Golder **Associates** Inc.

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August 22, 2000

Florida Department of Environmental Protection
New Source Review Section
2600 Blair Stone Road
Tallahassee, FL 32399-2400

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

RE: PRATT & WHITNEY'S RESEARCH & DEVELOPMENT FACILITY
LOX/KEROSENE ROCKET ENGINE STAND PROJECT
DEP FILE NO. 0990021-004-AC (PSD-FL-294)

Dear Mr. Linero:

Golder Associates Inc. (Golder), on behalf of Pratt & Whitney has prepared the following responses to the Palm Beach County Health Department (PBCHD) letter dated July 13, 2000 and the Florida Department of Environmental Protection's (DEP) letter dated July 19, 2000.

PBCHD Question 1 - Emission estimates for the criteria pollutants are not adequately documented. Please request the applicant to supply documentation on the expected emissions. If a combustion model was used, please have them submit a copy. Particulate matter (PM) emissions need to include solids within the cooling water, volatile organic compound (VOC) also need to be documented given the high carbon dioxide (CO) numbers.

For your information, some of my work at NASA's Stennis Space Center dealt with the testing of similar engine. For that project, the combustion model predicted high CO rates at the engine exhaust. However, when the exhaust gases mix with air, the model predicted overall lower CO emissions and an increase rate of NO_x.

Response PBCHD 1 - The combustion model used to determine the pollutants expected from the rocket test stand is the "NASA Combustion Deck (TEP)". This model is a modified version of the original NASA combustion model. A description of the model is attached as part of the response to this question. An overview of the model can be found at http://www2.ari.net/ahsystems/tep.html.

The emissions provided in the application are those provided from the model simulations. Because liquid oxygen is used as a propellant there is no atmospheric nitrogen that will form NO_x. When the exhaust enters the silencer, about 2,700 pounds per second (lb/sec) of air will mix with the rocket exhaust and 27,800 lb/sec of water will be used to quench the exhaust. As provided in the application, the final exhaust will angled at 45 degree toward vertical and

fuel N vs. atmospheric N_2

consist of steam at 230 degrees Fahrenheit (°F) within an estimated 60-foot-diameter plume. Since the quenching will occur very rapidly, NO_x formation from the air entering the silencer is expected to be low. As a conservative estimate of the NO_x emissions using the AP-42 emission factor for flares has been calculated (see attached AP-42 Table 13.5-1, revise September 1998). The total heat input from the kerosene is 14.3 million Btu/sec (741.1 lb/sec x 19,300 Btu/lb). The estimated NO_x emissions are 0.97 lb/sec or 233.4 lb/test. The model simulations did not predict emission of VOCs. The information presented in Section 2.3 regarding exhaust gas concentrations account for all the carbon and hydrogen in the kerosene. Again, as a conservative estimate of the VOC emissions, the AP-42 emission factor for flares was used. The calculated emissions are 2 lb/hr and 480 lb/test.

The PM emissions from the cooling water were estimated based on the amount of water required to reduce the exhaust temperature to 230°F. The reduction was assumed for the combined flow of the rocket exhaust and entrained air (i.e., 5,600 lb/sec). The amount of water evaporated is estimated at 5,400 lb/sec. The water used for cooling has 300-parts per million (ppm) total dissolved solids, which can become PM emissions. The calculated emissions are 1.6 lb/sec or 389 lb/test.

Based on the above calculations, the maximum estimated emissions of NO_x, VOC, and PM emissions are 1.4 tons/year, 2.9 tons/year, and 2.3 tons/year, respectively. These emissions rates are less than the PSD significant emission rates for these pollutants.

PBCHD Question 2 - Emission estimates for HAPs have not been provided. The activity is a listed source category under Section 112 of the Clean Air Act and the applicant should specifiate PM and VOC emissions, if possible. A case-by-case MACT determination may be required.

Response PBCHD 2 - The PM emissions would be from evaporated water primarily containing common dissolved minerals. These would typically be non-HAPs such as calcium. Any HAPs generated from the combustion will likely be VOCs. As noted in the response to PBCHD-1, the estimate amount of VOCs is 2.9 tons/year. Kerosene has low amounts of other contaminants in the fuel. Using AP-42 emission factors (see attached Table 1.3-10, rev 9/98) for trace elements in the fuel the maximum calculated emissions of HAPs are 0.05 lb/test (0.0003 TPY) for a single HAP (i.e., selenium) and 0.16 lb/test (0.00097 TPY) for all trace element HAPs (arsenic, beryllium, cadmium, chromium, lead, mercury, manganese, nickel, and selenium) . These emissions are much less than the MACT criteria in 40 Code of Federal Regulation Part 63.

PBCHD Question 3 - There are a number of unregulated activities with significant allowable emissions. The source needs to include these activities with the modeling analyses.

Response PBCHD 3 - As noted by the above responses and the information contained in the application, modeling of unregulated activities is not considered necessary. The very short nature of these tests, together with the conservative nature of the modeling, does not suggest that AAQS would be violated by the tests together with other unregulated facilities.

PBCHD Question 4 - The applicant 's BACT analysis is not correct. There are controls on the Russian Test Stand, which go beyond BACT. My understanding is that the controls were implemented (Cold War Stuff) to hide research activities. The NASA people at SSC are aware of the controls and unless the Department of Defense is funding, the controls would be cost prohibited.

Response PBCHD 4 - Although the Russian Test Stand does contain an exhaust "ducting" which injects water, the device was initially installed in an attempt to remove or reduce the heat signature of the test firings so that Cold War surveillance by satellite would not identify the testing being conducted. The device was not a pollutant control device and there is no evidence to indicate that any significant pollutant reduction was realized. Even so, if it could be shown that there was a pollutant reduction to be realized, the cost of the Russian Test Stand exhaust system would be cost prohibited at a cost in excess of $100 million.

PBCHD Question 5 - I disagree with the modeling approach. Use of the puff model is more appropriate given the nature of the activity. NASA used such a modeling approach to support the ARSM PSD Permit application. The applicant needs to submit a revised modeling analysis.

Response PBCHD 5 - The ISCST3 model, a steady state model, was used for the modeling analysis. It is our opinion that the steady state modeling analysis is a conservative procedure for this application. The assumptions used in the model to evaluate impacts included the assumption that the test emissions are continuous over an entire hour. This assumption resulted in a prediction of 1-hour impacts for comparison to the CO ambient air quality standard.

The PUFF model is a non-regulatory model. Currently, no Guideline model exists that is capable of simulating instantaneous or short duration releases. Appendix B of the Guideline lists several accidental release models that simulate a short-term release, but these models have not been designed for CO emissions. In any event, use of a non-guideline model would require prior written approval from EPA. However, to address PBCHD's concern, an evaluation of impacts was performed using the PUFF model. The PUFF model assumes that all of the CO test mass is released instantaneously. Because the actual emission has a 4-minute release duration, this analysis would tend to over-predict very short-term concentrations (i.e., 4-minute duration). The PUFF model evaluated a combination of stability classes and wind speeds. A summary of the Puff model results is presented in Table 1. Only the Puff model results for stable stability and very light wind speeds approached the magnitude of the presented ISCST3 model concentrations. This meteorological condition occurs less than 3 percent of the time (based on 5 years of weather data from Palm Beach International Airport, 1987-1991). Both models predicted maximum impacts well below the AAQS. Based on the nature of the 4-minute test, and the assumptions used for the PUFF modeling, it is Golder's opinion that the steady state analysis resulted in a conservative assessment.

DEP Question 1 - The receptors used to model impacts at the site boundary were not spaced at 100 m. Please re-evaluate impacts at the site boundary by using a fence line receptor network that has a 100-m resolution. Also in the receptor grid used for the screening analysis contained a 7-kilometer gap between the site boundary receptors and the nearest ring polar receptors. Please update the screening analysis to include a receptor grid that contains a denser mid-field receptor network.

Response DEP 1 - A revised modeling analysis has been performed. The modeling files to this response will be provided separately. The revised screening modeling results, Table 6-3, is attached. The screening results indicate no changes in the magnitude and location of the highest and highest, second highest predicted 1-hour concentrations.

DEP Question 2 - In the application it is assumed that all land enclosed by the site boundary is non-ambient. However, if there is no physical barrier about this property, the assumption is not valid. Please confirm the existence of a physical barrier that prevents public access onto the land that is enclosed by the site boundary that was used in the modeling.

Response DEP 2 - There is a fence around the property.

DEP Question 3 - Please prepare a CO emission inventory for the NAAQS. The inclusion of only monitored background data does not sufficiently demonstrate compliance with NAAQS.

Response DEP 3 - The air modeling analysis was designed to produce conservative air quality impacts. To determine compliance with the 1-hour CO AAQS, the following criteria was used for the test burn analysis:

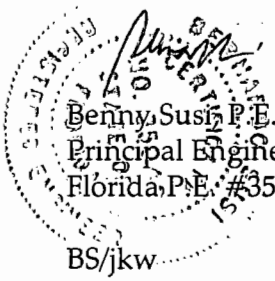
a. The emission release is for 4 minutes and will occur only 12 times per year.
b. The only significant CO emission sources in the vicinity of Pratt & Whitney are road vehicles. The nearest non-mobile emissions are in 20 kilometers away in Belle Glade.
c. The background CO values considered in the analysis were obtained from Palm Beach, an area that has a high traffic density. The area in the vicinity of the test does not have a high traffic density, and in fact, it is located in the extreme remote area of the Pratt & Whitney campus.

It is Golder's opinion that the use of the Palm Beach CO data produces a highly conservative impact assessment, which considering the transient nature of the test emissions, compensates for the added affect of other distance continuous emission sources.

Please call if you have any questions concerning this information.

Sincerely,

GOLDER ASSOCIATES INC.



Benny Susi, P.E.
Principal Engineer
Florida P.E. #35042

BS/jkw

Enclosures

cc: Dale Francke, Pratt & Whitney
Darrel Graziani, PBCHD
Ken Kosky, Golder

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Table 1. Summary of PUFF and ISCST3 1-Hour Model Results

Stability Class	Wind Speed (m/s)	Mixing Height (m)	Concentration (ug/m3)
ISCST3	High		5,012
	High, 2nd-High		3,822
PUFF			
Unstable	1	500	23
	1	1000	12
	2	1000	12
	3	1000	12
Neutral	1	1000	66
	2	1000	65
	3	1000	65
	4	1000	63
	5	1000	62
	6	1000	60
Stable	1	1000	5,633
	2	1000	4,800
	3	1000	3,856
AAQS			40,000

Table 6-2. Summary of CO Emissions and Stack Parameters for Engine Test Burn

Emissions (a)		Release Height		Diameter		Velocity (b)		Temperature	
lb/hr	g/s	ft	m	ft	m	fps	m/s	F	K
166656	20,999	70	21.3	60.00	18.3	40.0	12.20	230	383.2

(a) Based on 694.4 lb/sec for 240 seconds

(b). Maximum 45-degree discharge velocity times sine (38 degrees)

Table 6-3. Predicted CO Impacts From Proposed Project - Screening Analysis

Averaging Time	Concentration[a] (ug/m^3)	Receptor Location[b]		Time Period (YYMMDDHH)
		Direction (degree)	Distance (m)	
High 8-Hour[c]				
	351	318	5000	87090711
	533	204	1500	88060411
	480	200	1500	89081511
	623	140	1500	90082412
	374	246	4000	91061913
HSH 8-Hour[c]				
	336	4106	3561	87071211
	376	284	4000	88091101
	323	236	5000	89070311
	443	326	2000	90082119
	344	244	5000	91083007
High 1-Hour				
	2811	318	5000	87090613
	4264	204	1500	88032713
	3840	200	1500	89070114
	4982	140	1500	90072212
	2990	246	4000	91082611
HSH 1-Hour				
	2685	4106	3561	87071211
	3008	284	4000	88091712
	2585	236	5000	89082611
	3543	326	2000	90082912
	2749	244	5000	91092012

[a] Based on 5-year meteorological record, West Palm Beach, 1987-91
[b] Relative to engine discharge location
[c] Because no test emissions occur for the additional 7 hours of the period, 8-hour concentrations are set equal to 1/8 of 1-hour concentrations.
YYMMDDHH = Year, Month, Day, Hour Ending
HSH = Highest, Second-Highest

Table 6-4. Maximum Predicted CO Impacts Due to the Proposed Project Only, Refined Analysis

Averaging Time	Concentration[a] (ug/m^3)	Receptor Location[b] Direction (degree)	Receptor Location[b] Distance (m)	Time Period (YYMMDDHH)	EPA Significant Impact Level (ug/m^3)	*de Minimis* Air Monitoring Concentration (ug/m^3)
High 8-Hour	627[c]	140	1,600	90082412	500	575
High 1-Hour	5,012	140	1,600	90082412	2,000	NA

[a] Based on highest predicted with 5-year meteorological record, West Palm Beach, 1987-91
[b] Relative to Engine Discharge Location
[c] Because no test emissions occur for the additional 7 hours of the period, set equal to 1/8 of 1-hour concentrations
YYMMDDHH = Year, Month, Day, Hour Ending

Table 6-5. Maximum Predicted CO Impacts Due to the Test Burn For Comparison to AAQS, Refined Analysis

Averaging Time	Concentration (ug/m^3)			Receptor Location[b]		Time Period (YYMMDDHH)	Florida AAQS (ug/m^3)
	Total	Modeled[a]	Background[c]	Direction (degree)	Distance (m)		
HSH 8-Hour[d]	3,928	478	3,450	326	1700	90082912	10,000
HSH 1-Hour	10,262	3,822	6,440	326	1700	90082912	40,000

[a] Based on predicted HSH 1-hour concentration with 5-year meteorological record, West Palm Beach, 1987-91

[b] Relative to Engine Discharge Location

[c]. Based on the HSH measured concentrations from 1/98-6/99 at West Palm Beach.

[d]. Because no test emissions occur for the additional 7 hours of the period, set equal to 1/8 of 1-hour concentrations

YYMMDDHH = Year, Month, Day, Hour Ending
HSH = Highest, Second-Highest Concentration in 5 years.

Table 1.3-10. EMISSION FACTORS FOR TRACE ELEMENTS FROM DISTILLATE FUEL OIL COMBUSTION SOURCES[a]

EMISSION FACTOR RATING: E

Firing Configuration (SCC)	Emission Factor ($lb/10^{12}$ Btu)										
	As	Be	Cd	Cr	Cu	Pb	Hg	Mn	Ni	Se	Zn
Distillate oil fired (1-01-005-01, 1-02-005-01, 1-03-005-01)	4	3	3	3	6	9	3	6	3	15	4

[a] Data are for distillate oil fired boilers, SCC codes 1-01-005-01, 1-02-005-01, and 1-03-005-01. References 29-32, 40-44 and 83. To convert from $lb/10^{12}$ Btu to pg/J, multiply by 0.43.

Since flares do not lend themselves to conventional emission testing techniques, only a few attempts have been made to characterize flare emissions. Recent EPA tests using propylene as flare gas indicated that efficiencies of 98 percent can be achieved when burning an offgas with at least 11,200 kJ/m^3 (300 Btu/ft^3). The tests conducted on steam-assisted flares at velocities as low as 39.6 meters per minute (m/min) (130 ft/min) to 1140 m/min (3750 ft/min), and on air-assisted flares at velocities of 180 m/min (617 ft/min) to 3960 m/min (13,087 ft/min) indicated that variations in incoming gas flow rates have no effect on the combustion efficiency. Flare gases with less than 16,770 kJ/m^3 (450 Btu/ft^3) do not smoke.

Table 13.5-1 presents flare emission factors, and Table 13.5-2 presents emission composition data obtained from the EPA tests.[1] Crude propylene was used as flare gas during the tests. Methane was a major fraction of hydrocarbons in the flare emissions, and acetylene was the dominant intermediate hydrocarbon species. Many other reports on flares indicate that acetylene is always formed as a stable intermediate product. The acetylene formed in the combustion reactions may react further with hydrocarbon radicals to form polyacetylenes followed by polycyclic hydrocarbons.[2]

In flaring waste gases containing no nitrogen compounds, NO is formed either by the fixation of atmospheric nitrogen (N) with oxygen (O) or by the reaction between the hydrocarbon radicals present in the combustion products and atmospheric nitrogen, by way of the intermediate stages, HCN, CN, and OCN.[2] Sulfur compounds contained in a flare gas stream are converted to SO_2 when burned. The amount of SO_2 emitted depends directly on the quantity of sulfur in the flared gases.

Table 13.5-1 (English Units). EMISSION FACTORS FOR FLARE OPERATIONS[a]

EMISSION FACTOR RATING: B

Component	Emission Factor (lb/10^6 Btu)
Total hydrocarbons[b]	0.14
Carbon monoxide	0.37
Nitrogen oxides	0.068
Soot[c]	0 - 274

[a] Reference 1. Based on tests using crude propylene containing 80% propylene and 20% propane.
[b] Measured as methane equivalent.
[c] Soot in concentration values: nonsmoking flares, 0 micrograms per liter (μg/L); lightly smoking flares, 40 μg/L; average smoking flares, 177 μg/L; and heavily smoking flares, 274 μg/L.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA FEDERAL CENTER
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SEP 8 2000

4 APT-ARB

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

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

Dear Mr. Linero:

Thank you for submitting the above referenced PSD permit application (dated June 21, 2000) to the U.S. Environmental Protection Agency (EPA) for comments. The proposed project involves the construction and operation of a test cell for liquid oxygen (LOX)/kerosene-propelled rocket engines at the E-5 rocket test area of the existing West Palm Beach facility. The new test cell will consist of the following systems: LOX and kerosene supply tanks (64,000 and 36,000-gallon capacities, respectively), engine containment can, water-cooled silencer, exhaust gas deflector, lined cooling water retention pond, and elevated water supply tank (1 million-gallon capacity). The total emissions increase of carbon monoxide (CO) from the proposed project is above the significance threshold requiring PSD review.

Based on a review of the permit application, EPA has the following comments:

1. It appears that the permit application (see Section 3.4.1) has incorrectly exempted the 36,000-gallon kerosene storage tank from being subject to 40 C.F.R. Part 60, Subpart Kb. Pursuant to §60.110b(c), the tank will be subject only to the recordkeeping requirements of §60.116b(a) and (b) because the capacity is between 75 and 151 cubic meters (approximately 19,813 and 39,890 gallons, respectively) and the maximum true vapor pressure of kerosene is less than 15 kilopascals (approximately 2.18 pounds per square inch).

2. Compliance with the CO national ambient air quality standard (NAAQS) has been demonstrated on the basis that there will only be 12 tests per year with a duration of 240 seconds each. Therefore, EPA highly recommends that enforceable limits regarding the number and duration of tests be incorporated into the PSD permit to avoid any potential exceedance of the NAAQS. Also, without inherent or expressed limitations, other pollutants may become subject to PSD review as a result of their potential emissions increases being greater than the respective significance thresholds.

Thank you for the opportunity to comment on the UTC - Pratt & Whitney permit application. If you have any questions regarding these comments, please direct them to either Art Hofmeister at (404) 562-9115 or Jim Little at (404) 562-9118. EPA will inform the Florida Department of Environmental Protection by separate correspondence should there be any comments or suggestions regarding the applicant's ambient air quality impact analysis.

Sincerely,

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

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Golder Associates

October 6, 2000

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BUREAU OF AIR REGULATION

Florida Department of Environmental Protection
New Source Review Section
2600 Blair Stone Road
Tallahassee, FL, 32399-2400

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

RE: PRATT & WHITNEY'S RESEARCH & DEVELOPMENT FACILITY
LOX/KEROSENE ROCKET ENGINE STAND PROJECT
DEP FILE NO. 0990021-004-AC (PSD-FL-294)
ADDITIONAL CARBON MONOXIDE AIR QUALITYIMPACT ANALYSES

Dear Mr. Linero:

Golder Associates Inc. (Golder), on behalf of Pratt & Whitney, has performed additional air quality impact analyses for carbon monoxide (CO) emissions to further address Comment No. 3 made in the Department of Environmental Protection's (DEP) letter dated July 19, 2000. These analyses were based on modeling the Project's CO emissions together with CO emissions of other sources within the Project's modeling and screening areas. The Project's modeling area extended out to 35 km at which distance the Project's impacts are predicted to be below the 1-hour and 8-hour significant impact levels of 2,000 and 500 ug/m^3, respectively. The Project's screening area is predicted to extend out to 85 km that is 50 km beyond the modeling area. As shown in these analyses, the Project's CO impacts, together with those from background CO emission sources, are predicted to be well below the national and state ambient air quality standards (AAQS). The following summary provides descriptions of the methods and assumptions used to estimate total air quality CO concentrations for the Project and other sources.

Air Modeling Methods and Approach

The air modeling analyses were based on using the same methods and assumptions that were in the PSD permit application for the Project. The CO concentrations were predicted with the Industrial Source Complex Short-term (ISCST3, Version 00101) dispersion model (EPA, 1995) and five years of meteorological data from the National Weather Service (NWS) office at Palm Beach International Airport, which were used in the modeling presented in the PSD application. The 5-year period of meteorological data was from 1987 through 1991. Similarly, concentrations were predicted using the same screening receptor grid, and refinements were performed based on the results obtained from the screening grid.

Emission Inventory

The CO emission and operating data for the proposed engine test were presented in the PSD application. For this analysis, the CO emissions, stack parameters, and locations for the existing sources at the Pratt & Whitney facility were developed and are presented in Tables 1 and 2. The CO emission data were obtained by using emission factors from the USEPA document, *Compilation of Air Pollutant Emission Factors, Volume I*, referred to as AP-42, or from the annual operating report (AOR) prepared in 1999. Stack and operating data were obtained from the Title V permit application.

The emission inventories for background facilities were developed from data bases obtained from the DEP, previous air modeling studies performed by Golder Associates, and air permit data. All background sources that were in these inventories and located within the Project's modeling area (defined as the significant impact area for the Project) were included in the modeling.

For sources located in the screening area (defined as 50 km beyond the modeling area), a technique was used for eliminating sources in the modeling analyses if the source's emissions do not meet an emission criterion. This technique, which is approved for use by the DEP and the USEPA, is the *Screening Threshold* method, developed by the North Carolina Department of Natural Resources and Community Development. The method is designed to objectively eliminate from the emission inventory those sources that are unlikely to have a significant interaction with the source undergoing evaluation. In general, sources that should be considered in the modeling analyses are those with emissions greater than a screening threshold value (in TPY) that is calculated by the following criteria:

$$Q = 20 \times D$$

where Q = the screening threshold value (TPY), and
D = The distance (km) from the proposed facility to the source undergoing evaluation for short-term analysis, or
The distance (km) from the edge of the proposed facility's significant impact area to the source undergoing evaluation for long-term (annual) analysis.

For this analysis, the long-term criterion was used since fewer facilities would be eliminated than with the short-term criterion. Also, the total emissions from a facility were used rather than emissions from individual sources for comparison to the screening threshold value. These methods result in a more conservative approach to produce higher-than-expected concentrations. Those facilities with maximum allowable emissions that are below the calculated *screening threshold* were eliminated from further consideration in the AAQS modeling analyses.

A summary of the facilities considered for inclusion in the modeling analyses is presented in Table 3. This summary identifies those facilities located within the Project's modeling area and screening area. The facilities that were not included in the modeling analyses because

their CO emissions were less than the *screening threshold* criteria are also identified. A summary of the stack, operating, and emission data for sources used in the modeling analyses is presented in Table 4.

Background Concentrations

To estimate the total CO air quality concentrations, 1-hour and 8-hour background concentrations were added to the modeling results. The background concentration is considered to be the air quality concentration contributed by sources not included in the modeling evaluation. Because other background sources were modeled, a background value was used that was considered to be realistic but still conservative. In this analysis, background concentrations were assumed to be represented by the 90th percentile of concentrations measured from the nearest monitors.

The CO monitors nearest to the site are the DEP monitor, number 12-057-1006, located at 50 South Military Trail in West Palm Beach, and monitor number 12-057-1004, 3700 Belevedere Road in Palm Beach. For 1998 and 1999, the highest 90th percentile of the 1-hour and 8-hour measured concentrations at these monitors were 1.1 parts per million (ppm) (1,300 microgram per cubic meter (ug/m^3)) and 1.0 ppm (approximately 1,150 ug/m^3), respectively. These background levels were added to the refined model-predicted concentrations to estimate total CO air quality levels for comparison to the AAQS.

Summary of Results

A summary of the maximum 1-hour and 8-hour average CO concentrations predicted in the screening analysis is presented in Table 5. Based on the screening results, modeling refinements were performed for both the 1-hour and 8-hour averaging times. The results of the refined modeling analyses from the PSD application and this analysis are summarized in Table 6. For this analysis, the maximum 1-hour and 8-hour average CO concentrations due to all sources, including background concentrations, are 12,309 and 6,973 ug/m^3, respectively. These concentrations are 31 and 70 percent of the AAQS of 40,000 and 10,000 ug/m^3, respectively. These results are comparable to those presented in the PSD application.

Based on these air modeling results, the maximum CO concentrations from the Project and other CO emission sources will comply with the AAQS.

The air modeling output files which contain the results of the CO concentrations predicted for the Pratt & Whitney facility and background sources have been forwarded to the DEP using Golder's ftp site.

Please call if you have any questions concerning this information.

Sincerely,
GOLDER ASSOCIATES INC.

[signature]

Benny Susi, P.E.
Principal Engineer
Florida P.E. #35042

BS/jkw
cc: Dale Francke, Pratt & Whitney
K. Kosky, Golder
R. McCann, Golder
G. Reynolds
C. Holladay
D. Grayiani, PBCHD
SED
EPA
NPS

Table 1. Emission Calculations for Air Emission Sources at the Pratt & Whitney Facility

Emission Unit Number	Source Description	Emission Factor[a]	Maximum Heat Input (mmBTU/hr)	Maxium Fuel Use (gal/hr)	Maxium Fuel Use (ft^3/hr)	CO Emission Rate (lb/hr)	CO Emission Rate (g/s)
1	Slave Engine	6.72 lb/1000 gal	264	1,927	NA	12.95	1.63
16	Boiler BO-12-E6	84 lb/MMSCF	42	NA	40,777	3.43	0.43
22	Boilers BO-1-MBH and BO-2-MBH	84 lb/MMSCF	108	NA	104,854	8.81	1.11
40	Furnaces FU-3-MHT and FU-4-MHT	84 lb/MMSCF	12	NA	11,650	0.98	0.12
45	Evaporator EV-1-MW	84 lb/MMSCF	195	NA	189,320	15.90	2.01
59	Miscellaneous heaters	84 lb/MMSCF	62	NA	60,194	5.06	0.64
66	Boiler, BO-14-E8	1.9 lb/1000 gal	6.7	NA	6,505	0.01	0.00
68	Emergency Elect Gen Facility	1 lb/MMBTU	245	1,788	NA	1.79	0.23
69	Jet Engine Test Stands (all)	Average lb/hr	NA	NA	NA	47.40	5.98

NA = not applicable

[a] Emission factors based on EPA factors from Compilation of Air Pollutant Emission Factors, Volume I, AP-42 (7/1998), or Annual Operating Report (AOR) data from Pratt & Whitney (P&W)

EU 1- from P&W AOR 99
EU 16, 22, 40, 45,59- AP-42 Table 1.4.1
EU 66- AP-42 1.5.1
EU 68- AP-42 Table 3.4.1
EU 69- See P&W AOR 99 for specific CO emission factors for various jet engines

Table 2. Summary of Stack Parameters for Air Emission Sources at the Pratt & Whitney Facility

Emission Unit Number	Source Description[a]	Release Height (ft)	Release Height (m)	Diameter (ft)	Diameter (m)	Velocity (fps)	Velocity (m/s)	Temperature (°F)	Temperature (°K)
1	Slave Engine	50	15.2	3.0	0.9	471.6	143.7	1000	810.9
16	Boiler BO-12-E6	15	4.6	2.5	0.8	22.7	6.9	500	533.2
22	Boilers BO-1-MBH, BO-2-MBH	66	20.1	7.6	2.3	33.4	10.2	750	672.0
40	Furnaces FU-3-MHT, FU-4-MHT	49	14.9	4.0	1.2	0.1	0.04	77	298.2
45	Evaporator EV-1-MW	12	3.7	0.5	0.2	8.5	2.6	77	298.2
59	Miscellaneous heaters	20	6.1	1.5	0.5	16.0	4.9	500	533.2
68	Emergency Elect Gen Facility	12	3.7	0.8	0.2	496.7	151.4	1200	922.0
69	Jet Engine Test Stands (all)	18	5.5	12.0	3.7	0.3	0.08	300	422.0

[a] See Table 1; Boiler, BO-14-E8 (No. 66) not included in modeling analyses due to low emission rate.

Table 3. Summary of Facilities With CO Emissions (>1 TPY) Considered for Inclusion in the AAQS Air Modeling Analyses for the Pratt & Whitney Facility

Facility ID	Facility Name	Source Location North (km)	Source Location East (km)	Relative Location[a] X (km)	Y (km)	Distance (km)	Direction (deg.)	CO Emissions Rate (TPY)	Q Emissions Threshold[b] [(Dist. - SIA) X 20]	Include in Modeling Analysis?
0990185	SIKORSKY AIRCRAFT CORP. - JUPITER	2975.0	567.5	0.0	0.0	0.0	0	0.5	SIA	Yes
0990234	SOLID WASTE AUTH OF PBC/NO CO RRF	2961.3	584.5	17.0	-13.7	21.9	129	1,733.3	SIA	Yes
0990304	VETERANS AFFAIRS MEDICAL CENTER	2963.0	568.0	20.5	-12.0	23.8	120	5.0	SIA	Yes
0990349	SFWMD PUMP STATION #S-5A	2951.3	562.6	-5.0	-23.7	24.2	192	367.3	SIA	Yes
0850129	AMERICAN POWER TECH/INDIANTOWN	2990.8	549.1	-18.4	15.8	24.3	311	3.8	SIA	Yes
0990019	OSCEOLA FARMS[c,e]	2968.0	544.2	-23.3	-7.0	24.3	253	25,175.0	SIA	Yes
0990331	OSCEOLA COGENERATION PLANT[e]	2968.0	544.0	-23.5	-7.0	24.5	253	1,436.4	SIA	Yes
0990333	FGT STATION NO. 21 (WPB)	2957.1	584.4	16.9	-17.9	24.6	137	56.6	SIA	Yes
0990344	PARKWAY ASPHALT (RIVIERA)	2962.1	588.5	21.0	-12.9	24.6	122	14.1	SIA	Yes
0850102	INDIANTOWN COGENERATION PLANT	2990.7	547.7	-19.9	15.7	25.3	308	1,673.0	SIA	Yes
0850002	CAULKINS INDIANTOWN CITRUS	2991.5	548.0	-19.5	16.5	25.5	310	9.3	SIA	Yes
0990123	PHYSICAL DISTRIBUTION CENTER & OSF	2961.2	589.7	22.2	-13.8	26.1	122	4.0	SIA	Yes
0990563	MAGNUM ENV. SERVICES, INC. - WPB	2952.0	580.2	12.7	-23.0	26.3	151	22.1	SIA	Yes
0990087	WEST PALM PLANT	2951.7	579.9	12.4	-23.3	26.4	152	11.7	SIA	Yes
0990056	ST. MARYS HOSPITAL, INC.	2959.7	593.0	25.5	-15.3	29.7	121	3.7	SIA	Yes
0990325	ROYAL PALM MEMORIAL GARDENS, INC.	2960.2	593.4	25.9	-14.8	29.8	120	1.4	SIA	Yes
0990061	U.S. SUGAR CORP. BRYANT MILL[c,f]	2969.1	537.8	-29.7	-5.9	30.2	259	2,071.0	SIA	Yes
0990042	RIVIERA POWER PLANT	2960.6	594.3	26.8	-14.4	30.4	118	1,156.0	SIA	Yes
0850001	FPL MARTIN POWER PLANT[g]	2992.7	542.7	-24.8	17.7	30.5	306	1,816.0	SIA	Yes
0990016	ATLANTIC SUGAR MILL[c,g]	2945.2	552.4	-15.1	-29.8	33.4	207	25,065.0	SIA	Yes
0850015	AYCOCK FUNERAL HOME	3008.4	573.5	6.0	33.4	33.9	10	1.5	SIA	Yes
0850006	MARTIN MEMORIAL HEALTH SYSTEMS	3008.7	574.2	6.7	33.7	34.3	11	2.0	SIA	Yes
0850108	OUTBOARD MARINE/RALPH EVINRUDE TEST CTR	3009.4	572.5	5.0	34.4	34.7	8	97.5	SIA	Yes
0990562	SOUTH FLORIDA SHAVINGS CO.	2941.1	579.2	11.7	-33.9	35.9	161	1.5	17	No
0990026	SUGAR CANE GROWERS CO-Op[c,h]	2953.3	534.9	-32.6	-21.7	39.2	236	33,771.0	83	Yes
0990045	T G SMITH PLANT	2943.7	592.8	25.3	-31.3	40.2	141	762.5	105	Yes
0990568	LWG PLANT	2943.7	592.8	25.3	-31.3	40.2	141	204.5	105	Yes
0990322	TREASURE COAST CREMATORY	2941.0	594.0	26.5	-34.0	43.1	142	6.6	162	No
0990350	SFWMD PUMP STATION #S-6	2927.8	556.2	-11.3	-47.2	48.5	194	107.9	270	No
0990095	BETHESDA MEMORIAL HOSPITAL	2931.8	592.6	25.1	-43.2	50.0	150	5.3	299	No
1110040	RANGER/FT PIERCE/PLNT#129	3030.2	561.7	-5.8	55.2	55.5	354	9.9	410	No
0990332	OKEELANTA COGENERATION PLANT[c,d,e]	2940.0	524.1	-43.4	-35.0	55.8	231	3,289.0	415	Yes
1110003	FT PIERCE UTIL/H D KING PWR PLNT	3036.4	566.1	-1.4	61.3	61.4	359	416.8	527	No
1110060	FLORIDA GAS TRANSMISSION/ST LUCIE/STA 20	3035.8	557.2	-10.3	60.8	61.6	350	214.4	533	No
0510001	EVERGLADES SUGAR REFINERY	2954.0	509.5	-58.0	-21.0	61.7	250	16.3	534	No
0990119	BOCA RATON COMMUNITY HOSPITAL	2915.5	589.5	22.0	-59.5	63.4	160	4.3	569	No
0610003	U.S. SUGAR CLEWISTON MILL AND REFINERY[c,i]	2956.9	506.1	-61.4	-18.1	64.0	254	108,259.2	580	Yes
0990015	BOCA RATON RESORT AND CLUB	2913.7	592.0	24.5	-61.3	66.0	158	13.8	620	No
0110045	HARDRIVES ASPHALT(DEERFIELD PLANT)	2910.0	584.8	17.3	-65.0	67.3	165	11.4	645	No
0112094	WASTE MGMT-CENTRAL SANIT L F & RECYCLING	2908.0	583.2	15.7	-67.0	68.8	167	150.8	676	No
0112120	WHEELABRATOR NORTH BROWARD	2907.6	583.9	16.4	-67.4	69.4	166	257.7	687	No
0112103	SUN GRAPHIC, INC.	2904.3	585.2	17.7	-70.7	72.9	166	2.2	758	No
0110351	SFWMD PUMP STATION #S-8	2912.2	522.3	-45.2	-62.8	77.3	216	245.0	847	No
0610080	AMERICAN POWER TECH	3051.1	550.7	-16.8	76.1	77.9	348	1.1	859	No
0610021	OCEAN SPRAY CRANBERRIES/VERO BEACH	3051.3	550.6	-16.9	76.3	78.1	348	3.6	863	No
0430008	SOUTH FLORIDA THERMAL SERVICES, INC.	2966.5	489.2	-78.3	-8.4	78.7	264	10.5	875	No
0112146	ATLANTIC BURIAL CASKET CO. DBA ABCO	2897.7	584.3	16.8	-77.3	79.1	168	1.9	882	No
0112152	GOLD COAST CREMATORY	2897.6	584.6	17.1	-77.4	79.3	168	2.1	885	No
0610029	CITY OF VERO BEACH MUNICIPAL UTILITIES	3056.5	561.4	-6.1	81.5	81.7	356	343.1	935	No
0510015	SOUTHERN GARDENS CITRUS PROCESSING CORP.[b]	2957.6	487.5	-80.0	-17.4	81.9	258	2,891.2	937	Yes

Source: Florida Department of Environmental Protection (9/2000)

[a] Realtive location is with respect to the Pratt Whitney facility, which is located at UTM Coordinates: North 2975 km; East 567.5 km

[b] The significant impact area (SIA) for the project determined by modeling is 35 km

[c] Facilities or sources with facilities that operate only during the November 1 through April 30 crop season.

[d] Facility has sugar mill sources that operate all year

[e] Emissions and parameters taken from Title V Permit (3/21/1996)

[f] Parameters taken from Title V Permit (6/10/1996)

[g] Emissions and parameters taken from Atlantic Sugar PSD Application (10/99)

[h] Emissions and parameters taken from Title V Permit Application (6/15/1996)

[i] Emissions and parameters taken from Special Land Use and Site Plan Application (8/1999)

[j] Emissions and parameters taken from PSD Application (8/2000)

[k] Emissions and parameters taken from PSD Application (8/2000)

Table 4. Summary of CO Sources Included in the Air Modeling Analyses for the Pratt & Whitney Facility

Facility ID	Facility Name / Emission Units	Modeling ID Name	Stack Parameters: Height (m)	Diameter (m)	Temper. (K)	Velocity (m/s)	Emission Rate (g/s)
0990185	SIKORSKY AIRCRAFT CORP. - JUPITER						
	Paint spray booth (PS-13-SIK) with drying oven	SIK10	11.89	1.83	302.6	5.9	0.01
0990234	SOLID WASTE AUTH OF PBC/NO CO RRF						
	412.5MMBTU/HR RDF BOILER NO.1 (324,000 lb/hr STEAM)	SWPBC1	76.20	2.04	505.4	24.7	17.80
	412.5MMBTU/HR RDF BOILER NO.2 (324,000 lb./hr. steam)	SWPBC2	76.20	2.04	505.4	24.7	17.80
	Landfill Gas Coll Sys class I	SWPBC3	7.01	0.21	1033.2	24.4	1.96
	Landfill Gas Coll Sys class III	SWPBC4	7.01	0.15	1033.2	46.6	1.96
0990349	SFWMD PUMP STATION #S-5A						
	Six 1600 hp diesel engines powering flood control pumps	S5A1	4.88	0.99	685.9	5.3	8.37
0990019	OSCEOLA FARMS						
	BOILER #2 WITH SCRUBBERS AND 2 STACKS	OSBLR2	27.43	1.52	338.7	18.6	317.52
	BOILER #3 WITH SCRUBBER	OSBLR3	27.43	1.92	344.3	14.3	128.77
	BAGASSE BOILER #4 UNIT #5, 100000 LBS/HR STEAM MAX	OSBLR4	27.43	1.83	344.3	16.5	317.52
	165,000 LB/HR BAGASSE BOILER # 5 WITH 2 SCRUBBERS & 2 STACKS	OSBLR5	27.43	1.52	344.3	17.9	374.22
	BOILER #6 WITH SCRUBBER PSD	OSBLR6	27.43	1.92	338.7	18.3	310.40
0990331	OSCEOLA COGENERATION PLANT						
	760 MMBTU/HR BIOMASS/OIL/COAL FIRED BOILER	OSCOG1	60.96	3.05	419.3	15.9	16.37
	760 MMBTU/HR COGENERATION BOILER NO. 2	OSCOG2	60.96	3.05	419.3	15.9	16.37
0990333	FGT STATION NO. 21 (WPB)						
	COMPRESSOR #2101, 6500 BHP NATURAL GAS FIRED TURBINE	FGT1	15.24	1.01	763.7	56.4	0.65
	COMPRESSOR #2102, 6500 BHP NATURAL GAS FIRED TURBINE	FGT2	15.24	1.01	763.7	56.4	0.65
0990344	PARKWAY ASPHALT (RIVIERA)						
	Asphalt rotary drum dryer (400 TPH); counterflow	PARK1	12.80	1.42	422.0	18.5	0.32
0850102	INDIANTOWN COGENERATION PLANT						
	Pulverized Coal Main Boiler	INDCG1	150.88	4.88	333.2	28.4	37.60
	(2) Auxiliary Boilers	INDCG3	64.01	1.52	449.8	26.7	0.55
0850002	CAULKINS INDIANTOWN CITRUS						
	PEEL DRYER #1 WASTE HEAT EVAPORATOR (54,000 LB/HR CAPACITY)	CAULK4	28.65	0.98	343.2	11.6	0.16
	30 T/HR CITRUS PEEL DRYER #2	CAULK5	32.92	1.52	255.4	0.0	0.05
0990123	PHYSICAL DISTRIBUTION CENTER & OSF						
	12.5 mmBTU/hr boiler #1 (Unit A) burning No.6 fuel oil	PHYD1	9.14	0.52	491.5	10.1	0.05
	12.5 mmBTU/hr boiler #2 (Unit B) burning No.6 fuel oil	PHYD2	9.14	0.52	491.5	10.1	0.05
0990583	MAGNUM ENV. SERVICES, INC. - WPB						
	Soil thermal treatment facility	MAGN1	9.75	0.98	1144.3	31.6	0.50

Table 4. Summary of CO Sources Included in the Air Modeling Analyses for the Pratt & Whitney Facility

Facility ID	Facility Name	Emission Units	Modeling ID Name	Stack Parameters: Height (m)	Diameter (m)	Temper. (K)	Velocity (m/s)	Emission Rate (g/s)
0990087	WEST PALM PLANT							
		Double drum dryer (250 TPH) burning low sulfur residual oil	WPP4	10.97	1.01	394.3	41.1	0.27
0990188	ANIMAL RESCUE LEAGUE							
		ANIMAL CREMATION INCINERATOR; CRAWFORD #C-1000S; 250 LB/HR	ARL3	6.10	0.52	733.2	8.8	0.01
		ANIMAL CREMATION INCINERATOR; CRAWFORD #C-500P; 75 LB/HR	ARL4	6.10	0.52	788.7	3.4	0.004
0990056	ST. MARY'S HOSPITAL, INC.							
		Two identical process steam boilers; natural gas fired	STMAR2	24.38	1.22	505.4	0.1	0.03
0990325	ROYAL PALM MEMORIAL GARDENS, INC.							
		HUMAN CREMATION INCINERATOR, IEE CO. #IE 43-PPII (100 LB/HR)	RPMG1	6.10	0.55	865.9	4.9	0.03
0990061	U.S. SUGAR CORP. BRYANT MILL							
		BOILERs #1,#2,#3 WITH SCRUBBERS	USSBM123	19.81	1.65	338.7	36.4	1309.77
		BOILER #5 WITH TWO SCRUBBERS.	USSBM5	45.72	2.90	338.7	18.0	760.91
0990042	RIVIERA POWER PLANT							
		Fossil Fuel Steam Generator, Unit 3 -Phase II Acid Rain Unit	RIVP3	90.83	4.88	401.5	26.9	13.18
		Fossil Fuel Steam Generator, Unit 4 -Phase II Acid Rain Unit	RIVP4	90.83	4.88	401.5	26.6	13.18
0850001	FPL MARTIN POWER PLANT							
		Units 1 & 2	MART12	152.1	7.99	420.9	21.03	38.92
		Aux Blr PSD	MARTAUX	18.3	1.10	535.4	15.24	0
		Diesel Gens PSD	MARTGEN	7.6	0.30	785.9	39.62	0
		Units 3 & 4 PSD	MART34	64.9	6.10	410.9	18.90	26.66
0990016	ATLANTIC SUGAR MILL							
		BOILER #1 WITH SCRUBBER	ATLSM1	27.43	1.83	346.0	18.0	242.68
		BOILER #2 WITH 1 JOY TURBULAIRE TYPE D-40 IMPINGEMNT SCRUBBE	ATLSM2	27.43	1.83	350.0	23.4	242.68
		BOILER #3 WITH 2 JOY TURBULAIRE IMPINGEMENT SCRUBBERS	ATLSM3	27.43	1.83	350.0	21.6	294.84
		BOILER # 4	ATLSM4	27.43	1.83	344.0	25.2	311.85
		253 MM BTU/HR BAGASSE BOILER #5 W/SUPP FUEL OIL #6	ATLSM5	27.43	1.68	339.0	19.2	209.11
0850015	AYCOCK FUNERAL HOME							
		IND. EQUIP. & ENGR. MODEL IE43-PPII CREMATOR	AYCK2	7.32	0.52	865.9	5.5	0.03
0850006	MARTIN MEMORIAL HEALTH SYSTEMS							
		CLEAVER BROOKS MODEL CB 150 HP BOILER - UNIT #1	MMHS1	5.79	0.40	499.8	8.2	0.02
		CLEAVER BROOKS MODEL CB-150 HP STEAM BOILER #2	MMHS5	5.79	0.40	499.8	8.2	0.02
0850108	OUTBOARD MARINE/RALPH EVINRUDE TEST CTR							
		Engine Testing Cells (02), 2 Test tanks and 2 Cooling towers	OUT1	12.19	0.61	310.9	9.7	2.22
0990026	SUGAR CANE GROWERS CO-OP							
		BOILERS #1 AND #2 WITH 2 SCRUBBERS AND 1 STACK	SCGC12	45.72	1.87	339.0	21.8	547.09

Table 4. Summary of CO Sources Included in the Air Modeling Analyses for the Pratt & Whitney Facility

Facility ID	Facility Name	Emission Units	Modeling ID Name	Stack Parameters Height (m)	Diameter (m)	Temper. (K)	Velocity (m/s)	Emission Rate (g/s)
		BOILER #3 WITH SCRUBBER	SCGC3	27.43	1.52	339.0	22.3	187.61
		BOILER #4 WITH CYCLONES AND 3 SCRUBBERS WITH ONE STACK	SCGC4	54.90	2.44	339.0	21.7	467.71
		BOILER #5 WITH CYCLONES, TWO SCRUBBERS, AND ONE STACK	SCGC5	45.72	2.30	339.0	15.9	359.60
		504 MMBTU/HR BOILER # 8 RESIDUE/BAGASSE/OIL	SCGC8	47.24	2.90	339.0	13.6	381.02
0990045	T G SMITH PLANT							
		2000 KW DIESEL GENERATOR # 1 PEAKING UNIT	TGSM01	5.18	0.56	625.9	37.1	1.70
		2000 KW DIESEL GENERATOR # 2 PEAKING UNIT	TGSM02	5.18	0.56	625.9	37.1	1.70
		2000 KW DIESEL GENERATOR # 3 PEAKING UNIT	TGSM03	5.18	0.56	625.9	37.1	1.70
		2000 KW DIESEL GENERATOR # 4 PEAKING UNIT	TGSM04	5.18	0.56	625.9	37.1	1.70
		2000 KW DIESEL GENERATOR # 5 PEAKING UNIT	TGSM05	5.18	0.56	625.9	37.1	1.70
		GAS TURBINE # 1	TGSM06	14.02	4.88	720.4	24.8	2.07
		7.5 MW FOSSIL FUEL STEAM GENERATING UNIT 1	TGSM07	18.29	1.52	422.0	10.5	0.43
		FOSSIL FUEL STEAM GENERATOR #3 (Phase II, Acid Rain Unit)	TGSM09	34.44	2.13	418.2	15.7	1.25
		FOSSIL FUEL STEAM GENERATOR #4 (Phase II, Acid Rain Unit)	TGSM10	35.05	2.29	418.2	17.0	1.64
		COMBINED CYCLE UNIT (GT-2/S-5)	TGSM11	22.86	3.05	479.8	26.7	3.49
0990568	LWG PLANT							
		186 MW combined cycle gas turbine, GE Frame 7FA	LWG1	45.72	5.49	377.6	24.3	5.48
0990332	OKEELANTA COGENERATION PLANT							
		715 MMBTU/HR COGENERATION BOILER NOS. 1,2,3	OKCOGEN	60.60	3.05	438.7	17.5	94.61
0510003	U.S. SUGAR CLEWISTON MILL AND REFINERY							
		BOILER #1 WITH SCRUBBER	USSCM01	64.92	2.44	347.0	15.4	811.79
		BOILER #2 WITH SCRUBBER	USSCM02	64.92	2.44	338.7	13.9	732.19
		BOILER #3 WITH SCRUBBER	USSCM03	64.92	2.44	333.2	6.8	334.28
		BOILER #5 WITH SCRUBBER	USSCM04	45.72	2.51	344.3	20.3	518.43
		Boiler #7	USSCM07	68.58	2.59	405.4	20.8	71.62
0510015	SOUTHERN GARDENS CITRUS PROCESSING CORP.							
		Peel Dryer	SGARDDRY	38.1	7.45	1.16	353.0	65.69
		Boilers 1-3	SGARDBLR	16.8	14.23	1.22	478.0	0.23

Source: Florida Department of Environmental Protection (9/2000)

Table 5. Maximum CO Impacts Predicted for Sources at the Pratt & Whitney Facility Including Other Facilities - Screening Analysis

Averaging Time, Rank	Concentration[a] ($\mu g/m^3$)	Receptor Location[b] Direction (degree)	Receptor Location[b] Distance (m)	Time Period (YYMMDDHH)
8-Hour, Highest				
	2,670	260	30,000	87090516
	5,186	260	30,000	88060816
	3,221	250	25,000	89012116
	3,079	250	25,000	90041216
	2,788	260	30,000	91051416
8-Hour, HSH				
	2,591	260	30,000	87011916
	2,702	260	30,000	88022016
	2,479	250	25,000	89102216
	2,248	260	30,000	90062316
	2,615	260	30,000	91082416
1-Hour, Highest				
	9,458	260	30,000	87090509
	10,204	260	30,000	88042411
	9,285	260	30,000	89072009
	10,098	260	30,000	90062310
	10,155	260	30,000	91082412
1-Hour, HSH				
	9,387	260	30,000	87041514
	10,096	260	30,000	88090711
	8,626	260	30,000	89080210
	9,570	260	30,000	90010613
	9,415	260	30,000	91082010

[a] Based on 5-year meteorological record, West Palm Beach, 1987-91
[b] Relative to engine discharge location
YYMMDDHH = Year, Month, Day, Hour Ending
HSH = Highest, Second-Highest

Table 6. Maximum CO Impacts Predicted for Comparison to AAQS, Refined Analysis

Averaging Time, Rank	Concentration (μg/m3)			Receptor Location[b]		Time Period (YYMMDDHH)	Florida AAQS (μg/m3)
	Total	Modeled[a]	Background	Distance X (m)	Distance Y (m)		
From PSD Application							
8-Hour, HSH	3,927.8	477.8[a]	3,450[c]	-951	1,409	90082912	10,000
1-Hour, HSH	10,262	3,822[a]	6,440[c]	-951	1,409	90082912	40,000
Additional Modeling With Other Sources							
8-Hour, HSH	6,973	5,823[d]	1,150[e]	-30,300	-5,960	89051916	10,000
1-Hour, HSH	12,309	11,009[d]	1,300[e]	-30,050	-5,460	90083113	40,000

[a] Based on the HSH concentration predicted for the project's emissions with 5-year meteorological record of 1987 to 1991 from West Palm Beach

[b] Relative to Engine Discharge Location.

[c] Based on the second highest measured concentrations from January 1998 to June 1999 at West Palm Beach

[d] Based on the HSH concentrations predicted for all modeled sources with the 5-year meteorological record of 1987 to 1991 from West Palm Beach

e Based on the 90th percentile of measured concentrations from 1998 to 1999 at West Palm Beach

YYMMDDHH = Year, Month, Day, Hour Ending.

HSH = Highest, Second-Highest Concentration in 5 years.

Reynolds, John

From: Gee, Dean [geed@pwfl.com]
Sent: Thursday, June 21, 2001 4:13 PM
To: Alvaro Linero - FDEP (E-mail); Linero, Alvaro; Reynolds, John
Cc: Benny Susi (E-mail)
Subject: Pratt Rocket Test permit documents


RD180comments.doc


PERMIT294-prattmods.doc


TEPD294prattmods.doc


DBACT294prattmods.doc


INTENTprattmods.doc

Al and John,

Please find attached copies of modified FDEP permit documents for the Pratt & Whitney rocket engine test facility construction permit in West Palm Beach.

(Please forward a copy of this note with attachments to Darrel Graziani at Palm Beach County Health Department. I do not have an email address for him.)

These modified documents include changes that were discussed in conferences between Pratt and FDEP and Palm Beach County Health Dept.

Also attached are my notes summarizing the various discussions in relation to the specific permit conditions for the rocket test stand.
<<RD180comments.doc>>

We have utilized the "track changes" feature of MS Word to preserve the various edits and identify the person that made the changes. This should help you follow our logic and process in making these changes.

The primary document of interest includes the specific permit conditions - this document is named: Permit294-prattmods.
<<PERMIT294-prattmods.doc>>

The other enclosed documents were revised where necessary to accurately describe the project details and preserve internal consistency.

These documents are:
TEPD29-prattmods - Technical Evaluation
<<TEPD294prattmods.doc>>
DBACT294prattmods - BACT determination
<<DBACT294prattmods.doc>>

Intentprattmods - public notice and intent to issue
<<INTENTprattmods.doc>>

We appreciate the opportunity to work with you to prepare this permit application and discuss our concerns with you.

Please contact me if you have any questions.

Best regards,

Dean

> Dean Gee

> Envi. Engr.
> * geed@pwfl.com
> * Phone: 561-796-2108
> * Fax: 561-796-2787
> * Pratt and Whitney
> 17900 Beeline Highway
> Mailstop: 717- 03
> Jupiter, FL 33478
>
>

Draft Permit Conditions	Impact / Effects Discussion	Pratt's Proposed Mods	Pratt/DEP/PBCHD Discussions
Construction Requirements			
A.1. Test Stand Water cooled silencer – max diam = 20 feet, max length = 80 feet	Dimensions were very preliminary, not based on detailed engineering design	Delete these dimensional restrictions from permit, not relevant to emissions rates	PBCHD is concerned that changes will negatively affect the CO plume dispersion, will require confirmation modeling if final design differs significantly.
A.2. Oxygen Injection Study - Complete and submit to DEP an engineering and cost study evaluating direct O_2 injection methods and CO emissions reductions	Major effort to perform this type of research study, Estimated effort = 1.5 person-years and > $300,000; EPA is proposing no controls for MACT	Delete this from permit, on basis of no emissions control per proposed MACT and potential safety issues	DEP felt study is warranted, proposed MACT notwithstanding. Pratt to propose a study plan for DEP review and agreement.
Operating Restrictions			
A.3. Permitted capacity Test duration Test firings Oxidant/Fuel Ratio Fuel usage Quench water	All of these conditions were based strictly on permit application submitted Sufficient margin for operations flexibility? "Quench" water is used for sound absorption only, no effect on emissions. Water used by Russians to hide thermal signatures from spy satellites	As long as parameters provide sufficient operating margin, leave in permit Exception – Quench water rates, delete from permit - there is no effect on emissions per calcs, noise suppression only	It was agreed that numerical limits for emissions related test parameters are needed. However, quench water rate will be replaced by a requirement that the water system be in operation during testing.
A.4. Methods of Operation Fuels = kerosene Oxidants = liquid oxygen	Designed to use liquid oxygen and kerosene only	No changes	

Draft Permit Conditions	Impact / Effects Discussion	Pratt's Proposed Mods	Pratt/DEP/PBCHD Discussions
A.5. Test Conditions Restricted to Daylight hours and Ambient atmospheric conditions that provide good dispersion Nighttime testing allowed on case by case approval basis	NAAQS not exceeded per modeling including all ambient conditions, no reason for restrictions Will cause test delays if enforced	Modeling results indicate no exceedance is predicted for full range of ambient conditions, no basis for this permit condition exists – therefore delete from permit	PBCHD is concerned that tests might coincide with aggravating conditions (cane fields burning or temperature inversion). Pratt agrees that early test notification would allow PBCHD to delay test if necessary for these reasons, due to their infrequency. Pratt may revise test time by phone, should a daytime test be delayed to nighttime for unforeseen circumstances.
A.6. Hours of Operation As limited by A.3 and A.5 conditions described above	Refer to A.3 and A.5 issues	Refer to A.3 and A.5 issues	
Emissions Limitations and Standards			
A.7. Visible emissions Limited to 40% opacity	Photographs of Russian tests show no smoke Exceedance due to uncombined water (steam) only is not a violation This test is not really intended for operations of short durations	None proposed	Discussed and acknowledged limitations of Method 9 (daylight, duration, and steam).

Draft Permit Conditions	Impact / Effects Discussion	Pratt's Proposed Mods	Pratt/DEP/PBCHD Discussions
A.8. Carbon Monoxide Emissions CO emissions limited on minute (41.5 tons), 8 hour (83 tons), and annual (1000 tons) basis as determined by NASA-Lewis chemical equilibrium computer program or equivalent approved method	Verified results of NASA-Lewis chemical equilibrium computer program	No changes	
A.9. BACT Determination Comply with BACT determination portion of permit (Appendix BD)	Eliminate oxygen injection to control CO emissions study. Based on EPA MACT, no emissions control is being proposed	Pratt & Whitney has fulfilled BACT determination as regulatory requirement. BACT was determined to be combustion design (oxidant/fuel ratio) which is integral to the process design, therefore no additional (add on) controls required. Delete oxygen injection study	Pratt will submit a written plan to be used for complying with the oxygen injection study to fulfill BACT requirement.
Test Methods and Procedures			
A.10. Visible Emissions Monitor per DEP Method 9 for duration of the rocket firing test	Method 9 – requires certified "smoke reader" to conduct visible emissions test Can only be performed with adequate natural light	No changes if reg basis is confirmed. Resolve conflict if nighttime testing is performed.	Acknowledged limitations of the visible emissions test. No changes proposed.

Draft Permit Conditions	Impact / Effects Discussion	Pratt's Proposed Mods	Pratt/DEP/PBCHD Discussions
A.11. Carbon Monoxide Emissions Monitoring Establish CO ambient air quality monitoring program for measuring CO before, during and after rocket test firings consistent with quoted EPA guidelines	Ambient air quality monitoring is costly and results are highly dependent on weather conditions. Usefulness of results would be very limited.	Delete this requirement based on marginal usefulness with respect to costs and very small chance that NAAQS would be exceeded.	PBCHD insists on a CO ambient air monitoring requirement for the permit. However, PBCHD will draft specific guidelines for the CO monitoring program. These will include 4 monitoring runs, covering each season of year during a rocket test. Bag sampling method is acceptable.
Compliance Demonstrations and Periodic Monitoring			
A.12. Initial Compliance Demonstrations Visible emissions – monitor opacity during initial firing and for each new oxidant/fuel ratio per Conditions A.8 and A.11 described above	40% opacity limit for visible emissions.	No changes	PBCHD agreed to revise to an initial test and additional test whenever O_2/fuel ratio is decreased. Acknowledgement of test limitations.
A.13. Continuous Compliance Demonstrations Use ambient air quality monitoring program (per Condition A.11) to demonstrate CO compliance	Ambient air quality monitoring will not provide accurate compliance info without excessive costs	Delete this requirement	
A.14. Annual Compliance Demonstration Formal compliance test for visible emissions once per Federal fiscal year (Oct 1 to Sept 30)	This visible emissions test requirement is redundant if Permit Condition A.12 is met. No regulatory basis found.	Delete this requirement if A.12 is included in permit. No reg basis.	PBCHD agrees to a requirement that test be performed upon permit renewal (5 yr) instead of annual.

Draft Permit Conditions	Impact / Effects Discussion	Pratt's Proposed Mods	Pratt/DEP/PBCHD Discussions
A.15. Flow Monitors Install and maintain flow monitors for recording oxidant, fuel, and quench water rates during tests	Fuel and oxidant rates will affect emissions rates. Fuel and oxidant rates will be monitored for rocket performance test purposes. Compare maintenance, recordkeeping, and monitoring requirement details of permit vs. rocket tests needs. No regulatory basis for quench water rate measurements exists.	Delete flow monitoring requirements for quench water, no emissions impact.	PBCHD agreed to eliminate quench water rates as condition and require that quench water system is operating during test as substitute.
A.16. Recordkeeping Maintain records for rates, durations, times, test condition summary, ambient CO, etc. as described	Recordkeeping elements directly related to emissions except for ambient CO monitoring.	Delete all ambient air monitoring requirements.	Language addressing CO ambient monitoring required.

Draft Permit Conditions	Impact / Effects Discussion	Pratt's Proposed Mods	Pratt/DEP/PBCHD Discussions
A.17. Reporting Test Notifications – provide 24 hour prior notice to PBCHD for each rocket test, including test details Mishap Reports – submit written notice within 24 hours and written analysis with 30 days (including excess emissions and ambient air quality impacts, if any)	Will require clear understanding, responsibility guidelines, and close communications between Rocket Test Support staff and EHS to ensure timely and adequate reporting details are provided to agency. No reg basis for Mishap Reports found, stated citation did was not consistent with permit condition	Obtain clear details of reporting requirements including methods (fax, phone, email?) for test notifications. Delete requirements regarding ambient air quality impacts – this can only be done via monitoring or modeling, in either case – results are not definitive, i.e., not necessarily representative of actual impacts Report mishaps as an "excursion from intended test conditions" with no reference to emissions.	24 hour notification: (Refer to A.5 also). Pratt to notify PBCHD a minimum of 24 hours prior to test, notification format to be determined with PBCHD input. PBCHD will allow proposed test date unless emissions aggravating conditions exist requiring a reschedule. Pratt requests that Mishap Reports be renamed "Excursions from test plan conditions". Pratt will report these excursions with reference to 40% opacity limits as required.
A.18. Excess Emissions Excess emissions are allowed provided that Pratt demonstrates that no predicted impacts exceeding the NAAQS CO limit adjusted for ambient air monitoring program, significant increase in PSD pollutants, or HAPS	Any excursions from test conditions that increase emissions will create an Excess Emissions condition by permit definitions. Clear demonstration of NAAQS exceedance is difficult/impossible. Similarly for other PSD criteria pollutants and HAPS (results of modeling or ambient air monitoring are not definitive).	Same basis for deletion as described for A.17 above. Pratt & Whitney should report these incidents as an "excursion from intended test conditions" with no reference to excess emissions unless excess emissions were observed or directly measured.	As discussed in A.17 – Pratt intends to report all "Excursions from test plan conditions" along with results of visible emissions (smoke reading) test results as required. Pratt believes that it is not feasible to determine NAAQS exceedance or HAPS emissions for such an incident.

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 ~~is~~ are 3724 and 3764.

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

STATEMENT OF BASIS

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

APPENDICES

The attached appendices are a part of this permit:

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

Howard L. Rhodes, Director
Division of Air Resources Management

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 nominal 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 (nominal) 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 Nominal Capacity

REGULATORY CLASSIFICATION

The facility is classified as a Major ~~or Title V~~ Source of air pollution under the PSD and Title V programs ~~because the facility is a major source~~based on potential emissions of carbon monoxide (CO), volatile organic compounds (VOC), nitrogen oxides (NOx), sulfur dioxide (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

SECTION II. FACILITY-WIDE SPECIFIC CONDITIONS

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

ADMINISTRATIVE

1. Regulating Agencies: All documents related to applications for permits to construct, or modify an emissions unit should be submitted to the Bureau of Air Regulation (BAR), Florida Department of Environmental Protection at Mail Station #5505, 2600 Blair Stone Road, Tallahassee, Florida 32399-2400, phone number 850/488-0114. All documents related to reports, tests, operation permit applications, minor modifications and notifications shall be submitted to the Palm Beach County Health Department, post Office Box 29, 901 Evernia Street, West Palm Beach, Florida 33402-0029, Phone 562-355-3136.

2. General Conditions: The permittee is subject to and shall operate under the attached General Permit Conditions G.1 through G.15 listed in Appendix GC of this permit. General Permit Conditions are binding and enforceable pursuant to Chapter 403 of the Florida Statutes. [Rule 62-4.160, F.A.C.]

3. Terminology: The terms used in this permit have specific meanings as defined in the corresponding chapters of the Florida Administrative Code.

4. Applicable Regulations, Forms and Application Procedures: Unless otherwise indicated in this permit, the construction and operation of the subject emissions unit shall be in accordance with the capacities and specifications stated in the application. The facility is subject to all applicable provisions of Chapter 403, F.S. and Florida Administrative Code Chapters 62-4, 62-110, 62-204, 62-212, 62-213, 62-296, 62-297 and the Code of Federal Regulations Title 40, Part 60, adopted by reference in the Florida Administrative Code (F.A.C.) regulations. The permittee shall use the applicable forms listed in Rule 62-210.900, F.A.C. and follow the application procedures in Chapter 62-4, F.A.C. Issuance of this permit does not relieve the facility owner or operator from compliance with any applicable federal, state, or local permitting or regulations.
[Rules 62-204.800, 62-210.300 and 62-210.900, F.A.C.]

5. New or Additional Conditions: Pursuant to Rule 62-4.080, F.A.C., for good cause shown and after notice and an administrative hearing, if requested, the Department may require the permittee to conform to new or additional conditions. The Department shall allow the permittee a reasonable time to conform to the new or additional conditions, and on application of the permittee, the Department may grant additional time. [Rule 62-4.080, F.A.C.]

6. Expiration: This air construction permit shall expire on March 31, 2003. The permittee, for good cause, may request that this construction/PSD permit be extended. Such a request shall be submitted to the Department's Bureau of Air Regulation prior to 60 days before the expiration of the permit.
[Rules 62-210.300(1), 62-4.070(4), 62-4.080, and 62-4.210, F.A.C]

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

   BACT Determination: In conjunction with extension of the 18 month period to commence or continue construction, or extension of the permit expiration date, the permittee may be required to demonstrate the adequacy of any previous determination of Best Available Control Technology (BACT) for the source as applied to any new or modified emission units.
[Rules 62-4.070(4), 62-4.210(2) & (3), 62-210.300(1)(a), and 62-212.400(6)(b), F.A.C.]

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. ~~Pursuant to the NESHAP requirements, excess emissions shall also be reported in accordance with 40 CFR 63, Subpart A.~~ [Rule 62-4.130, F.A.C.]

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

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

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 conceptual design specifications provided within the application and the following ~~minimum and maximum~~ specifications:

(i). **Water Cooled Silencer**: ~~Maximum~~ Approximate diameter of 20 feet and an ~~maximum~~ approximate length of 80 feet; and

(ii). **Exhaust Gas Deflector**: ~~Minimum~~ Approximate height of 70 feet, ~~maximum~~ approximate distance from Water Cooled Silencer of 100 feet. The surface between the water-cooled silencer and the exhaust gas deflector shall be paved to minimize particulate emissions due to soil erosion.

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

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

A.2. **Oxygen Injection Study**: Permittee shall develop a plan for an Oxygen Injection Study for FDEP review and approval within 90 days ~~Within one year~~ of initial issuance of this permit,. T ~~t~~he 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 within 1 year of FDEP approval of the plan. ~~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 an ~~minimum~~ oxidant/fuel ratio of 2.72 pounds of oxygen per pound of fuel (4 minute average).

(iv). **Fuel Usage**: Rocket engine test firings shall not consume more than 6,625 gallons per minute (4-minute average), 26,500 gallons per 8-hour period, and 318,000 gallons per year (12-month rolling total)

(v). **Quench Water**: All rocket engine test firings shall be conducted with ~~a minimum quench water flow of 3,220 gallons per second~~the quench water system in operation.

[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 periods when rocket test emissions will not combine with existing adverse ambient conditions, including but not limited to temperature inversions or cane field burnings, that will cause excessive air quality impacts, such as exceedance of NAAQS ~~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 A.3** and the test conditions of **Condition A.5** of this permit.

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

EMISSION LIMITATIONS AND STANDARDS

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

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

A.8. **Carbon Monoxide Emissions**: Rocket engine test firings shall not result in CO emissions greater than ~~41.5~~ 20.75 tons per minute (~~24~~-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~~ plan specified by Palm Beach County Health Department. This plan includes one monitoring event for 1 test during each of the 4 climatic seasons (spring, summer, fall, and winter) as allowed by test schedule, use of air pump/bag sampling, and 1 sample coinciding with each averaging period (i.e., one - 1 hour "bag" and one - 8 hour "bag") for each test event monitored. Monitoring would be performed 1 day before the scheduled test, on the day of testing, and the day following the test. ~~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~~ lower average oxidant/fuel ratio is used. Initial compliance with the CO emission limitations shall be demonstrated through compliance with **Conditions A.8** and A.11 of this permit.

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

A.13. **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 A.11** of this permit.

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

A.14. ~~**Annual**~~ **Compliance Demonstrations for Permit Renewal**: The permittee shall have a formal compliance test conducted for visible emissions ~~annually during each federal fiscal year (October 1 – September 30), unless otherwise specified by rule, order, or~~ upon renewal of the permit.

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

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

[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)~~System in Operation During Test;
(viii). Test Condition Summary;
(ix). CO Ambient Concentrations;
(x). ~~Mishaps~~ Test Plan Conditions Excursion; 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**~~ **Test Condition Excursion Reports**: In the event an excursion from test plan conditions ~~mishap~~ (i.e., test duration > 240 seconds, O/F ratio less than 2.72 (4 minute average), fuel usage > ~~13,250~~6,625 gpm (4 minute average), 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 an excursion ~~mishap~~, the permittee shall submit an analysis ~~showing~~ describing the excursion event/parameter, measures taken to prevent recurrences, and excess emissions (opacity) observed, if any. ~~the excess emissions associated ambient air quality impacts, if any.~~

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

A.18. **Excess Emissions**: Excess emissions and excursions from test plan conditions shall be reported to PBCHD as described in A.17 permit condition. Excess emissions parameters reported shall be limited to visible emissions (opacity). ~~shall be allowed provided the permittee demonstrates that the emissions did not result in a predicted ambient impact greater than the National Ambient Air Quality Standards (NAAQS) for CO adjusted based on the ambient monitoring program; a significant emissions increase in a PSD Pollutant; or result in emissions of a hazardous air pollutant in an amount of 10 tons per year or greater individually or 25 tons per year or greater collectively.~~

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

~~1.The construction and operation of Emissions Unit 075 shall be in accordance with the capacities and specifications stated in the application. Firing of engines shall not exceed 12 tests per year of 240 seconds duration for each test. [Rules 62-210.200, Definitions-Potential to Emit (PTE) and 62-213.440(1)(b)1.b., F.A.C.]~~

~~4.Operations monitoring records for Emissions Unit 076 shall be maintained as required by 40 C.F.R 60.116b(a) and (b). [Rule 62-4.070(3) and 40 C.F.R. 60.116b]~~

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

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

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

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

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

EMISSIONS UNITS DETAILS

Emissions Unit 076 is a stationary storage 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~~Tank Throughput.** The permittee shall not allow, cause, suffer, or permit the operation of Emissions Unit 076 in excess of 354,000 ~~318,000~~ gallons throughput per year without prior authorization from the Permitting Authority: This annual throughput represents fuel volume consumed by 12 rocket test runs plus 1 tank refill. (318,000 + 36,000 = 354,000)

[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.]

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

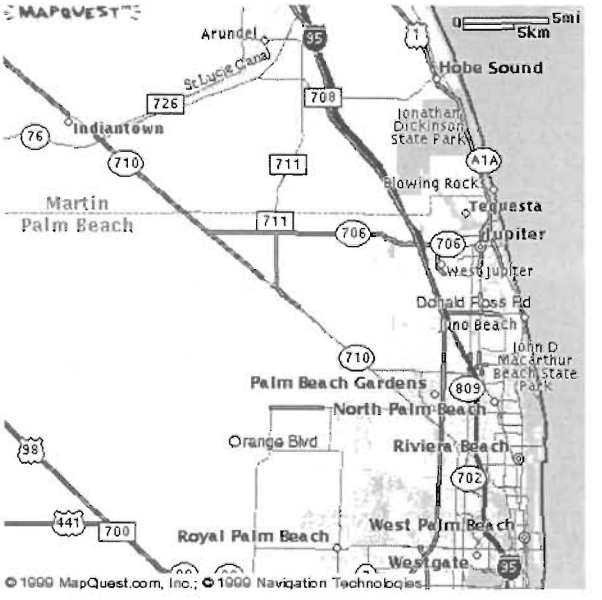

Figure 2 – Site - SR 710 and CR 711

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 nominal 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 ~~83~~20.75 ~~41.5~~ tons per ~~minute~~minute ~~(2~~ 4-minute ~~period~~average) ~~and average), 83 tons~~ 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 an approximate ~~maximum~~ diameter of 20 feet and ~~a~~ approximate~~maximum~~ length of 80 feet and an Exhaust Gas Deflector with an approximate ~~Minimum~~ height of 70 feet, an approximate~~maximum~~ distance from Water Cooled Silencer of 100 feet. The surface between the water-cooled silencer and the exhaust gas deflector shall be paved. As built drawings with the final design dimensions will be provided to the Department prior to operation.

- 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 an ~~average minimum~~ oxidant/fuel ratio of 2.72 lb~~.~~ O_2/lb~~.~~ f~~F~~uel (4-minute average).
- Fuel Usage – Rocket engine test firings shall not consume more than ~~26,500~~6,625 ~~6,625~~ gallons per minute ~~minute~~ (4-minute ~~period~~average~~average), 26,500 gallons and~~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 using ~~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 periods when rocket test emissions will not combine with existing adverse ambient conditions, including but not limited to temperature inversions or cane field burnings, that will cause excessive air quality impacts, such as exceedance of NAAQS in accordance with a Test Plan to be submitted to the Palm Beach County Health Department (PBCHD) for approval prior to the initial test. ~~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 of an excursion from test plan conditions ~~mishap~~ (i.e., test duration > 240 seconds, O/F ratio ~~greater~~less than 2.72 (4-minute average)~~less than 2.72~~, fuel usage > ~~26,500 gallons per 4-minute period~~6,625 gpm (4 minute average) ~~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~~ the excursion event/parameter, measures taken to prevent recurrences, and excess emissions (opacity) observed, if any. ~~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 by the PBCHD ~~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~~ 90 days of initial issuance of this permit, the permittee shall complete and submit to the Department a plan to conduct 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 be completed within 1 year of the Department's approval of the plan. ~~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 once initially at startup, once for each new lower average oxidant/fuel ratio and ~~annually~~ once for each permit renewal thereafter. Compliance with the CO emissions limitation shall be demonstrated by ~~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 an exceedance of the visible emissions 40 % opacity limit.~~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.~~1.~~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. Background concentrations were based on the second-highest concentrations measured at a CO monitor located in West Palm Beach. 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 less than 45 percent of the 1-hour AAQS and within 90 percent of the 8-hour 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. It should be noted that the maximum 8-hour average impact was predicted more than 30 km from the project. The project's contribution to this maximum impact was predicted to be less than the significant impact levels. Background sources' impacts, both modeled and assumed from the monitoring data, accounted for about 98 percent of the maximum predicted impact.

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 estimated ~~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~~ 4 ~~quarterly~~seasonal (spring, summer, autumn, winter) 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.

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. The current project's rocket motor utilizes liquid oxygen and kerosene for propellants. Since the propellant does not use or contain beryllium, Subpart D does not apply to this rocket test facility.

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 nominal 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 ~~83~~20.75 ~~41.5~~ tons per minute ~~minute (2-~~ 4-minute average) ~~period average), 83 tons and~~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 approximately 20 feet and a ~~maximum~~ length of approximately 80 feet and an Exhaust Gas Deflector with a ~~approximate Minimum~~ height of approximately 70 feet, maximum distance from Water Cooled Silencer of approximately 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 an ~~average minimum~~ oxidant/fuel ratio of 2.72 lb~~.~~ O_2/lb~~.~~ f~~F~~uel (4-minute average).
- Fuel Usage – Rocket engine test firings shall not consume more than ~~26,500~~6,625 ~~6,625~~ gallons per minute ~~minute (~~ 4-minute ~~period and~~average ~~average), 26,500 gallons~~ 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 using ~~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 periods when rocket test emissions will not combine with existing adverse ambient conditions, including but not limited to temperature inversions or cane field burnings, that will cause excessive air quality impacts, such as exceedance of NAAQS ~~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 an excursion from test plan conditions ~~mishap~~ occurs during a test (i.e., test duration > 240 seconds, ~~average~~ O/F ratio ~~greater~~less than ~~less than~~ 2.72 (4-minute average), fuel usage > 26,500 gallons per 4-minute period~~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~~condition causing the excursion and corrective actions.

- 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 by PBCHD.~~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~~90 days ~~-~~of initial issuance of this permit, the permittee shall complete and submit to the Department a plan for conducting 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 once initially~~-~~, once for each new lower oxidant/~~duel~~ fuel ratio, and ~~annual~~ once for each new permit renewal 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 visible emissions exceeding the 40% opacity limit. ~~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:

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 _____ to the person(s) listed:

John K. Sillan*
Benny Susi, P.E., Golder Associates
Isidore Goldman, SED
Darrel Graziani, PBCHD
Gregg Worley, EPA
John Bunyak, NPS

Clerk Stamp

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

_____ _____
(Clerk) (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 ~~average~~ 2.72 pounds of oxygen per ~~ton~~ pound of fuel (4-minute average). 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

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