Department of
Environmental Protection

Jeb Bush
Governor

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

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 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 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

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

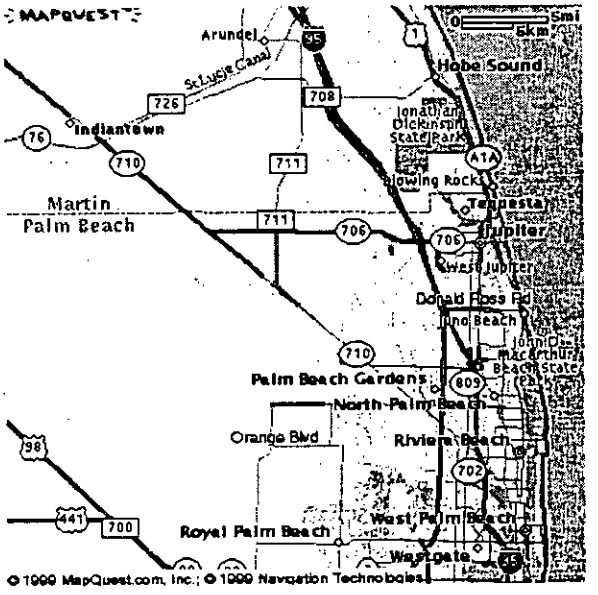

Figure 2 – Site - SR 710 and CR 711

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 PM_{10} (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 (SO_2) 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.

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, SO_2, 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.

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.

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."

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.

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% CO_2, 8% H_2 and 41% H_2O 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 O_2 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.

- 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. O_2/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 O_2 (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 O_2 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 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

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.

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.

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

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 (SO_2), 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

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 if 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. [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.]

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 (SO_2), 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 O_2 (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 O_2 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 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.]

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.]

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.]

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.]

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

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

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. Copeland, (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. Copeland'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

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), PM_{10} (6,060 lb/test), SO_2 (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, PM_{10}, SO_2, 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.

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% CO_2, 8% H_2 and 41% H_2O vapor. Kerosene rocket engines fire a fuel rich mixture for heat control flexibility, firing at approximately 82% of theoretical O_2 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 CO_2 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

to evaluate the feasibility of direct O_2 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. O_2/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).

- 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 O_2 (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 O_2 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/duel 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.

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:

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

Date:

Approved By:

Howard L. Rhodes, Director
Division of Air Resources Management

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.

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 extend 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.