ENGINE 3000. 4
 RE DISCPOLR ENGINE 1322. 6
 RE DISCPOLR ENGINE 1500. 6
 RE DISCPOLR ENGINE 2000. 6
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 RE DISCPOLR ENGINE 3000. 6
 RE DISCPOLR ENGINE 1385. 8
 RE DISCPOLR ENGINE 1500. 8
 RE DISCPOLR ENGINE 2000. 8
 RE DISCPOLR ENGINE 2500. 8
 RE DISCPOLR ENGINE 3000. 8
 RE DISCPOLR ENGINE 1457. 10
 RE DISCPOLR ENGINE 1500. 10
 RE DISCPOLR ENGINE 2000. 10
 RE DISCPOLR ENGINE 2500. 10
 RE DISCPOLR ENGINE 3000. 10
 RE DISCPOLR ENGINE 1538. 12
 RE DISCPOLR ENGINE 2000. 12
 RE DISCPOLR ENGINE 2500. 12
 RE DISCPOLR ENGINE 3000. 12
 RE DISCPOLR ENGINE 1631. 14
 RE DISCPOLR ENGINE 2000. 14
 RE DISCPOLR ENGINE 2500. 14
 RE DISCPOLR ENGINE 3000. 14
 RE DISCPOLR ENGINE 1739. 16
 RE DISCPOLR ENGINE 2000. 16
 RE DISCPOLR ENGINE 2500. 16
 RE DISCPOLR ENGINE 3000. 16
 RE DISCPOLR ENGINE 1864. 18
 RE DISCPOLR ENGINE 2000. 18
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 RE DISCPOLR ENGINE 3000. 18
 RE DISCPOLR ENGINE 2011. 20
 RE DISCPOLR ENGINE 2500. 20

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RE DISCPOLR ENGINE	2500.	22
RE DISCPOLR ENGINE	3000.	22
RE DISCPOLR ENGINE	2398.	24
RE DISCPOLR ENGINE	2500.	24
RE DISCPOLR ENGINE	3000.	24
RE DISCPOLR ENGINE	2658.	26
RE DISCPOLR ENGINE	3000.	26
RE DISCPOLR ENGINE	2986.	28
RE DISCPOLR ENGINE	3000.	28
RE DISCPOLR ENGINE	3412.	30
RE DISCPOLR ENGINE	3984.	32
RE DISCPOLR ENGINE	4794.	34
RE DISCPOLR ENGINE	5316.	36
RE DISCPOLR ENGINE	5316.	38
RE DISCPOLR ENGINE	5322.	40
RE DISCPOLR ENGINE	5335.	42
RE DISCPOLR ENGINE	5355.	44
RE DISCPOLR ENGINE	5381.	46
RE DISCPOLR ENGINE	5414.	48
RE DISCPOLR ENGINE	5454.	50
RE DISCPOLR ENGINE	5502.	52
RE DISCPOLR ENGINE	5557.	54
RE DISCPOLR ENGINE	5621.	56
RE DISCPOLR ENGINE	5692.	58
RE DISCPOLR ENGINE	5773.	60
RE DISCPOLR ENGINE	5864.	62
RE DISCPOLR ENGINE	5964.	64
RE DISCPOLR ENGINE	6076.	66
RE DISCPOLR ENGINE	6199.	68
RE DISCPOLR ENGINE	6336.	70
RE DISCPOLR ENGINE	6487.	72
RE DISCPOLR ENGINE	6653.	74
RE DISCPOLR ENGINE	6837.	76
RE DISCPOLR ENGINE	7040.	78
RE DISCPOLR ENGINE	7265.	80
RE DISCPOLR ENGINE	7514.	82
RE DISCPOLR ENGINE	7790.	84
RE DISCPOLR ENGINE	8098.	86
RE DISCPOLR ENGINE	8442.	88
RE DISCPOLR ENGINE	8827.	90
RE DISCPOLR ENGINE	9261.	92
RE DISCPOLR ENGINE	9359.	94
RE DISCPOLR ENGINE	6246.	96
RE DISCPOLR ENGINE	4691.	98
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RE DISCPOLR ENGINE	2500.	106
RE DISCPOLR ENGINE	3000.	106
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RE DISCPOLR ENGINE	3000.	108
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RE DISCPOLR ENGINE	3000.	110
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RE DISCPOLR ENGINE	3000.	112
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RE DISCPOLR ENGINE	3000.	114
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RE DISCPOLR ENGINE	3000.	128
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RE DISCPOLR ENGINE	3000.	232
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RE DISCPOLR ENGINE	1232.	238
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SENDER: COMPLETE THIS SECTION	COMPLETE THIS SECTION ON DELIVERY	
<ul style="list-style-type: none"> Complete items 1, 2, and 3. Also complete item 4 if Restricted Delivery is desired. Print your name and address on the reverse so that we can return the card to you. Attach this card to the back of the mailpiece, or on the front if space permits. 	A. Received by (Please Print Clearly)	B. Date of Delivery 7-12-01
<p>1. Article Addressed to:</p> <p>Mr. John K. Sillan, Manager Facilities Management United Technologies Corp.- Pratt & Whitney P.O. Box 109600 West Palm Beach, FL 33410-9600</p>	C. Signature <i>[Handwritten Signature]</i>	<input type="checkbox"/> Agent <input type="checkbox"/> Addressee
<p>2. Article Number (Copy from service label) 7000 0600 0026 4129 8337</p>	<p>D. Is delivery address different from item 1? <input checked="" type="checkbox"/> Yes If YES, enter delivery address below:</p>	
<p>PS Form 3811, July 1999</p>	<p>3. Service Type</p> <input type="checkbox"/> Certified Mail <input type="checkbox"/> Express Mail <input type="checkbox"/> Registered <input type="checkbox"/> Return Receipt for Merchandise <input type="checkbox"/> Insured Mail <input type="checkbox"/> C.O.D.	<p>4. Restricted Delivery? (Extra Fee) <input type="checkbox"/> Yes</p>
	<p>Domestic Return Receipt</p>	<p>102595-99-M-1789</p>

U.S. Postal Service
CERTIFIED MAIL RECEIPT
(Domestic Mail Only; No Insurance Coverage Provided)

7000 0600 0026 4129 8337

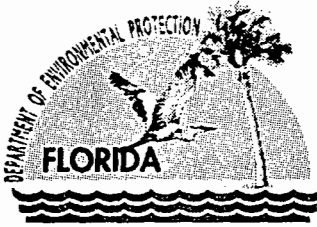
Postage	\$	
Certified Fee		
Return Receipt Fee (Endorsement Required)		
Restricted Delivery Fee (Endorsement Required)		
Total Postage & Fees	\$	

Postmark
Here

Recipient's Name (Please Print Clearly) (to be completed by mailer)
 Mr. John K. Sillan, Mgr.
 Street, Apt. No., or PO Box No.
 PO Box 109600
 City, State, ZIP+4
 West Palm Beach, FL 33410-9600

PS Form 3800, February 2000

See Reverse for Instructions



Jeb Bush
Governor

Department of Environmental Protection

Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

David B. Struhs
Secretary

July 10, 2001

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Mr. John K. Sillan, Manager
Facilities Management
United Technologies Corp.-Pratt & Whitney
P.O. Box 109600
West Palm Beach, Florida 33410-9600

Re: DEP File No. 0990021-004-AC (PSD-FL-294)
LOX/Kerosene Rocket Engine Test Stand

Dear Mr. Sillan:

Enclosed is one copy of the modified draft air construction permit to construct a LOX/Kerosene Rocket Engine Test Stand located at 17900 Beeline Highway, near Jupiter, Palm Beach County, Florida. The revised Technical Evaluation and Preliminary Determination, the Department's Intent to Issue Air Construction Permit and the "Public Notice of Intent to Issue Air Construction Permit" are also included. These documents replace those issued on January 29.

The "Public Notice" must be published one time only, as soon as possible, in the legal advertisement section of a newspaper of general circulation in the area affected, pursuant to the requirements Chapter 50, Florida Statutes. Proof of publication, i.e., newspaper affidavit, must be provided to the Department's Bureau of Air Regulation office within seven days of publication. Failure to publish the notice and provide proof of publication may result in the denial of the permit.

Please submit any written comments you wish to have considered concerning the Department's proposed action to A. A. Linero, P.E., Administrator, New Source Review Section at the above letterhead address. If you have any other questions, please contact Mr. Linero at 850/921-9523.

Sincerely,

C. H. Fancy, P.E., Chief,
Bureau of Air Regulation

CHF/al

Enclosures

"More Protection, Less Process"

Printed on recycled paper.

In the Matter of an
Application for Permit by:

John K. Sillan, Manager Facilities Management
United Technologies Corp.-Pratt & Whitney
P.O. Box 109600
West Palm Beach, Florida 33410-9600

DEP File No. 0990021-004-AC (PSD-FL-294)
LOX/Kerosene Rocket Engine Test Stand
Palm Beach County

INTENT TO ISSUE AIR CONSTRUCTION PERMIT

The Department of Environmental Protection (Department) gives notice of its intent to issue an air construction permit (copy of draft permit attached) for the proposed project, detailed in the application specified above and the enclosed Technical Evaluation and Preliminary Determination, for the reasons stated below. This Intent replaces a previous one issued on January 29, 2001.

The applicant, United Technologies Corp.-Pratt & Whitney, initially applied on June 20, 2000 to the Department for an air construction permit to construct a LOX/Kerosene Rocket Engine Test Stand to be located at 17900 Beeline Highway, Jupiter, Palm Beach County.

The Department has permitting jurisdiction under the provisions of Chapter 403, Florida Statutes (F.S.), and Florida Administrative Code (F.A.C.) Chapters 62-4, 62-210, and 62-212. The above actions are not exempt from permitting procedures. The Department has determined that an air construction permit is required to construct the project.

The Department intends to issue this air construction permit based on the belief that reasonable assurances have been provided to indicate that operation of these emission units will not adversely impact air quality, and the emission units will comply with all appropriate provisions of Chapters 62-4, 62-204, 62-210, 62-212, 62-296, and 62-297, F.A.C.

Pursuant to Section 403.815, F.S., and Rule 62-110.106(7)(a)1., F.A.C., you (the applicant) are required to publish at your own expense the enclosed Public Notice of Intent to Issue Air Construction Permit. The notice shall be published one time only in the legal advertisement section of a newspaper of general circulation in the area affected. Rule 62-110.106(7)(b), F.A.C., requires that the applicant cause the notice to be published as soon as possible after notification by the Department of its intended action. For the purpose of these rules, "publication in a newspaper of general circulation in the area affected" means publication in a newspaper meeting the requirements of Sections 50.011 and 50.031, F.S., in the county where the activity is to take place. If you are uncertain that a newspaper meets these requirements, please contact the Department at the address or telephone number listed below. The applicant shall provide proof of publication to the Department's Bureau of Air Regulation, at 2600 Blair Stone Road, Mail Station #5505, Tallahassee, Florida 32399-2400 (Telephone: 850/488-0114; Fax 850/ 922-6979). You must provide proof of publication within seven days of publication, pursuant to Rule 62-110.106(5), F.A.C. No permitting action for which published notice is required shall be granted until proof of publication of notice is made by furnishing a uniform affidavit in substantially the form prescribed in section 50.051, F.S. to the office of the Department issuing the permit. Failure to publish the notice and provide proof of publication may result in the denial of the permit pursuant to Rules 62-110.106(9) & (11), F.A.C.

The Department will issue the final permit with the attached conditions unless a response received in accordance with the following procedures results in a different decision or significant change of terms or conditions.

The Department will accept written comments and requests for public meetings concerning the proposed permit issuance action for a period of thirty (30) days from the date of publication of Public Notice of Intent to Issue Air Permit. Written comments and requests for public meetings should be provided to the Department's Bureau of Air Regulation at 2600 Blair Stone Road, Mail Station #5505, Tallahassee, FL 32399-2400. Any written comments filed shall be made available for public inspection. If written comments received result in a significant change in the proposed agency action, the Department shall revise the proposed permit and require, if applicable, another Public Notice.

The Department will issue the permit with the attached conditions unless a timely petition for an administrative hearing is filed pursuant to sections 120.569 and 120.57 F.S., before the deadline for filing a petition. The procedures for petitioning for a hearing are set forth below.

A person whose substantial interests are affected by the proposed permitting decision may petition for an administrative proceeding (hearing) under sections 120.569 and 120.57 of the Florida Statutes. The petition must contain the information set forth below and must be filed (received) in the Office of General Counsel of the Department at 3900 Commonwealth Boulevard, Mail Station #35, Tallahassee, Florida, 32399-3000. Petitions filed by the permit applicant or any of the parties listed below must be filed within fourteen days of receipt of this notice of intent. Petitions filed by any persons other than those entitled to written notice under section 120.60(3) of the Florida Statutes must be filed within fourteen days of publication of the public notice or within fourteen days of receipt of this notice of intent, whichever occurs first. Under section 120.60(3), however, any person who asked the Department for notice of agency action may file a petition within fourteen days of receipt of that notice, regardless of the date of publication. A petitioner shall mail a copy of the petition to the applicant at the address indicated above at the time of filing. The failure of any person to file a petition within the appropriate time period shall constitute a waiver of that person's right to request an administrative determination (hearing) under sections 120.569 and 120.57 F.S., or to intervene in this proceeding and participate as a party to it. Any subsequent intervention will be only at the approval of the presiding officer upon the filing of a motion in compliance with Rule 28-106.205 of the Florida Administrative Code.

A petition that disputes the material facts on which the Department's action is based must contain the following information: (a) The name and address of each agency affected and each agency's file or identification number, if known; (b) The name, address, and telephone number of the petitioner, the name, address, and telephone number of the petitioner's representative, if any, which shall be the address for service purposes during the course of the proceeding; and an explanation of how the petitioner's substantial interests will be affected by the agency determination; (c) A statement of how and when petitioner received notice of the agency action or proposed action; (d) A statement of all disputed issues of material fact. If there are none, the petition must so indicate; (e) A concise statement of the ultimate facts alleged, including the specific facts the petitioner contends warrant reversal or modification of the agency's proposed action; (f) A statement of the specific rules or statutes the petitioner contends require reversal or modification of the agency's proposed action; and (g) A statement of the relief sought by the petitioner, stating precisely the action petitioner wishes the agency to take with respect to the agency's proposed action.

A petition that does not dispute the material facts upon which the Department's action is based shall state that no such facts are in dispute and otherwise shall contain the same information as set forth above, as required by Rule 28-106.301.

Because the administrative hearing process is designed to formulate final agency action, the filing of a petition means that the Department's final action may be different from the position taken by it in this notice. Persons whose substantial interests will be affected by any such final decision of the Department on the application have the right to petition to become a party to the proceeding, in accordance with the requirements set forth above. Mediation is not available in this proceeding.

In addition to the above, a person subject to regulation has a right to apply for a variance from or waiver of the requirements of particular rules, on certain conditions, under Section 120.542 F.S. The relief provided by this state statute applies only to state rules, not statutes, and not to any federal regulatory requirements. Applying for a variance or waiver does not substitute or extend the time for filing a petition for an administrative hearing or exercising any other right that a person may have in relation to the action proposed in this notice of intent.

The application for a variance or waiver is made by filing a petition with the Office of General Counsel of the Department, 3900 Commonwealth Boulevard, Mail Station #35, Tallahassee, Florida 32399-3000. The petition must specify the following information: (a) The name, address, and telephone number of the petitioner; (b) The name, address, and telephone number of the attorney or qualified representative of the petitioner, if any; (c) Each rule or portion of a rule from which a variance or waiver is requested; (d) The citation to the statute underlying (implemented by) the rule identified in (c) above; (e) The type of action requested; (f) The specific facts that would justify a variance or waiver for the petitioner; (g) The reason why the variance or waiver would serve the purposes of the underlying statute (implemented by the rule); and (h) A statement whether the variance or waiver is permanent or temporary and, if temporary, a statement of the dates showing the duration of the variance or waiver requested.

The Department will grant a variance or waiver when the petition demonstrates both that the application of the rule would create a substantial hardship or violate principles of fairness, as each of those terms is defined in Section 120.542(2) F.S., and that the purpose of the underlying statute will be or has been achieved by other means by the petitioner.

Persons subject to regulation pursuant to any federally delegated or approved air program should be aware that Florida is specifically not authorized to issue variances or waivers from any requirements of any such federally delegated or approved program. The requirements of the program remain fully enforceable by the Administrator of the EPA and by any person under the Clean Air Act unless and until the Administrator separately approves any variance or waiver in accordance with the procedures of the federal program.

Executed in Tallahassee, Florida.



C. H. Fancy, P.E., Chief
Bureau of Air Regulation

CERTIFICATE OF SERVICE

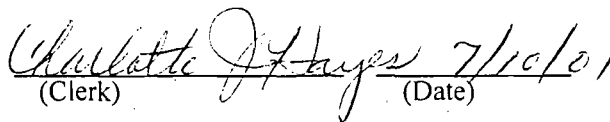
The undersigned duly designated deputy agency clerk hereby certifies that this Intent to Issue Air Construction Permit (including the Public Notice, Technical Evaluation and Preliminary Determination, Draft Best Available Control Technology Determination, and the Draft permit) was sent by certified mail (*) and copies were mailed by U.S. Mail before the close of business on 7/10/01 to the person(s) listed:

John K. Sillan*
Benny Susi, P.E., Golder Associates
Isidore Goldman, SED

Darrel Graziani, PBCHD
Gregg Worley, EPA
John Bunyak, NPS

Clerk Stamp

FILING AND ACKNOWLEDGMENT FILED,
on this date, pursuant to §120.52, Florida Statutes,
with the designated Department Clerk, receipt of
which is hereby acknowledged.


(Clerk) 7/10/01 (Date)

PUBLIC NOTICE OF INTENT TO ISSUE AIR CONSTRUCTION PERMIT

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION

DEP File No. 0990021-004-AC (PSD-FL-294)

United Technologies Corp.-Pratt & Whitney
LOX/Kerosene Rocket Engine Test Stand
Palm Beach County

The Department of Environmental Protection (Department) gives notice of its intent to issue an air construction permit to United Technologies Corp.-Pratt & Whitney for construction of a LOX/Kerosene Rocket Engine Test Stand located at 17900 Beeline Highway, near Jupiter, Palm Beach County. A Best Available Control Technology (BACT) determination was required for emissions of carbon monoxide (CO) pursuant to Rule 62-212.400, F.A.C., Prevention of Significant Deterioration (PSD). The applicant's mailing address is: United Technologies Corp.-Pratt & Whitney, Post Office Box 109600, West Palm Beach, Florida 33410-9600.

Emissions of CO are estimated to be approximately 1,000 tons per year. These emissions shall be restricted by limiting fuel usage to 318,000 gallons per year, test firings to 12 per year, and duration of firings to 240 seconds each. The minimum oxidant to fuel ratio will be 2.72 pounds of oxygen per ton of fuel. The Department will require the applicant to establish and operate an ambient air quality monitoring program.

An air quality impact analysis was conducted. Emissions from the facility will not significantly contribute to or cause a violation of any state or federal ambient air quality standards or PSD increment.

The Department will issue the final permit with the attached conditions unless a response received in accordance with the following procedures results in a different decision or significant change of terms or conditions.

The Department will accept written comments and requests for public meetings concerning the proposed permit issuance action for a period of thirty (30) days from the date of publication of this Public Notice of Intent to Issue Air Construction Permit. Written comments and requests for public meetings should be provided to the Department's Bureau of Air Regulation at 2600 Blair Stone Road, Mail Station #5505, Tallahassee, FL 32399-2400. Any written comments filed shall be made available for public inspection. If written comments received result in a significant change in the proposed agency action, the Department shall revise the proposed permit and require, if applicable, another Public Notice.

The Department will issue the permit with the attached conditions unless a timely petition for an administrative hearing is filed pursuant to sections 120.569 and 120.57 F.S., before the deadline for filing a petition. The procedures for petitioning for a hearing are set forth below. Mediation is not available in this proceeding.

A person whose substantial interests are affected by the proposed permitting decision may petition for an administrative proceeding (hearing) under sections 120.569 and 120.57 of the Florida Statutes. The petition must contain the information set forth below and must be filed (received) in the Office of General Counsel of the Department at 3900 Commonwealth Boulevard, Mail Station #35, Tallahassee, Florida, 32399-3000. Petitions filed by the permit applicant or any of the parties listed below must be filed within fourteen days of receipt of this notice of intent. Petitions filed by any persons other than those entitled to written notice under section 120.60(3) of the Florida Statutes must be filed within fourteen days of publication of the public notice or within fourteen days of receipt of this notice of intent, whichever occurs first. Under section 120.60(3), however, any person who asked the Department for notice of agency action may file a petition within fourteen days of receipt of that notice, regardless of the date of

NOTICE TO BE PUBLISHED IN THE NEWSPAPER

publication. A petitioner shall mail a copy of the petition to the applicant at the address indicated above at the time of filing. The failure of any person to file a petition within the appropriate time period shall constitute a waiver of that person's right to request an administrative determination (hearing) under sections 120.569 and 120.57 F.S., or to intervene in this proceeding and participate as a party to it. Any subsequent intervention will be only at the approval of the presiding officer upon the filing of a motion in compliance with Rule 28-106.205 of the Florida Administrative Code.

A petition that disputes the material facts on which the Department's action is based must contain the following information: (a) The name and address of each agency affected and each agency's file or identification number, if known; (b) The name, address, and telephone number of the petitioner, the name, address, and telephone number of the petitioner's representative, if any, which shall be the address for service purposes during the course of the proceeding; and an explanation of how the petitioner's substantial interests will be affected by the agency determination; (c) A statement of how and when petitioner received notice of the agency action or proposed action; (d) A statement of all disputed issues of material fact. If there are none, the petition must so indicate; (e) A concise statement of the ultimate facts alleged, including the specific facts the petitioner contends warrant reversal or modification of the agency's proposed action; (f) A statement of the specific rules or statutes the petitioner contends require reversal or modification of the agency's proposed action; and (g) A statement of the relief sought by the petitioner, stating precisely the action petitioner wishes the agency to take with respect to the agency's proposed action.

A petition that does not dispute the material facts upon which the Department's action is based shall state that no such facts are in dispute and otherwise shall contain the same information as set forth above, as required by rule 28-106.301

Because the administrative hearing process is designed to formulate final agency action, the filing of a petition means that the Department's final action may be different from the position taken by it in this notice. Persons whose substantial interests will be affected by any such final decision of the Department on the application have the right to petition to become a party to the proceeding, in accordance with the requirements set forth above.

A complete project file is available for public inspection during normal business hours, 8:00 a.m. to 5:00 p.m., Monday through Friday, except legal holidays, at:

Dept. of Environmental Protection
Bureau of Air Regulation
Suite 4, 111 S. Magnolia Drive
Tallahassee, FL 32301
Telephone: 850/488-0114
Fax: 850/922-6979

Palm Beach County Health Dept.
Env. Science & Engineering Div.
901 Evernia Street
West Palm Beach, FL 33401
Telephone: 561/355-3070
Fax: 561/355-2442

Dept. of Environmental Protection
Southeast District Office
400 North Congress Avenue
West Palm Beach, FL 33416-5425
Telephone: 561/681-6600
Fax: 561/681-6755

The complete project file includes the application, technical evaluations, draft permit, and the information submitted by the responsible official, exclusive of confidential records under Section 403.111, F.S. Interested persons may contact the Administrator, New Source Review Section at 111 South Magnolia Drive, Suite 4, Tallahassee, FL 32301 or call 850/488-0114 for additional information. The Department's Intent to Issue and related documents can also be viewed at <http://www8.myflorida.com/licensingpermitting/learn/environment/air/airpermit.html>

TECHNICAL EVALUATION
AND
PRELIMINARY DETERMINATION

United Technologies Corp.-Pratt & Whitney

LOX/Kerosene Rocket Engine Test Stand
Palm Beach County

DEP File No. 0990021-004-AC
PSD-FL-294

Department of Environmental Protection
Division of Air Resources Management
Bureau of Air Regulation

Month Day, 2001

TECHNICAL EVALUATION/PRELIMINARY DETERMINATION

1. APPLICATION INFORMATION

Applicant Name and Address

United Technologies Corp.-Pratt & Whitney
17900 Beeline Highway (SR 710)
Jupiter, Florida 33478

Authorized Representative: John K. Sillan, Manager Facilities Management

Application Review Schedule

Date of Receipt of Application	06-20-00
First Request for Additional Information	07-19-00
Final Request for Additional Information	10-01-00
Date Application Complete	10-09-00
Waiver of Processing Clock by 30 days	12-19-00
Intent Issued	01-29-01
Intent Re-issued	06-21-01

2. FACILITY INFORMATION

Facility Location

The existing facility is located at 17900 Beeline Highway (SR 710) near Jupiter, Palm Beach County. The proposed LOX/Kerosene Rocket Test Stand will be located at the E-5 rocket test area. The facility is located more than 100 kilometers (62 miles) from the nearest PSD Class I area, Everglades National Park. The UTM coordinates of the site are Zone 17, 567.3 km East and 2974.4 km North.

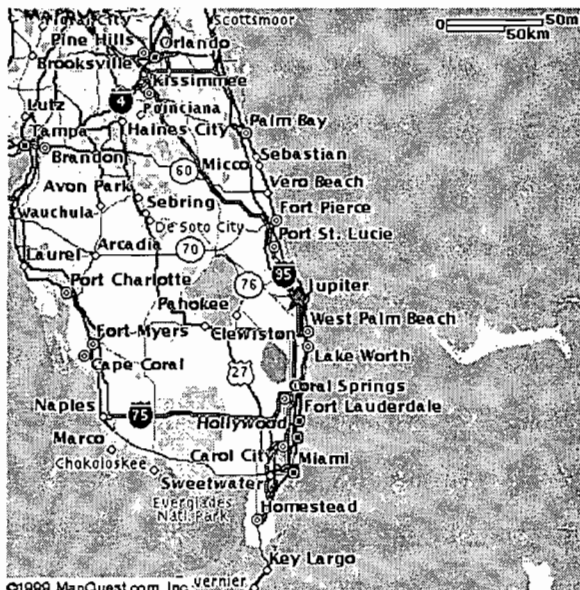


Figure 1 – Jupiter, Florida

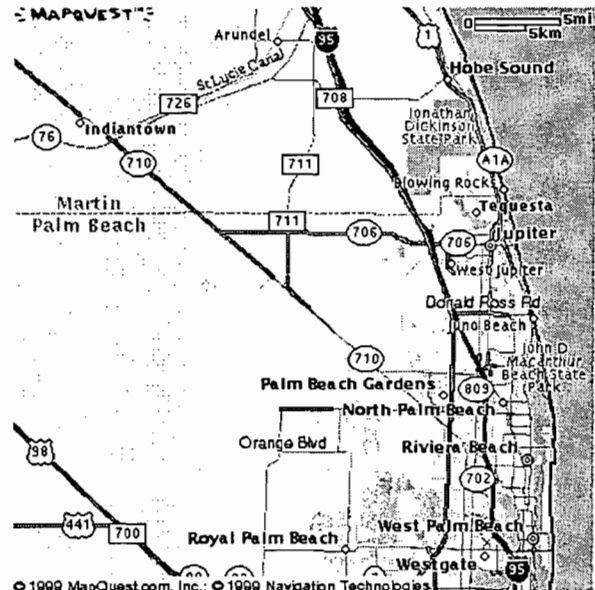


Figure 2 – Site - SR 710 and CR 711

TECHNICAL EVALUATION/PRELIMINARY DETERMINATION

Standard Industrial Classification Codes (SIC)

Major Group Number	37	Transportation Equipment
Group Numbers	372	Aircraft and Parts
	376	Guided Missile and Space Vehicles and Parts
Industry Numbers	3724	Aircraft Engines and Engine Parts
	3764	Guided Missile and Space Vehicle Propulsion Units and Propulsion Unit Parts

Facility Description

The facility is engaged in research and development as well as manufacturing activities associated with gas turbine and rocket engines. Gas turbine engine operations include the engineering, manufacturing, and testing of prototype parts and engines. Rocket engine operations include the engineering, manufacturing, and testing of prototype and commercial engines. A Materials Laboratory that develops and tests new materials supports both engine group operations.

Area Designations

The facility is located within an area that is currently designated as attainment for the pollutant's ozone, carbon monoxide, sulfur dioxide, and nitrogen dioxide; and unclassifiable for the pollutants lead and PM₁₀ (Particulate Matter less than 10 micrometers in diameter). The area is further designated as a maintenance area for the pollutant ozone and a PSD Class II area.

Facility Classifications

Preconstruction Review Programs: The facility is classified as an existing "Major Source" under the Prevention of Significant Deterioration (PSD) program with potential emissions of Carbon Monoxide (CO), Oxides of Nitrogen (NO_x), and Sulfur Dioxide (SO₂) greater than 250 tons per year. The facility is not on the list of the 28 Major Facility Categories (Table 62-212.400-1, F.A.C.).

Hazardous Air Pollutant (HAP) Programs: The facility is classified as an existing "Major Source" under the Section 112 of the Clean Air Act (CAA) with potential emissions of total HAPs greater than 25 tons per year. In addition, the facility includes the following regulated and source category activities:

- 40 CFR Part 63, Subpart T, Halogenated Solvent Cleaners;
- 40 CFR Part 63, Subpart GG, Aerospace Manufacturing and Rework Facilities; and
- Source Categories: Combustion Turbines, Engine Test Firing; Industrial/Commercial/Institutional Boilers; Miscellaneous Metal Parts And Products; Paint Stripping Operations; Reciprocating Internal Combustion Engines; Rocket Engine Test Firing; and Site Remediation.

TECHNICAL EVALUATION/PRELIMINARY DETERMINATION

New Source Performance Standards: The facility operates several emission units subject to the following standards:

- 40 CFR Part 60, Subpart Kb, Standards of Performance for Volatile Organic Liquid Storage Vessels (Including Petroleum Liquid Storage Vessels) for Which Construction, Reconstruction, or Modification Commenced After July 23, 1984; and
- 40 CFR Part 60, Subpart Dc, Standards of Performance for Small Industrial/Commercial/Institutional Boilers.

Title V Operating Permit Program: The facility is classified as a "Major Source" under the Title V program based on potential emissions of CO, NO_x, SO₂, Particulate Matter (PM), and Volatile Organic Compound (VOC) greater than 100 tons per year and total HAP emissions greater than 25 tons per year.

Facility Emissions

The facility's current potential emissions, based on the initial Title V permit application include the following:

Pollutant	PTE (Tons Per Year)
Oxides Of Nitrogen (NO _x)	1,756
Sulfur Dioxide (SO ₂)	571
Carbon Monoxide (CO)	389
Volatile Organic Compounds (VOC)	152
Particulate Matter (PM)	121
Total HAPs	43

3. PROJECT DESCRIPTION

Background

On June 20, 2000, the applicant applied for an air construction permit for the expansion of its existing rocket engine operations. The proposed project includes the construction and operation of a LOX/Kerosene Rocket Engine Stand at its existing facility in West Palm Beach. This project will consist of liquid oxygen and fuel storage tanks (64,000 and 36,000 gallon capacities), an engine containment can, a water-cooled silencer, an exhaust gas deflector, a lined cooling water retention pond, and an elevated 1-million gallon water supply tank.

TECHNICAL EVALUATION/PRELIMINARY DETERMINATION

Emissions Units:

The proposed project includes the addition of the following emissions units at the site:

EMISSION UNIT NO.	EMISSION UNIT DESCRIPTION
075	LOX/Kerosene Rocket Engine Test Stand ⁽¹⁾
076	Kerosene Fuel Storage Tank
Note: ⁽¹⁾ The EPA has determined that emissions from Rocket Firing at Test Stands are considered point source emissions; June 9, 1988	

Emissions

The potential emissions associated with the proposed project were estimated by the applicant using the "NASA Combustion Deck TEP" model and emission factors for flares from AP-42. The predicted short-term and annual emissions associated with 12 test firings per year and a duration of 240 seconds per test are as follows:

Pollutant	CO	CO ₂	H ₂	VOC	PM	SO _x	NO _x
lb/sec	694.4	1,366.0	17.1	2.0	1.6	<1	0.97
TPY	1,000.0	1,967.0	24.7	2.9	2.3	1.4	1.4

Classification

Preconstruction Review Programs: The proposed project is classified as a major modification at an existing major source of air pollution. Based on the potential emissions of CO, the proposed project is subject to the requirements of Rule 62-212.400, F.A.C., Prevention of Significant Deterioration.

Hazardous Air Pollutant (HAP) Programs: The U.S. EPA is currently developing a National Emission Standard for Hazardous Air Pollutants (NESHAP) for Rocket Engine Test Firing under Section 112 of the Clean Air Act and will propose such standards in the future. Until a NESHAP is proposed, the Department is required by its rules to develop a case-by-case determination of Maximum Achievable Control Technology (MACT) determination for new major sources of HAPs.

Potential emissions of HAPs have not been quantified, but are expected to be less than 10 tons per year and total HAPs less than 25 tons per year based on the applicant's estimates of PM and VOC emissions. As such, a case-by-case MACT determination was not required for the project at this time. The Department reserves the right to re-address HAPs should better emissions data become available or upon promulgation of the Rocket Engine Test Firing NESHAP.

New Source Performance Standards: The proposed project is not subject to any standards adopted under Section 111 of the CAA.

Title V Operating Permit Program: The proposed project will require a revision to the Title V operating permit upon completion of construction and a demonstration of compliance.

TECHNICAL EVALUATION/PRELIMINARY DETERMINATION

4. RULE APPLICABILITY

The proposed project is subject to pre-construction review and permitting requirements under the provisions of Chapter 403, Florida Statutes, and Chapters 62-4, 62-204, 62-210, 62-212, 62-296, and 62-297 of the Florida Administrative Code (F.A.C.). This facility is located in Palm Beach County, an area designated as a PSD area for the pollutant Carbon Monoxide in accordance with Rule 62-204.360, F.A.C.

The proposed project is subject to Rule 62-212.400, F.A.C., Prevention of Significant Deterioration (PSD), for CO and is also subject to reporting and record keeping requirements of 40 C.F.R. 60.116b for the kerosene fuel storage tank.

Federal PSD requirements are contained in the CFR, Title 40, Part 52.21. Florida has adopted PSD regulations (Rule 62-212.400, F.A.C.) that are essentially the same as the federal regulations. Florida's State Implementation Plan (SIP), which contains PSD regulations, has been approved by EPA; therefore, PSD approval authority has been granted to DEP. PSD regulations require that all new major stationary facilities or major modifications to existing major facilities, which emit air pollutants regulated under the Clean Air Act (CAA), must be reviewed and a permit issued before the commencement of construction.

The control technology review requirements of the federal and state PSD regulations require that all applicable federal and state emission-limiting standards be met, and that Best Available Control Technology (BACT) be applied to control emissions from the source (Rule 62-212.400, (5)(c), F.A.C.). The BACT requirements are applicable to all regulated pollutants for which the increase in emissions from the facility or modification exceeds the significant emission rate.

BACT is defined in 52.21 (b)(12) and Rule 62-210.200, F.A.C., as: "An emissions limitation (including a visible emission standard) based on the maximum degree of reduction of each pollutant subject to regulation under the Act which would be emitted by any proposed major stationary source or major modification which the Administrator, on a case-by-case basis, taking into account energy, environmental, and economic impacts, and other costs, determines is achievable through application of production processes and available methods, systems, and techniques (including fuel cleaning or treatment or innovative fuel combustion techniques) for control of such pollutant.

In no event shall application of best available control technology result in emissions of any pollutant, which would exceed the emissions allowed by any applicable standard under 40 CFR Parts 60 and 61. If the Administrator determines that technological or economic limitations on the application of measurement methodology to a particular part of a source or facility would make the imposition of an emission standard infeasible, a design, equipment, work practice, operational standard or combination thereof, may be prescribed instead to satisfy the requirement for the application of BACT. Such standard shall, to the degree possible, set forth the emissions reductions achievable by implementation of such design, equipment, work practice, or operation and shall provide for compliance by means which achieve equivalent results."

TECHNICAL EVALUATION/PRELIMINARY DETERMINATION

The postconstruction monitoring requirements (Rule 62-212.400(5)(g), F.A.C.) of the state PSD regulations allow the Department to require the owner to conduct air quality monitoring and provide the data to the Department if the Department finds that such monitoring is necessary to determine the effect that emissions from the project are having on air quality in any area.

The emission units affected by this permit shall comply with all applicable provisions of the Florida Administrative Code (including applicable portions of the Code of Federal Regulations incorporated therein) and, specifically, the following Chapters and Rules:

Chapter 62-4	Permits.
Rule 62-204.220	Ambient Air Quality Protection
Rule 62-204.240	Ambient Air Quality Standards
Rule 62-204.800	Federal Regulations Adopted by Reference (40CFR60 in Particular)
Rule 62-210.300	Permits Required
Rule 62-210.350	Public Notice and Comments
Rule 62-210.370	Reports
Rule 62-210.550	Stack Height Policy
Rule 62-210.650	Circumvention
Rule 62-210.700	Excess Emissions
Rule 62-210.900	Forms and Instructions
Rule 62-212.300	General Pre-construction Review Requirements
Rule 62-212.400	Prevention of Significant Deterioration (including BACT & Postconstruction Monitoring)
Rule 62-213	Operation Permits for Major Sources of Air Pollution
Rule 62-296.320	General Pollutant Emission Limiting Standards
Rule 62-297.310	General Test Requirements
Rule 62-297.401	Compliance Test Methods

5. PROJECT ANALYSIS

The Department's analysis of the proposed project included review of the permit application, the emissions units, the emissions estimates and methodologies, the applicable regulations, the air quality control strategy, and the ambient air quality data and potential impacts of the proposed project. The results of the Department's analyses on the air quality control strategy and ambient air quality impact analyses are presented below.

Air Quality Control Strategy – Carbon Monoxide

The applicant has requested that the Department's BACT determination for CO emissions require no add-on control equipment due to prohibitive cost and impracticability of controlling such a large exhaust stream. Instead, the applicant proposed that the BACT requirements focus on combustion control by way of adjusting the oxygen to fuel ratio to maximize combustion efficiency thus reducing CO emissions, limiting test duration to no longer than 240 seconds per test, and limiting testing to no more than 12 tests per year.

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The applicant's BACT evaluation referred to a Russian rocket test stand that employed a water injection and ducting system solely for the purpose of avoiding heat detection by surveillance satellites during the Cold-War era. According to the applicant, the Russian test stand was not designed as an emission control system and should not be considered as any sort of exemplary emission control system. This is the only rocket test stand known to have any equipment that could be construed as add-on controls.

The molar concentration of the rocket engine exhaust gases was estimated to contain approximately 23% CO, 28% CO₂, 8% H₂ and 41% H₂O vapor by the applicant using the TEP model. The applicant reported that kerosene rocket engines fire a fuel rich mixture for heat control flexibility, firing approximately 82% of the theoretical O₂ required for complete combustion. Consequently, CO emissions from engines of this type are very high compared to combustion turbines and other sources that burn fuel for purposes of energy transfer or conversion to steam or power. At the same time, use of liquid oxygen reduces the availability of atmospheric nitrogen for participation in NO_x formation.

Add-on Controls – Incineration: The applicant reported that if CO oxidation technology from the gas turbine industry was considered, differences in exhaust concentrations will affect the design and costs for adaptation to rocket engines. Turbine exhaust oxidation technology applied to a rocket engine test stand will result in greater costs due to the severity of the exhaust conditions. Estimates provided by the applicant indicate that a conventional incinerator would cost about 579 million dollars with an annualized cost of about 68 million. An additional 100 million would be required, according to the applicant, to construct an appropriate infrastructure for a control device designed to withstand the maximum thrust and high temperatures of the rocket engine exhaust.

BACT-Determination: Details of the Department's BACT determination are given in the separate Draft BACT Determination issued concurrently with this evaluation. The Department does not necessarily accept the cost estimates of \$579,000,000 with annualized costs of \$68,000,000 for add-on emissions control or the \$100,000,000 infrastructure cost estimate. However, the Department agrees with the applicants finding that existing oxidation technology is not feasible at this time. As a result, the Department has preliminarily proposed BACT for the rocket engine test stand to be a visible emissions limitation of forty (40) percent opacity and the following work practices:

- Carbon Monoxide (CO) Emissions – Rocket engine test firings shall not result in CO emissions greater than 41.5 tons per minute (2-minute average), 83 tons per 8-hour period, and 1,000 tons per year (12-month rolling total) as determined using the NASA-Lewis chemical equilibrium computer program or equivalent method approved by the Department.
- Test Stand - The test stand shall be constructed in accordance with the design specifications provided within the application including a Water Cooled Silencer and an Exhaust Gas Deflector with a Minimum height of 70 feet, maximum distance from Water Cooled Silencer of 100 feet. The surface between the water-cooled silencer and the exhaust gas deflector shall be paved.

TECHNICAL EVALUATION/PRELIMINARY DETERMINATION

- Test Duration – Rocket engine test firings shall not exceed a total 240 seconds per 8-hour period
- Test Firings – Rocket engine test firings shall not exceed 2,880 seconds per year (12-month rolling total);
- Oxidant/Fuel Ratio – All rocket engine test firings shall be conducted at a minimum oxidant/fuel ratio of 2.72 lb. O₂/lb. Fuel.
- Fuel Usage – Rocket engine test firings shall not consume more than 6,625 gallons per minute (4-minute average), 26,500 gallons per 8-hour period, and 318,000 gallons per year (12-month rolling total).
- Quench Water - All rocket engine test firings shall be conducted with sufficient quench water to minimize NO_x formation.
- Fuel and Oxidizer Types - Rocket engine test firings shall be limited to the firing of kerosene as the fuel and liquid oxygen (LOX) as the oxidizer.
- Test Conditions – Rocket engine test firings shall be restricted to daylight hours (1 hour after sunrise and 1 hour prior to sunset) and only under ambient conditions that provide good dispersion of the exhaust gases in accordance with a Test Plan to be submitted to the Palm Beach County Health Department (PBCHD) for approval prior to the initial test. Non-daylight hour testing maybe approved on a case-by-case basis by the Palm Beach County Health Department (PBCHD).
- Test Notifications – At least 24 hours prior to a rocket engine test firing, notification shall be provided to the PBCHD. The notification shall include the date and time of the test firing, the expected duration of the test firing, the planned oxidant/fuel ratio, and the planned fuel usage rate. In the event that an upset occurs during a test (i.e., test duration > 240 seconds, O/F ratio less than 2.72, fuel usage > 13,250 gpm, a flame out, etc.), a written excess emissions report shall be provided to the PBCHD within 24 hours of the test. The report shall identify the upset and impacts.
- Postconstruction Monitoring – The permittee shall, prior to any rocket engine test firings, establish an ambient air quality monitoring program to measure ambient air concentrations of CO before, during, and after a rocket engine test firing. The Program shall be approved by the Palm Beach County Health Department (PBCHD) and may be discontinued upon written request and PBCHD approval.
- Oxygen Injection Study – Within one year of initial issuance of this permit, the permittee shall complete and submit to the Department an engineering and cost study evaluating the technical feasibility and cost effectiveness of direct O₂ injection for reducing CO emissions in the exhausts of rocket engines tested at the permittee's facility. The study shall evaluate possibilities for direct O₂ injection including a heat-shielded, internally-cooled oxygen lance for injecting stoichiometric rates of oxygen into the exhaust downstream of the engine. Appropriate kinetic modeling shall be utilized to predict the oxidation reaction rates and overall CO conversion for various configurations of the injection apparatus and various injection locations and methods.

TECHNICAL EVALUATION/PRELIMINARY DETERMINATION

- Compliance Demonstrations – Compliance with the visible emissions limitation shall be demonstrated initially for each new oxidant/fuel ratio and annually thereafter. Compliance with the CO emissions limitation shall be demonstrated initially and continuously thereafter through the use of the NASA Lewis chemical equilibrium computer program or its equivalent as approved by the Department or Palm Beach County Health Department and the ambient air quality monitoring program.
- Excess Emissions - Excess emissions shall be allowed provided the permittee demonstrates that the emissions did not result in any of the following:
 1. a predicted ambient impact greater than the National Ambient Air Quality Standards (NAAQS) for CO after adjustment based on the ambient monitoring program;
 2. a significant emissions increase in a PSD Pollutant; or
 3. emissions of a hazardous air pollutant in an amount of 10 tons per year or greater individually or 25 tons per year or greater collectively.

Air Quality Impacts

The proposed project will increase CO emissions at a level in excess of PSD significant amounts. The air quality impact analyses required by the PSD regulations for this pollutant include:

- An analysis of existing air quality;
- A significant impact analysis;
- An Ambient Air Quality Standards (AAQS) analysis; and
- An analysis of impacts on soils, vegetation, and visibility and of growth-related air quality modeling impacts.

The analysis of existing air quality generally relies on preconstruction monitoring data collected with EPA-approved methods. The significant impact and AAQS analyses depend on air quality dispersion modeling carried out in accordance with EPA guidelines.

Based on the required analyses, the Department has reasonable assurance that the proposed project, as described in this report and subject to the conditions of approval proposed herein, will not cause or significantly contribute to a violation of any AAQS or PSD increment. A discussion of the required analyses follows.

Analysis of Existing Air Quality: Preconstruction ambient air quality monitoring is required for all pollutants subject to PSD review unless otherwise exempted or satisfied. This monitoring requirement may be satisfied by using previously existing representative monitoring data, if available. An exemption to the monitoring requirement may be obtained if either of the following conditions is met: the maximum predicted air quality impact resulting from the projected emissions increase, as determined by air quality modeling, is less than a pollutant-specific de minimus concentration, or the existing ambient concentrations are less than a pollutant-specific de minimus concentration. If preconstruction ambient monitoring is exempted, determination of background concentrations for PSD significant pollutants with established AAQS may still be necessary for use in any required AAQS analysis. These

TECHNICAL EVALUATION/PRELIMINARY DETERMINATION

concentrations may be established from the required preconstruction ambient air quality monitoring analysis or from the existing representative monitoring data. These background ambient air quality concentrations are added to pollutant impacts predicted by modeling.

For this project, the maximum eight-hour CO impacts from the project were predicted to be 627 ug/m³, which is greater than the de minimus level of 575 ug/m³; therefore, preconstruction monitoring is required. However, the applicant requested that the previously existing monitoring data from monitors located in West Palm Beach be considered as representative. The Department agreed with the applicant's request and allowed the data to be used to satisfy the preconstruction monitoring requirement and to establish a background concentration for use in the required AAQS analysis.

Models and Meteorological Data Used In Significant Impact, PSD Increment And AAQS Analyses: The applicant used the EPA-approved Industrial Source Complex Short-Term (ISCST3) dispersion model to evaluate the pollutant emissions from the proposed project and other existing major facilities. The model determines ground-level concentrations of inert gases or small particles emitted into the atmosphere by point, area, and volume sources. The model incorporates elements for plume rise, transport by the mean wind, Gaussian dispersion, and pollutant removal mechanisms such as deposition. The ISCST3 model allows for the separation of sources, building wake downwash, and various other input and output features. A series of specific model features, recommended by the EPA, are referred to as the regulatory options. The applicant used the EPA recommended regulatory options in each modeling scenario. Direction-specific downwash parameters were used for all sources for which downwash was considered. The stacks associated with this project all satisfy the good engineering practice (GEP) stack height criteria.

Meteorological data used in the ISCST3 model consisted of a concurrent 5-year period of hourly surface weather observations and twice-daily upper air soundings from the National Weather Service (NWS) station at West Palm Beach, Florida. The 5-year period of meteorological data was from 1987 through 1991. This NWS station was selected for use in the study because it is the closest primary weather station to the study area and is most representative of the project site. The surface observations included wind direction, wind speed, temperature, cloud cover, and cloud ceiling.

For this project, only the impacts of CO emissions are being evaluated. Since the CO standards are based on short-term averages and five years of data were used in ISCST3, the highest-second-high (HSH) short-term predicted concentrations were compared with the appropriate AAQS. For determining the project's significant impact area in the vicinity of the facility, the highest short-term predicted concentrations were compared to their respective significant impact levels.

Significant Impact Analysis: Initially, the applicant conducted modeling to determine whether the proposed project's CO emissions were predicted to have a significant impact in the vicinity of the facility. The applicant placed over 950 receptors along the site boundary and out to 35 km from the facility. The table below shows the results of this modeling. The radius of significant impact is also shown. The EPA has not established PSD Class I or II increments for CO.

TECHNICAL EVALUATION/PRELIMINARY DETERMINATION

Maximum Project Air Quality Impact for Comparison With the PSD Class II Significant Impact Level in the Vicinity of the Facility

Averaging Time	Maximum Predicted Impact (ug/m3)	Significant Impact Level (ug/m3)	Significant Impact?	Radius of Significant Impact (km)
8-HOUR	627	500	YES	35
1-HOUR	5,012	2,000	YES	35

As shown in the tables the maximum predicted air quality impacts due to CO emissions from the proposed project are greater than the PSD significant impact levels in the vicinity of the facility. Therefore, the applicant was required to do full impact CO modeling in the vicinity of the facility, within the applicable significant impact area, to determine the impacts of the project along with all other sources in the vicinity of the facility. The significant impact area is based upon the predicted radius of significant impact. Full impact modeling is modeling that considers not only the impact of the project but the impacts of the existing facility and other sources, including background concentrations, located within the vicinity of the project to determine whether all increments or AAQS are predicted to be met.

Procedure for Performing AAQS Analyses: For the AAQS analyses, receptor grids normally are based on the size of the significant impact area for each pollutant. The size of the significant impact areas for the required CO analysis were based on a 35 km radius of significant impact. The results of the CO AAQS analysis are summarized in the table below. As shown in this table, emissions from the proposed facility are not expected to cause or significantly contribute to a violation of any AAQS.

Ambient Air Quality Impacts

Averaging Time	Modeled Sources Impact (ug/m ³)	Background Conc. (ug/m ³)	Maximum Predicted Impact (ug/m ³)	AAQS (ug/m ³)	Predicted Impact Greater Than AAQS?
8-hour	5,823	3,450	9,267	10,000	NO
1-hour	11,009	5,777	16,786	40,000	NO

Additional Impacts Analysis - Impacts On Soils, Vegetation, Wildlife, and Visibility: The maximum ground-level concentrations predicted to occur due to CO emissions as a result of the proposed project, including all other nearby sources, will be below the associated AAQS which are designed to protect both the public health and welfare. This project will not have a harmful impact on soils and vegetation in the PSD Class II area in the vicinity of the facility.

TECHNICAL EVALUATION/PRELIMINARY DETERMINATION

Additional Impacts Analysis Growth-Related Air Quality Impacts: There will be no growth associated with this project.

Postconstruction Monitoring: The maximum ground level concentration was predicted to be within 90 percent of the AAQS using the available ambient monitoring data, the existing source inventory, the estimated emissions from the rocket engine test firing, and the ISCST3 dispersion model. Although the ISCST3 dispersion model is the default regulatory model, its application to short-term release scenarios is limited. In addition, the emission estimates for the rocket engine test firing are based on theoretical calculations and may vary significantly. For these reasons and the very high concentration of CO predicted within the rocket engine exhaust gases, the Department will require the applicant to establish an air monitoring program to monitor CO concentrations down wind of the test stand in accordance with Rule 62-212.400(5)(g), F.A.C.

The monitoring program shall be established prior to the initial test firing and shall provide for the collection of data for a minimum of four (4) test firings, one in each calendar quarter. The program will allow the applicant to discontinue monitoring upon approval of the PBCHD during extended periods when testing is not scheduled.

6. CONCLUSION

Based on information provided by the applicant, supplemented by other information available to the Department, the restriction within the draft permit and BACT Determination, the Department has reasonable assurance that the proposed project will not cause a violation of any air quality standard or PSD increment.

APPENDIX BD - DETERMINATION OF
BEST AVAILABLE CONTROL TECHNOLOGY (BACT)

United Technologies Corp.- Pratt & Whitney
LOX/Kerosene Rocket Engine Stand Project
Palm Beach County

DEP File No. 0990021-004-AC
PSD-FL-294

Department of Environmental Protection
Division of Air Resources Management
Bureau of Air Regulation

Month Day, 2001

APPENDIX BD - BACT DETERMINATION

United Technologies Corp. – Pratt & Whitney LOX/Kerosene Rocket Engine Stand Project Palm Beach County

United Technologies Corp.- Pratt & Whitney (UTC-P&W) proposes to construct a Liquid Oxygen (LOX)/Kerosene Rocket Engine Test Stand at the E-5 rocket test area located at 17900 Beeline Highway (SR 710) near Jupiter, Palm Beach County.

The proposed project will result in a significant emissions increase of carbon monoxide (CO) according to Table 212.400-2, Florida Administrative Code (F.A.C.). The project is therefore subject to review for Prevention of Significant Deterioration (PSD) and a determination of Best Available Control Technology (BACT) in accordance with Rule 62-212.400, F.A.C.

The details of PSD applicability and a description of the process are presented in the separate Technical Evaluation and Preliminary Determination issued concurrently with this determination.

BACT DETERMINATION REQUESTED BY THE APPLICANT:

The applicant requested that the Department's BACT determination for CO emissions require no control equipment due to prohibitive cost and impracticability of controlling such a large exhaust stream. Instead, the applicant proposed that the BACT requirements focus on combustion control by way of adjusting the oxygen to fuel ratio to maximize combustion efficiency thus reducing CO emissions.

BACT DETERMINATION PROCEDURE:

In accordance with Chapter 62-212, F.A.C., a BACT determination is based on the maximum degree of reduction of each pollutant emitted which the Department of Environmental Protection (Department), on a case by case basis, taking into account energy, environmental and economic impacts, and other costs, determines is achievable through application of production processes and available methods, systems, and techniques. In addition, the regulations state that, in making the BACT determination, the Department shall give consideration to:

- Any Environmental Protection Agency determination of BACT pursuant to Section 169, and any emission limitation contained in 40 CFR Part 60 - Standards of Performance for New Stationary Sources or 40 CFR Part 61 - National Emission Standards for Hazardous Air Pollutants.
- All scientific, engineering, and technical material and other information available to the Department.
- The emission limiting standards or BACT determinations of any other state.
- The social and economic impact of the application of such technology.

The EPA currently stresses that BACT should be determined using the "top-down" approach. The first step in this approach is to determine, for the emission unit in question, the most stringent control available for a similar or identical emission unit or emission unit category. If it is shown that this level of control is technically or economically infeasible for the emission unit in question, then the next most stringent level of control is determined and similarly evaluated. This process

APPENDIX BD - BACT DETERMINATION

continues until the BACT level under consideration cannot be eliminated by any substantial or unique technical, environmental, or economic objections.

Under 40 CFR Part 60 - Standards of Performance for New Stationary Sources (NSPS) there is no promulgated emission standard that applies to emissions from rocket engine test facilities.

Under 40 CFR Part 61 - National Emission Standards for Hazardous Air Pollutants (NESHAP) there is a promulgated emission standard that applies to emissions from rocket engine test facilities. The Standard, 40 CFR Part 61, Subpart D applies specifically to Beryllium Rocket Motor Firing. It includes an emission standard based on a time-weighted atmospheric concentration of beryllium and a requirement to monitor ambient air concentrations to ensure compliance with the emission standard. The monitoring program requires prior approval from the Administrator.

Under 40 CFR Part 63 - National Emission Standards for Hazardous Air Pollutants (NESHAP) for Source Categories, Rocket Engine Test Firing is a targeted source category. On December 8, 1998 the EPA workgroup working on this matter, distributed Information Collection Requests to the major companies (including OTC Pratt & Whitney) potentially affected by such a NESHAP. The Department's contacted Mr. Richard A. Copland, the project team leader at EPA. According to Mr. Copland, (based on the information received) it appears at this time that there will be no controls due to the relatively short firing time, remote facility locations, costs, etc. EPA is still researching the matter so Mr. Copland's assessment of the present situation is not considered as final.

BACT DETERMINATIONS BY EPA AND STATES:

The Department's review for any prior BACT determinations for emissions from rocket engine test facilities referred to in the RACT/BACT/LAER Clearinghouse identified the following:

- MS-0019, State of Mississippi, December 1990 BACT Determination for the National Aeronautics and Space Administration's (NASA) Stennis Space Center. The BACT determination required use of a deflector ramp to aid in dispersion and prevent scouring of soil and restrictions on meteorological conditions to prevent possible acid rain formation. Specific numerical limits were not established. The project was associated with the Advanced Solid Rocket Motor (ASRM). The project was later discontinued when Congress suspended funding.

OTHER INFORMATION AVAILABLE TO THE DEPARTMENT

The primary sources of information related to rocket engine test stands included the applicant's data, the MDEQ, and the NESHAP activities. These sources provided information on existing test stands, emissions, permitting requirements and control strategies.

The applicant provided estimates of emissions based on a fuel combustion model developed by NASA. Known as the NASA-Lewis chemical equilibrium computer program, emission estimates were provided by the applicant in supplemental information filed during the application completeness process. The NASA-Lewis chemical equilibrium computer program appears to be the primary source of most emission estimates for rocket engine test operations.

The Department contacted the Mississippi Department of Environmental Quality (MDEQ) regarding the 1990 BACT determination. MDEQ provided additional information as well as

APPENDIX BD - BACT DETERMINATION

identifying a current in-house project for the NASA Stennis Space Center. The project included the establishment of federally enforceable permit conditions on the facility's LOX/hydrocarbon rocket engine test stands. A copy of the draft permit (1000-00005) was provided to the Department for review. The enforceable conditions within the permit included the following:

- Emissions Limitations: PM (10,270 lb/test), PM₁₀ (6,060 lb/test), SO₂ (2,520 lb/test), NO_x (2520 lb/test) CO (558,600 lb/test) and VOC (50 lb/test).
- Fuel Authorizations: Liquid Hydrogen (LH₂)/Liquid Oxygen (LOX) and hydrocarbon fuels.
- Emission Estimates: NASA-Lewis chemical equilibrium computer program or an equivalent version.
- Records: For each test - the duration, the fuels and the calculated emission rates for PM, PM₁₀, SO₂, NO_x, CO, and VOC. Semiannual report showing number of tests per month, total emissions per month, and the highest lb/test emissions rate during the reporting period.

The Department is also aware of the other rocket engine test stands, however, the 1990 MDEQ BACT determination is the only one that included a BACT determination and is thus a BACT floor.

PROPOSED PROJECT AND EMISSIONS

The applicant proposes to construct and operate a LOX/Kerosene Rocket Engine Stand at its existing rocket test facility in West Palm Beach. The applicant also operates a gas turbine testing facility and a helicopter development facility at the existing site. This project will consist of liquid oxygen and fuel storage tanks (64,000 and 36,000 gallon capacities), an engine containment can, a water-cooled silencer, an exhaust gas deflector, a lined cooling water retention pond, and an elevated 1-million gallon water supply tank.

Emissions will be generated from combustion of fuel during 12 test firings per year lasting 240 seconds each. These emissions have been estimated according to the NASA combustion model as indicated next:

Pollutant	CO	CO ₂	H ₂	VOC	PM	SO _x	NO _x
lb/sec	694	1,366	17	2	1.6	<1	1
TPY	1,000	1,967	25	3	2.3	1.4	1.4

As indicated in the table above, the only regulated pollutant believed to be emitted in significant quantities is CO in the amount of 1,000 TPY. No estimates are given for HAPs. In any case, HAPs emissions are believed to be less than 10 TPY of any single HAP or less than 25 TPY of all HAPs combined.

APPENDIX BD - BACT DETERMINATION

BACT CONTROL OPTIONS

The applicant has requested that the Department's BACT determination for CO emissions require no add-on control equipment due to prohibitive cost and impracticability of controlling such a large exhaust stream. Instead, the applicant proposed that the BACT requirements focus on combustion control by way of adjusting the oxygen to fuel ratio to maximize combustion efficiency thus reducing CO emissions, limiting test duration to no longer than 240 seconds per test, and limiting testing to no more than 12 tests per year.

The applicant's BACT evaluation referred to a Russian rocket test stand that employed a water injection and ducting system solely for the purpose of avoiding heat detection by surveillance satellites during the Cold-War era. According to the applicant, the Russian test stand was not designed as an emission control system and should not be considered as any sort of exemplary emission control system. This is the only rocket test stand reported by the applicant that may be construed to have any add-on controls.

BACT DETERMINATION

If the BACT analysis is based on the transfer of CO oxidation technology from the gas turbine industry, differences in exhaust concentrations must be considered. Based on the modeled exhaust flow, the molar concentration of exhaust gases will be about 23% CO, 28% CO₂, 8% H₂ and 41% H₂O vapor. Kerosene rocket engines fire a fuel rich mixture for heat control flexibility, firing at approximately 82% of theoretical O₂ required for complete combustion. Consequently, CO emissions from engines of this type are very high compared to combustion turbines that rarely exceed 150-200 ppm CO even at medium loads.

Turbine exhaust oxidation technology applied to a rocket engine test stand will result in far greater costs. Estimates provided by the applicant indicate that a conventional incinerator would cost about \$579,000,000 with an annualized cost of about \$68,000,000. An additional \$100,000,000 would be required, according to the applicant, to construct an appropriate infrastructure for a control device designed to withstand the maximum thrust and high temperatures of the rocket engine exhaust. The Department does not necessarily accept these figures, but agrees that actual figures can be many millions of dollars.

If a system could be designed to capture the rocket engine exhaust gases and convert the CO to CO₂ catalytically or by thermal oxidation, it would be massive (~ 60 ft. diameter) and have to withstand extreme temperatures and thrust pressures adding significantly to construction and operating costs. Cost effectiveness for catalytic oxidation of natural gas-fired turbine exhausts for the largest sizes of utility turbines ranges from \$5,000 to over \$8,000 per ton of CO removed. When scaled up for the extreme conditions of a rocket engine exhaust and the numerous uncertainties inherent in such a system, the overall cost effectiveness might exceed \$100,000 per ton depending on the safety factors used in the design. Considering these uncertainties, the Department concludes that catalytic oxidation such as employed by turbines would not be practicable or cost-effective and neither would incineration.

Yet, it is conceivable that other means could be used for injecting oxygen into the exhaust gases to create conditions suitable for oxidation of much of the CO. An automobile emission control system with air injection is one example. Since this facility will emit at least 1,000 TPY CO, and since CO is a criteria air pollutant, the Department proposes that a study be done by the applicant

APPENDIX BD - BACT DETERMINATION

to evaluate the feasibility of direct O₂ injection into the gas stream downstream of the body of the engine. The study should employ kinetic modeling to determine the practicability and economic feasibility of adding the balance of stoichiometric oxygen required for complete combustion via direct injection at an appropriate point or points in the rocket engine exhaust. A period of one year is provided for completion of the study and submitting it to the Department.

The Department agrees with the applicant's finding that existing oxidation technology is not feasible at this time. As a result, the Department has determined BACT for the rocket engine test stand to be a visible emissions limitation of forty (40) percent opacity and the following work practices:

- Carbon Monoxide (CO) Emissions – Rocket engine test firings shall not result in CO emissions greater than 41.5 tons per minute (2-minute average), 83 tons per 8-hour period, and 1,000 tons per year (12-month rolling total) as determined using the NASA-Lewis chemical equilibrium computer program or equivalent method approved by the Department or the Palm Beach Public Health Department.
- Test Stand - The test stand shall be constructed in accordance with the design specifications provided within the application including a Water Cooled Silencer and an Exhaust Gas Deflector with a Minimum height of 70 feet, maximum distance from Water Cooled Silencer of 100 feet. The surface between the water-cooled silencer and the exhaust gas deflector shall be paved.
- Test Duration – Rocket engine test firings shall not exceed a total of 240 seconds per 8-hour period.
- Test Firings – Rocket engine test firings shall not exceed 2,880 seconds per year (12-month rolling total).
- Oxidant/Fuel Ratio – All rocket engine test firings shall be conducted at a minimum oxidant/fuel ratio of 2.72 lb. O₂/lb. Fuel.
- Fuel Usage – Rocket engine test firings shall not consume more than 6,625 gallons per minute (4-minute average), 26,500 gallons per 8-hour period, and 318,000 gallons per year (12-month rolling total).
- Quench Water - All rocket engine test firings shall be conducted with sufficient quench water to minimize NO_x formation.
- Fuel and Oxidizer Types - Rocket engine test firings shall be limited to the firing of kerosene as the fuel and liquid oxygen (LOX) as the oxidizer.
- Test Conditions – Rocket engine test firings shall be restricted to daylight hours (1 hour after sunrise and 1 hour prior to sunset) and only under ambient conditions that provide good dispersion of the exhaust gases in accordance with a Test Plan to be submitted to the Palm Beach County Health Department (PBCHD) for approval prior to the initial test. Non-daylight hour testing may be approved on a case-by-case basis by the Palm Beach County Health Department (PBCHD).

APPENDIX BD - BACT DETERMINATION

- Test Notifications – At least 24 hours prior to a rocket engine test firing, notification shall be provided to the PBCHD. The notification shall include the date and time of the test firing, the expected duration of the test firing, the planned oxidant/fuel ratio, and the planned fuel usage rate. In the event that an upset occurs during a test (i.e., test duration > 240 seconds, O/F ratio less than 2.72, fuel usage > 13,250 gpm, a flame out, etc.), a written excess emissions report shall be provided to the PBCHD within 24 hours of the test. The report shall identify the upset and impacts.
- Postconstruction Monitoring – The permittee shall, prior to any rocket test firings, establish an approved ambient air quality monitoring program to measure ambient air concentrations of CO before, during, and after a rocket engine test firing. The Program shall be approved by the Palm Beach County Health Department (PBCHD) and may be discontinued upon written request and PBCHD approval.
- Oxygen Injection Study – Within one year of initial issuance of this permit, the permittee shall complete and submit to the Department an engineering and cost study evaluating the technical feasibility and cost effectiveness of direct O₂ injection for reducing CO emissions in the exhausts of rocket engines tested at the permittee's facility. The study shall evaluate possibilities for direct O₂ injection including a heat-shielded, internally-cooled oxygen lance for injecting stoichiometric rates of oxygen into the exhaust downstream of the engine. Appropriate kinetic modeling shall be utilized to predict the oxidation reaction rates and overall CO conversion for various configurations of the injection apparatus and various injection locations and methods.
- Compliance Demonstrations – Compliance with the visible emissions limitation shall be demonstrated initially for each new oxidant/fuel ratio and annually thereafter. Compliance with the CO emissions limitation shall be demonstrated initially and continuously thereafter through the use of the NASA Lewis chemical equilibrium computer program or its equivalent as approved by the Department or the Palm Beach County Health Department and the ambient air quality monitoring program.
- Excess Emissions - Excess emissions shall be allowed provided the permittee demonstrates that the emissions did not result in a predicted ambient impact greater than the National Ambient Air Quality Standards (NAAQS) for CO adjusted based on the ambient monitoring program; a significant emissions increase in a PSD Pollutant; or result in emissions of a hazardous air pollutant in an amount of 10 tons per year or greater individually or 25 tons per year or greater collectively.

APPENDIX BD - BACT DETERMINATION

DETAILS OF THE ANALYSIS MAY BE OBTAINED BY CONTACTING:

A. A. Linero, P.E. Administrator
Bureau of Air Regulation
2600 Blair Stone Road, MS # 5505
Tallahassee, Florida 32399-2400
850/488-0114

Recommended By:

Approved By:

C. H. Fancy, P.E., Chief
Bureau of Air Regulation

Howard L. Rhodes, Director
Division of Air Resources Management

Date:

Date:

Memorandum

Florida Department of Environmental Protection

TO: Clair Fancy

FROM: A. A. Linero *aal* 7/9

DATE: July 9, 2001

SUBJECT: United Technologies Corp.-Pratt & Whitney
DEP File No. 0990021-004-AC (PSD-FL-294)
LOX/Kerosene Rocket Engine Test Stand

Attached for your review and approval is the revised Intent to Issue for the construction of a LOX/Kerosene Rocket Engine Test Stand at the subject facility near in Palm Beach County.

Pratt & Whitney never published notice and instead requested extensions of time to file a petition. We had a teleconference with them in early May and they met with Palm Beach a few days later. We made several changes in the draft package and are ready to send it out again.

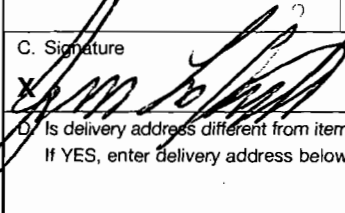
Pratt and Whitney has not been in a rush for this permit. They seem to be concerned about many small details that could probably have been ironed during the comment period after public notice.

They asked for another 90-day extension of time on May 17 "to allow P&W and FDEP to complete our work on this permit and resolve these issues without the necessity for a formal hearing."

Let's send out the revised package. I'll let them know we might publish it if they don't.

I recommend your approval and signature.

AAL/

SENDER: COMPLETE THIS SECTION	COMPLETE THIS SECTION ON DELIVERY
<ul style="list-style-type: none"> Complete items 1, 2, and 3. Also complete item 4 if Restricted Delivery is desired. Print your name and address on the reverse so that we can return the card to you. Attach this card to the back of the mailpiece, or on the front if space permits. 	A. Received by (Please Print Clearly) _____ B. Date of Delivery 9-10-01
1. Article Addressed to: Mr. John K. Silan, Manager Facilities Management United Technologies Corp. - Pratt & Whitney P. O. Box 109600 W. Palm Beach, FL 33410-9600	C. Signature  <input type="checkbox"/> Agent <input type="checkbox"/> Addressee D. Is delivery address different from item 1? <input type="checkbox"/> Yes If YES, enter delivery address below: <input type="checkbox"/> No
2. Article Number (Copy from service label) 7000 0600 0026 4129 8085	3. Service Type <input checked="" type="checkbox"/> Certified Mail <input type="checkbox"/> Express Mail <input type="checkbox"/> Registered <input type="checkbox"/> Return Receipt for Merchandise <input type="checkbox"/> Insured Mail <input type="checkbox"/> C.O.D. 4. Restricted Delivery? (Extra Fee) <input type="checkbox"/> Yes

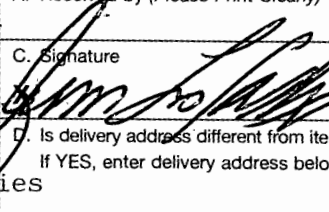
PS Form 3811, July 1999

Domestic Return Receipt

102595-99-M-1789

U.S. Postal Service CERTIFIED MAIL RECEIPT (Domestic Mail Only; No Insurance Coverage Provided)											
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<table border="1"> <tr> <td>Postage</td> <td>\$</td> </tr> <tr> <td>Certified Fee</td> <td></td> </tr> <tr> <td>Return Receipt Fee (Endorsement Required)</td> <td></td> </tr> <tr> <td>Restricted Delivery Fee (Endorsement Required)</td> <td></td> </tr> <tr> <td>Total Postage & Fees</td> <td>\$</td> </tr> </table>	Postage	\$	Certified Fee		Return Receipt Fee (Endorsement Required)		Restricted Delivery Fee (Endorsement Required)		Total Postage & Fees	\$	Postmark Here
Postage	\$										
Certified Fee											
Return Receipt Fee (Endorsement Required)											
Restricted Delivery Fee (Endorsement Required)											
Total Postage & Fees	\$										
<table border="1"> <tr> <td colspan="2"> Recipient's Name (Please Print Clearly) (to be completed by mailer) John K. Silan Street, Apt. No., or PO Box No. P. O. Box 109600 City, State, ZIP+4 W. Palm Beach, FL 33410-9600 </td> </tr> <tr> <td>PS Form 3800, February 2000</td> <td>See Reverse for Instructions</td> </tr> </table>		Recipient's Name (Please Print Clearly) (to be completed by mailer) John K. Silan Street, Apt. No., or PO Box No. P. O. Box 109600 City, State, ZIP+4 W. Palm Beach, FL 33410-9600		PS Form 3800, February 2000	See Reverse for Instructions						
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7000 0600 0026 4129 8085

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<ul style="list-style-type: none"> Complete items 1, 2, and 3. Also complete item 4 if Restricted Delivery is desired. Print your name and address on the reverse so that we can return the card to you. Attach this card to the back of the mailpiece, or on the front if space permits. 	A. Received by (Please Print Clearly)	B. Date of Delivery 6-31
1. Article Addressed to: Mr. John Sillan, Manager Facilities Management United Technologies Corp.- Pratt & Whitney P. O. Box 109600 West Pam Beach, FL 33410-9600	C. Signature 	
	D. Is delivery address different from item 1? <input type="checkbox"/> Yes If YES, enter delivery address below: <input type="checkbox"/> No	
2. Article Number (Copy from service label) 7099 3400 0000 1449 4574	3. Service Type <input checked="" type="checkbox"/> Certified Mail <input type="checkbox"/> Express Mail <input type="checkbox"/> Registered <input type="checkbox"/> Return Receipt for Merchandise <input type="checkbox"/> Insured Mail <input type="checkbox"/> C.O.D.	
	4. Restricted Delivery? (Extra Fee) <input type="checkbox"/> Yes	
PS Form 3811, July 1999 Domestic Return Receipt 102595-99-M-1789		

U.S. Postal Service CERTIFIED MAIL RECEIPT (Domestic Mail Only; No Insurance Coverage Provided)		
Article Sent To: John K. Sillan		
Postage	\$	United Tech. Pratt & Whitney Postmark Here
Certified Fee		
Return Receipt Fee (Endorsement Required)		
Restricted Delivery Fee (Endorsement Required)		
Total Postage & Fees	\$	
Name (Please Print Clearly) (to be completed by mailer) Mr. John K. Sillan		
Street, Apt. No., or PO Box No. P. O. Box 109600		
City, State, ZIP+4 West Palm Beach, FL 33410-9600		
PS Form 3800, July, 1999		See Reverse for Instructions

7099 3400 0000 1449 4574

Z 341 355 333

US Postal Service
Receipt for Certified Mail

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Sent to	
<i>John K. Silan Pratt & Whitney</i>	
Street & Number	
<i>P.O. Box 109600</i>	
Post Office, State, & ZIP Code	
<i>WPB, FL 33410-9600</i>	
Postage	\$
Certified Fee	
Special Delivery Fee	
Restricted Delivery Fee	
Return Receipt Showing to Whom & Date Delivered	
Return Receipt Showing to Whom, Date, & Addressee's Address	
TOTAL Postage & Fees	\$
Postmark or Date	
<i>7/17/00</i>	

PS Form 3800, April 1995

SENDER: COMPLETE THIS SECTION

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- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

Mr. John K. Silan
Manager Facilities Management
United Technologies Corp -
Pratt & Whitney
P.O. Box 109600
West Palm Beach, FL 33410-9600

2. Article Number (Copy from service label)

Z 341 355 333

PS Form 3811, July 1999

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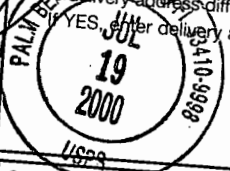
A. Received by (Please Print Clearly) B. Date of Delivery

C. Signature

[Signature]

- Agent
- Addressee
- Yes
- No

Is the delivery address different from item 1? Yes No



3. Service type

- Certified Mail Express Mail
- Registered Return Receipt for Merchandise
- Insured Mail C.O.D.

4. Restricted Delivery? (Extra Fee) Yes

Domestic Return Receipt

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- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

*Mr. John K. Silan
Manager Facilities Mgt.
United Technologies Corp
Pratt & Whitney
P.O. Box 109600
West Palm Beach, FL 33410*

2. Article Number (Copy from service label)

Z 341 355 340

COMPLETE THIS SECTION ON DELIVERY

A. Received by (Please Print Clearly) B. Date of Delivery

C. Signature

[Handwritten Signature]

- Agent
- Addressee

D. Is delivery address different from item 1? Yes
If YES, enter delivery address below: No

3. Service Type

- Certified Mail Express Mail
- Registered Return Receipt for Merchandise
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4. Restricted Delivery? (Extra Fee) Yes

Z 341 355 340

US Postal Service
Receipt for Certified Mail

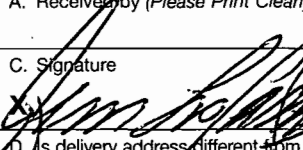
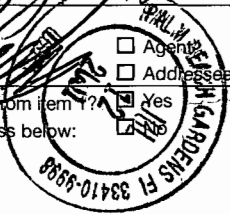
No Insurance Coverage Provided.
Do not use for International Mail (See reverse)

Sent to <i>John Silan</i>	
Street & Number <i>P.O. Box 109600</i>	
Post Office, State, & ZIP Code <i>West Palm Beach, FL 33410-9600</i>	
Postage	\$
Certified Fee	
Special Delivery Fee	
Restricted Delivery Fee	
Return Receipt Showing to Whom & Date Delivered	
Return Receipt Showing to Whom, Date, & Addressee's Address	
TOTAL Postage & Fees	\$

PS Form 3800 April 1995

Postmark or Date
7/19/00

United Tech. Corp - Pratt & Whitney

SENDER: COMPLETE THIS SECTION	COMPLETE THIS SECTION ON DELIVERY
<ul style="list-style-type: none"> Complete items 1, 2, and 3. Also complete item 4 if Restricted Delivery is desired. Print your name and address on the reverse so that we can return the card to you. Attach this card to the back of the mailpiece, or on the front if space permits. 	A. Received by (Please Print Clearly) _____ B. Date of Delivery <u>7-12-01</u>
1. Article Addressed to: Mr. John K. Sillan, Manager Facilities Management United Technologies Corp.- Pratt & Whitney P.O. Box 109600 West Palm Beach, FL 33410-9600	C. Signature  <input type="checkbox"/> Agent <input type="checkbox"/> Addressee D. Is delivery address different from item 1? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No If YES, enter delivery address below: _____ 
2. Article Number (Copy from service label) 7000 0600 0026 4129 8337	3. Service Type <input type="checkbox"/> Certified Mail <input type="checkbox"/> Express Mail <input type="checkbox"/> Registered <input type="checkbox"/> Return Receipt for Merchandise <input type="checkbox"/> Insured Mail <input type="checkbox"/> C.O.D. 4. Restricted Delivery? (Extra Fee) <input type="checkbox"/> Yes
PS Form 3811, July 1999 Domestic Return Receipt 102595-99-M-1789	

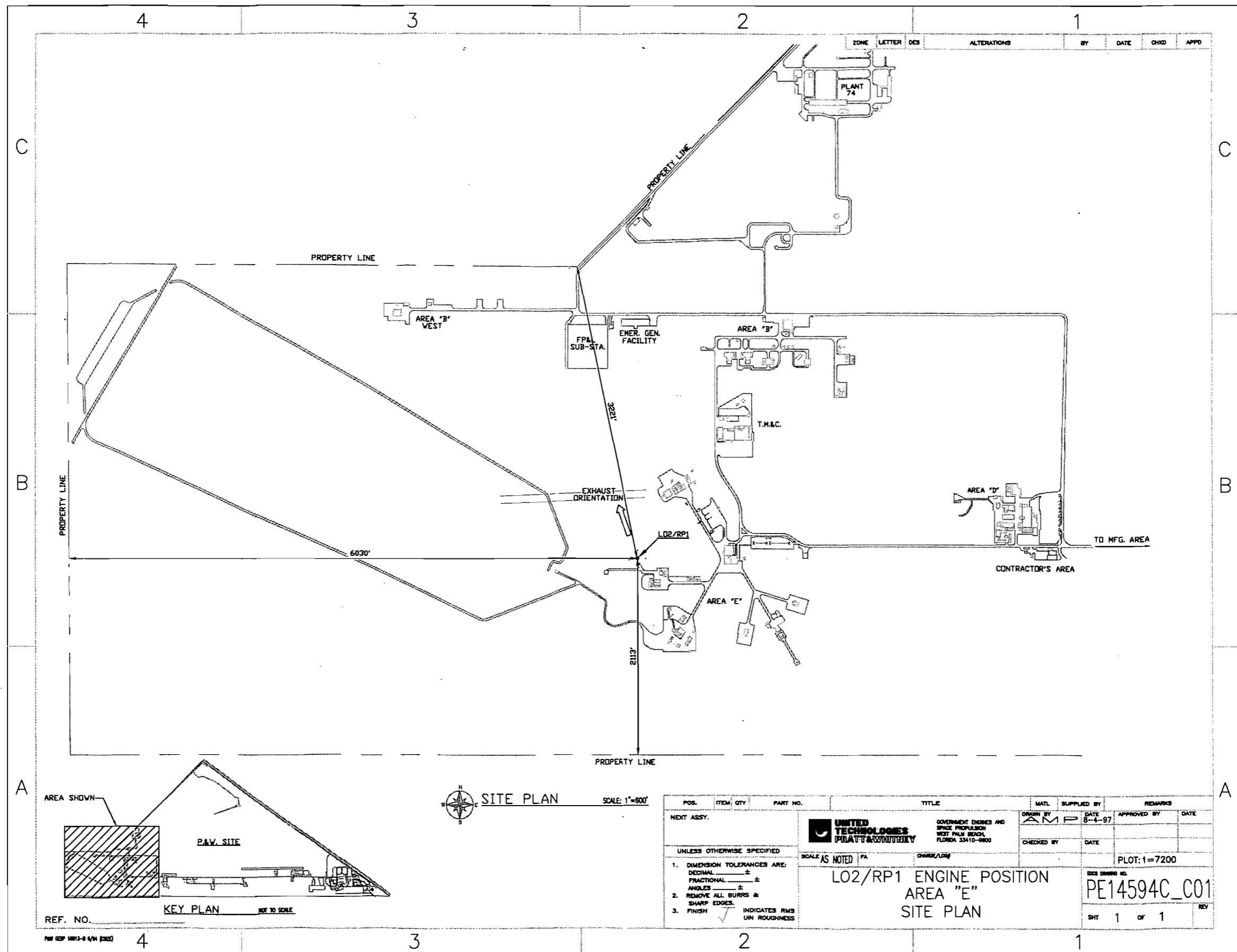
U.S. Postal Service
CERTIFIED MAIL RECEIPT
(Domestic Mail Only; No Insurance Coverage Provided)

7000 0600 0026 4129 8337

Postage	\$	Postmark Here
Certified Fee		
Return Receipt Fee (Endorsement Required)		
Restricted Delivery Fee (Endorsement Required)		
Total Postage & Fees	\$	

Recipient's Name (Please Print Clearly) (to be completed by mailer)
 Mr. John K. Sillan, Mgr.
 Street, Apt. No. or PO Box No.
 PO Box 109600
 City, State, ZIP+4
 West Palm Beach, FL 33410-9600

PS Form 3800, February 2000 See Reverse for Instructions



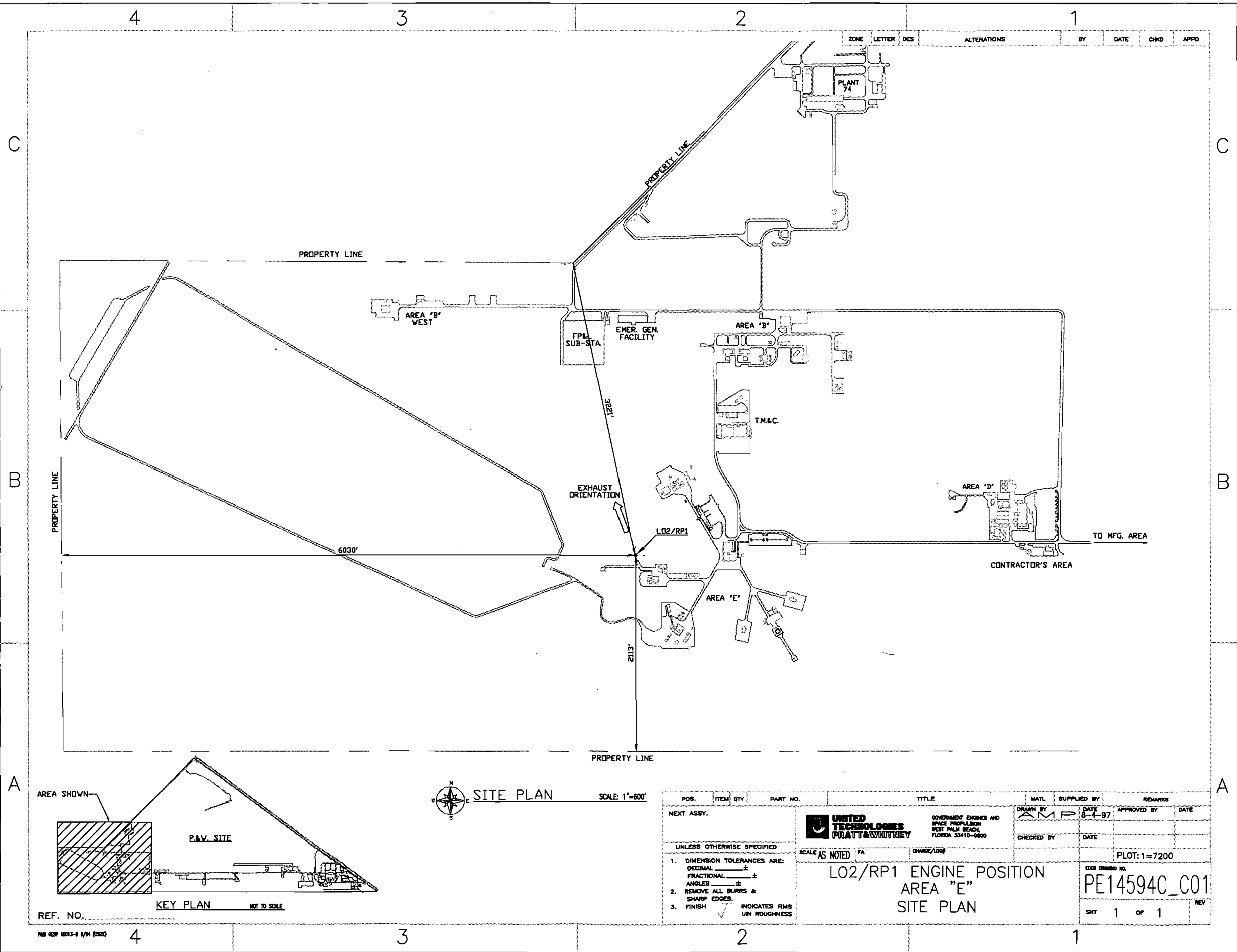
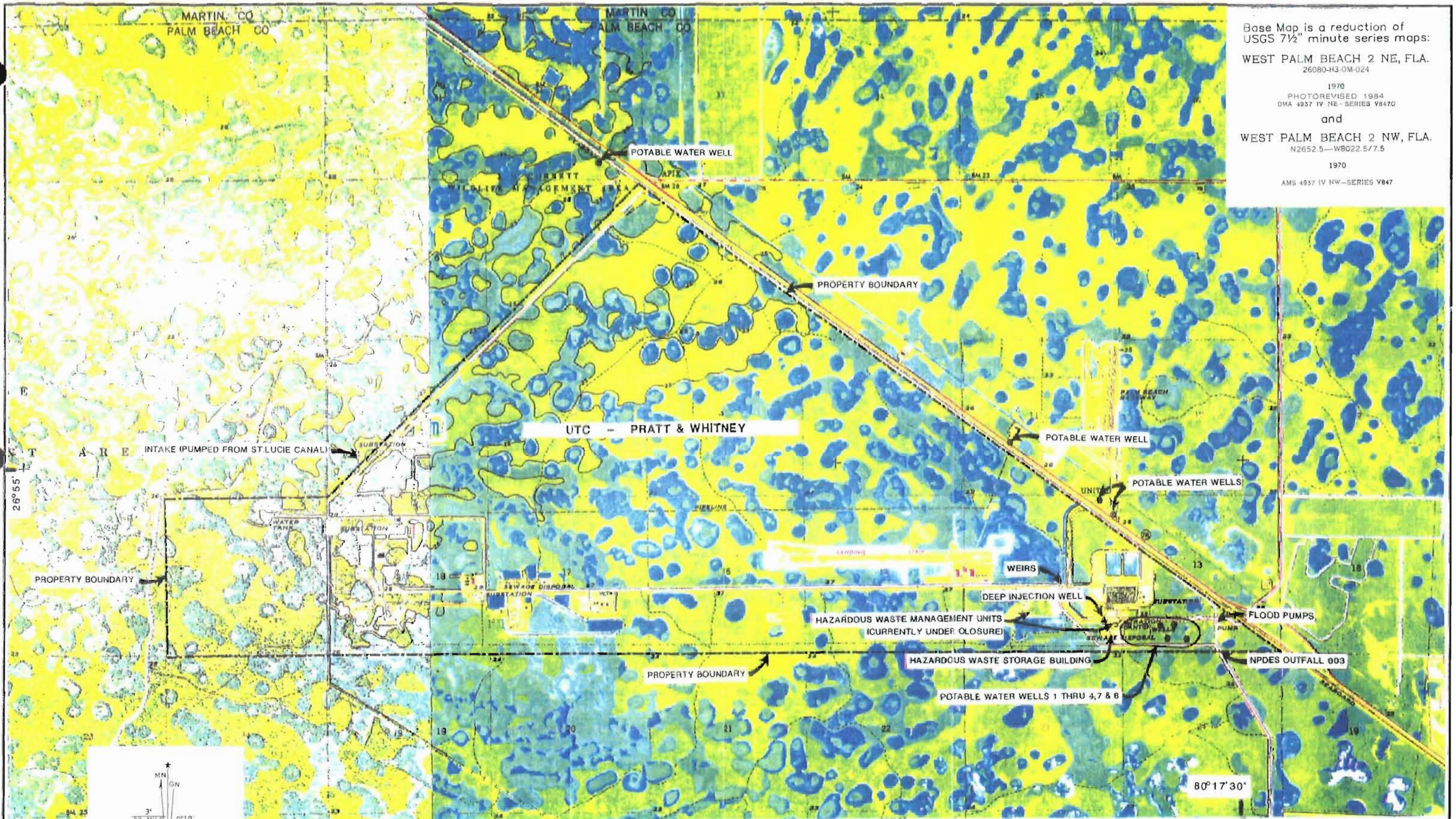


Figure 1-1. General Location

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Last Updated: 5/23/2000 by ARZ

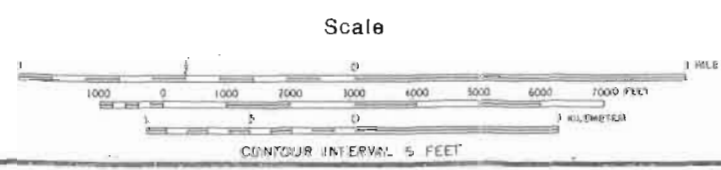




Base Map is a reduction of
 USGS 7½" minute series maps:
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 26080-H3-0M-024
 1970
 PHOTOREVISED 1984
 DMA 4937 IV NE-SERIES V8470
 and
 WEST PALM BEACH 2 NW, FLA.
 N2652.5-WB022.5/7.5
 1970
 AMS 4937 IV NW-SERIES V847

MN
 GN
 3"
 53 MILS
 0°19'
 6 MILS

1984 Magnetic North
 Declination



**UNITED
 TECHNOLOGIES
 PRATT & WHITNEY**

FIGURE 1
 SITE TOPOGRAPHIC MAP