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INVESTIGATION OF DC-8 NACELLE MODIFICATIONS TO REDUCE FAN-COMPRESSOR NOISE IN AIRPORT COMMUNITIES

Part III – Static Tests of Noise Suppressor Configurations

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16. Abstract

Four acoustically treated inlet-duct configurations, a simulated variable-area primary nozzle, and one set of acoustically treated fan-exhaust ducts were fabricated, tested, and evaluated. The test articles were installed on a JT3D turbofan engine mounted on an engine test stand. Far-field sound pressure levels (at a distance of 150 ft from the engine) and engine-performance data were obtained to evaluate the performance of the test configurations. The objective of the tests was to reduce the perceived noise level during the landing approach of McDonnell Douglas DC-8-50/61 airplanes. The goal of the program was a 7 to 10 PNdB reduction in perceived noise level under the landing-approach path with no increase in noise under the takeoff flight path. The reduction in perceived noisiness was to be obtained through significant reductions in the discrete-frequency tones radiated from the inlet and fan-exhaust ducts.

As a result of acoustical and engine performance evaluations, a treated-nacelle configuration, consisting of a treated one-ring inlet and treated 48-inch-long fan-exhaust ducts, was selected for flight testing. The selected configuration was estimated to be able to meet the 7 to 10 PNdB noise-reduction design goal.

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SUMMARY

In May 1967, the NASA initiated a program to investigate turbofan-engine nacelle modifications designed to reduce fan-compressor noise radiated from the JT3D engines on DC-8-50/61 aircraft. The program was directed at the definition of nacelle modifications that could reduce the perceived-noise level under the landing-approach path by 7 to 10 PNdB with no increase in takeoff noise level. The program was conducted in five phases: (1) nacelle-modification design studies and duct-lining investigations, (2) ground static tests of noise-suppressor configurations, (3) flyover-noise and cruise-performance tests, (4) studies of the economic implications of retrofit, and (5) an evaluation of human response to the flyover noise of the modified nacelles. This document reports the results of the investigations of the second phase and the resultant selection of the nacelle to be tested in the succeeding flight-test phase of the program.

Four configurations of full-scale acoustically treated inlet ducts, one set of acoustically treated, 48-in.-long fan-exhaust ducts, and a simulation of a variable-area primary nozzle were installed on a Pratt and Whitney Aircraft JT3D turbofan engine mounted on a static engine test stand. Far-field sound pressure levels and engine performance were measured to evaluate the effectiveness of each configuration.

Based on analyses of the test results, a treated inlet with a single concentric ring vane in combination with treated, 48-inch-long fan-exhaust ducts was selected as the nacelle modification to be flight tested. The treated inlet had acoustically absorptive linings on the surface of the inlet duct, both surfaces of the ring, and the surface of the centerbody. The treated fan-exhaust ducts had treatment on the inner and the outer surfaces of the duct and on both surfaces of the flow splitters. Changes in engine performance and estimated changes in flyover noise levels beneath a landing-approach and a takeoff flight path are presented herein for the selected flight-test configuration. The nacelle modification was estimated to be able to meet the noise-reduction goal of the program, although it reduced takeoff-rated thrust and increased specific fuel consumption.

INTRODUCTION

The growth of the air transportation industry and the increase in the number of people living in communities around airports have increased human annoyance due to operations of commercial jet transports. This increased annoyance has stimulated efforts to find means to alleviate the problem through reducing the level of the noise radiated from airplanes, modifying airplane operational procedures, and achieving compatible usage of the land around airports. These efforts are being conducted as part of a coordinated industry-government research program.

In 1965, the NASA extended its research programs to supplement those of industry in the development of practical methods for reducing noise (ref. 1). In May 1967, the Langley Research Center of the NASA contracted with the McDonnell Douglas Corporation and The Boeing Company to investigate nacelle modifications for operational McDonnell Douglas and Boeing transports powered by Pratt & Whitney Aircraft (P&WA) JT3D turbofan engines. The nacelle modifications were to achieve significant reductions in flyover noise levels in airport communities located under landing-approach flight paths.

During landing approach, the perceived noisiness, and hence the annoyance, of the sound from the JT3D engines is attributed principally to the discrete-frequency tones radiated from the fan stages through the inlet and fan-exhaust ducts. Accordingly, the McDonnell Douglas and the Boeing investigations were directed at developing fan-noise suppression methods. The goal of the McDonnell Douglas program was to design, build, and evaluate an economically viable nacelle modification primarily through the use of acoustically treated short fan-exhaust ducts and acoustically treated inlet ducts. A secondary concept to be investigated consisted of reducing the fan rotational speed for a given landing thrust by controlling the exhaust area of the primary nozzle. These modifications were to achieve a reduction of 7 to 10 PNdB in perceived noise level (PNL) outdoors under the landing-approach path, and were to produce no increase in noise during takeoff or climbout.

The scope of the McDonnell Douglas investigation was limited to the study of nacelle modifications for the various models of the Series 50 DC-8 airplanes and for the Model 61 of the Series 60 airplanes. These airplanes are equipped with 24-inch-long fan-exhaust ducts, referred to as short ducts.

The Boeing program is summarized in reference 2. The McDonnell Douglas program is reported in six parts: Part I, a summary of the major results of the program (ref. 3); Part II, a report of the initial nacelle-modification design studies and duct-lining investigations (ref. 4); Part III, a report of the static tests of noise-suppressor configurations (presented in this document); Part IV, a flight evaluation of the acoustical and performance effects of the selected design of modified nacelles on a DC-8-55 airplane (ref. 5); Part V, a study of the economic implications of retrofit of the selected design on DC-8-50/61 airplanes (ref. 6); and Part VI, an evaluation of human response to the flyover noise of the modified nacelles (ref. 7).

This report describes the static ground-runup tests that were conducted to assess the acoustic and engine performance of the various candidate nacelle configurations and to select one for flight testing. The components that were tested included four configurations of treated inlets, one pair of treated fan ducts, a simulation of a variable-area primary nozzle, and the combination of treated inlet and fan ducts selected for subsequent flight-test evaluation. The test results are generally presented in terms of the differences in sound pressure levels produced by the treated and the untreated ducts as measured around the engine test stand. Estimates of the PNL under landing-approach and takeoff flight paths are also given to compare the performance of the treated ducts to the noise-reduction goals.

SYMBOLS

BPF	blade passage frequency, Hertz
EPR	indicated engine pressure ratio, p_{t_7}/p_{t_0}
F_g	gross thrust, pounds
F_g/δ_{am}	referred gross thrust, pounds
M_i	Mach number at throat of engine inlet duct
N_1	low-pressure compressor-rotor shaft speed, revolutions per minute
$N_1/\sqrt{\theta_{t_2}}$	referred low-pressure compressor-rotor shaft speed, revolutions per minute
p_{am}	ambient pressure, pounds/square foot
$p_{am\ sl}$	ambient pressure at sea-level, 2116 pounds/square foot
p_{local}	local static pressure, pounds/square foot
p_{t_0}	free-stream total pressure, pounds/square foot
$p_{t_{local}}$	local total pressure, pounds/square foot
p_{t_7}	total pressure at inlet to primary-exhaust duct, pounds/square foot
PNL	instantaneous perceived noise level, perceived noise decibels (PNdB)
PNLM	maximum value of the instantaneous PNL, PNdB
q_i	dynamic pressure at throat of engine inlet duct, pounds/square foot
q_2	dynamic pressure at engine inlet, pounds/square foot
SFC	specific fuel consumption, (pounds/hour)/pound
SPL	sound pressure level, decibels (dB) re 0.0002 dynes/square centimeter
$T_{am\ std}$	standard-day ambient air temperature, 518.7° Rankine
T_{t_2}	total temperature at engine inlet, degrees Rankine
V_2	FAA takeoff safety speed, knots
δ_{am}	ratio of absolute ambient pressure to 2116 pounds/square foot, $p_{am}/p_{am\ sl}$
θ_{t_2}	ratio of total air temperature at engine inlet to 518.7° Rankine, $T_{t_2}/T_{am\ std}$

TEST PROCEDURES

General

The basic approach to the static-test program was to test the nacelle modifications selected as a result of the design studies discussed in reference 4. In all, a total of 13 configurations were tested. These consisted of four configurations of simulated variable-area primary nozzles, four configurations of treated inlet ducts, a baseline configuration for the treated inlet tests, one configuration of treated fan-exhaust ducts and an appropriate baseline configuration, and the final configuration selected for subsequent flight testing together with a baseline configuration. The baseline configuration consisted of the existing inlet duct, the 24-in.-long fan-exhaust ducts, and the primary exhaust nozzle.

Sound pressure levels (SPL) and engine performance were measured for each configuration over a range of engine power settings. Each nacelle modification was evaluated by comparing its acoustic and engine performance to that of the appropriate baseline configuration. Noise-suppressor enclosures were utilized to individually evaluate the acoustically treated inlet ducts and the acoustically treated fan-exhaust ducts.

Evaluations of the nacelle modifications are presented in this report principally in terms of reductions in 1/3-octave band SPLs measured at a distance of 150 ft from the engine. Some estimates, however, of PNLs beneath the flight path are also presented for the treated inlets and treated fan-exhaust ducts. No estimates of PNLs are presented for the tests on the simulated variable-area primary nozzles.

Test Facilities

Engine test stand. – The Douglas Aircraft Company has an engine test stand at Edwards Air Force Base. The stand is situated at the western edge of Rogers Dry Lake in southern California at an elevation of approximately 2300 feet. This facility satisfied the acoustical and engine performance requirements for full-scale nacelle testing, and was used to evaluate all of the candidate configurations. An aerial view of the engine test stand and the surrounding terrain is shown in figure 1.

The test engine was a P&WA JT3D-1 modified to permit operation at the higher JT3D-3 thrust settings. Also incorporated in this engine was the standard P&WA "hush-kit" comprised, in part, of 35 blades in the first stage of the fan-compressor and 32 blades in the second stage.

The engine was supported with its centerline at a height of 5 ft by a thrust-instrumented structure. This structure was installed on a concrete pad and simulated the inboard-pylon section of a wing installation on a DC-8 airplane. The simulated wing was suspended by flexures to measure engine thrust by means of electronic load cells. The external nacelle surfaces aft of the fan exit were shielded by an afterbody shroud that was physically separated from the engine case. The forces on the afterbody shroud were carried to the ground and were not included in the thrust measurements. This procedure was necessary in order to differentiate the internal engine forces from the scrubbing forces due to the flow of fan-exhaust air over the afterbody shroud.

Engine control and data recording were performed in a control building located near the engine (see fig. 1). This building was equipped with engine operating controls and test equipment for recording acoustical and engine-performance data, and for measuring meteorological parameters. The control building had provisions for visually monitoring the engine through windows and via closed-circuit television. The control building had 4-in.-thick fiberglass batts fastened to the exterior surface facing the microphones to absorb incident sound energy and to minimize reflections.

A T-shaped aluminum structure, approximately 9 in. high, was placed on the concrete pad in front of the engine to inhibit the formation of vortices. This structure, termed a vortex barrier, was in place for all tests except those where an inlet-noise-suppressor enclosure was installed.

The ground plane was well drained and was surfaced to minimize the variations of ground effects in the propagation path between the engine and the microphones. The dirt surface (visible in fig. 1) beyond the concrete surface around the engine stand was flush with the concrete, compacted, and stabilized by an oil covering. The surface characteristics remained approximately constant throughout the test program.

Microphone locations. – Fourteen microphone locations were spaced along an arc having a 150-ft radius and centered at the engine primary-exhaust nozzle. For most of the tests, the microphones were located at azimuths between 15 and 157 degrees from the engine inlet. For some tests at the beginning of the test program, the last azimuth was 160 degrees instead of 157 degrees. The microphone location at the 160-degree azimuth was relocated to 157 degrees to provide more reliable SPL measurements at all engine power settings by placing the microphone outside the turbulent airflow of the high-velocity jet exhaust.

Noise-suppressor enclosures. – In addition to the standard test facilities, noise-suppressor enclosures were used to independently test the acoustical performance of inlets and fan-exhaust ducts. During the acoustical tests of each treated-inlet configuration and the baseline for the treated inlet tests, a fan-exhaust noise-suppressor enclosure was installed; conversely, an inlet-noise-suppressor enclosure was installed when the treated fan-exhaust ducts and baseline were tested.

The design criteria for the magnitude of the noise reduction to be achieved by each enclosure was based upon (1) estimates of the relative strengths of the inlet or fan-exhaust noise sources, (2) an estimate of the amount of noise reduction that the treatment in the inlets or fan-exhaust ducts might achieve, and (3) a factor of 10 dB to ensure an adequate signal-to-noise ratio. The criteria were specified in terms of the change in SPL to be measured on the 150-ft arc in the octave bands with center frequencies of 2000 Hz and 4000 Hz. The required noise reductions were 15 dB in the aft quadrant for the inlet-noise-suppressor enclosure and 17 dB in the forward quadrant for the fan-exhaust noise-suppressor enclosure.

The fan-exhaust noise-suppressor enclosure, a five-sided structure (no rear wall) having approximate dimensions of 30 by 30 by 8 ft, was fabricated using 1-in.-thick plywood panels fastened to 2 by 4-in. wood studs. The acoustical treatment on all of the interior surfaces of the enclosure was unwrapped 4-in.-thick fiberglass batts. The batts were covered with porous fabric and large-mesh wire screen to reduce erosion. The exterior surface of the front face was similarly treated. The front panel had an opening to allow for a 1-in. clearance around the inlet. The opening was filled with fiberglass batt material and soft felt. This flexible seal allowed engine movement yet maintained an acoustical seal to eliminate fan-noise leaks into the forward quadrant. Figure 2 shows an interior view of the fan-exhaust noise-suppressor enclosure.

Figure 3 shows the two major elements of the inlet-noise-suppressor enclosure, namely a steel tunnel and a wooden rectangular duct that had 4-in.-thick fiberglass batts on the interior surfaces. The function of the duct was to absorb and redirect the sound radiated from the engine forward through the tunnel. The wooden duct was constructed of 1-in.-thick plywood in a manner similar to that used to fabricate the fan exhaust noise-suppressor enclosure. The cylindrical tunnel, approximately 7 ft in diameter and 40 ft long, was fabricated of 3/16-in.-thick sheet steel. The tunnel was mounted on rails and casters to allow longitudinal movement. To reduce the amplitude of sound reflections from the exterior surface of the steel tunnel and to minimize sound leaks, the inlet cowl of the engine and both ends of the tunnel were lagged with batts of 4-in.-thick, unwrapped fiberglass, as indicated in figure 3.

An acoustical evaluation of the noise-suppressor enclosures was made by using a high-intensity loudspeaker driven by a power amplifier. Octave bands of random noise at geometric mean frequencies of 2000 Hz and 4000 Hz were used with the noise source inside and outside each enclosure. The measured changes in the far-field SPL exceeded the design criteria and the noise-suppressor enclosures were therefore judged acceptable.

Test Constraints

In order to acquire valid and repeatable data, constraints were established for acoustical and engine-performance tests.

Acoustical constraints. – Far-field SPLs were not recorded unless the wind speed was steady and 7 knots or less. Wind direction was also required to be fairly constant. Tests were conducted only when signal–to–background-noise ratios were at least 20 dB in each 1/3-octave band from 50 to 8000 Hz. Because of these constraints and to minimize test time, all acoustical tests were conducted between the early morning hours of 1 a.m. and 7 a.m.

No ambient air temperature or relative humidity limits were established for the acoustical tests because the microphones were only 150 ft from the engine. The atmospheric absorption corrections that were applied to the SPL measurements were always small over this distance.

Three runs were required for the acoustic tests of each configuration to obtain a minimum acceptable statistical confidence in the measurements. A run constituted the testing required for acoustic and engine-performance data. The minimum interval between runs was 30 minutes. Six, seven, or nine subruns were obtained for each run, depending on the configuration.

For the treated inlet and the treated fan-exhaust-duct tests, the reference engine-power-setting parameter was the referred low-pressure rotor speed $N_1/\sqrt{\theta_{t_2}}$; table I indicates the values of nominal referred rotor speeds used for these tests. Referred rotor speed was used to specify the engine power setting because the noise level at the source was considered to be a direct function of the fan tip Mach number. Selection of referred rotor speed as a parameter meant that the actual rotor speeds used were a function of the ambient air temperature. Engine speed was required to be stabilized within ±2 percent of the selected speed during the recording of acoustical data.

The procedure of operating the engine at fixed values of $N_1/\sqrt{\theta_{t_2}}$ minimized variations in the level of the noise source, but resulted in fundamental fan-blade-passage frequencies varying slightly with ambient temperature. This effect could be observed during data analysis when the blade-passage frequency was close to the band-edge frequency of the 1/3-octave band filters. The variations, however, did not affect the evaluation of the candidate configurations.

For the simulated variable-area primary nozzle tests, the reference parameter was selected as referred net thrust because fixed values of thrust are required during landing approach for a given landing weight and flap setting. The engine speed was adjusted to provide the required thrust. Other than the substitution of referred thrust for referred rotor speed, the test procedures for the simulated variable-area primary nozzles were the same as for the treated inlet and fan-exhaust duct tests.

Engine-performance constraints. – Although engine-performance measurements were made during the subruns when acoustic data were recorded (i.e., with a 7-knot wind limit), additional engine-performance runs were made, as required, to obtain data when the wind speed was 3 knots or less. Data obtained with the 3-knot wind-speed limit were considered more reliable and were the data used for determining the effect of the treated ducts on engine performance. No ambient air temperature limits were established for the engine-performance tests because widely accepted correction procedures were available to account for the effects of changes in ambient temperature.

Acoustical Measurements

Data acquisition. – SPLs in the acoustic far-field were sensed by condenser microphones mounted at a height of 5 ft, and oriented vertically to establish grazing incidence between the microphone diaphragms and the direction of the sound waves.

The microphone signals were routed into the control building and monitored for waveform and recording level. Each microphone channel had an amplifier, with 10 dB step-attenuator adjustments, that was used to adjust the microphone signals to levels suitable for tape recording. A 14-channel frequency-modulated tape recorder was used to simultaneously record all microphone signals. Each recording was 2 to 3 minutes long and was preceded by the annotation needed for identifying the subrun. A photograph of the data-acquisition system is shown in figure 4.

Associated equipment included the instrumentation for indicating the engine operating parameters and measuring the weather conditions. An anemometer and wind vane were mounted 24 ft above the ground on the roof of the engine control building. The wind speed and wind direction were monitored and the readings tabulated during each subrun. The air temperatures necessary for determining the moisture content of the air were measured at approximately 15-minute intervals by a hand-held psychrometer having fan-aspirated wet- and dry-bulb thermometers.

Acoustical calibration equipment used for each noise-measuring channel included a precision sound source for system-sensitivity calibration at 250 Hz and 124 dB, and a variable-frequency, constant-amplitude electrical signal source for system frequency-response calibration.

Even with the 7-knot wind limit and stabilized engine speeds, large amplitude fluctuations were occasionally observed in the discrete-frequency fan noise. These fluctuations required that the noise recordings have durations of 3 minutes at each test power setting to achieve a valid average at each of the three subruns on a given test configuration.

Data reduction. – Data reduction was accomplished at the Douglas facility in Long Beach, California. A simplified block diagram of the equipment is shown in figure 5. The essential functions of the equipment include tape signal control and monitoring, 1/1-octave and 1/3-octave band filtering, root mean squaring, logarithmic conversion of the filtered signal, digitizing of the analog level, and recording on punch cards. By using an externally programmed digital computer, the digitized records were converted into SPLs corrected for variations in system frequency response. The recorded signals were filtered into four 1/1-octave band SPLs with center frequencies of 63, 125, 250, and 500 Hz, and into eleven 1/3-octave band SPLs with center frequencies of 800 through 8000 Hz.

The combination of four 1/1-octave bands and eleven 1/3-octave bands was used for the majority of the data reduction in this program. However, for the four configurations of simulated variable-area primary nozzles, tested early in the program during August 1967, the recorded signals were filtered into five 1/1-octave-band SPLs with center frequencies of 63, 125, 250, 500, and 1000 Hz, and eight 1/3-octave-band SPLs with center frequencies of 1600 to 8000 Hz.

Engine-Performance Measurements

Data acquisition. – The test engine was instrumented to provide the measurements needed to evaluate the effect of the nacelle modifications on engine performance. A list of the main parameters that were measured and the instrument manufacturers' tolerances is given in table II.

Data reduction. – The engine-performance measurements were reduced, using conventional procedures, to reference atmospheric conditions with an air temperature of 59°F and sea-level barometric pressure. The calculations were carried out by a digital computer and then plotted to check their consistency and to eliminate gross errors. Mean values of the results were obtained by fairing curves through the plotted data.

TEST CONFIGURATIONS

Simulated Variable-Area Primary Nozzle

Tests were conducted of two methods of varying the exit area of the primary exhaust nozzle during a landing approach. One method consisted of a simple convergent conical nozzle, the exit area of which was increased by incrementally cutting away the aft portion of the nozzle. The second method represented one possible flight configuration wherein a set of panels could be moved into the exhaust nozzle to reduce the exit area.

The conical nozzle was built with an exit area equal to approximately 40-percent of that of the existing JT3D primary nozzle. Figure 6(a) shows a sketch of the conical nozzle as it was installed.

The first attempt to run the engine with the 40-percent nozzle was unsuccessful in that the engine could not be satisfactorily started and operated. The nozzle was enlarged to 50-percent of the standard exit area and the engine was started and operated satisfactorily. Data were obtained with nozzles that were 50, 60, and 80 percent of the standard exit area.

After the nozzle had been trimmed to an exit area that equaled the standard exit area, eight flat wedges were installed inside the nozzle as indicated in the sketch in figure 6(a) and as shown in the photograph in figure 6(b).

Two-Ring Inlet

Configuration. – The design of the two-ring inlet was based on the nacelle-modification design studies discussed in reference 4. The inner ring and the inner portions of the support struts could be removed to permit testing the inlet with only the outer ring in place (i.e., as the one-ring inlet). Both rings and all of the support struts could also be removed to permit testing the inlet with no rings in place (i.e., as the no-ring inlet). In this manner, the two-ring inlet provided three separate test configurations. No tests were conducted with just the inner ring installed.

A sketch of the cross section of the two-ring inlet is shown in figure 7(a). The length of the inlet duct, the shape of the internal lip from the inlet highlight to the throat, and the diameter of the duct at the throat were the same as on the existing production inlet on DC-8-50/61 airplanes. The inlet length, measured along the duct centerline, was 45 inches. The throat diameter was 46 inches. The internal lip thickness at the throat was 11 percent of the inlet throat radius.

Downstream of the inlet-throat station, the diameter of the inlet duct was increased to compensate for the flow area occupied by the concentric rings and support struts. This displacement of the inlet duct wall was required in order to maintain inlet duct Mach numbers comparable to those in the existing inlet duct.

No increase in the diameter of an inlet cowl would be required to accommodate this increase in inlet-duct diameter because sufficient space remained between the surface of the inlet duct and the skin of the outer cowl to accommodate the required inlet support structure and associated equipment.

For convenience in construction, the entire inlet was designed as a body of revolution based on the loft lines at the maximum half breadth of the existing inlet duct. The 4-degree downward cant of the inlet plane (needed in a flight inlet to correct for wing upwash, nacelle attitude, and cruise angle of attack) was not incorporated into the static-test configuration. A photograph showing the installation of the two-ring inlet on the engine test stand is given in figure 7(b).

Materials and construction. – The inlet shell and centerbody were constructed of 0.25-inch-thick, dense fiberglass laminate, with recessed sections to accept the acoustical treatment. The surface of the treatment followed the loft lines of the inlet duct wall and centerbody. A steel engine-attachment ring was built into the inlet duct during its manufacture to provide the engine-inlet mating surface. The fiberglass-laminate shell of the centerbody was supported by a conical steel support bolted to the engine centerbody-support studs.

The basic structure of the concentric ring was fabricated with fiberglass-laminate leading and trailing edges, and an 0.020-in.-thick sheet-steel septum to support the acoustical treatment and to provide structural rigidity. The rings had a total thickness of 1.1 inches and were supported by two sets of five untreated radial aluminum struts, one set near the leading edge of the rings and another near the trailing edge. Two steel tie rods were used in each support strut as structural members.

The acoustical treatment consisted of a single layer of porous stainless-steel fibermetal bonded by a film-epoxy resin to the edges of heat-resistant phenolic-coated fiberglass-honeycomb core. This configuration provided a series of air-filled cavities or cells behind the porous metal surface. The honeycomb had nominal 0.75-inch cells of sinusoidal design, and a depth of 0.75 inch on the walls of the cowl and centerbody and 0.5 inch on the inner and outer surfaces of the rings. The nominal flow resistance of the fibermetal was 10 cgs rayls. The nominal thickness of the fibermetal facing sheets was 0.040 inch.

Aerodynamic design. – The internal aerodynamic design of the two-ring inlet was analyzed by using potential flow calculations performed by a high-speed digital computer. Incompressible flow conditions were assumed. The method of designing the inlet was to postulate a set of inlet duct and centerbody lines that would be smooth and that would have a satisfactory flow-area distribution, including allowance for the cross-sectional area of the rings. The no-ring configuration was analyzed using the results of the potential-flow program, and the streamlines in the inlet were traced. The rings were then designed with the leading and trailing edges following the desired streamline. Pressure distributions for the complete geometry were then calculated. The final position and camber of the rings was such that they were in hoop tension, with a 0.5 psi maximum pressure differential across each ring.

Figures 8(a) through 8(f) show the predicted incompressible pressure coefficients and flow areas for the two-ring inlet. These predictions were based on potential-flow analyses. Comparable predictions for the existing inlet are given in figure 9. These results indicate that the stream flow at a distance inside the inlet equal to or greater than one-half an inlet radius is insensitive to changes in inlet mass flow. Because the leading edges of the rings were located more than one-half an inlet radius inside the inlet, the rings should not sense the change in mass-flow ratio between takeoff and cruise conditions.

Figure 10 shows the predicted pressure coefficients and flow areas for the one-ring inlet. Comparison of the calculations shown in figure 10 to those shown in figure 8 indicates that satisfactory inlet flow conditions were provided for both test configurations.

Further confirmation of satisfactory flow conditions was provided by an analysis of the development of the boundary layer along the walls of the inlet duct and the concentric rings. The program assumed that transition from laminar to turbulent flow occurs at the location of the peak negative pressure. Figure 11 shows the results of the calculations for the two-ring inlet; figure 12 presents comparable results for the existing inlet. No separation problems were anticipated because the calculated values for the shape parameter were all below the flow-separation criterion of 2.4.

47-Percent Lightbulb Inlet

Configuration. – A sketch of the cross-section of the 47-percent lightbulb inlet is shown in figure 13(a). An increase in inlet length of 21 in. was needed to maintain reasonable inlet flow-diffusion angles. The inlet leading edge and the throat area were identical in shape to those of the existing inlet. Although the inlet-duct diameter downstream of the throat was increased to obtain a satisfactory flow area distribution around the lightbulb centerbody, no increase in the maximum cowl diameter was required. The term 47 percent, describing the inlet, refers to the percentage of the axial line-of-sight blockage provided by the enlarged centerbody. Both the concentric ring and the centerbody were supported by two sets of five untreated radial struts, one forward and one aft. The centerbody was attached to the engine centerbody studs by a special support flange built into the fiberglass-laminate shell. Like the two-ring inlet, this inlet was also designed as a body of revolution to simplify construction and to reduce cost. A photograph of the lightbulb inlet as installed on the engine test stand is shown in figure 13(b).

Materials and construction. – The materials and construction methods used for the lightbulb inlet were similar to those employed for the two-ring inlet. Table III summarizes the acoustical duct-lining parameters for the two-ring and the lightbulb inlets.

Aerodynamic design. – Potential-flow analysis was used in the design of the lightbulb inlet and to locate the position of the concentric ring. Figure 14 shows the predicted incompressible pressure coefficients and flow areas for the lightbulb inlet. The results of boundary layer calculations, which again indicated that there would be no flow-separation problems, are shown in figure 15.

48-Inch-Long Fan-Exhaust Ducts

Configuration. – The acoustically treated fan-exhaust ducts were bifurcated ducts with an axial length from flange to flange of 48 inches. This duct length was twice that of the existing ducts on DC-8-50/61 airplanes. To reduce tooling and test costs, the ducts for the right and left-hand sides of the engine were made identical and thus were interchangeable.

Materials and construction. – The 48-in.-long fan-exhaust ducts were fabricated from 0.25-in.-thick fiberglass laminate, with a steel attach angle and adapter ring at the duct entrance. Recessed sections in the duct walls were provided to accept the acoustical treatment which was similar to that used for the treated inlets. The honeycomb core was of the heat-resistant phenolic-coated fiberglass type, with a sinusoidal construction having nominal 0.75-inch cells. The core was 0.5 inch deep on the surfaces of the inner duct walls and both sides of the flow splitters. The outboard walls used core that was 0.75 inch deep. The porous metal surface was made from nominal 0.040-inch-thick fibermetal, having a nominal flow resistance of 8 cgs rayls. The outer half of a duct shell with the flow splitters installed is shown in figure 16(a). The splitter septum was 0.020-in.-thick stainless-steel sheet, while the leading and trailing edges were aluminum alloy. The acoustic treatment began 8 in. from the duct entrance and ended 8 in. from the exit. Table IV summarizes the acoustical duct-lining parameters for the 48-in.-long fan-exhaust ducts.

Aerodynamic design. – Prior experience showed that it was desirable to keep the duct cross-sectional area constant through the upstream half of the duct, and then decrease it gradually in the downstream half until the desired exit area was achieved. The bifurcated section of the long fan-exhaust ducts on the DC-8-62/63 airplanes had this constant-area property and was otherwise compatible. This section was therefore used as a basis for the design of the treated 48-in.-long ducts. The four treated splitters in each duct decreased the flow area by about 10 percent, requiring the outer walls to be displaced outward to compensate for the reduction and to maintain the original cross-sectional area. As a result, the first 18 inches of the treated duct, which constituted most of the S-bend turn, had an approximately constant cross-sectional area. The duct lines were smoothly faired from the end of the constant area section to the exit plane.

To provide a smooth flow transition, a tapered untreated splitter ranging in thickness from 1.1 in. to 1/16 in. was used for the final 8 inches. Two alternate leading edge designs for the splitters were investigated. The leading edge of each splitter was positioned to maintain alignment with an exit-guide vane. One design tapered smoothly from the 1/16-inch thickness of the engine exit-guide vanes to the 1.1-in. thickness of the treated splitter. The second design was swept back from 2 in. on the inner wall to 6.5 in. on the outer wall, and had an elliptical leading edge. This cutback and sweepback of the leading edge theoretically permitted the pressure to equalize between adjacent duct channels, while introducing the splitter flow-blockage area gradually into each channel. The former design (no sweepback) was tested initially, and provided a satisfactory pressure distribution at the duct entrance. Therefore, no test of the sweptback leading edges was conducted.

After lofting the duct lines at 2-in. intervals, the flow area of the treated duct without splitters was calculated. By moving, reshaping, and relofting the walls and corners of the duct through an iterative process, the duct lines were improved until a satisfactory flow area distribution was developed. Using these preliminary duct lines, the full-scale wooden mockup shown in figure 16(b) was constructed and used to check for interference of the ducts with engine piping, electrical lines, and other accessories.

The mockup revealed that several major engine accessories interfered with the duct lines. Rather than relocate the generator-removal envelope and the fuel control, the fan duct lines were modified and the acoustical treatment eliminated at these locations to provide adequate clearance. New interstage-bleed ducts were fabricated to facilitate this clearance.

The relofted duct lines, together with approximate splitter lines, were used to calculate the new flow area for the ducts. The locations of the four flow splitters were then varied, using an iterative process until the flow area in each of the five channels was satisfactory. The flow-area-ratio distributions that were finally determined are shown in figures 17(a), 17(b), and 17(c).

Figure 17(d) shows the total flow-area-ratio distribution for the five channels and the duct Mach number associated with this total duct area ratio. Duct Mach numbers were calculated for choked flow at the duct exit. All five channels had a wedge inserted along the outer duct wall from station 44 to station 48. These wedges, of varying height, were inserted during the tests of the treated ducts on the engine test stand. The wedges reduced the duct exit-area ratio from the value of 0.675 for the fiberglass-laminate shell to the desired value of 0.633 shown in figure 17(d).

FLYOVER-NOISE PREDICTION METHOD

Background

Although the 1/3-octave-band SPLs measured at 150 ft were the principal means of evaluating the noise reduction achieved by the nacelle modifications, estimates of PNLs under the landing-approach and takeoff flight paths were made for the treated inlet and the treated fan-exhaust ducts. The method of making these flyover noise predictions, that was developed during this program, evolved from several previous years of experience in measuring and predicting flyover noise levels.

Many of the analyses of aircraft flyover-noise levels that have been conducted in the past have been in terms of composite perceived noise levels. Composite perceived noise levels are computed from the maximum SPL readings in 1/1- or 1/3-octave bands, irrespective of the times of occurrence of the maximum values. Composite perceived noise levels are readily obtainable because they do not require sophisticated data-reduction systems. By contrast, instantaneous PNLs must be calculated from SPL spectra determined at discrete, closely spaced intervals of time throughout a flyover noise cycle. Both instantaneous and composite perceived noise levels can be determined from the noisiness tables of reference 10.

When using PNLs to evaluate the effect of a noise-suppression device on flyover noise levels, it has been common practice to consider the change in the respective maximum values of the instantaneous PNLs, i.e., the change in PNLM. Noise reductions predicted for suppression devices of the type considered in this program are generally larger with PNLMs than with composite perceived noise levels. This result is due to the fact that the SPLs in the low-frequency region in the composite spectra are generally higher than those in the spectra obtained at the instant of PNLM. The contribution of these low-frequency sounds to the annoyance of the total spectrum is relatively more important for the sound from the treated nacelles than that from untreated nacelles.

Instantaneous PNLs were specified as the measure to use when rating the noise-suppression devices. Specifically, to determine compliance with the 7 to 10 PNdB noise-reduction goal, the difference between the PNLMs of the existing and the modified nacelles was to be determined for selected altitudes and engine power settings.

Development

In developing the noise-prediction method, it was necessary to select an appropriate independent variable to use when interpolating or extrapolating from the available 1/3-octave-band SPLs.

High frequency noise (e.g., frequencies greater than 800 Hz) from the existing, unsuppressed JT3D nacelle is related to fan-blade tip Mach number and hence was assumed to be a function of $N_1/\sqrt{\theta_{t_2}}$. Initially, the low-frequency noise (e.g., frequencies less than 800 Hz) was assumed to be a function of jet-exhaust velocity (or relative jet-exhaust velocity) because past studies of turbojet-engine noise had indicated that the jet-exhaust-velocity parameter produced reasonable agreement between predicted and measured values within this frequency range. The jet-exhaust velocity was the thermodynamic, fully expanded velocity determined from the EPR, the turbine-discharge total temperature, and the airplane Mach number.

Spectral estimates made using the jet-exhaust-velocity parameter did not agree well with measured spectra of flyover noise levels. Estimates made using relative jet-exhaust velocity (relative to the speed of the airplane) did not improve the agreement and made the prediction method more difficult because of the requirement to extrapolate beyond the limit of available data.

After considerable experimentation, involving comparisons of predictions from ground-runup data to measured flyover SPLs (using data from JT3D- and JT8D-powered airplanes, e.g., DC-8's and DC-9's), a parameter was selected that would produce acceptable spectral estimates over a range of engine-powered settings. The selected parameter was $N_1/\sqrt{\theta_{t_2}}$ for each of the 1/3-octave bands between 50 and 800 Hz. In addition, empirical corrections were applied to the estimated flyover SPLs for the 1/3-octave bands between 50 and 630 Hz in order to make the predicted SPLs, at the time associated with the PNLM for existing JT3D-powered airplanes, agree with previously measured values. When developing these empirical corrections, comparisons were also made with composite spectra consisting of the maximum 1/3-octave-band SPLs noted during a flyover.

Procedure

The noise-prediction technique involved the use of 1/3-octave band SPLs projected to various sideline distances, that is, to lines drawn parallel to the engine axis at selected distances from 200 to 3000 feet. The projections to the various sidelines were made along radial lines passing through the microphone positions and assumed that the source of sound was at the primary exhaust nozzle. Corrections were made to the measured SPLs to account for inverse-square loss and for atmospheric absorption at an air temperature of 59°F and a relative humidity of 70 percent. The atmospheric absorption corrections used data from reference 8 and incorporated the modifications of reference 9. No corrections were included directly for any absorption due to ground effects. However, the empirical correction factors used to adjust the low-frequency portion of the spectra may implicitly have included some correction for the ground absorption.

Estimates of the variation of the SPL with time during a flyover were made by assuming that the projected sideline SPLs were representative of those produced by an airplane flying in straight and level flight over an observer on the ground. The method assumed an appropriate constant airplane speed for each flight condition.

Estimates were made for each of the twenty-three 1/3-octave bands, for each engine power setting used for the ground runup tests, and for discrete, closely spaced intervals of time from the beginning to the end of a flyover. The total duration of the flyover depended on the microphone azimuths that were used in the tests. SPLs for twenty-three 1/3-octave bands were derived from the four 1/1-octave-band SPLs and the eleven 1/3-octave-band SPLs by making a bandwidth correction to the four 1/1-octave-band SPLs to yield twelve 1/3-octave-band SPLs.

The flyover SPLs predicted from the measurements around the single engine on the test stand were adjusted to account for the difference in level produced by four engines by adding 6 dB to each 1/3-octave-band SPLs. The perceived noisiness of the predicted flyover SPLs for a given flight condition was determined by making use of tables (ref. 10) to convert the SPLs to noisiness values. PNLs were then calculated from the total perceived noisiness values. A large-capacity digital computer was programmed to carry out the computations.

Reference Conditions

For a landing-approach condition, the noise reduction was to be estimated for an airplane at maximum landing gross weight, flying along a 3-degree approach path with flaps fully deflected. Representative conditions for a DC-8-55 were selected with a maximum landing weight of 240 000 lb, a referred installed net thrust per engine of 5500 lb, and a Mach number of 0.22. The corresponding value of $N_1/\sqrt{\theta_{t_2}}$ was 4740 rpm. The noise reduction was to be determined at a location 1 n. mi. from threshold where the height of the airplane was approximately 370 ft.

For the takeoff condition, the noise reduction was to be estimated for an airplane at maximum takeoff gross weight climbing out with an airspeed of V_2 + 10 knots and with a 25-degree flap setting. The maximum takeoff gross weight for the DC-8-55 is 325 000 lb. With the existing nacelles, a 325 000-lb airplane requires a referred installed net thrust of 14 300 lb per engine (an $N_1/\sqrt{\theta_{t_2}}$ of 6460 rpm) to maintain the selected airspeed with the 25-degree flap setting. The airspeed, at this weight, corresponded to a Mach number of approximately 0.26. The thrust required by the modified nacelles would be determined after the engine-performance tests had established the loss in takeoff-rated thrust. The noise reduction was to be determined at a location 3.5 n. mi. from brake release. At this location, the 325 000-lb airplane with the existing nacelles would reach a height of approximately 975 ft when using the 25-degree takeoff flap setting.

Accuracy

At the time of developing the prediction method, no flyover-noise measurements were available on JT3D-powered airplanes with treated nacelles. The accuracy of the flyover noise-prediction method was limited because of the assumptions required and because of the use of empirical correction factors. The accuracy of predicted PNLM values was estimated to be within ±2 PNdB of the average values determined from a series of flyover noise tests. Additional discussion relevant to the question of accuracy is presented in reference 5.

Applicability

The flyover noise prediction method was only applicable to the sound from the existing nacelles and from those nacelle modifications consisting of the acoustically treated inlet and fan-exhaust ducts. The method was not applicable to the simulated variable-area primary-nozzle tests because the reduction in the size of the primary nozzle changed the fundamental relationship between engine rotor speed and jet velocity. Hence, the empirical correction factors (which account for the change in the low-frequency jet-exhaust noise measured on the ground and measured in flight) were not applicable. For this reason, no PNL estimates are presented for the simulated variable-area primary nozzle tests.

RESULTS AND DISCUSSION

The results of the acoustic and engine-performance measurements of the simulated variable-area primary nozzles, the treated inlets, and the treated fan-exhaust ducts are presented and discussed in this section. Tabulated values of the average SPLs measured at 150 ft for the 13 test configurations are presented in Appendix A for use in additional analyses of the data.

Simulated Variable-Area Primary Nozzle

The concept of the variable-area primary nozzle was one wherein the exit area of the primary exhaust nozzle could be decreased during a landing-approach, thereby reducing the pressure drop across the fan-drive turbine. As a result, at any given landing thrust requirement, less power would be available for the low-pressure rotor. Consequently, the rotational speed of the fan stages would be decreased while the EPR, the primary thrust, and the jet-exhaust velocity would be increased.

Because fan-compressor noise was considered to be directly related to fan tip Mach number, the reduction in fan rotational speed should produce a corresponding reduction in noise level at the fan blade-passage frequencies. The reduction in the amplitude of the discrete-frequency fan-noise would be accompanied, at equal values of thrust, by an increase in the lower-frequency jet-exhaust noise due to the increased velocity of the jet from the primary nozzle.

Acoustical performance. – The analysis of the data that were obtained was handicapped by an inability to make meaningful projections to in-flight conditions. The analysis presented here assumes that valid comparisons can be made at equal values of nominal static referred gross thrust. A nominal static gross thrust of 8000 lb was selected.

Figure 18 shows spectra of the SPLs measured at 150 ft at an angle of 110 degrees in the aft quadrant [fig. 18(a)] and at 60 degrees in the forward quadrant [fig. 18(b)]. In examining these results it was felt that, in order for the concept of the simulated variable-area primary nozzle to be considered worth further development (even in conjunction with acoustically treated inlet and fan-exhaust ducts), it would have to be capable of reducing the amplitude of the fundamental fan blade-passage frequency by at least 10 dB in the aft quadrant. The 10-dB goal for the reduction in fan noise was established to help balance the additional annoyance that was expected from the increased jet-exhaust noise levels.

The results shown in figures 18(a) and 18(b) were not encouraging. The noise from the existing nacelle shows the strong discrete frequency components that were anticipated in the 2500- and 5000-Hz bands containing the fundamental and second-harmonic of the blade-passage frequencies, respectively. In the 2500-Hz band, the conical nozzle with 80 percent of the standard exit area achieved a noise reduction of approximately 1 dB, but increased the noise in the 500-Hz band, for example, by approximately 4 dB. The corresponding reduction in rotor speed was approximately 330 rpm.

For the 50-percent nozzle, the reduction in rotor speed was approximately 900 rpm (from 4900 rpm) and the corresponding reduction in the SPL in the 2500-Hz band was larger and on the order of 4 dB. The jet noise in the 500-Hz band, however, was increased by approximately 12 dB. The 4-dB reduction in fan noise would probably be more than offset by the 12-dB increase in jet noise.

The wedged nozzle did not decrease the noise levels in any 1/3-octave band at either 110 or 60 degrees. This result was particularly disappointing because the wedged nozzle was representative of a production version of a variable-area primary nozzle. Thus, none of the test configurations met the 10-dB minimum noise-reduction requirement.

Based on these acoustical performance results, it was decided to abandon further consideration of the concept of variable-area primary nozzles and to concentrate on the development of acoustically treated inlets and fan-exhaust ducts.

Engine performance. – The engine started with only slightly more than normal cranking with the 50-percent primary nozzle installed. Power could be increased or decreased between idle and maximum allowable power with slow throttle movements. However, with jam throttle movements, the engine required 20 to 30 seconds to either accelerate to maximum allowable power, or to decelerate to idle. Both acceleration and deceleration were accompanied by "chugs" indicating compressor-blade stalls. During succeeding tests with larger exit areas, jam acceleration times were not measured. Occasional chugging was encountered with the 60-percent nozzle installed. As anticipated, the chugging diminished and acceleration improved as the primary nozzle area was increased.

Figure 19 shows the results of the engine-performance tests with the simulated variable-area primary nozzles. Substantial increases in indicated EPR, figure 19(a), were required to attain a given thrust with the smaller primary nozzles. The higher EPRs were allowed since they could be attained in the reduced-area configuration without exceeding the maximum allowable turbine-inlet temperature. Figure 19(b) indicates that the value of $N_1/\sqrt{\theta_{t2}}$ was significantly reduced, at a given thrust, by the installation of the reduced-area primary nozzles.

With the eight wedges installed inside the 100-percent primary nozzle, all engine gas-generator parameters except thrust indicated that the engine was operating as though it were equipped with a conical nozzle having approximately 62 percent of the standard primary-nozzle exit area. The gross thrust measurements were similar to those that would have been obtained with a 55-percent primary nozzle installed on the engine, as indicated by the lower dashed line in figure 19(a). Static pressure measurements behind the wedges indicated that there were large thrust losses induced by the drag of these wedges. By using the pressure data, it was estimated that if this base drag were eliminated (e.g., by a more refined design) the thrust would have exhibited characteristics similar to those that would have been obtained with a conical nozzle with approximately 62-percent exit area installed on the engine, as indicated by the upper dashed line in figure 19(a). The equivalent performance of fan-rotor speed, with the estimated base drag eliminated, is indicated by the dashed line in figure 19(b).

Treated Inlet Ducts

Acoustical performance. – All tests on the treated inlet ducts were conducted with the fan-exhaust noise-suppressor enclosure around the engine and the vortex barrier on the ground in front of the inlet. SPL measurements were restricted to the forward quadrant (15 to 100 degrees). Analyses of the data are presented for two of the seven engine-power settings used for the tests. These two power settings are for nominal referred rotor speeds of 4600 and 6300 rpm. The 4600-rpm condition corresponds to a landing power setting, the 6300-rpm condition corresponds to a takeoff power setting on a hot day.

The data presented in the following sections are in terms of the changes in the spectrum of the sound at a given angle and in terms of the changes in directivity of selected 1/3-octave bands. The angle chosen for the inlet-noise analyses was 60 degrees because estimates of the flyover PNL during landing approach indicated that the PNLM, for the noise radiated from the existing inlet, occurred at approximately 60 degrees when the 150-ft polar SPL data were projected to a 400-ft sideline.

Existing inlet baseline: The SPL spectrum at 60 degrees is shown in figure 20(a) for the 4600-rpm power setting. This spectrum is characterized by high SPLs in the 1/3-octave bands centered at 2500 and 5000 Hz. These bands contain the fundamental and the second harmonic of the blade-passage frequencies (BPF) from the two fan stages. The SPL of the fundamental BPF tones in the 2500-Hz band was 5 to 6 dB higher than the SPL of the second harmonic of the BPF tones in the 5000-Hz band.

The fundamental BPF tones in the 3150- and 4000-Hz bands for the 6300-rpm power setting are also shown in figure 20(a). As noted at the landing power setting, the SPL in the 1/3-octave bands containing the fundamental tones is 5 to 6 dB higher than the SPL in the bands containing the second harmonic. The absolute value of the SPL at the fundamental is lower for the takeoff than for the landing power setting. The level of the lower-frequency broadband noise (in the frequency range from 45 to 700 Hz) is much lower at the landing power setting than at the takeoff power setting.

In the mid-frequency range (700 to 2000 Hz), both spectra in figure 20(a) are dominated by numerous discrete-frequency components within the 1/3-octave bands. These components (only evident in narrow-band analyses) are not related to blade passage. The components are referred to as combination tones which occur at frequencies that are integral multiples of the rotor speed. Combination tones are believed to be produced by the series of shock waves that become randomly spaced as they propagate forward of those sections of the fan blades which are rotating at supersonic relative tip Mach numbers. These patterns of rotating shock waves repeat once for each engine revolution. Reference 11 contains additional information on the formation of these combination tones and notes that the most-intense combination tones are usually at frequencies that are 15 to 20 times the rotational speed of the low-pressure rotor. Thus, at the landing power setting, the combination tones lie within the 1/3-octave bands centered at 1000, 1250, and 1600 Hz and, at the takeoff power setting, in the 1/3-octave bands centered at 1600, 2000, and 2500 Hz.

Figure 20(b) shows the directivity of the SPLs in the 2500-Hz band at the landing power setting and in the 4000-Hz band at the takeoff power setting. Note that the maximum SPLs do not occur at 60 degrees on a polar basis. Inverse-square loss and atmospheric absorption account for the change in the angle of maximum radiation when the polar data are projected to a sideline.

Two-ring inlet and 47-percent lightbulb inlet: Figure 21 shows the spectra of the noise reduction achieved at the 60-degree azimuth for the four treated-inlet configurations. The noise reduction increased with the number of rings. The noise reductions achieved by the lightbulb and the two-ring inlets were similar and both were larger than the reduction achieved by the one-ring or the no-ring inlets.

In the bands containing the fundamental and second harmonic of the BPF tones, the noise reduction at the landing power setting, figure 21(a), was greater than that obtained at the takeoff power setting, figure 21(b). This result was expected and was attributed to the following conditions: (1) the SPLs incident on the treated surfaces are lower at takeoff than during landing, (2) the velocity of the air flowing over the treated surfaces is greater at takeoff, and (3) the absorptivity of the treatment for frequencies between 3400 to 3700 Hz is less than the absorptivity in the frequency region around 2500 Hz.

For the takeoff power setting, figure 21(b), there was essentially no difference between the noise reduction achieved at the fundamental and at the second harmonic of the BPF tones for each of the four configurations. This result contrasts with that shown in figure 21(a) for the landing power setting where the noise reduction at the fundamental was as much as 11 dB more than the noise reduction at the second harmonic. The difference in results is attributed principally to the difference in the SPLs of the fundamental BPF tones at the two power settings, see figure 20(a).

The significant increases in noise reduction obtained when the rings were installed indicate the importance of having small distances (i.e., small in terms of the wavelength of the fundamental BPF) between acoustically absorptive surfaces. These results tend to corroborate the design guidelines presented with the discussion of the acoustic design chart in reference 4. The results also tend to corroborate the selection of the cavity depths for the acoustically treated surfaces.

The noise reduction in the bands containing the combination tones [1000, 1250, and 1600 Hz in figure 21(a) and 1600, 2000, and 2500 Hz in figure 21(b)] was significant for all configurations. Apparently, the treatment on the wall of the inlet duct was an effective absorber of the shock waves generated near the tips of the fan blades. At the landing power setting, addition of the treated rings produced only a small increase in the reduction of the amplitude of the combination tones, probably because most of the combination-tone energy was concentrated near the wall of the inlet duct. The effect of adding the single outer ring was to produce more noise reduction at the takeoff power setting than at the landing power setting. This effect was probably related to the fact that a larger segment of each fan blade was rotating at supersonic tip speed at the takeoff power setting than at the landing power setting. Also, judging from figure 20(a), the SPLs of the combination tones were higher at the takeoff than at the landing power setting. Because of the change in the effective flow resistance that occurs when high SPLs are incident on porous surfaces, some of the additional noise reduction may be due to a change in the effective acoustical impedance of the duct lining at the takeoff power setting compared to the effective impedance at the landing power setting.

Figure 22 presents polar distributions of the inlet noise reduction in the 1/3-octave bands containing the fundamental BPF tones. Figure 22(a) shows the reductions achieved in the 2500-Hz band at the landing power setting; figure 22(b) shows the reductions achieved in the 4000-Hz band at the takeoff power setting. At the landing power setting, a reduction of 3.5 to 5 dB was achieved between 50 and 90 degrees with no rings installed. With one ring installed, the reduction was between 11.5 and 14.5 dB; with two rings installed, the reduction was 16.5 to 18 dB over the same range of angles. At the takeoff power setting, the same trends were obtained as noted at the landing power setting but the magnitude of the reductions was less at all angles. At both engine power settings, the lightbulb inlet achieved more noise reduction at all angles in the forward quadrant than the one- or two-ring inlets. The larger reductions achieved at the low angles (15 to 40 degrees) indicate that the duration of the flyover PNL would be less for an airplane equipped with lightbulb inlets than with inlets having one or two concentric rings. The larger noise reduction at these low angles is attributed to the line-of-sight blockage provided by the large lightbulb-shaped centerbody.

Engine performance. – Engine performance data, taken with the fan-exhaust noise-suppressor enclosure installed, indicated that the enclosure affected the absolute level of performance, particularly thrust, to an unknown degree. The fan-exhaust noise-suppressor enclosure functioned as a zero-flow ejector and reduced the pressure on the aft external portion of the engine by several inches of water relative to the ambient air pressure. Because the resulting tare forces could not be accurately determined by analytical techniques, the baseline that was established with the fan-exhaust noise-suppressor enclosure installed served as the reference for the engine-performance tests of the treated inlets. The data that were obtained were indicative of the comparative losses due to the treated inlets, but were only suitable for rank ordering the designs with respect to engine performance. However, a rank ordering of the performance of the inlet designs was sufficient to satisfy the objectives of the test program.

Test results obtained with the fan-exhaust noise-suppressor enclosure in place are presented in figure 23. These data suggest that, from an engine performance standpoint, the treated inlet configurations would be ranked in descending order of desirability as follows: (1) no-ring inlet, (2) one-ring inlet, (3) two-ring inlet, and (4) lightbulb inlet. This rank ordering is in the reverse order from that of the acoustical evaluations discussed above.

Aerodynamic performance. – Inlet aerodynamic performance was analyzed using measurements of the total pressure at the engine inlet and static pressures along the wall of the inlet duct. Engine-inlet total pressure distributions were measured during tests of the one-ring and lightbulb inlets. The total-pressure rakes were positioned at the engine inlet station to measure the total pressure losses at the wall of the inlet duct and centerbody, in the wake behind the ring, behind a support strut, and behind an intersection of the ring and a support strut. Static-pressure distributions along the inlet wall were measured for the two-ring, one-ring, no-ring, and lightbulb inlets. The static-pressure data were compared with potential flow calculations and were used to determine the pressure gradients along the duct wall.

Figure 24 shows the distributions of the static-pressure coefficients along the inlet duct wall. The data were normalized using the Mach number, M_i, at the throat of the engine inlet duct. The data were corrected for first-order compressibility effects to permit comparison with incompressible potential-flow calculations, which are also shown in figure 24. The normalized measured data and the potential flow calculations show good agreement in general and excellent agreement for all inlet configurations operating at inlet Mach numbers less than 0.3. No flow separation problems along the inlet duct wall were indicated by the measured data.

Figure 25 shows the distribution of the total-pressure-loss profiles for the one-ring inlet at an EPR of 1.79. The total-pressure loss is expressed in coefficient form as a fraction of q_2, the dynamic pressure for one-dimensional flow at the engine inlet. The EPR of 1.79 corresponds to an engine power setting slightly less than takeoff. The corresponding inlet-duct Mach number is 0.56. Clearly indicated in figure 25 is the boundary-layer profile on the duct wall and the wake caused by the concentric ring. Both the boundary-layer profile and the size and shape of the wake indicate that the inlet was aerodynamically satisfactory. The location of the ring wake relative to the location of the ring trailing edge indicates a slight contraction of the stream tube behind the ring.

Figure 26 gives a comparison of the total-pressure-loss profiles in the wake of the ring in the one-ring inlet for three values of EPR which correspond to three values of inlet Mach number. The data indicate that the ring wake was satisfactory and that there were no flow separations over the range of power settings. The slight stream-tube contraction (i.e., the displacement of the peak of the profile and the ring trailing edge) noted in figure 25 is also noticeable in figure 26. The method of presenting the data in coefficient form was selected to eliminate the effect of Mach number. As shown in figure 26, this method was largely successful.

Figure 27 shows a comparison of the boundary-layer total-pressure-loss profiles at the inlet duct wall for the one-ring inlet and the existing inlet. The solid line represents the fairing through the data shown in figure 25. The several data points represent repeated tests. No distinction can be made between the total-pressure-loss profiles for either inlet because the differences are within the scatter of the data.

Figure 28 shows the fractional loss in available total pressure behind one of the aft struts that supported the ring. The data indicate that the strut was not aligned with the on-coming flow and that a side force was therefore generated. For this reason, the total-pressure-loss data would not be expected to generalize if plotted in coefficient form as a fraction of q_2. The data show that engine power affects not only the width but also the location of the peak of the profile. Since the struts were positioned so their centerlines were at right angles to the engine inlet, the change in wake with engine power is considered to be due to the pre-swirl imparted by the engine to the incoming airflow.

Figure 29 shows the distributions of the static-pressure coefficients along the duct wall for the lightbulb inlet. As for the two-ring inlet, the data were corrected for compressibility effects in order that they could be compared with the plot of the incompressible potential-flow pressure coefficients also shown in the figure. The comparison shows that higher static pressures were experienced on the forward part of the inlet duct than had been predicted by the potential flow calculations. This result indicates that the flow over the inlet duct may have separated and then reattached. The data also show that a severe adverse pressure gradient was present over the surface of the centerbody.

Figure 30 shows the total-pressure-loss profiles at the engine inlet. A boundary layer approximately 2.5 in. thick at this location is indicated to have existed on the centerbody. This relatively thick boundary layer was caused, not only by the large size of the centerbody, but also by the relatively severe adverse-pressure gradient indicated in figure 29. The wake from the concentric ring had essentially the same width and total-pressure loss as that indicated in figure 25 for the ring in the one-ring inlet. As would be expected, the wake behind the junction of a strut and the ring was significantly larger than that behind the ring alone and also had a higher total pressure loss.

It is evident from figure 30 that a thick boundary layer existed on the inlet duct wall. The edge of the wake from the ring-strut junction appears to intersect the outer edge of the duct-wall boundary layer throughout the bottom quadrant of the inlet. The reason for the thicker boundary layer at the top of the duct than at the bottom is not obvious. Small differences in lip contour, however, could significantly affect the degree to which the lip flow apparently separated.

A comparison of the inlet integrated total-pressure-loss coefficients for the no-ring inlet, the one-ring inlet, and the lightbulb inlet is shown in figure 31. For reference, the total-pressure-loss coefficient for the existing inlet is also included. The inlet loss occurring in the no-ring inlet is indicated to be slightly greater than that of the existing inlet. However, the loss for both ducts is small, and the small difference between them is within the measuring and data-averaging tolerance. Thus, any difference in inlet loss due to the slight difference in duct wall contours and to the replacement of the aluminum walls by the acoustical treatment is within the accuracy of the measurements. The addition of the single concentric ring approximately doubles the inlet total-pressure loss of the existing inlet. The high loss shown for the lightbulb inlet is due to the thick boundary layer on the duct wall and on the enlarged centerbody.

The losses in figure 31 are shown for operation at zero free-stream Mach number. At this condition, the inlet operates at an infinite mass-flow ratio and with high flow velocities around the inlet lip. These high velocities cause losses that are relatively high compared to the losses experienced during cruise conditions with lower mass-flow ratios. The losses during cruise operation would therefore be less than those shown in figure 31. This conclusion is particularly true for the lightbulb inlet, which appeared to suffer a flow separation at the inlet lip during operation at an infinite mass-flow ratio.

Treated Fan-Exhaust Ducts

Tests of the baseline configuration and the treated fan-exhaust ducts were conducted with the inlet-noise-suppressor enclosure around the existing inlet cowl.

Prior to recording acoustic and engine-performance data, the exit area of the treated fan-exhaust ducts was adjusted using a wedge in each channel along the outer duct wall. Exit-area adjustments were required to ensure that the relationship between fan-rotor speed and fan-pressure ratio remained unchanged from that of the existing nacelle. This relationship is a function of the exit areas of the fan ducts and the (unchanged) exit area of the existing primary nozzle.

Acoustical performance. – SPLs were recorded at angles ranging from 75 to 157 degrees on the 150-ft-radius arc. Figure 32 presents results of the measurements around the baseline configuration. Figure 32(a) shows the SPL spectra at an angle of 110 degrees for the landing and the takeoff power settings. The 110-degree angle was selected because projections to a 400-ft sideline for this configuration had indicated that SPLs radiated from this angle determined the PNLM at the landing power setting. The spectra illustrate the prominent discrete-frequency tones and the difference in the relative levels of the jet-exhaust noise between the landing and the takeoff power settings (i.e., between referred rotor speeds of 4600 and 6300 rpm). These characteristics were similar to those noted for the SPLs shown for the inlet baseline in figure 20. The absolute values of the SPLs in figure 32, however, are significantly higher than those in figure 20.

The polar distribution of the SPLs in the 1/3-octave bands containing the fundamental BPF tones is presented in figure 32(b). The SPLs are fairly constant from 90 to 120 degrees, and decrease for angles less than 90 degrees and greater than 120 degrees.

The spectra and directivity of the noise reduction achieved by the treated fan-exhaust ducts are shown in figure 33. Figure 33(a) presents the spectra of the noise reduction at 110 degrees for the landing and the takeoff power settings. Figure 33(b) presents the polar directivity for the 2500-Hz band at the landing power setting and the 4000-Hz band at the takeoff power setting.

At the landing power setting, there was significant noise reduction in the bands containing the fundamental (2500 Hz) and the second harmonic (5000 Hz) of the BPF. At the takeoff power setting, the reduction at the fundamental (3500 Hz, which is between the 3150- and 4000-Hz bands), while less than at the landing power setting, was still significant. The noise reduction for the takeoff power setting would have been larger if the center frequency of the 1/3-octave-band filter had been at the fundamental BPF rather than at the center frequencies of 3150 and 4000 Hz, which are about 1/6 octave below and above the 3500-Hz fundamental.

The polar distribution of the noise reduction showed rather uniform noise reductions in the aft quadrant. Farther aft (140 to 157 degrees), the reduction was less than at angles of maximum radiation (90 to 120 degrees), possibly because the noise floor from the jet exhaust masked the amplitude of the fan tones.

Engine performance. – The unaccountable friction and pressure-area forces introduced by the presence of the inlet-noise-suppressor enclosure around the inlet duct prevented determination of accurate absolute values of engine performance. The data that were obtained, however, did indicate that, at fixed values of indicated EPR, the effect of the treated fan-exhaust ducts on thrust was negligible.

Selection of Flight Configuration

As discussed in reference 4, meeting the 7 to 10 PNdB goal for the reduction of noise levels under the landing-approach flight path required that the treated inlet ducts produce noise levels that were approximately 7 PNdB lower than the noise radiated from the existing inlet ducts. Similarly, the treated fan-exhaust ducts were to achieve noise levels that were approximately 10 PNdB lower than the noise radiated from the existing fan-exhaust ducts. If the reduction in PNLM achieved by the treated inlet ducts was significantly more than 7 PNdB, this additional reduction would not provide substantially lower PNLMs unless the reduction in the noise radiated from the fan-exhaust ducts was also correspondingly larger. The flight nacelle therefore had to have a treated inlet duct, the acoustical performance of which would be appropriately matched to the acoustical performance of the treated fan-exhaust ducts.

Based on 150-ft SPL measurements and by using the flyover-noise prediction method described above with the engine and airplane parameters for the landing-approach reference conditions, it was estimated that the 48-in.-long fan-exhaust ducts would reduce the PNLM by approximately 12 PNdB below the PNLM of the baseline configuration with the inlet-noise-suppressor enclosure around the inlet duct. This value of estimated noise reduction was somewhat larger than the 10-PNdB target value and the design of treated fan-exhaust ducts was therefore considered acceptable for use in the flight nacelle.

Under the same conditions, the approximate reductions in PNLM (below the PNLM of the baseline configuration with the fan-exhaust noise-suppressor enclosure around the engine) achieved by the treated inlets were: 2 PNdB for the no-ring inlet, 8.5 PNdB for the one-ring inlet, 10.5 PNdB for the two-ring inlet, and 11 PNdB for the 47-percent lightbulb inlet. The one-ring inlet was chosen for the flight configuration because it met the 7-PNdB target for inlet noise reduction with the least performance penalty.

Combination of One-Ring Inlet and 48-Inch-Long Fan-Exhaust Ducts

The combination of the one-ring inlet and the 48-in.-long fan-exhaust ducts was tested following its selection as the candidate flight nacelle. This combination was referred to as the modified nacelle. Figure 34 shows the modified nacelle mounted on the JT3D engine test stand. A baseline configuration was also tested using the existing inlet and fan-exhaust ducts. Both configurations were tested without noise-suppressor enclosures around the engine but with the vortex barrier on the ground in front of the inlet.

Acoustical performance. – Figure 35 shows SPL spectra for the existing and the modified nacelles. The spectra are those measured at 110 degrees for the 4600 and the 6300-rpm referred rotor speeds. The spectra for the existing nacelle are similar to the baseline spectra with the inlet-noise-suppressor enclosure around the inlet [fig. 32(a)]. At both power settings, the modified nacelle achieved significant reductions of the SPLs in the 1/3-octave bands containing the discrete BPF tones. The reductions were larger, however, at the landing power setting, figure 35(a), than at the takeoff power setting, figure 35(b).

The spectra in figures 35(a) and 35(b) indicate an increase of 0.5 to 2 dB in the SPLs in the bands with center frequencies of 63, 125, 250 and 500 Hz. The mechanism responsible for this increase in low-frequency SPLs was not determined although it may have been related to a difference in turbulence levels and shear gradients between the jet flow from the fan-exhaust ducts and the jet flow from the primary exhaust nozzle due to the extension of the fan-exhaust nozzle 24 in. closer to the exit of the primary nozzle.

The spectra of the noise reduction achieved at 110 degrees is shown in figure 36. These results are similar to those shown in figure 33(a) for the tests of the treated fan-exhaust ducts with the inlet-noise-suppressor enclosure around the inlet. Comparable noise reduction values were larger, however, for the modified nacelle data shown in figure 36 than for the treated fan-exhaust-duct results shown in figure 33(a).

The polar distribution of the noise reduction in three 1/3-octave bands is shown in figure 37 for the landing and the takeoff power settings. The three bands were selected to show the noise reduction in the bands controlled (a) by jet-exhaust noise, (b) by the fundamental of the BPF tones, and (c) by the second harmonic of the BPF tones. The reduction in the bands containing the fundamental and the second harmonic was significant at all angles from 15 to 157 degrees. The reduction, in the 500-Hz band controlled by jet-exhaust noise, was negligible at all angles, as anticipated.

Predicted flyover PNLs and spectra at the time of PNLM are shown in figures 38 and 39 for the reference landing-approach and takeoff conditions, respectively. For each nacelle configuration, the predicted PNLs in figures 38(a) and 39(a) are plotted relative to the time of occurrence of the PNLM. The total time interval in each case corresponds to the azimuth limits of 15 and 157 degrees. The airplane equipped with the modified nacelles had a loss in takeoff-rated thrust of 2.1 percent, after allowance for a reduction of 0.4 percent in scrubbing drag. As explained in greater detail in reference 5, this loss in takeoff-rated thrust caused a loss in height of 40 ft when passing over the 3.5-n. mi. point, i.e., the airplane achieved a height of 935 ft compared to 975 ft for the airplane with the existing nacelles. The referred low-pressure rotor speed for the airplane with the modified nacelles was 6410 rpm corresponding to an installed referred net thrust of 14 055 lb per engine.

The reductions in PNLM predicted were approximately 12 PNdB for the landing-approach condition and approximately 1 PNdB for the takeoff condition. The predicted reduction in PNLM for the landing-approach condition with the modified nacelle essentially confirmed the results predicted from the tests of the individual components. With these estimates, it was considered that a flight version of the nacelle modification could meet the design goal, confirming the selection of this configuration for subsequent flight evaluation (ref. 5).

The predicted spectra at the time of PNLM shown in figures 38(b) and 39(b) are similar to the spectra shown in figures 35(a) and 35(b). At the landing power setting, significant reductions were predicted for the SPLs in the bands containing the BPF tones and in the bands containing the combination tones. At the takeoff power setting, there was essentially no change in any band except the 4000-Hz band containing the fundamental of the BPF tones.

Engine performance. – The results of the performance tests of the modified nacelle are given in figures 40(a) and 40(b). Figure 40(a) indicates that there was a thrust loss of approximately 0.5 percent at high values of indicated EPR. A reduction in the allowable takeoff-rated EPR would be required, however, to prevent engine overboost. After adjusting the EPR, the resultant loss in takeoff thrust was determined to be 2.5 percent. However, with the 24-in.-long fan-exhaust ducts, there would be a reduction in the scrubbing drag on the nacelle afterbody downstream of the fan discharge nozzle. The reduction in scrubbing drag was estimated to be 0.4 percent yielding a net reduction in takeoff-rated thrust of 2.1 percent. Reference 5 provides additional information on the effects of the modified nacelles on engine performance.

Figure 40(b) indicates that the modified nacelle increased the referred specific fuel consumption by approximately 1 percent. This result was attributed to the effects on thrust and fuel flow of changes in the total pressure losses of the inlet and fan-exhaust ducts.

CONCLUDING REMARKS

Two methods of simulating a variable-area primary nozzle, four configurations of acoustically treated inlet ducts, and one pair of acoustically treated fan-exhaust ducts were evaluated in this JT3D noise-suppressor development program. The simulated variable-area primary nozzles, consisting of reduced-area convergent conical nozzles and a wedged nozzle with eight flat wedges arranged around the inside of the nozzle, did not produce any significant reductions in fan-compressor noise but did cause substantial increases in low-frequency jet-exhaust noise. The variable-area primary-nozzle concept was therefore abandoned as a candidate nacelle modification in favor of treated inlets and treated fan-exhaust ducts.

The four treated-inlet configurations were comprised of two types of inlet ducts: an inlet with a conventionally shaped centerbody and two concentric ring vanes, and a lengthened inlet with an enlarged lightbulb-shaped centerbody and one concentric ring vane. Acoustical treatment consisting of porous fibermetal sheets bonded to honeycomb core was applied to the walls of the inlet ducts, centerbodies, and to both sides of an impervious central septum in the ring vanes. The two-ring inlet was tested with the inner ring removed (i.e., the one-ring inlet) and with both rings removed (i.e., the no-ring inlet). The 48-in.-long treated fan-exhaust ducts had acoustical treatment, similar to that used in the inlet ducts, installed on the inner and outer duct walls and on both sides of a central septum in the four flow splitters in each duct.

A method was developed to predict flyover perceived noise levels from SPLs measured at a distance of 150 ft around the engine test stand. The method used referred low-pressure rotor speed for interpolating or extrapolating to reference conditions. Empirical correction factors were utilized to adjust the SPLs in the 1/3-octave bands from 50 to 630 Hz. These empirical corrections were derived from comparisons of measured and predicted flyover-noise spectra on JT3D- and JT8D-powered jet transports.

Reference conditions for landing approach consisted of a location 1 n. mi. from threshold with the airplane at a height of 370 ft and flying a 3-degree flight path. The selected gross weight was the maximum landing weight for the DC-8-55 of 240 000 lb. With the flaps fully deflected, the installed referred net thrust was 5500 lb per engine. At a Mach number of 0.22, the referred rotor speed was 4740 rpm. The air temperature was 59°F, the relative humidity 70 percent, and there was no wind.

At these landing-approach reference conditions, the 48-in.-long treated fan-exhaust ducts were predicted to reduce the PNLM of the existing nacelle (with an inlet-noise-suppressor enclosure around the inlet) by approximately 12 PNdB. Since the goal for the reduction of noise radiated from the fan-exhaust ducts had been set at 10 PNdB, the design for the acoustically treated fan-exhaust ducts was considered acceptable for use as part of the configuration of the flight-test version of the treated nacelle.

Under the same reference conditions, the approximate reductions predicted for the treated inlets (below the PNLM of the existing nacelle with a fan-exhaust noise-suppressor enclosure around the engine) were: 2 PNdB for the no-ring inlet, 8.5 PNdB for the one-ring inlet, 10.5 PNdB for the two-ring inlet, and 11 PNdB for the 47-percent lightbulb inlet. Since the goal for the reduction of noise radiated from the inlet duct had been set at 7 PNdB, the one-ring inlet was chosen for use with the 48-in.-long treated fan-exhaust ducts because it met the noise-reduction goal with the smallest economic and performance penalty.

The results of the tests on the treated inlet ducts demonstrated the value of close spacing between acoustically absorptive surfaces for efficient attenuation of high-frequency fan-compressor noise. The concentric rings provided a means of increasing the amount of absorptive surface area exposed to the sound field. The concentric rings also provided an efficient method of installing absorptive duct linings in channels where the height could be made approximately equal to the wavelength of sound at the fundamental blade-passage frequency.

A static-test version of the selected flight nacelle was tested. This version consisted of the combination of the one-ring inlet and the 48-in.-long fan-exhaust ducts. Predictions were made of the reduction in flyover noise levels under the landing-approach and takeoff flight paths. The landing approach conditions were the same as those used for the tests of the separate nacelle components. The takeoff conditions included: a location 3.5 n. mi. from brake release with the airplane climbing at an airspeed of V_2 + 10 knots using full takeoff-rated thrust and a 25-degree flap setting. The selected gross weight was the maximum takeoff gross weight for the DC-8-55 of 325 000 lb. At this weight, the climb Mach number was approximately 0.26. The airplane with existing nacelles had an installed referred net thrust of 14 300 lb per engine, a referred low-pressure rotor speed of 6460 rpm, and reached a height of 975 ft at the 3.5-n. mi. point. Reflecting the loss in takeoff-rated thrust, the airplane with modified nacelles would have an installed referred net thrust of 14 055 lb per engine, a referred rotor speed of 6410 rpm, and would reach a height of 935 ft at the 3.5-n. mi. point.

The modified nacelles were predicted to reduce the PNLM by approximately 12 PNdB during landing approach and by 1 PNdB during takeoff. Engine performance measurements of the treated nacelle indicated that the combination of the treated inlet and treated fan-exhaust ducts would require a reduction in takeoff-rated gross thrust of 2.5 percent. The reduction in scrubbing drag that accompanied the 24-in. extension of the nozzle on the fan-exhaust ducts was estimated as 0.4 percent. Thus, the resultant reduction in installed takeoff-rated net thrust was 2.1 percent. Based on these acoustical and engine performance predictions, it was decided that the combination of the treated one-ring inlet and the treated 48-in.-long fan-exhaust ducts would be acceptable for use in a subsequent flight evaluation of the modified nacelle.

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McDonnell Douglas Corporation
Long Beach, California, December 1969

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APPENDIX A

FAR-FIELD SOUND PRESSURE LEVELS

This appendix presents tabulated values of the sound pressure levels (SPL) measured around the 13 configurations tested in the static-test program. The SPLs (in dB re 0.0002 dynes/sq cm) were measured at various azimuths along a circular arc, with a radius of 150 ft, centered at the primary exhaust nozzle of the P&WA JT3D engine on the engine test stand at Edwards Air Force Base. The microphones were located at a height of 5 ft above the ground plane, at a maximum of 14 azimuths ranging from 15 to 160 degrees from the engine inlet. Microphone locations at fewer than 14 azimuths were used for the tests of the treated inlets and treated fan-exhaust ducts.

The SPLs in the tables are the average (on a mean square basis) of the SPLs measured during three separate runs for each configuration. SPLs are presented for twenty-three 1/3-octave bands from 50 to 8000 Hz. The SPLs in the 12 bands from 50 to 630 Hz were derived from SPLs in the four 1/1-octave bands with center frequencies of 63, 125, 250, and 500 Hz by subtracting a bandwidth correction of 4.8 dB. In applying this bandwidth correction, it was assumed that the spectrum of the sound did not change rapidly within the frequency range covered by the octave band. The SPLs in the 11 bands from 800 to 8000 Hz were obtained directly as 1/3-octave-band SPLs. All SPLs were adjusted for the difference in atmospheric absorption (over a distance of 150 ft) between that occurring at the air temperature and relative humidity on the day of the test, and that obtained with an air temperature of 59^{o}F and a relative humidity of 70 percent. The absorption corrections were based on the atmospheric-absorption values presented in SAE ARP 866, reference 8.

The combination of four 1/1-octave bands and eleven 1/3-octave bands was used for the majority of the data reduction. However, for the four configurations of simulated variable-area primary nozzles (tables A2, A3, A4, and A5), tested early in the program during August 1967, the recorded signals were filtered into five 1/1-octave-band SPLs with center frequencies of 63, 125, 250, 500, and 1000 Hz, and eight 1/3-octave-band SPLs with center frequencies of 1600 to 8000 Hz. The 4.8 dB bandwidth correction described above was applied to the five 1/1-octave-band SPLs to determine 15 1/3-octave-band SPLs which were combined with the eight directly obtained 1/3-octave-band SPLs to provide SPLs for the 23 center frequencies from 50 to 8000 Hz.

For the baseline configurations and for the treated inlet and treated fan-exhaust configurations, the tables include calculated values of acoustic power level (PWL) in dB re 10^{-13} watts. The PWLs in the 1/3-octave bands and the overall PWL (over a frequency range of 45 to 9000 Hz) were calculated assuming the sound field to be symmetric about the jet axis and the ground plane to be a perfect acoustic reflector. The sound intensity determined from the SPL at a particular azimuth was assumed to be uniform over a zone of a hemisphere (or quarter sphere). The products of the intensity and the area of each zone were then summed to determine the power levels in each 1/3-octave-band.

Each table contains 6, 7, or 9 parts corresponding to the number of engine power settings used with a given configuration. For the treated inlet or treated fan-duct tests (tables A6 through A13), there are seven parts corresponding to subruns 01 through 07 in table I. For the baseline configuration in table A1, there are nine parts corresponding to subruns 01 through 09 in table I. For the simulated variable-area primary nozzle tests (tables A2 through A5), the engine power settings were based on referred thrust as a parameter rather than referred low-pressure rotor speed; the number of power settings varied from six to nine depending on the configuration.

At the bottom of each table are listed the following four items: average referred net thrust, average referred low-pressure rotor speed, average jet-exhaust velocity of the gas discharged from the primary nozzle (calculated from the pressure and temperature and assuming complete isentropic expansion), and average engine pressure ratio. These quantities were determined from corresponding values for the three runs.

The following tables are included:

A1. - Baseline configuration with existing, production inlet duct, 24-in.-long fan-exhaust ducts, and production primary nozzle. No noise-suppressor enclosures around the engine.

A2. - Simulated variable-area primary nozzle with a conical exhaust nozzle having an exit area 50 percent of that of the existing, production nozzle. Existing inlet and fan-exhaust ducts. No noise-suppressor enclosures around the engine.

A3. - Simulated variable-area primary nozzle with a conical exhaust nozzle having an exit area 60 percent of that of the existing, production nozzle. Existing inlet and fan-exhaust ducts. No noise-suppressor enclosures around the engine.

A4. - Simulated variable-area primary nozzle with a conical exhaust nozzle having an exit area 80 percent of that of the existing, production nozzle. Existing inlet and fan-exhaust ducts. No noise-suppressor enclosures around the engine.

A5. - Simulated variable-area primary nozzle with the existing, production primary nozzle with 8 wedges inside the tailpipe. Existing inlet and fan-exhaust ducts. No noise-suppressor enclosures around the engine.

A6. - Baseline configuration for treated-inlet tests. Existing, production inlet, 24-in.-long fan-exhaust ducts, and production primary nozzle. Fan-exhaust noise-suppressor enclosure around engine.

A7. - No-ring treated inlet. Treatment on walls of inlet duct and centerbody. Existing, production 24-in.-long fan-exhaust ducts and production primary nozzle. Fan-exhaust noise-suppressor enclosure around engine.

A8. - One-ring treated inlet. Treatment on walls of single concentric ring vane, inlet duct, and centerbody. Existing, production 24-in.-long fan-exhaust ducts, and production primary nozzle. Fan-exhaust noise-suppressor enclosure around engine.

A9. - Two-ring treated inlet. Treatment on walls of two concentric ring vanes, inlet duct, and centerbody. Existing, production 24-in.-long fan-exhaust ducts, and production primary nozzle. Fan-exhaust noise-suppressor enclosure around engines.

A10. - 47-percent lightbulb inlet. Treatment on walls of concentric ring vane, inlet duct, and lightbulb centerbody. Existing, production 24-in.-long fan-exhaust ducts, and production primary nozzle. Fan-exhaust noise-suppressor enclosure around engine.

A11. - Baseline for treated fan-exhaust-duct tests. Existing, production inlet, 24-in.-long fan-exhaust ducts, and production primary nozzle. Inlet-noise-suppressor enclosure around inlet duct.

A12. - Treated, 48-in.-long fan-exhaust ducts. Treatment on inner and outer walls of the ducts and on both sides of an impervious septum on each flow splitter. Existing, production inlet duct and production primary nozzle. Inlet-noise-suppressor enclosure around inlet duct.

A13. - Acoustically treated nacelle with combination of one-ring treated inlet and 48-in.-long treated fan-exhaust ducts. Production primary nozzle. No noise-suppressor enclosures around the engine.

TABLE A-1. – BASELINE CONFIGURATION WITH EXISTING PRODUCTION INLET AND 24-IN.-LONG FAN-EXHAUST DUCTS. EXISTING PRODUCTION PRIMARY NOZZLE. NO NOISE-SUPPRESSOR ENCLOSURES.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 116-01, 118-01, AND 119-01.

		ANGLES FROM ENGINE INLET CENTERLINE, DEGREES														
B		15	30	40	50	60	75	90	100	110	120	130	140	150	157	PWL
A	50	86.2	82.9	83.3	84.7	85.1	86.3	87.5	88.1	89.0	89.7	91.8	94.3	95.0	93.9	141.0
N	63	86.2	82.9	83.3	84.7	85.1	86.3	87.5	88.1	89.0	89.7	91.8	94.3	95.0	93.9	141.0
D	80	86.2	82.9	83.3	84.7	85.1	86.3	87.5	88.1	89.0	89.7	91.8	94.3	95.0	93.9	141.0
	100	86.1	85.7	86.7	87.8	87.9	87.8	87.9	88.2	89.3	90.3	93.0	95.5	94.8	91.6	141.6
C	125	86.1	85.7	86.7	87.8	87.9	87.8	87.9	88.2	89.3	90.3	93.0	95.5	94.8	91.6	141.6
E	160	86.1	85.7	86.7	87.8	87.9	87.8	87.9	88.2	89.3	90.3	93.0	95.5	94.8	91.6	141.6
N	200	85.7	85.3	84.8	84.8	85.6	85.5	86.0	87.0	88.0	88.2	89.4	90.2	90.0	88.1	138.7
T	250	85.7	85.3	84.8	84.8	85.6	85.5	86.0	87.0	88.0	88.2	89.4	90.2	90.0	88.1	138.7
E	315	85.7	85.3	84.8	84.8	85.6	85.5	86.0	87.0	88.0	88.2	89.4	90.2	90.0	88.1	138.7
R	400	83.8	83.3	82.5	83.1	82.7	83.0	83.4	84.5	85.8	86.4	86.3	85.9	83.3	82.5	135.8
	500	83.8	83.3	82.5	83.1	82.7	83.0	83.4	84.5	85.8	86.4	86.3	85.9	83.3	82.5	135.8
F	630	83.8	83.4	82.6	83.1	82.7	83.0	83.4	84.5	85.9	86.4	86.4	85.9	83.4	82.5	135.8
R	800	82.9	81.4	79.7	78.8	77.7	78.0	78.8	78.5	79.6	81.9	83.0	81.0	79.3	77.9	131.4
E	1000	85.3	83.0	81.8	81.5	81.7	80.6	79.7	81.0	82.2	82.5	82.8	80.8	77.9	77.7	133.1
Q	1250	89.0	87.2	85.7	84.7	83.9	82.6	83.7	85.3	84.9	85.2	82.9	80.6	78.6	78.0	135.9
U	1600	87.6	85.9	86.7	86.8	84.9	85.6	87.1	90.0	90.1	89.1	84.8	82.8	80.3	78.1	138.5
E	2000	90.0	92.7	91.8	90.8	90.2	90.8	91.5	91.1	94.7	92.1	90.5	88.2	83.7	81.6	142.7
N	2500	98.6	109.5	103.5	104.0	102.8	101.7	102.9	99.1	105.1	100.4	100.4	101.3	94.1	92.8	154.4
C	3150	93.4	95.5	92.9	92.9	91.4	90.0	91.7	92.1	92.8	91.5	89.9	89.1	84.7	83.1	143.1
Y	4000	93.1	92.2	92.3	92.1	91.0	91.5	93.5	94.2	94.7	93.4	90.5	86.5	84.4	82.4	143.7
,	5000	98.2	99.4	98.8	96.8	96.5	96.8	100.9	101.4	100.9	99.4	98.1	93.8	90.5	88.3	150.1
H	6300	93.6	93.3	92.8	92.0	91.8	92.0	94.9	94.7	94.9	94.2	92.1	88.0	85.3	83.4	144.4
Z	8000	94.2	95.9	94.3	94.4	92.6	92.4	95.5	95.5	96.0	95.1	94.7	90.0	85.6	84.4	145.6

AVERAGE NET REFERRED THRUST, FN/DELTA = 6086.1 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED,N1/VTHETA = 4299.5 RPM
AVERAGE JET EXHAUST VELOCITY = 803.3 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.20

TOTAL PWL= 158.0

ANALYSIS OF JT3D STATIC NOISE-REDUCTION TESTS AT EDWARDS AFB

TABLE A-1. – BASELINE CONFIGURATION WITH EXISTING PRODUCTION INLET AND 24-IN.-LONG FAN-EXHAUST DUCTS. EXISTING PRODUCTION PRIMARY NOZZLE. NO NOISE-SUPPRESSOR ENCLOSURES – Continued.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 116-02, 118-02, AND 119-02.

BAND CENTER FREQUENCY, HZ	ANGLES FROM ENGINE INLET CENTERLINE, DEGREES														
	15	30	40	50	60	75	90	100	110	120	130	140	150	157	PWL
50	85.6	85.1	84.5	85.8	86.4	88.2	89.5	90.0	90.9	92.1	94.9	97.5	98.6	97.5	143.8
63	85.6	85.1	84.5	85.8	86.4	88.2	89.5	90.0	90.9	92.1	94.9	97.5	98.6	97.5	143.8
80	85.6	85.1	84.5	85.8	86.4	88.2	89.5	90.0	90.9	92.1	94.9	97.5	98.6	97.5	143.8
100	87.5	87.6	88.7	89.5	89.9	89.7	90.0	90.4	91.6	93.0	96.4	99.0	98.1	94.7	144.5
125	87.5	87.6	88.7	89.5	89.9	89.7	90.0	90.4	91.6	93.0	96.4	99.0	98.1	94.7	144.5
160	87.5	87.6	88.7	89.5	89.9	89.7	90.0	90.4	91.6	93.0	96.4	99.0	98.1	94.7	144.5
200	87.9	87.5	87.7	86.7	87.3	87.9	88.2	89.3	90.5	90.7	92.3	93.8	92.7	90.5	141.3
250	87.9	87.5	87.7	86.7	87.3	87.9	88.2	89.3	90.5	90.7	92.3	93.8	92.7	90.5	141.3
315	87.9	87.5	87.7	86.7	87.3	87.9	88.2	89.3	90.5	90.7	92.3	93.8	92.7	90.5	141.3
400	84.6	85.6	84.6	84.9	84.8	85.1	85.4	86.8	88.1	88.9	89.1	88.3	85.7	84.8	138.0
500	84.6	85.6	84.6	84.9	84.8	85.1	85.4	86.8	88.1	88.9	89.1	88.3	85.7	84.8	138.0
630	84.7	85.6	84.6	85.0	84.8	85.1	85.5	86.8	88.1	88.9	89.1	88.3	85.7	84.8	138.0
800	83.6	82.8	81.8	80.6	79.5	80.1	81.0	80.6	81.9	84.2	85.4	83.4	81.3	80.0	133.5
1000	84.2	85.0	84.1	86.7	84.3	82.8	81.5	82.5	83.9	84.4	84.8	82.3	79.9	79.2	135.1
1250	87.7	87.3	85.7	85.9	85.4	84.6	84.9	86.0	87.4	86.8	83.8	82.5	79.8	79.6	137.0
1600	88.8	87.3	86.8	86.4	85.5	86.8	87.2	89.8	89.9	90.0	84.9	83.8	81.2	79.5	138.9
2000	90.4	90.2	90.6	89.0	87.5	88.7	89.7	90.8	91.2	91.5	87.9	85.2	82.5	79.5	140.8
2500	101.3	109.2	106.9	102.3	99.4	101.2	104.9	102.1	107.9	103.5	100.6	95.9	95.3	92.6	155.3
3150	94.5	99.9	98.3	95.1	92.7	93.7	96.8	95.3	98.1	94.0	93.4	90.8	89.3	86.9	146.9
4000	93.0	92.4	92.3	91.9	90.7	91.4	93.0	94.0	93.6	92.6	90.3	86.6	84.3	82.7	143.3
5000	97.9	100.3	98.6	97.1	95.9	97.6	99.5	101.7	102.6	99.3	96.6	93.8	90.6	88.0	150.3
6300	94.1	94.6	93.5	92.4	92.4	93.0	95.1	95.1	96.3	94.5	92.4	89.1	86.1	83.4	145.1
8000	95.5	95.7	94.8	94.7	92.9	94.1	96.8	97.3	98.7	97.3	93.9	89.8	86.5	85.3	146.9

AVERAGE NET REFERRED THRUST, FN/DELTA = 7206.1 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED,N1/VTHETA = 4595.7 RPM
AVERAGE JET EXHAUST VELOCITY = 880.4 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.24

TOTAL PWL= 159.3

TABLE A-1. – BASELINE CONFIGURATION WITH EXISTING PRODUCTION INLET AND 24-IN.-LONG FAN-EXHAUST DUCTS. EXISTING PRODUCTION PRIMARY NOZZLE. NO NOISE-SUPPRESSOR ENCLOSURES – Continued.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 116-03, 118-03, AND 119-03.

		ANGLES FROM ENGINE INLET CENTERLINE, DEGREES														
B		15	30	40	50	60	75	90	100	110	120	130	140	150	157	PWL
A	50	87.8	85.6	87.1	87.0	87.8	89.5	91.1	91.6	92.8	94.3	98.0	101.1	101.9	100.4	146.5
N	63	87.8	85.6	87.1	87.0	87.8	89.5	91.1	91.6	92.8	94.3	98.0	101.1	101.9	100.4	146.5
D	80	87.8	85.6	87.1	87.0	87.8	89.5	91.1	91.6	92.8	94.3	98.0	101.1	101.9	100.4	146.5
	100	90.1	89.3	90.3	91.3	91.7	91.6	91.9	93.0	94.3	95.9	99.9	102.8	101.6	97.9	147.5
C	125	90.1	89.3	90.3	91.3	91.7	91.6	91.9	93.0	94.3	95.9	99.9	102.8	101.6	97.9	147.5
E	160	90.1	89.3	90.3	91.3	91.7	91.6	91.9	93.0	94.3	95.9	99.9	102.8	101.6	97.9	147.5
N	200	89.9	89.4	89.0	89.0	89.3	89.9	90.6	91.5	93.1	93.6	95.5	97.4	95.5	92.8	143.9
T	250	89.9	89.4	89.0	89.0	89.3	89.9	90.6	91.5	93.1	93.6	95.5	97.4	95.5	92.8	143.9
E	315	89.9	89.4	89.0	89.0	89.3	89.9	90.6	91.5	93.1	93.6	95.5	97.4	95.5	92.8	143.9
R	400	87.1	87.3	86.7	86.8	86.5	87.2	87.6	89.0	90.0	91.0	91.7	91.4	88.2	87.2	140.3
	500	87.1	87.3	86.7	86.8	86.5	87.2	87.6	89.0	90.0	91.0	91.7	91.4	88.2	87.2	140.3
F	630	87.1	87.3	86.7	86.8	86.5	87.3	87.7	89.0	90.0	91.0	91.7	91.4	88.2	87.2	140.3
R	800	85.4	84.5	83.8	83.2	82.2	82.3	83.0	82.6	84.1	86.5	87.7	86.2	83.9	82.2	135.7
E	1000	85.4	84.6	83.4	83.5	82.9	83.4	83.6	84.8	85.6	86.1	86.8	84.6	81.9	80.4	135.9
Q	1250	88.3	88.1	86.8	86.9	85.9	87.6	88.1	87.9	90.1	90.6	86.9	84.8	82.8	81.2	139.2
U	1600	88.3	86.3	86.6	86.5	86.5	87.9	88.1	89.4	89.6	89.5	86.1	85.0	82.0	79.1	139.0
E	2000	91.5	90.2	90.1	89.0	88.5	89.3	89.5	90.7	91.1	91.3	88.4	86.3	83.4	80.1	141.0
N	2500	101.3	103.8	103.0	101.4	100.7	99.8	96.8	102.7	106.5	102.8	100.5	99.4	95.7	92.6	153.2
C	3150	102.6	107.9	106.5	102.8	102.8	102.8	98.6	99.4	99.3	105.2	100.5	99.3	95.6	91.9	154.1
Y	4000	93.1	92.4	92.6	91.4	91.0	91.7	92.9	94.0	93.9	92.9	90.5	87.9	85.1	82.4	143.5
,	5000	96.4	96.9	96.3	95.3	94.9	97.4	99.3	98.7	98.5	99.3	94.6	91.7	88.7	85.8	148.5
H	6300	98.1	98.2	97.9	96.8	95.7	96.2	98.6	98.6	97.6	98.0	95.1	91.6	88.9	85.8	148.4
Z	8000	95.4	96.2	95.3	94.9	93.8	96.9	97.2	98.6	98.5	96.8	94.3	91.0	87.3	85.3	147.5

AVERAGE NET REFERRED THRUST, FN/DELTA = 8531.4 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED,N1/VTHETA = 4899.2 RPM
AVERAGE JET EXHAUST VELOCITY = 982.2 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.30

TOTAL PWL= 160.5

TABLE A-1. – BASELINE CONFIGURATION WITH EXISTING PRODUCTION INLET AND 24-IN.-LONG FAN-EXHAUST DUCTS. EXISTING PRODUCTION PRIMARY NOZZLE. NO NOISE-SUPPRESSOR ENCLOSURES – Continued.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 116-04, 118-04, AND 119-04.

BAND CENTER FREQUENCY, HZ	ANGLES FROM ENGINE INLET CENTERLINE, DEGREES														
	15	30	40	50	60	75	90	100	110	120	130	140	150	157	PWL
50	88.8	87.2	87.9	89.0	90.0	91.7	93.3	94.2	95.7	98.5	102.4	105.9	107.4	104.9	150.9
63	88.8	87.2	87.9	89.0	90.0	91.7	93.3	94.2	95.7	98.5	102.4	105.9	107.4	104.9	150.9
80	88.8	87.2	87.9	89.0	90.0	91.7	93.3	94.2	95.7	98.5	102.4	105.9	107.4	104.9	150.9
100	92.8	92.0	93.0	94.1	94.0	94.3	95.3	96.8	98.1	100.7	105.6	109.1	107.6	103.5	152.8
125	92.8	92.0	93.0	94.1	94.0	94.3	95.3	96.8	98.1	100.7	105.6	109.1	107.6	103.5	152.8
160	92.8	92.0	93.0	94.1	94.0	94.3	95.3	96.8	98.1	100.7	105.6	109.1	107.6	103.5	152.8
200	93.4	92.6	92.3	92.4	92.7	93.3	94.3	95.6	97.3	98.6	101.2	103.6	101.3	98.1	148.9
250	93.4	92.6	92.3	92.4	92.7	93.3	94.3	95.6	97.3	98.6	101.2	103.6	101.3	98.1	148.9
315	93.4	92.6	92.3	92.4	92.7	93.3	94.3	95.6	97.3	98.6	101.2	103.6	101.3	98.1	148.9
400	90.2	90.6	89.7	90.2	90.1	90.6	91.3	92.8	94.0	95.6	96.8	96.5	92.5	91.6	144.5
500	90.2	90.6	89.7	90.2	90.1	90.6	91.3	92.8	94.0	95.6	96.8	96.5	92.5	91.6	144.5
630	90.3	90.6	89.7	90.3	90.2	90.6	91.3	92.8	94.1	95.7	96.8	96.5	92.5	91.7	144.5
800	88.7	88.3	87.5	86.2	85.6	85.9	87.2	87.1	88.3	91.1	92.7	90.5	88.1	85.7	139.9
1000	88.8	87.6	86.8	85.9	85.6	86.4	86.9	89.0	89.2	90.4	91.2	88.1	85.5	84.0	139.5
1250	91.1	90.6	90.7	91.4	90.4	90.9	91.8	93.4	92.7	93.6	90.1	88.1	87.2	84.1	142.8
1600	90.1	89.1	88.7	88.5	89.6	90.1	90.8	92.6	92.3	92.3	90.2	88.6	85.6	81.2	141.8
2000	92.8	91.9	91.7	90.9	90.7	91.8	92.1	92.9	93.8	93.2	91.6	89.2	86.1	81.1	143.2
2500	100.9	98.8	99.8	97.3	96.0	99.4	99.3	103.4	103.1	101.2	97.6	94.8	92.8	89.9	151.2
3150	106.4	107.4	106.7	104.9	103.2	105.3	106.5	109.3	109.4	107.4	103.1	102.4	99.0	95.9	157.7
4000	95.7	96.6	96.1	94.9	95.1	94.3	96.2	98.2	97.7	96.1	95.0	93.1	89.7	85.6	147.1
5000	96.5	95.7	95.8	94.6	94.7	97.1	98.8	101.7	98.9	98.7	94.0	92.3	90.1	85.7	148.8
6300	100.9	100.3	99.8	99.2	98.8	102.6	102.4	106.7	103.7	104.5	99.0	97.1	93.8	90.5	153.6
8000	95.2	94.9	94.6	95.1	94.2	97.2	97.6	100.4	99.3	98.3	94.9	91.9	89.1	86.5	148.2

AVERAGE NET REFERRED THRUST, FN/DELTA = 10917.2 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED,N1/VTHETA = 5347.9 RPM
AVERAGE JET EXHAUST VELOCITY = 1152.6 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.41

TOTAL PWL= 163.9

ANALYSIS OF JT3D STATIC NOISE-REDUCTION TESTS AT EDWARDS AFB

TABLE A-1. – BASELINE CONFIGURATION WITH EXISTING PRODUCTION INLET AND 24-IN.-LONG FAN-EXHAUST DUCTS. EXISTING PRODUCTION PRIMARY NOZZLE. NO NOISE-SUPPRESSOR ENCLOSURES – Continued.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 116-05, 118-05, AND 119-05.

		ANGLES FROM ENGINE INLET CENTERLINE, DEGREES														
B		15	30	40	50	60	75	90	100	110	120	130	140	150	157	PWL
A	50	90.4	89.9	91.0	91.8	92.8	94.5	96.4	97.1	99.3	103.3	108.5	112.4	113.0	110.5	156.6
N	63	90.4	89.9	91.0	91.8	92.8	94.5	96.4	97.1	99.3	103.3	108.5	112.4	113.0	110.5	156.6
D	80	90.4	89.9	91.0	91.8	92.8	94.5	96.4	97.1	99.3	103.3	108.5	112.4	113.0	110.5	156.6
	100	96.7	96.1	97.0	97.5	97.6	98.4	100.1	101.5	103.4	107.1	114.0	117.6	115.4	111.3	160.5
C	125	96.7	96.1	97.0	97.5	97.6	98.4	100.1	101.5	103.4	107.1	114.0	117.6	115.4	111.3	160.5
E	160	96.7	96.1	97.0	97.5	97.6	98.4	100.1	101.5	103.4	107.1	114.0	117.6	115.4	111.3	160.5
N	200	98.9	97.8	97.6	97.6	97.9	98.5	100.0	101.5	103.2	105.5	110.2	114.1	111.5	107.8	157.4
T	250	98.9	97.8	97.6	97.6	97.9	98.5	100.0	101.5	103.2	105.5	110.2	114.1	111.5	107.8	157.4
E	315	98.9	97.8	97.6	97.6	97.9	98.5	100.0	101.5	103.2	105.5	110.2	114.1	111.5	107.8	157.4
R	400	94.9	96.7	95.4	95.3	95.3	95.6	96.8	98.6	99.9	102.4	104.7	105.1	100.9	98.0	151.3
	500	94.9	96.7	95.4	95.3	95.3	95.6	96.8	98.6	99.9	102.4	104.7	105.1	100.9	98.0	151.3
F	630	95.0	96.7	95.4	95.4	95.3	95.7	96.8	98.6	100.0	102.5	104.7	105.1	100.9	98.1	151.3
R	800	94.2	93.5	93.1	93.1	91.7	91.6	93.3	92.8	94.7	98.0	100.2	97.4	94.5	91.2	146.4
E	1000	95.4	93.7	94.7	94.6	92.4	92.4	92.2	93.4	95.3	96.8	98.3	95.2	91.9	89.8	145.9
Q	1250	96.3	95.2	97.3	97.7	96.8	94.4	95.7	97.0	97.3	97.5	96.1	94.1	91.6	89.0	147.6
U	1600	98.3	98.7	96.6	96.9	96.1	95.8	96.4	97.3	98.0	97.5	96.3	94.7	91.6	88.4	148.0
E	2000	100.0	98.5	97.0	97.2	96.5	96.8	96.4	96.9	97.6	97.7	96.9	94.7	91.6	88.4	148.3
N	2500	98.7	98.8	98.3	97.9	97.5	98.9	99.8	99.3	98.3	98.4	97.5	95.2	92.3	89.5	149.6
C	3150	105.5	105.4	105.3	103.4	102.8	110.9	110.1	114.0	108.1	110.2	105.1	102.2	100.7	101.1	160.2
Y	4000	102.4	101.4	101.3	100.1	99.3	102.0	103.4	103.4	104.5	103.6	103.0	100.2	97.4	95.3	153.6
,	5000	98.6	97.8	98.1	97.2	97.1	98.1	99.3	99.2	99.0	97.9	97.0	94.7	91.8	89.2	149.3
H	6300	99.6	99.0	100.0	98.9	99.4	104.6	104.3	104.1	103.3	102.8	99.8	97.4	94.5	92.0	153.5
Z	8000	96.4	96.2	96.0	96.1	96.0	98.6	99.6	100.6	100.0	99.6	98.5	95.6	91.8	89.7	149.6

AVERAGE NET REFERRED THRUST, FN/DELTA = 15053.0 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED,N1/VTHETA = 5999.2 RPM
AVERAGE JET EXHAUST VELOCITY = 1422.9 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.64

TOTAL PWL= 169.5

ANALYSIS OF JT3D STATIC NOISE-REDUCTION TESTS AT EDWARDS AFB

TABLE A-1. – BASELINE CONFIGURATION WITH EXISTING PRODUCTION INLET AND 24-IN.-LONG FAN-EXHAUST DUCTS. EXISTING PRODUCTION PRIMARY NOZZLE. NO NOISE-SUPPRESSOR ENCLOSURES – Continued.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 116-06, 118-06, AND 119-06.

		ANGLES FROM ENGINE INLET CENTERLINE, DEGREES														
B		15	30	40	50	60	75	90	100	110	120	130	140	150	157	PWL
A	50	90.2	88.7	89.9	90.7	91.3	93.6	95.1	96.0	98.1	101.1	105.9	109.6	110.9	108.4	154.3
N	63	90.2	88.7	89.9	90.7	91.3	93.6	95.1	96.0	98.1	101.1	105.9	109.6	110.9	108.4	154.3
D	80	90.2	88.7	89.9	90.7	91.3	93.6	95.1	96.0	98.1	101.1	105.9	109.6	110.9	108.4	154.3
	100	95.4	94.2	95.5	96.2	96.0	96.5	98.3	99.5	101.0	104.3	110.4	114.1	111.7	107.8	157.1
C	125	95.4	94.2	95.5	96.2	96.0	96.5	98.3	99.5	101.0	104.3	110.4	114.1	111.7	107.8	157.1
E	160	95.4	94.2	95.5	96.2	96.0	96.5	98.3	99.5	101.0	104.3	110.4	114.1	111.7	107.8	157.1
N	200	96.4	95.4	95.4	95.3	95.7	96.2	97.5	99.1	100.6	102.4	106.3	109.5	107.0	103.4	153.6
T	250	96.4	95.4	95.4	95.3	95.7	96.2	97.5	99.1	100.6	102.4	106.3	109.5	107.0	103.4	153.6
E	315	96.4	95.4	95.4	95.3	95.7	96.2	97.5	99.1	100.6	102.4	106.3	109.5	107.0	103.4	153.6
R	400	92.6	93.0	92.7	93.3	93.0	93.3	94.3	96.0	97.4	99.4	101.4	101.0	96.8	94.1	148.1
	500	92.6	93.0	92.7	93.3	93.0	93.3	94.3	96.0	97.4	99.4	101.4	101.0	96.8	94.1	148.1
F	630	92.6	93.0	92.7	93.3	93.0	93.3	94.4	96.1	97.4	99.5	101.4	101.1	96.8	94.1	148.1
R	800	90.6	90.5	89.7	89.1	88.6	88.9	90.3	90.5	91.8	95.0	96.8	94.3	91.2	89.4	143.3
E	1000	90.9	89.8	89.2	88.4	88.2	88.6	89.5	91.4	92.6	94.3	95.2	91.7	88.7	87.6	142.6
Q	1250	94.2	91.7	93.0	91.3	92.3	91.8	94.3	95.2	96.4	96.1	93.7	92.0	88.3	87.7	145.1
U	1600	96.4	93.6	94.5	94.0	95.3	95.5	94.5	95.0	95.5	95.3	93.5	91.9	89.4	85.5	146.0
E	2000	96.3	95.2	95.7	94.4	95.0	94.7	94.6	95.2	95.8	95.6	94.6	92.4	89.4	85.7	146.2
N	2500	99.6	98.6	98.2	97.4	97.7	99.1	100.2	101.6	99.1	98.0	96.6	94.5	91.8	89.0	150.1
C	3150	107.0	109.1	106.2	106.3	108.5	112.8	107.1	115.8	110.5	107.0	105.2	103.0	102.1	99.4	161.4
Y	4000	99.0	99.4	98.2	97.8	97.7	98.3	100.2	101.0	99.9	100.3	99.7	97.3	94.4	90.6	150.5
,	5000	98.1	97.7	97.3	96.8	96.7	97.5	99.3	99.0	98.1	96.9	95.4	93.0	90.4	87.4	148.7
H	6300	100.7	100.2	100.8	99.7	101.6	103.8	104.7	108.7	104.8	102.8	101.1	97.5	95.4	93.1	154.9
Z	8000	96.2	96.3	95.8	95.7	95.7	98.1	98.7	100.8	99.2	98.1	96.9	94.1	90.9	88.1	149.0

AVERAGE NET REFERRED THRUST, FN/DELTA = 13164.4 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED,N1/VTHETA = 5707.9 RPM
AVERAGE JET EXHAUST VELOCITY = 1300.0 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.53

TOTAL PWL= 167.3

ANALYSIS OF JT3D STATIC NOISE-REDUCTION TESTS AT EDWARDS AFB

TABLE A-1. – BASELINE CONFIGURATION WITH EXISTING PRODUCTION INLET AND 24-IN.-LONG FAN-EXHAUST DUCTS. EXISTING PRODUCTION PRIMARY NOZZLE. NO NOISE-SUPPRESSOR ENCLOSURES – Continued.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 116-07, 118-07, AND 119-07.

		ANGLES FROM ENGINE INLET CENTERLINE, DEGREES														
B		15	30	40	50	60	75	90	100	110	120	130	140	150	157	PWL
A	50	92.4	91.2	92.3	92.9	93.9	95.9	97.6	98.7	100.9	105.6	111.3	115.1	115.8	112.1	159.0
N	63	92.4	91.2	92.3	92.9	93.9	95.9	97.6	98.7	100.9	105.6	111.3	115.1	115.8	112.1	159.0
D	80	92.4	91.2	92.3	92.9	93.9	95.9	97.6	98.7	100.9	105.6	111.3	115.1	115.8	112.1	159.0
	100	100.1	98.2	98.8	99.1	99.3	100.1	102.2	103.6	105.4	110.2	117.6	121.0	117.6	113.1	163.5
C	125	100.1	98.2	98.8	99.1	99.3	100.1	102.2	103.6	105.4	110.2	117.6	121.0	117.6	113.1	163.5
E	160	100.1	98.2	98.8	99.1	99.3	100.1	102.2	103.6	105.4	110.2	117.6	121.0	117.6	113.1	163.5
N	200	101.4	100.4	100.2	100.1	100.1	100.9	102.6	104.4	106.2	108.9	114.7	118.4	115.6	110.2	161.3
T	250	101.4	100.4	100.2	100.1	100.1	100.9	102.6	104.4	106.2	108.9	114.7	118.4	115.6	110.2	161.3
E	315	101.4	100.4	100.2	100.1	100.1	100.9	102.6	104.4	106.2	108.9	114.7	118.4	115.6	110.2	161.3
R	400	97.5	98.3	97.9	97.9	97.8	98.4	99.6	101.5	103.0	106.1	108.8	109.9	106.1	100.2	155.0
	500	97.5	98.3	97.9	97.9	97.8	98.4	99.6	101.5	103.0	106.1	108.8	109.9	106.1	100.2	155.0
F	630	97.5	98.4	98.0	98.0	97.8	98.4	99.6	101.5	103.0	106.2	108.8	110.0	106.2	100.2	155.0
R	800	96.1	96.0	94.7	95.3	94.7	94.7	96.1	96.7	98.8	102.8	104.6	102.6	98.7	95.2	150.4
E	1000	95.4	94.9	94.6	94.6	93.6	94.0	95.1	96.5	98.4	100.8	102.8	100.0	96.0	93.4	148.9
Q	1250	96.9	96.2	97.0	95.9	95.6	95.2	96.2	98.0	99.6	99.9	100.6	97.9	94.5	91.6	148.9
U	1600	97.3	96.9	97.1	96.9	96.6	96.6	98.1	99.4	100.4	99.6	98.9	97.1	94.1	89.6	149.3
E	2000	97.4	98.0	98.6	97.7	97.8	97.8	98.4	99.5	100.5	99.4	98.9	97.0	93.9	89.1	149.8
N	2500	99.1	98.4	97.8	97.7	97.6	98.3	99.3	99.8	99.8	99.2	98.8	96.8	93.7	90.0	149.9
C	3150	100.8	103.2	102.8	102.1	105.5	104.6	109.3	106.9	108.8	104.9	101.5	99.8	97.4	95.6	156.9
Y	4000	101.6	100.7	100.9	101.3	101.5	103.3	109.2	107.3	106.3	106.4	103.5	100.3	98.2	95.6	156.3
,	5000	96.7	96.2	96.8	96.4	96.9	98.5	100.0	100.5	99.9	99.2	98.0	96.1	93.1	88.4	149.7
H	6300	97.8	96.7	97.7	97.6	98.8	101.9	103.6	103.3	102.9	100.9	98.0	95.5	93.1	90.6	152.1
Z	8000	96.5	95.6	96.1	96.6	97.4	101.0	101.3	102.0	102.4	100.7	99.4	96.2	92.7	90.7	151.1

AVERAGE NET REFERRED THRUST, FN/DELTA = 17095.5 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED,N1/VTHETA = 6304.0 RPM
AVERAGE JET EXHAUST VELOCITY = 1562.2 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.77

TOTAL PWL= 172.1

TABLE A-1. – BASELINE CONFIGURATION WITH EXISTING PRODUCTION INLET AND 24-IN.-LONG FAN-EXHAUST DUCTS. EXISTING PRODUCTION PRIMARY NOZZLE. NO NOISE-SUPPRESSOR ENCLOSURES – Continued.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 116-08, 118-08, AND 119-08.

BAND CENTER FREQUENCY, HZ	ANGLES FROM ENGINE INLET CENTERLINE, DEGREES														
	15	30	40	50	60	75	90	100	110	120	130	140	150	157	PWL
50	71.5	71.7	70.6	71.3	72.0	71.9	72.3	72.2	72.7	72.9	73.6	74.5	74.8	75.9	124.2
63	71.5	71.7	70.6	71.3	72.0	71.9	72.3	72.2	72.7	72.9	73.6	74.5	74.8	75.9	124.2
80	71.5	71.7	70.6	71.3	72.0	71.9	72.3	72.2	72.7	72.9	73.6	74.5	74.8	75.9	124.2
100	71.4	71.8	71.6	72.4	72.4	72.3	73.0	73.7	73.4	73.9	74.8	75.9	76.4	75.4	125.0
125	71.4	71.8	71.6	72.4	72.4	72.3	73.0	73.7	73.4	73.9	74.8	75.9	76.4	75.4	125.0
160	71.4	71.8	71.6	72.4	72.4	72.3	73.0	73.7	73.4	73.9	74.8	75.9	76.4	75.4	125.0
200	71.8	73.3	71.9	71.4	72.1	71.6	71.1	72.4	73.3	73.0	73.6	74.7	72.3	72.3	124.0
250	71.8	73.3	71.9	71.4	72.1	71.6	71.1	72.4	73.3	73.0	73.6	74.7	72.3	72.3	124.0
315	71.8	73.3	71.9	71.4	72.1	71.6	71.1	72.4	73.3	73.0	73.6	74.7	72.3	72.3	124.0
400	75.2	76.0	73.6	71.9	70.7	70.0	70.0	70.7	72.5	73.0	73.1	71.4	69.3	67.4	123.5
500	75.2	76.0	73.6	71.9	70.7	70.0	70.0	70.7	72.5	73.0	73.1	71.4	69.3	67.4	123.5
630	75.2	76.0	73.7	71.9	70.8	70.0	70.0	70.7	72.5	73.0	73.1	71.5	69.3	67.4	123.5
800	82.2	78.6	75.0	72.6	69.8	68.3	68.8	67.8	68.9	73.4	73.8	73.0	68.8	67.8	124.9
1000	79.5	76.9	74.7	72.8	70.1	68.5	68.1	71.3	72.0	72.4	73.9	71.6	68.7	68.0	124.1
1250	81.4	82.5	82.0	81.7	79.9	77.1	76.5	80.2	78.2	77.4	80.4	76.4	73.3	73.0	130.8
1600	81.8	80.7	81.5	82.1	81.6	79.4	78.6	79.5	79.4	78.1	79.2	75.3	72.1	71.1	131.1
2000	84.3	84.3	83.7	83.0	80.9	77.5	76.6	77.0	78.5	78.2	81.2	77.5	72.6	71.9	131.6
2500	91.6	93.4	93.3	92.8	83.5	84.4	85.0	82.9	83.4	85.6	89.1	85.1	80.0	79.4	139.6
3150	84.1	82.7	81.9	80.7	77.7	75.4	77.6	79.2	79.2	79.0	81.1	77.1	72.8	70.7	130.8
4000	82.9	83.4	83.3	81.8	79.7	78.1	81.0	83.3	83.3	82.2	85.0	79.9	76.6	74.4	133.3
5000	81.6	82.5	82.6	80.5	78.2	74.4	77.2	79.1	79.5	79.8	81.5	78.8	73.6	71.3	130.8
6300	79.9	77.6	77.8	76.8	75.4	72.2	74.9	76.8	77.9	77.1	79.4	74.6	70.0	68.2	127.9
8000	77.1	75.9	75.8	75.3	72.6	70.1	72.7	75.3	76.6	76.0	78.1	72.5	68.0	67.1	126.1

AVERAGE NET REFERRED THRUST, FN/DELTA = 1360.7 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED,N1/VTHETA = 2199.1 RPM
AVERAGE JET EXHAUST VELOCITY = 356.9 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.04

TOTAL PWL= 143.5

ANALYSIS OF JT3D STATIC NOISE-REDUCTION TESTS AT EDWARDS AFB

TABLE A-1. – BASELINE CONFIGURATION WITH EXISTING PRODUCTION INLET AND 24-IN.-LONG FAN-EXHAUST DUCTS. EXISTING PRODUCTION PRIMARY NOZZLE. NO NOISE-SUPPRESSOR ENCLOSURES – Concluded.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 116-09, 118-09, AND 119-09.

		ANGLES FROM ENGINE INLET CENTERLINE, DEGREES														
B		15	30	40	50	60	75	90	100	110	120	130	140	150	157	PWL
A	50	81.1	79.4	76.1	80.7	81.5	82.0	82.5	82.8	83.9	84.1	85.4	86.7	87.3	86.3	134.9
N	63	81.1	79.4	76.1	80.7	81.5	82.0	82.5	82.8	83.9	84.1	85.4	86.7	87.3	86.3	134.9
D	80	81.1	79.4	76.1	80.7	81.5	82.0	82.5	82.8	83.9	84.1	85.4	86.7	87.3	86.3	134.9
	100	80.8	80.8	78.5	82.9	83.0	82.4	82.7	83.3	83.4	84.1	85.8	87.7	87.3	84.6	135.3
C	125	80.8	80.8	78.5	82.9	83.0	82.4	82.7	83.3	83.4	84.1	85.8	87.7	87.3	84.6	135.3
E	160	80.8	80.8	78.5	82.9	83.0	82.4	82.7	83.3	83.4	84.1	85.8	87.7	87.3	84.6	135.3
N	200	80.5	80.7	76.7	79.8	80.5	80.3	80.3	81.4	82.2	82.3	82.8	82.6	82.4	81.0	132.6
T	250	80.5	80.7	76.7	79.8	80.5	80.3	80.3	81.4	82.2	82.3	82.8	82.6	82.4	81.0	132.6
E	315	80.5	80.7	76.7	79.8	80.5	80.3	80.3	81.4	82.2	82.3	82.8	82.6	82.4	81.0	132.6
R	400	79.2	79.7	75.0	78.5	77.8	77.9	78.0	79.3	80.7	81.1	80.7	79.7	77.8	76.7	130.5
	500	79.2	79.7	75.0	78.5	77.8	77.9	78.0	79.3	80.7	81.1	80.7	79.7	77.8	76.7	130.5
F	630	79.3	79.8	75.1	78.6	77.9	78.0	78.0	79.3	80.7	81.2	80.7	79.8	77.8	76.8	130.5
R	800	80.0	78.0	76.7	75.3	74.8	75.4	75.9	75.4	75.1	76.8	80.0	79.3	78.9	77.6	128.5
E	1000	84.9	85.2	83.6	79.4	78.1	77.1	76.6	77.1	76.9	77.6	83.1	82.3	79.5	81.3	132.0
Q	1250	84.1	83.1	82.1	82.2	81.3	80.3	80.8	81.0	80.4	80.0	84.7	83.1	78.5	80.3	133.2
U	1600	86.0	84.3	86.9	85.3	84.4	82.1	84.2	84.1	82.1	82.7	81.2	78.5	77.1	76.1	134.9
E	2000	92.7	93.9	95.4	96.4	93.0	94.6	93.9	94.1	91.0	92.1	92.3	84.9	83.8	82.0	144.7
N	2500	91.3	91.8	91.5	89.5	87.9	87.3	87.9	87.0	85.0	85.5	87.4	83.0	80.7	79.9	139.4
C	3150	89.1	88.5	88.2	88.1	87.5	85.9	86.7	85.2	84.6	84.3	57.8	54.7	53.1	52.0	137.2
Y	4000	95.2	94.7	96.5	95.9	96.4	93.6	97.0	95.6	94.4	92.9	64.8	61.1	59.0	58.2	145.9
,	5000	90.5	89.8	91.3	90.2	90.1	88.6	90.6	89.1	89.0	87.9	61.0	57.9	55.5	54.4	140.2
H	6300	91.5	91.2	92.9	92.2	92.5	90.9	92.3	91.1	90.3	89.4	61.7	58.6	56.4	55.1	142.0
Z	8000	87.7	88.2	88.2	88.7	87.8	87.1	88.6	88.0	86.8	86.2	59.9	56.6	54.3	53.8	138.2

AVERAGE NET REFERRED THRUST, FN/DELTA = 3823.5 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED, N1/VTHETA = 3547.2 RPM
AVERAGE JET EXHAUST VELOCITY = 601.9 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.11

TOTAL PWL= 151.8

ANALYSIS OF JT3D STATIC NOISE-REDUCTION TESTS AT EDWARDS AFB

TABLE A-2. – SIMULATED VARIABLE-AREA PRIMARY NOZZLE. EXIT AREA OF CONICAL EXHAUST NOZZLE WAS 50-PERCENT OF EXISTING PRODUCTION NOZZLE. EXISTING INLET AND FAN-EXHAUST DUCTS.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 047-01, 048-01, AND 049-01.

		ANGLES FROM ENGINE INLET CENTERLINE, DEGREES													
B		15	30	40	50	60	75	90	100	110	120	130	140	150	160
A	50	71.7	72.4	71.1	72.2	72.4	73.7	74.2	75.3	75.0	77.8	80.6	83.0	85.0	---
N	63	71.7	72.4	71.1	72.2	72.4	73.7	74.2	75.3	75.0	77.8	80.6	83.0	85.0	---
D	80	71.7	72.4	71.1	72.2	72.4	73.7	74.2	75.3	75.0	77.8	80.6	83.0	85.0	---
	100	76.3	75.7	76.5	77.0	76.9	77.4	78.0	79.1	79.3	81.3	83.7	86.5	87.9	---
C	125	76.3	75.7	76.5	77.0	76.9	77.4	78.0	79.1	79.3	81.3	83.7	86.5	87.9	---
E	160	76.3	75.7	76.5	77.0	76.9	77.4	78.0	79.1	79.3	81.3	83.7	86.5	87.9	---
N	200	77.5	76.7	77.0	76.8	76.9	77.6	78.0	78.9	79.2	80.4	81.6	82.1	82.7	---
T	250	77.5	76.7	77.0	76.8	76.9	77.6	78.0	78.9	79.2	80.4	81.6	82.1	82.7	---
E	315	77.5	76.7	77.0	76.8	76.9	77.6	78.0	78.9	79.2	80.4	81.6	82.1	82.7	---
R	400	76.8	75.9	75.4	74.8	74.4	75.1	75.0	76.7	76.8	78.2	78.1	77.3	72.5	---
	500	76.8	75.9	75.4	74.8	74.4	75.1	75.0	76.7	76.8	78.2	78.1	77.3	72.5	---
F	630	76.8	75.9	75.4	74.8	74.4	75.1	75.0	76.7	76.8	78.2	78.1	77.3	72.5	---
R	800	83.6	80.2	79.8	78.2	75.8	74.9	72.3	75.5	75.1	76.9	79.4	77.3	71.4	---
E	1000	83.6	80.2	79.8	78.2	75.8	74.9	72.3	75.5	75.1	76.9	79.4	77.3	71.4	---
Q	1250	83.6	80.2	79.8	78.2	75.8	74.9	72.3	75.5	75.1	76.9	79.4	77.3	71.4	---
U	1600	82.9	81.8	81.3	81.7	79.9	78.1	76.9	80.6	80.4	77.9	78.9	76.6	72.9	---
E	2000	84.0	83.5	81.9	83.6	83.8	80.4	78.1	79.7	80.1	78.6	81.9	77.4	73.4	---
N	2500	91.6	91.4	92.2	91.0	91.1	87.6	86.0	88.8	87.4	86.4	92.8	87.3	82.3	---
C	3150	85.0	84.8	84.6	83.2	83.9	79.2	78.3	79.9	80.8	80.0	82.7	78.7	74.9	---
Y	4000	85.2	84.2	84.7	84.0	82.2	79.1	78.9	83.6	83.4	83.9	84.5	81.8	77.4	---
,	5000	82.2	82.5	83.4	81.0	80.0	76.9	76.8	79.6	81.4	80.2	82.1	79.3	74.5	---
H	6300	79.9	79.3	79.8	77.4	75.0	73.2	73.1	77.7	79.0	76.7	78.2	75.1	70.8	---
Z	8000	78.0	77.5	77.3	74.9	73.8	71.2	71.4	75.8	77.1	76.2	76.1	73.1	70.6	---

AVERAGE NET REFERRED THRUST, FN/DELTA = 2016.5 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED,N1/VTHETA = 2303.5 RPM
AVERAGE JET EXHAUST VELOCITY = 727.7 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.16

ANALYSIS OF JT3D STATIC NOISE-REDUCTION TESTS AT EDWARDS AFB

TABLE A-2. – SIMULATED VARIABLE-AREA PRIMARY NOZZLE. EXIT AREA OF CONICAL EXHAUST NOZZLE WAS 50-PERCENT OF EXISTING PRODUCTION NOZZLE. EXISTING INLET AND FAN-EXHAUST DUCTS – Continued.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 047-02, 048-02, AND 049-02.

BAND CENTER FREQUENCY, HZ	ANGLES FROM ENGINE INLET CENTERLINE, DEGREES													
	15	30	40	50	60	75	90	100	110	120	130	140	150	160
50	78.9	80.0	78.7	79.3	79.4	80.1	81.1	82.3	83.6	87.2	91.4	94.6	97.0	---
63	78.9	80.0	78.7	79.3	79.4	80.1	81.1	82.3	83.6	87.2	91.4	94.6	97.0	---
80	78.9	80.0	78.7	79.3	79.4	80.1	81.1	82.3	83.6	87.2	91.4	94.6	97.0	---
100	84.2	83.9	84.2	84.2	84.4	84.3	85.8	87.2	88.3	90.9	95.9	100.9	102.6	---
125	84.2	83.9	84.2	84.2	84.4	84.3	85.8	87.2	88.3	90.9	95.9	100.9	102.6	---
160	84.2	83.9	84.2	84.2	84.4	84.3	85.8	87.2	88.3	90.9	95.9	100.9	102.6	---
200	86.4	85.3	85.7	85.6	86.2	86.8	87.9	88.9	89.9	91.4	94.4	96.8	98.0	---
250	86.4	85.3	85.7	85.6	86.2	86.8	87.9	88.9	89.9	91.4	94.4	96.8	98.0	---
315	86.4	85.3	85.7	85.6	86.2	86.8	87.9	88.9	89.9	91.4	94.4	96.8	98.0	---
400	84.2	83.6	83.7	83.8	84.3	84.3	85.4	87.6	87.6	89.5	90.8	91.0	85.4	---
500	84.2	83.6	83.7	83.8	84.3	84.3	85.4	87.6	87.6	89.5	90.8	91.0	85.4	---
630	84.2	83.6	83.7	83.8	84.3	84.3	85.4	87.6	87.6	89.5	90.8	91.0	85.4	---
800	84.2	82.8	82.3	80.7	80.4	80.4	80.0	81.9	82.3	84.1	83.9	82.1	78.8	---
1000	84.2	82.8	82.3	80.7	80.4	80.4	80.0	81.9	82.3	84.1	83.9	82.1	78.8	---
1250	84.2	82.8	82.3	80.7	80.4	80.4	80.0	81.9	82.3	84.1	83.9	82.1	78.8	---
1600	89.6	86.5	90.2	87.0	88.5	85.4	87.1	86.5	87.9	88.1	89.4	85.1	83.5	---
2000	91.8	91.8	95.1	92.8	93.5	88.1	90.5	91.7	91.3	90.0	91.4	85.4	84.2	---
2500	91.8	94.1	92.9	89.5	87.3	84.9	85.4	87.3	88.1	87.8	88.9	84.4	80.8	---
3150	94.3	93.2	94.7	91.7	90.4	88.9	88.9	97.5	95.3	95.4	94.9	90.5	87.0	---
4000	96.4	96.0	97.6	95.5	92.2	90.4	89.8	95.7	98.9	92.3	93.4	91.1	87.4	---
5000	92.8	92.0	90.0	88.8	87.2	88.1	86.5	90.0	92.3	88.4	90.7	86.5	82.9	---
6300	89.0	88.8	89.0	86.5	85.0	85.4	85.2	88.6	89.4	88.2	88.3	84.5	80.7	---
8000	86.6	87.3	87.7	85.0	83.9	82.7	81.9	87.6	87.5	85.9	85.4	82.2	79.1	---

AVERAGE NET REFERRED THRUST, FN/DELTA = 4079.7 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED,N1/VTHETA = 3118.5 RPM
AVERAGE JET EXHAUST VELOCITY = 1096.7 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.35

ANALYSIS OF JT3D STATIC NOISE-REDUCTION TESTS AT EDWARDS AFB

TABLE A-2. – SIMULATED VARIABLE-AREA PRIMARY NOZZLE. EXIT AREA OF CONICAL EXHAUST NOZZLE WAS 50-PERCENT OF EXISTING PRODUCTION NOZZLE. EXISTING INLET AND FAN-EXHAUST DUCTS – Continued.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 047-03, 048-03, AND 049-03.

BAND CENTER FREQUENCY, HZ	ANGLES FROM ENGINE INLET CENTERLINE, DEGREES 15	30	40	50	60	75	90	100	110	120	130	140	150	160
50	81.5	82.0	80.8	81.4	81.6	82.8	84.2	85.1	86.7	90.8	95.5	99.0	101.6	---
63	81.5	82.0	80.8	81.4	81.6	82.8	84.2	85.1	86.7	90.8	95.5	99.0	101.6	---
80	81.5	82.0	80.8	81.4	81.6	82.8	84.2	85.1	86.7	90.8	95.5	99.0	101.6	---
100	87.8	86.8	87.2	87.2	87.5	87.2	88.8	90.4	91.6	95.0	100.9	106.2	108.1	---
125	87.8	86.8	87.2	87.2	87.5	87.2	88.8	90.4	91.6	95.0	100.9	106.2	108.1	---
160	87.8	86.8	87.2	87.2	87.5	87.2	88.8	90.4	91.6	95.0	100.9	106.2	108.1	---
200	89.2	88.8	89.4	89.2	89.7	90.5	91.5	92.4	93.8	95.9	99.7	103.1	105.0	---
250	89.2	88.8	89.4	89.2	89.7	90.5	91.5	92.4	93.8	95.9	99.7	103.1	105.0	---
315	89.2	88.8	89.4	89.2	89.7	90.5	91.5	92.4	93.8	95.9	99.7	103.1	105.0	---
400	87.1	87.5	87.8	87.5	88.4	88.3	89.5	91.3	91.9	94.0	96.1	96.2	91.8	---
500	87.1	87.5	87.8	87.5	88.4	88.3	89.5	91.3	91.9	94.0	96.1	96.2	91.8	---
630	87.1	87.5	87.8	87.5	88.4	88.3	89.5	91.3	91.9	94.0	96.1	96.2	91.8	---
800	85.8	85.1	84.7	84.0	83.9	83.9	84.4	85.7	86.8	88.5	88.6	86.5	83.3	---
1000	85.8	85.1	84.7	84.0	83.9	83.9	84.4	85.7	86.8	88.5	88.6	86.5	83.3	---
1250	85.8	85.1	84.7	84.0	83.9	83.9	84.4	85.7	86.8	88.5	88.6	86.5	83.3	---
1600	87.1	85.8	87.3	88.8	86.3	86.3	86.8	89.0	90.2	89.5	88.0	86.4	85.4	---
2000	91.9	91.3	97.5	102.4	98.0	90.7	91.2	98.4	97.3	96.3	95.7	89.7	90.6	---
2500	91.7	94.7	94.2	91.9	90.0	88.1	88.7	90.7	91.4	91.4	92.0	87.5	84.7	---
3150	91.3	91.1	89.8	88.7	87.3	87.0	87.9	89.8	91.1	91.0	90.4	87.0	84.7	---
4000	96.7	99.9	96.2	95.9	93.8	92.6	93.3	95.9	100.0	96.3	97.8	94.3	92.2	---
5000	90.8	91.0	91.2	90.0	88.0	88.5	88.6	91.2	92.9	90.9	90.5	87.4	84.9	---
6300	90.9	93.2	91.3	90.3	89.7	88.4	89.3	91.1	92.8	91.9	90.0	88.2	84.3	---
8000	89.0	89.8	89.8	88.0	86.6	86.2	87.1	91.2	91.6	90.4	88.6	85.6	83.7	---

AVERAGE NET REFERRED THRUST, FN/DELTA = 4992.1 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED,N1/VTHETA = 3384.1 RPM
AVERAGE JET EXHAUST VELOCITY = 1249.3 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.46

ANALYSIS OF JT3D STATIC NOISE-REDUCTION TESTS AT EDWARDS AFB

TABLE A-2. – SIMULATED VARIABLE-AREA PRIMARY NOZZLE. EXIT AREA OF CONICAL EXHAUST NOZZLE WAS 50-PERCENT OF EXISTING PRODUCTION NOZZLE. EXISTING INLET AND FAN-EXHAUST DUCTS – Continued.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 047-04, 048-04, AND 049-04.

BAND CENTER FREQUENCY, HZ	ANGLES FROM ENGINE INLET CENTERLINE, DEGREES													
	15	30	40	50	60	75	90	100	110	120	130	140	150	160
50	83.7	84.0	82.9	83.5	84.0	84.8	86.0	87.3	89.3	94.2	98.4	102.0	105.0	---
63	83.7	84.0	82.9	83.5	84.0	84.8	86.0	87.3	89.3	94.2	98.4	102.0	105.0	---
80	83.7	84.0	82.9	83.5	84.0	84.8	86.0	87.3	89.3	94.2	98.4	102.0	105.0	---
100	90.3	89.1	89.4	89.5	89.8	89.5	91.8	92.8	94.4	98.6	105.3	110.4	111.6	---
125	90.3	89.1	89.4	89.5	89.8	89.5	91.8	92.8	94.4	98.6	105.3	110.4	111.6	---
160	90.3	89.1	89.4	89.5	89.8	89.5	91.8	92.8	94.4	98.6	105.3	110.4	111.6	---
200	92.3	91.9	92.8	92.4	93.0	93.5	94.9	95.6	97.1	99.8	104.3	108.4	109.8	---
250	92.3	91.9	92.8	92.4	93.0	93.5	94.9	95.6	97.1	99.8	104.3	108.4	109.8	---
315	92.3	91.9	92.8	92.4	93.0	93.5	94.9	95.6	97.1	99.8	104.3	108.4	109.8	---
400	90.3	90.9	91.3	91.0	91.8	91.6	93.1	95.2	95.9	98.6	101.2	101.8	98.8	---
500	90.3	90.9	91.3	91.0	91.8	91.6	93.1	95.2	95.9	98.6	101.2	101.8	98.8	---
630	90.3	90.9	91.3	91.0	91.8	91.6	93.1	95.2	95.9	98.6	101.2	101.8	98.8	---
800	87.8	87.3	87.4	86.8	87.1	87.0	88.0	89.9	90.9	93.9	93.7	91.8	88.2	---
1000	87.8	87.3	87.4	86.8	87.1	87.0	88.0	89.9	90.9	93.9	93.7	91.8	88.2	---
1250	87.8	87.3	87.4	86.8	87.1	87.0	88.0	89.9	90.9	93.9	93.7	91.8	88.2	---
1600	88.0	87.1	87.7	87.5	87.1	87.8	89.3	91.6	93.3	92.4	90.7	90.0	89.0	---
2000	95.0	97.1	100.4	96.8	94.4	97.3	92.8	100.1	96.6	98.4	95.7	92.1	90.5	---
2500	92.4	94.2	94.3	91.4	90.4	91.3	91.5	94.1	94.7	94.7	93.0	90.5	88.5	---
3150	92.2	91.8	91.8	89.9	89.5	88.9	90.2	91.4	92.6	93.3	91.8	89.4	87.0	---
4000	95.8	93.9	95.3	94.0	92.3	93.6	95.3	96.7	99.6	97.1	96.1	93.2	90.6	---
5000	92.6	92.4	92.7	91.0	89.9	90.0	90.3	93.0	94.1	92.8	92.1	89.8	86.7	---
6300	92.2	93.1	94.3	94.4	91.0	90.1	90.8	94.2	93.6	93.3	93.2	88.5	85.8	---
8000	90.4	90.2	90.1	87.7	87.4	86.7	87.1	90.9	91.8	91.0	88.2	85.5	84.1	---

AVERAGE NET REFERRED THRUST, FN/DELTA = 6141.4 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED,N1/VTHETA = 3622.0 RPM
AVERAGE JET EXHAUST VELOCITY = 1396.7 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.57

TABLE A-2. – SIMULATED VARIABLE-AREA PRIMARY NOZZLE. EXIT AREA OF CONICAL EXHAUST NOZZLE WAS 50-PERCENT OF EXISTING PRODUCTION NOZZLE. EXISTING INLET AND FAN-EXHAUST DUCTS – Continued.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SOUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 047-05, 048-05, AND 049-05.

		ANGLES FROM ENGINE INLET CENTERLINE, DEGREES													
B		15	30	40	50	60	75	90	100	110	120	130	140	150	160
A	50	87.7	87.6	86.1	86.9	87.3	88.4	89.6	90.7	93.2	98.6	103.2	107.3	109.8	---
N	63	87.7	87.6	86.1	86.9	87.3	88.4	89.6	90.7	93.2	98.6	103.2	107.3	109.8	---
D	80	87.7	87.6	86.1	86.9	87.3	88.4	89.6	90.7	93.2	98.6	103.2	107.3	109.8	---
	100	94.5	93.2	93.5	93.6	94.1	93.4	96.0	97.0	98.8	104.1	111.9	116.2	116.1	---
C	125	94.5	93.2	93.5	93.6	94.1	93.4	96.0	97.0	98.8	104.1	111.9	116.2	116.1	---
E	160	94.5	93.2	93.5	93.6	94.1	93.4	96.0	97.0	98.8	104.1	111.9	116.2	116.1	---
N	200	97.9	97.9	99.0	98.3	98.6	99.4	100.6	101.5	102.3	106.3	111.9	115.8	115.3	---
T	250	97.9	97.9	99.0	98.3	98.6	99.4	100.6	101.5	102.3	106.3	111.9	115.8	115.3	---
E	315	97.9	97.9	99.0	98.3	98.6	99.4	100.6	101.5	102.3	106.3	111.9	115.8	115.3	---
R	400	96.4	97.2	98.1	97.1	98.0	97.6	100.2	101.3	102.1	105.2	109.7	111.4	108.1	---
	500	96.4	97.2	98.1	97.1	98.0	97.6	100.2	101.3	102.1	105.2	109.7	111.4	108.1	---
F	630	96.4	97.2	98.1	97.1	98.0	97.6	100.2	101.3	102.1	105.2	109.7	111.4	108.1	---
R	800	93.3	92.8	92.9	92.9	92.7	92.7	93.7	95.5	97.1	100.1	101.7	100.7	96.5	---
E	1000	93.3	92.8	92.9	92.9	92.7	92.7	93.7	95.5	97.1	100.1	101.7	100.7	96.5	---
Q	1250	93.3	92.8	92.9	92.9	92.7	92.7	93.7	95.5	97.1	100.1	101.7	100.7	96.5	---
U	1600	93.2	92.1	92.3	92.4	92.4	93.4	94.5	97.0	98.9	97.9	97.7	97.0	95.5	---
E	2000	95.2	95.4	96.5	94.0	94.9	95.0	98.0	98.5	100.9	100.5	99.9	97.9	96.4	---
N	2500	99.4	100.0	103.2	97.3	97.2	95.9	99.2	100.8	103.1	103.2	99.8	98.9	95.8	---
C	3150	94.2	94.4	93.9	92.9	92.9	93.8	95.4	96.7	98.6	99.6	97.7	96.0	93.2	---
Y	4000	95.8	94.3	95.3	93.5	93.7	94.5	97.9	101.6	99.9	101.4	97.2	95.4	92.7	---
,	5000	96.8	97.7	98.3	95.1	95.1	95.0	96.4	98.0	99.0	98.4	97.7	94.9	92.6	---
H	6300	94.0	95.3	94.7	93.0	92.6	92.3	93.0	97.3	96.7	95.9	94.5	92.4	89.9	---
Z	8000	92.5	93.8	92.8	91.7	91.7	90.9	90.8	94.4	94.9	94.3	92.1	90.1	88.9	---

AVERAGE NET REFERRED THRUST, FN/DELTA = 7993.8 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED,N1/VTHETA = 4010.1 RPM
AVERAGE JET EXHAUST VELOCITY = 1687.8 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.83

ANALYSIS OF JT3D STATIC NOISE-REDUCTION TESTS AT EDWARDS AFB

TABLE A-2. – SIMULATED VARIABLE-AREA PRIMARY NOZZLE. EXIT AREA OF CONICAL EXHAUST NOZZLE WAS 50-PERCENT OF EXISTING PRODUCTION NOZZLE. EXISTING INLET AND FAN-EXHAUST DUCTS – Concluded.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 047-06, 048-06, AND 049-06.

BAND CENTER FREQUENCY, HZ	ANGLES FROM ENGINE INLET CENTERLINE, DEGREES 15	30	40	50	60	75	90	100	110	120	130	140	150	160
50	90.7	90.2	89.0	89.4	89.8	90.9	92.2	93.3	96.1	101.9	107.0	110.4	113.1	---
63	90.7	90.2	89.0	89.4	89.8	90.9	92.2	93.3	96.1	101.9	107.0	110.4	113.1	---
80	90.7	90.2	89.0	89.4	89.8	90.9	92.2	93.3	96.1	101.9	107.0	110.4	113.1	---
100	97.2	96.1	96.1	96.9	96.9	96.5	99.4	100.2	101.7	108.3	116.3	120.0	119.0	---
125	97.2	96.1	96.1	96.9	96.9	96.5	99.4	100.2	101.7	108.3	116.3	120.0	119.0	---
160	97.2	96.1	96.1	96.9	96.9	96.5	99.4	100.2	101.7	108.3	116.3	120.0	119.0	---
200	101.7	102.1	102.9	102.2	102.2	103.2	104.5	105.5	106.4	111.0	117.4	120.5	118.2	---
250	101.7	102.1	102.9	102.2	102.2	103.2	104.5	105.5	106.4	111.0	117.4	120.5	118.2	---
315	101.7	102.1	102.9	102.2	102.2	103.2	104.5	105.5	106.4	111.0	117.4	120.5	118.2	---
400	101.7	102.7	103.7	102.4	103.1	102.7	104.8	106.3	107.5	110.8	116.4	117.8	112.3	---
500	101.7	102.7	103.7	102.4	103.1	102.7	104.8	106.3	107.5	110.8	116.4	117.8	112.3	---
630	101.7	102.7	103.7	102.4	103.1	102.7	104.8	106.3	107.5	110.8	116.4	117.8	112.3	---
800	99.2	99.2	98.9	98.8	98.8	98.5	99.2	100.8	103.4	105.9	108.9	109.0	102.9	---
1000	99.2	99.2	98.9	98.8	98.8	98.5	99.2	100.8	103.4	105.9	108.9	109.0	102.9	---
1250	99.2	99.2	98.9	98.8	98.8	98.5	99.2	100.8	103.4	105.9	108.9	109.0	102.9	---
1600	97.6	96.8	97.0	97.5	97.9	98.6	99.9	102.3	104.3	104.5	105.4	104.8	102.8	---
2000	97.9	97.3	97.3	97.5	97.9	99.1	100.7	103.0	105.1	104.2	105.5	104.9	101.9	---
2500	100.4	109.6	107.1	105.5	102.3	100.9	105.9	104.1	108.5	105.8	106.1	104.9	101.6	---
3150	96.6	97.4	96.5	96.3	96.6	97.8	99.8	101.4	103.4	104.4	104.4	103.3	99.2	---
4000	96.1	95.6	95.4	95.5	95.9	97.3	98.7	100.3	102.2	102.6	102.6	101.5	97.9	---
5000	98.5	100.3	100.3	98.6	97.4	98.8	98.9	102.3	104.3	103.1	102.1	100.5	96.9	---
6300	94.4	95.4	95.1	93.6	92.9	94.8	95.7	98.1	99.8	99.2	98.8	97.7	95.0	---
8000	94.6	97.4	95.6	92.7	93.7	94.2	94.8	97.6	98.7	99.0	98.0	96.3	94.4	---

AVERAGE NET REFERRED THRUST, FN/DELTA = 9962.5 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED,N1/VTHETA = 4283.1 RPM
AVERAGE JET EXHAUST VELOCITY = 1935.1 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 2.11

ANALYSIS OF JT3D STATIC NOISE-REDUCTION TESTS AT EDWARDS AFB

TABLE A-3.– SIMULATED VARIABLE-AREA PRIMARY NOZLE. EXIT AREA OF CONICAL EXHAUST NOZZLE WAS 60-PERCENT OF EXISTING PRODUCTION NOZZLE. EXISTING INLET AND FAN-EXHAUST DUCTS.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 050-01, 051-01, AND 052-01.

BAND CENTER FREQUENCY, HZ	ANGLES FROM ENGINE INLET CENTERLINE, DEGREES													
	15	30	40	50	60	75	90	100	110	120	130	140	150	160
50	72.0	71.2	71.5	72.9	73.7	74.2	74.2	74.3	75.5	77.0	79.2	80.9	82.7	---
63	72.0	71.2	71.5	72.9	73.7	74.2	74.2	74.3	75.5	77.0	79.2	80.9	82.7	---
80	72.0	71.2	71.5	72.9	73.7	74.2	74.2	74.3	75.5	77.0	79.2	80.9	82.7	---
100	75.2	75.1	76.0	76.6	76.6	77.2	77.9	78.0	79.1	80.0	81.3	83.5	84.8	---
125	75.2	75.1	76.0	76.6	76.6	77.2	77.9	78.0	79.1	80.0	81.3	83.5	84.8	---
160	75.2	75.1	76.0	76.6	76.6	77.2	77.9	78.0	79.1	80.0	81.3	83.5	84.8	---
200	76.0	76.7	76.5	76.2	76.7	77.1	77.4	78.2	79.0	78.8	79.6	79.4	80.4	---
250	76.0	76.7	76.5	76.2	76.7	77.1	77.4	78.2	79.0	78.8	79.6	79.4	80.4	---
315	76.0	76.7	76.5	76.2	76.7	77.1	77.4	78.2	79.0	78.8	79.6	79.4	80.4	---
400	75.0	74.3	73.6	73.4	73.0	73.2	72.8	74.6	75.5	75.9	75.5	74.5	72.3	---
500	75.0	74.3	73.6	73.4	73.0	73.2	72.8	74.6	75.5	75.9	75.5	74.5	72.3	---
630	75.0	74.3	73.6	73.4	73.0	73.2	72.8	74.6	75.5	75.9	75.5	74.5	72.3	---
800	82.0	81.3	78.7	77.0	74.2	73.9	72.0	74.0	74.9	77.1	76.9	74.4	72.1	---
1000	82.0	81.3	78.7	77.0	74.2	73.9	72.0	74.0	74.9	77.1	76.9	74.4	72.1	---
1250	82.0	81.3	78.7	77.0	74.2	73.9	72.0	74.0	74.9	77.1	76.9	74.4	72.1	---
1600	84.7	83.3	83.1	82.3	80.8	78.8	78.1	82.2	81.8	80.3	81.6	77.7	76.3	---
2000	84.2	83.8	83.5	85.3	84.4	81.4	79.5	81.7	81.9	80.6	83.7	79.0	75.2	---
2500	92.5	96.2	90.1	90.8	87.7	85.5	87.2	91.8	86.0	91.4	94.7	90.8	85.6	---
3150	88.9	91.4	87.5	89.1	85.0	84.1	83.3	85.4	84.6	87.8	87.9	86.4	83.5	---
4000	86.8	84.6	85.0	84.1	83.5	83.7	81.9	85.5	86.9	87.2	86.9	84.2	80.7	---
5000	83.1	83.7	83.7	81.1	79.3	77.2	77.8	81.6	83.3	82.3	84.1	81.5	77.8	---
6300	81.2	81.0	80.8	79.5	78.1	74.7	74.7	78.7	80.4	79.1	80.0	78.2	73.6	---
8000	78.3	77.4	77.4	76.0	75.0	71.9	73.2	77.4	76.8	77.1	77.0	74.1	71.0	---

AVERAGE NET REFERRED THRUST, FN/DELTA = 2009.8 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED,N1/VTHETA = 2408.7 RPM
AVERAGE JET EXHAUST VELOCITY = 632.5 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.12

ANALYSIS OF JT3D STATIC NOISE-REDUCTION TESTS AT EDWARDS AFB

TABLE A-3.– SIMULATED VARIABLE-AREA PRIMARY NOZZLE. EXIT AREA OF CONICAL EXHAUST NOZZLE WAS 60-PERCENT OF EXISTING PRODUCTION NOZZLE. EXISTING INLET AND FAN-EXHAUST DUCTS – Continued.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 050-02, 051-02, AND 052-02.

BAND CENTER FREQUENCY, HZ	ANGLES FROM ENGINE INLET CENTERLINE, DEGREES													
	15	30	40	50	60	75	90	100	110	120	130	140	150	160
50	79.2	78.0	78.5	79.7	80.1	80.4	80.9	81.8	83.8	86.3	89.6	92.7	95.2	---
63	79.2	78.0	78.5	79.7	80.1	80.4	80.9	81.8	83.8	86.3	89.6	92.7	95.2	---
80	79.2	78.0	78.5	79.7	80.1	80.4	80.9	81.8	83.8	86.3	89.6	92.7	95.2	---
100	82.5	82.6	83.3	83.4	83.4	83.3	84.1	85.6	86.4	89.2	92.9	96.7	98.6	---
125	82.5	82.6	83.3	83.4	83.4	83.3	84.1	85.6	86.4	89.2	92.9	96.7	98.6	---
160	82.5	82.6	83.3	83.4	83.4	83.3	84.1	85.6	86.4	89.2	92.9	96.7	98.6	---
200	83.9	84.0	84.0	84.3	84.9	85.9	86.0	87.1	88.1	88.3	90.5	92.2	92.6	---
250	83.9	84.0	84.0	84.3	84.9	85.9	86.0	87.1	88.1	88.3	90.5	92.2	92.6	---
315	83.9	84.0	84.0	84.3	84.9	85.9	86.0	87.1	88.1	88.3	90.5	92.2	92.6	---
400	81.7	80.8	81.0	81.4	81.8	82.0	82.6	84.5	84.9	86.1	86.5	86.7	83.1	---
500	81.7	80.8	81.0	81.4	81.8	82.0	82.6	84.5	84.9	86.1	86.5	86.7	83.1	---
630	81.7	80.8	81.0	81.4	81.8	82.0	82.6	84.5	84.9	86.1	86.5	86.7	83.1	---
800	83.0	81.6	80.6	79.3	78.5	77.7	77.4	79.2	79.1	81.2	80.9	78.5	76.8	---
1000	83.0	81.6	80.6	79.3	78.5	77.7	77.4	79.2	79.1	81.2	80.9	78.5	76.8	---
1250	83.0	81.6	80.6	79.3	78.5	77.7	77.4	79.2	79.1	81.2	80.9	78.5	76.8	---
1600	88.4	84.8	86.6	86.2	84.5	85.6	83.7	88.3	87.8	86.3	86.4	84.3	80.3	---
2000	91.6	91.4	94.0	97.3	96.8	97.6	92.6	97.9	92.3	93.1	95.2	91.3	87.5	---
2500	91.9	91.9	91.2	90.2	88.7	86.1	84.0	86.8	87.5	87.2	89.0	83.5	80.8	---
3150	92.4	92.7	91.9	91.3	88.7	86.7	86.8	92.3	91.4	92.7	90.4	86.7	83.9	---
4000	96.8	96.0	94.8	95.5	94.2	94.0	89.5	98.9	97.9	100.9	97.0	92.8	91.6	---
5000	89.3	89.9	89.5	89.2	87.3	85.9	85.5	89.0	90.7	89.4	90.3	87.9	82.5	---
6300	89.6	91.4	90.2	90.1	86.4	87.0	86.6	90.5	90.0	89.0	89.4	85.9	82.1	---
8000	86.2	86.6	87.7	85.6	85.4	82.6	84.5	88.4	87.5	87.8	86.7	83.5	80.3	---

AVERAGE NET REFERRED THRUST, FN/DELTA = 4005.2 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED,N1/VTHETA = 3256.9 RPM
AVERAGE JET EXHAUST VELOCITY = 937.0 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.26

TABLE A-3.– SIMULATED VARIABLE-AREA PRIMARY NOZZLE. EXIT AREA OF CONICAL EXHAUST NOZZLE WAS 60-PERCENT OF EXISTING PRODUCTION NOZZLE. EXISTING INLET AND FAN-EXHAUST DUCTS – Continued.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 050-03, 051-03, AND 052-03.

		ANGLES FROM ENGINE INLET CENTERLINE, DEGREES													
B		15	30	40	50	60	75	90	100	110	120	130	140	150	160
A	50	81.5	80.6	81.4	82.2	82.4	83.1	83.8	84.7	86.4	90.1	93.8	97.4	100.2	---
N	63	81.5	80.6	81.4	82.2	82.4	83.1	83.8	84.7	86.4	90.1	93.8	97.4	100.2	---
D	80	81.5	80.6	81.4	82.2	82.4	83.1	83.8	84.7	86.4	90.1	93.8	97.4	100.2	---
	100	85.5	85.9	86.1	86.3	86.2	86.4	87.5	89.0	90.2	93.0	97.7	102.5	104.2	---
C	125	85.5	85.9	86.1	86.3	86.2	86.4	87.5	89.0	90.2	93.0	97.7	102.5	104.2	---
E	160	85.5	85.9	86.1	86.3	86.2	86.4	87.5	89.0	90.2	93.0	97.7	102.5	104.2	---
N	200	86.9	87.1	87.3	87.5	88.2	87.7	88.5	90.7	91.8	92.6	95.6	98.1	98.4	---
T	250	86.9	87.1	87.3	87.5	88.2	87.7	88.5	90.7	91.8	92.6	95.6	98.1	98.4	---
E	315	86.9	87.1	87.3	87.5	88.2	87.7	88.5	90.7	91.8	92.6	95.6	98.1	98.4	---
R	400	84.9	84.6	84.7	85.2	85.7	86.1	86.7	88.4	89.4	90.7	91.9	91.5	88.5	---
	500	84.9	84.6	84.7	85.2	85.7	86.1	86.7	88.4	89.4	90.7	91.9	91.5	88.5	---
F	630	84.9	84.6	84.7	85.2	85.7	86.1	86.7	88.4	89.4	90.7	91.9	91.5	88.5	---
R	800	82.7	83.2	82.6	81.4	81.1	81.1	80.8	82.8	82.8	85.1	85.6	83.2	81.3	---
E	1000	82.7	83.2	82.6	81.4	81.1	81.1	80.8	82.8	82.8	85.1	85.6	83.2	81.3	---
Q	1250	82.7	83.2	82.6	81.4	81.1	81.1	80.8	82.8	82.8	85.1	85.6	83.2	81.3	---
U	1600	84.9	84.5	85.5	85.2	83.8	84.1	83.9	87.1	86.5	86.8	84.5	82.5	81.7	---
E	2000	93.5	92.8	100.6	94.2	95.0	93.3	92.5	97.0	95.1	93.4	91.3	90.0	87.2	---
N	2500	91.6	93.0	94.2	90.5	89.5	87.6	87.6	90.2	90.4	89.8	90.0	86.1	83.8	---
C	3150	90.5	90.2	90.5	89.2	88.0	85.7	85.2	87.7	89.0	89.4	87.4	84.0	82.0	---
Y	4000	94.3	94.8	94.8	94.9	93.3	91.3	93.1	96.8	99.7	96.9	93.8	91.7	88.9	---
,	5000	91.4	91.3	91.7	90.2	89.3	87.3	88.2	91.5	92.0	90.7	90.4	88.1	85.0	---
H	6300	91.7	91.7	91.7	92.1	90.3	89.3	89.2	92.6	93.1	91.9	90.8	87.5	85.3	---
Z	8000	88.3	88.2	87.8	86.4	86.4	85.1	86.1	90.0	89.3	88.8	86.8	84.4	82.4	---

AVERAGE NET REFERRED THRUST, FN/DELTA = 4849.3 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED,N1/VTHETA = 3565.8 RPM
AVERAGE JET EXHAUST VELOCITY = 1076.3 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.34

TABLE A-3.– SIMULATED VARIABLE-AREA PRIMARY NOZZLE. EXIT AREA OF CONICAL EXHAUST NOZZLE WAS 60-PERCENT OF EXISTING PRODUCTION NOZZLE. EXISTING INLET AND FAN-EXHAUST DUCTS – Continued.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 050-04, 051-04, AND 052-04.

BAND CENTER FREQUENCY, HZ	ANGLES FROM ENGINE INLET CENTERLINE, DEGREES													
	15	30	40	50	60	75	90	100	110	120	130	140	150	160
50	83.7	82.4	83.1	83.4	84.1	84.8	85.8	87.1	88.8	93.0	96.9	100.4	103.2	---
63	83.7	82.4	83.1	83.4	84.1	84.8	85.8	87.1	88.8	93.0	96.9	100.4	103.2	---
80	83.7	82.4	83.1	83.4	84.1	84.8	85.8	87.1	88.8	93.0	96.9	100.4	103.2	---
100	88.2	87.8	88.2	88.0	88.3	88.4	89.9	91.4	92.8	96.1	101.6	106.3	108.0	---
125	88.2	87.8	88.2	88.0	88.3	88.4	89.9	91.4	92.8	96.1	101.6	106.3	108.0	---
160	88.2	87.8	88.2	88.0	88.3	88.4	89.9	91.4	92.8	96.1	101.6	106.3	108.0	---
200	89.5	89.5	89.5	89.8	90.4	91.1	91.8	92.9	94.1	95.8	99.5	102.7	103.4	---
250	89.5	89.5	89.5	89.8	90.4	91.1	91.8	92.9	94.1	95.8	99.5	102.7	103.4	---
315	89.5	89.5	89.5	89.8	90.4	91.1	91.8	92.9	94.1	95.8	99.5	102.7	103.4	---
400	87.3	87.3	87.7	88.1	88.6	88.7	89.8	91.5	92.2	93.8	96.0	95.7	92.4	---
500	87.3	87.3	87.7	88.1	88.6	88.7	89.8	91.5	92.2	93.8	96.0	95.7	92.4	---
630	87.3	87.3	87.7	88.1	88.6	88.7	89.8	91.5	92.2	93.8	96.0	95.7	92.4	---
800	85.6	84.9	84.3	83.9	83.5	83.6	83.6	85.7	86.1	88.6	88.8	86.4	84.2	---
1000	85.6	84.9	84.3	83.9	83.5	83.6	83.6	85.7	86.1	88.6	88.8	86.4	84.2	---
1250	85.6	84.9	84.3	83.9	83.5	83.6	83.6	85.7	86.1	88.6	88.8	86.4	84.2	---
1600	86.5	85.3	85.9	85.6	85.1	86.0	86.2	89.4	89.8	89.3	86.2	85.3	84.3	---
2000	94.2	93.4	97.6	97.2	94.4	90.6	89.7	93.6	95.9	93.7	96.0	90.6	91.4	---
2500	94.6	96.4	100.7	98.4	95.4	90.0	90.0	94.1	93.7	95.8	93.4	90.1	88.8	---
3150	92.6	91.1	91.8	91.3	89.6	87.9	87.3	89.2	90.6	90.2	88.3	86.0	83.9	---
4000	96.3	93.6	95.2	93.5	93.9	93.3	91.6	98.1	95.7	95.1	93.7	90.3	88.7	---
5000	94.6	94.3	94.9	93.7	91.4	89.9	91.3	96.0	95.7	93.6	93.4	91.0	88.2	---
6300	92.6	94.2	95.9	91.8	91.7	90.9	91.1	93.9	93.3	92.2	91.7	89.0	86.0	---
8000	89.3	89.5	90.5	88.2	88.1	87.3	88.0	91.2	90.6	89.4	87.1	85.3	83.4	---

AVERAGE NET REFERRED THRUST, FN/DELTA = 5991.2 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED,N1/VTHETA = 3826.4 RPM
AVERAGE JET EXHAUST VELOCITY = 1202.4 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.43

TABLE A-3.– SIMULATED VARIABLE-AREA PRIMARY NOZZLE. EXIT AREA OF CONICAL EXHAUST NOZZLE WAS 60-PERCENT OF EXISTING PRODUCTION NOZZLE. EXISTING INLET AND FAN-EXHAUST DUCTS – Continued.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 050-05, 051-05, AND 052-05.

BAND CENTER FREQUENCY, HZ	ANGLES FROM ENGINE INLET CENTERLINE, DEGREES													
	15	30	40	50	60	75	90	100	110	120	130	140	150	160
50	87.3	85.3	85.9	86.6	87.1	87.9	89.1	90.2	92.3	97.3	101.8	105.4	107.8	---
63	87.3	85.3	85.9	86.6	87.1	87.9	89.1	90.2	92.3	97.3	101.8	105.4	107.8	---
80	87.3	85.3	85.9	86.6	87.1	87.9	89.1	90.2	92.3	97.3	101.8	105.4	107.8	---
100	92.7	91.4	91.7	91.4	91.9	92.0	93.9	95.4	96.9	101.3	108.2	113.1	113.7	---
125	92.7	91.4	91.7	91.4	91.9	92.0	93.9	95.4	96.9	101.3	108.2	113.1	113.7	---
160	92.7	91.4	91.7	91.4	91.9	92.0	93.9	95.4	96.9	101.3	108.2	113.1	113.7	---
200	94.2	93.6	94.1	94.1	94.6	95.3	96.3	97.4	99.1	101.7	106.2	111.0	111.4	---
250	94.2	93.6	94.1	94.1	94.6	95.3	96.3	97.4	99.1	101.7	106.2	111.0	111.4	---
315	94.2	93.6	94.1	94.1	94.6	95.3	96.3	97.4	99.1	101.7	106.2	111.0	111.4	---
400	91.9	92.0	92.6	92.7	93.2	93.2	94.3	96.4	97.6	100.1	103.0	103.1	102.0	---
500	91.9	92.0	92.6	92.7	93.2	93.2	94.3	96.4	97.6	100.1	103.0	103.1	102.0	---
630	91.9	92.0	92.6	92.7	93.2	93.2	94.3	96.4	97.6	100.1	103.0	103.1	102.0	---
800	89.3	88.4	88.3	88.2	87.9	88.2	88.4	90.4	91.4	94.2	95.0	93.3	90.9	---
1000	89.3	88.4	88.3	88.2	87.9	88.2	88.4	90.4	91.4	94.2	95.0	93.3	90.9	---
1250	89.3	88.4	88.3	88.2	87.9	88.2	88.4	90.4	91.4	94.2	95.0	93.3	90.9	---
1600	90.1	88.6	89.0	88.7	88.8	90.5	90.7	93.8	94.8	94.2	91.9	91.4	90.6	---
2000	91.3	92.5	92.5	92.1	91.4	93.2	94.5	95.2	96.7	95.3	93.6	92.1	91.5	---
2500	97.1	106.0	105.7	102.2	99.5	98.5	102.8	100.8	105.9	100.8	97.9	96.5	96.2	---
3150	93.5	94.2	93.4	92.5	91.4	91.3	91.6	93.7	95.1	95.9	93.0	91.4	89.5	---
4000	93.7	92.2	92.5	92.5	91.4	92.4	92.4	95.6	95.5	95.8	92.5	90.8	89.3	---
5000	98.9	98.8	98.1	96.8	94.8	97.2	96.5	98.1	100.8	101.0	98.0	94.8	92.2	---
6300	92.2	93.4	93.2	91.8	91.0	91.3	91.0	93.9	95.0	94.4	91.6	90.3	88.6	---
8000	92.4	94.8	94.6	92.3	92.2	91.2	91.5	94.7	94.8	94.4	92.2	90.5	89.1	---

AVERAGE NET REFERRED THRUST, FN/DELTA = 7994.9 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED,N1/VTHETA = 4232.4 RPM
AVERAGE JET EXHAUST VELOCITY = 1437.1 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.62

ANALYSIS OF JT3D STATIC NOISE-REDUCTION TESTS AT EDWARDS AFB

TABLE A-3.– SIMULATED VARIABLE-AREA PRIMARY NOZZLE. EXIT AREA OF CONICAL EXHAUST NOZZLE WAS 60-PERCENT OF EXISTING PRODUCTION NOZZLE. EXISTING INLET AND FAN-EXHAUST DUCTS – Continued.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 050-06, 051-06, AND 052-06.

BAND CENTER FREQUENCY, HZ	ANGLES FROM ENGINE INLET CENTERLINE, DEGREES													
	15	30	40	50	60	75	90	100	110	120	130	140	150	160
50	90.6	88.4	88.8	89.5	89.8	90.7	92.0	93.0	95.9	100.9	106.2	110.0	112.4	---
63	90.6	88.4	88.8	89.5	89.8	90.7	92.0	93.0	95.9	100.9	106.2	110.0	112.4	---
80	90.6	88.4	88.8	89.5	89.8	90.7	92.0	93.0	95.9	100.9	106.2	110.0	112.4	---
100	96.0	94.9	94.9	95.1	95.3	95.4	97.7	98.9	100.9	106.2	113.8	118.2	117.6	---
125	96.0	94.9	94.9	95.1	95.3	95.4	97.7	98.9	100.9	106.2	113.8	118.2	117.6	---
160	96.0	94.9	94.9	95.1	95.3	95.4	97.7	98.9	100.9	106.2	113.8	118.2	117.6	---
200	98.5	98.5	99.2	99.0	99.0	100.2	101.1	102.3	103.5	107.0	113.1	117.7	116.8	---
250	98.5	98.5	99.2	99.0	99.0	100.2	101.1	102.3	103.5	107.0	113.1	117.7	116.8	---
315	98.5	98.5	99.2	99.0	99.0	100.2	101.1	102.3	103.5	107.0	113.1	117.7	116.8	---
400	96.7	97.1	98.1	97.9	98.4	98.0	99.7	101.7	102.7	105.8	110.2	111.1	110.5	---
500	96.7	97.1	98.1	97.9	98.4	98.0	99.7	101.7	102.7	105.8	110.2	111.1	110.5	---
630	96.7	97.1	98.1	97.9	98.4	98.0	99.7	101.7	102.7	105.8	110.2	111.1	110.5	---
800	93.0	92.2	92.6	92.9	92.9	93.4	93.8	95.8	97.3	100.9	102.8	100.9	99.3	---
1000	93.0	92.2	92.6	92.9	92.9	93.4	93.8	95.8	97.3	100.9	102.8	100.9	99.3	---
1250	93.0	92.2	92.6	92.9	92.9	93.4	93.8	95.8	97.3	100.9	102.8	100.9	99.3	---
1600	92.7	91.4	91.5	92.0	92.8	94.0	94.7	97.7	99.2	99.0	98.4	97.6	96.0	---
2000	93.2	92.5	92.5	92.6	93.2	94.9	96.0	98.4	99.6	99.3	97.8	96.6	95.3	---
2500	98.7	105.3	101.6	103.8	103.6	99.6	106.2	103.7	106.9	105.4	102.1	98.5	99.3	---
3150	94.4	96.9	95.1	96.3	96.3	94.8	98.4	98.4	100.5	100.2	97.9	96.5	95.9	---
4000	93.3	92.0	92.3	92.5	92.5	93.8	94.3	96.4	97.7	97.7	95.6	94.5	93.0	---
5000	98.3	100.1	96.2	96.8	95.9	96.9	98.9	100.9	102.9	99.7	97.1	95.9	93.8	---
6300	93.7	94.4	92.6	91.9	91.2	92.4	93.1	95.9	96.4	95.4	94.2	93.2	91.3	---
8000	93.1	95.2	92.7	91.7	92.5	93.2	94.4	97.3	97.8	96.8	93.5	92.4	91.3	---

AVERAGE NET REFERRED THRUST, FN/DELTA = 10171.2 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED,N1/VTHETA = 4571.5 RPM
AVERAGE JET EXHAUST VELOCITY = 1657.3 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.83

TABLE A-3.– SIMULATED VARIABLE-AREA PRIMARY NOZZLE. EXIT AREA OF CONICAL EXHAUST NOZZLE WAS 60-PERCENT OF EXISTING PRODUCTION NOZLE. EXISTING INLET AND FAN-EXHAUST DUCTS – Concluded.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 050-07, 051-07, AND 052-07.

BAND CENTER FREQUENCY, HZ	ANGLES FROM ENGINE INLET CENTERLINE, DEGREES													
	15	30	40	50	60	75	90	100	110	120	130	140	150	160
50	92.7	90.3	90.8	91.2	91.7	92.5	93.9	94.8	96.9	103.9	108.7	112.5	114.8	---
63	92.7	90.3	90.8	91.2	91.7	92.5	93.9	94.8	96.9	103.9	108.7	112.5	114.8	---
80	92.7	90.3	90.8	91.2	91.7	92.5	93.9	94.8	96.9	103.9	108.7	112.5	114.8	---
100	97.9	97.2	97.3	97.5	97.8	97.9	100.4	100.9	102.3	110.0	117.5	121.4	120.1	---
125	97.9	97.2	97.3	97.5	97.8	97.9	100.4	100.9	102.3	110.0	117.5	121.4	120.1	---
160	97.9	97.2	97.3	97.5	97.8	97.9	100.4	100.9	102.3	110.0	117.5	121.4	120.1	---
200	101.8	102.4	102.7	102.4	102.6	103.2	104.6	105.5	106.2	111.3	117.7	121.5	119.8	---
250	101.8	102.4	102.7	102.4	102.6	103.2	104.6	105.5	106.2	111.3	117.7	121.5	119.8	---
315	101.8	102.4	102.7	102.4	102.6	103.2	104.6	105.5	106.2	111.3	117.7	121.5	119.8	---
400	100.9	101.5	102.9	102.0	102.2	101.9	103.8	105.2	106.3	110.6	115.8	117.8	114.8	---
500	100.9	101.5	102.9	102.0	102.2	101.9	103.8	105.2	106.3	110.6	115.8	117.8	114.8	---
630	100.9	101.5	102.9	102.0	102.2	101.9	103.8	105.2	106.3	110.6	115.8	117.8	114.8	---
800	96.7	96.1	96.3	96.7	97.0	97.0	98.2	99.5	100.7	106.3	109.2	109.7	105.7	---
1000	96.7	96.1	96.3	96.7	97.0	97.0	98.2	99.5	100.7	106.3	109.2	109.7	105.7	---
1250	96.7	96.1	96.3	96.7	97.0	97.0	98.2	99.5	100.7	106.3	109.2	109.7	105.7	---
1600	95.9	94.7	95.3	95.8	96.3	97.7	98.6	101.1	103.2	104.0	104.6	104.2	101.5	---
2000	97.1	94.6	95.2	95.5	96.4	98.1	99.3	101.7	103.5	103.0	103.5	103.6	100.5	---
2500	100.8	103.4	101.0	99.0	98.7	101.0	102.8	101.6	106.5	105.4	104.4	102.8	100.6	---
3150	102.1	105.8	103.5	99.7	100.5	100.1	105.0	101.2	103.2	104.9	104.1	102.2	99.8	---
4000	94.5	93.7	93.9	94.3	94.7	96.3	97.4	99.0	100.9	101.8	100.4	100.4	97.4	---
5000	95.8	95.2	95.1	95.4	94.7	97.0	98.6	101.0	101.9	101.0	99.4	99.1	96.0	---
6300	95.0	97.0	96.4	94.8	94.2	95.6	96.0	99.5	99.1	99.0	97.5	97.2	94.5	---
8000	93.2	94.7	93.2	92.4	93.8	95.3	96.6	98.1	98.6	97.9	95.9	95.7	93.7	---

AVERAGE NET REFERRED THRUST, FN/DELTA = 11996.7 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED,N1/VTHETA = 4846.4 RPM
AVERAGE JET EXHAUST VELOCITY = 1867.4 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 2.06

ANALYSIS OF JT3D STATIC NOISE-REDUCTION TESTS AT EDWARDS AFB

TABLE A-4. – SIMULATED VARIABLE-AREA PRIMARY NOZZLE. EXIT AREA OF CONICAL EXHAUST NOZZLE WAS 80-PERCENT OF EXISTING PRODUCTION NOZZLE. EXISTING INLET AND FAN-EXHAUST DUCTS.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 053-01, 054-01, AND 055-01.

BAND CENTER FREQUENCY, HZ	ANGLES FROM ENGINE INLET CENTERLINE, DEGREES													
	15	30	40	50	60	75	90	100	110	120	130	140	150	160
50	74.6	73.5	73.4	74.6	75.3	75.3	75.6	75.3	75.6	76.7	77.1	78.3	79.2	---
63	74.6	73.5	73.4	74.6	75.3	75.3	75.6	75.3	75.6	76.7	77.1	78.3	79.2	---
80	74.6	73.5	73.4	74.6	75.3	75.3	75.6	75.3	75.6	76.7	77.1	78.3	79.2	---
100	77.1	77.0	77.5	77.5	78.2	78.1	78.5	78.7	79.2	79.5	80.2	81.1	81.2	---
125	77.1	77.0	77.5	77.5	78.2	78.1	78.5	78.7	79.2	79.5	80.2	81.1	81.2	---
160	77.1	77.0	77.5	77.5	78.2	78.1	78.5	78.7	79.2	79.5	80.2	81.1	81.2	---
200	77.4	78.5	78.0	77.7	78.3	79.0	78.9	79.5	79.8	79.2	79.5	78.8	79.2	---
250	77.4	78.5	78.0	77.7	78.3	79.0	78.9	79.5	79.8	79.2	79.5	78.8	79.2	---
315	77.4	78.5	78.0	77.7	78.3	79.0	78.9	79.5	79.8	79.2	79.5	78.8	79.2	---
400	75.8	75.1	74.5	74.2	73.7	74.1	74.3	75.3	77.1	77.3	76.7	74.4	73.0	---
500	75.8	75.1	74.5	74.2	73.7	74.1	74.3	75.3	77.1	77.3	76.7	74.4	73.0	---
630	75.8	75.1	74.5	74.2	73.7	74.1	74.3	75.3	77.1	77.3	76.7	74.4	73.0	---
800	83.6	82.8	79.3	77.8	75.4	74.9	74.8	76.7	74.8	77.8	78.2	77.7	73.8	---
1000	83.6	82.8	79.3	77.8	75.4	74.9	74.8	76.7	74.8	77.8	78.2	77.7	73.8	---
1250	83.6	82.8	79.3	77.8	75.4	74.9	74.8	76.7	74.8	77.8	78.2	77.7	73.8	---
1600	86.8	84.8	86.3	85.5	84.8	83.6	81.9	82.9	82.5	82.0	81.2	78.6	76.1	---
2000	86.4	85.5	86.2	86.9	86.4	82.9	79.8	82.4	82.6	82.3	83.0	78.2	75.9	---
2500	91.3	92.9	94.1	87.6	86.7	85.6	84.8	84.9	90.7	89.1	92.0	87.9	83.3	---
3150	93.1	96.4	97.6	93.7	90.5	92.2	90.6	91.2	96.3	96.0	96.4	91.8	87.5	---
4000	87.8	87.5	86.5	86.3	86.2	83.6	83.5	87.8	88.4	87.9	86.4	84.7	81.7	---
5000	86.1	85.4	85.6	83.9	82.3	81.4	83.6	86.5	86.7	86.4	85.2	82.8	79.8	---
6300	84.7	86.8	85.2	84.0	81.3	79.4	78.8	83.1	84.8	82.8	83.6	80.6	77.3	---
8000	82.2	81.4	82.2	80.1	79.3	76.7	78.8	81.2	81.5	81.3	81.7	77.8	74.9	---

AVERAGE NET REFERRED THRUST, FN/DELTA = 2005.5 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED,N1/VTHETA = 2561.6 RPM
AVERAGE JET EXHAUST VELOCITY = 516.1 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.08

TABLE A-4. – SIMULATED VARIABLE-AREA PRIMARY NOZZLE. EXIT AREA OF CONICAL EXHAUST NOZZLE WAS 80-PERCENT OF EXISTING PRODUCTION NOZZLE. EXISTING INLET AND FAN-EXHAUST DUCTS – Continued.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 053-02, 054-02, AND 055-02.

BAND CENTER FREQUENCY, HZ	ANGLES FROM ENGINE INLET CENTERLINE, DEGREES													
	15	30	40	50	60	75	90	100	110	120	130	140	150	160
50	80.7	79.1	79.5	80.6	80.9	81.7	82.3	83.0	83.6	85.1	86.9	89.3	90.5	---
63	80.7	79.1	79.5	80.6	80.9	81.7	82.3	83.0	83.6	85.1	86.9	89.3	90.5	---
80	80.7	79.1	79.5	80.6	80.9	81.7	82.3	83.0	83.6	85.1	86.9	89.3	90.5	---
100	82.2	82.5	82.8	83.2	84.0	83.8	84.2	84.8	85.2	87.0	88.8	91.4	91.5	---
125	82.2	82.5	82.8	83.2	84.0	83.8	84.2	84.8	85.2	87.0	88.8	91.4	91.5	---
160	82.2	82.5	82.8	83.2	84.0	83.8	84.2	84.8	85.2	87.0	88.8	91.4	91.5	---
200	84.3	84.8	84.5	84.8	85.7	86.8	86.3	87.1	87.6	86.9	87.1	87.6	87.8	---
250	84.3	84.8	84.5	84.8	85.7	86.8	86.3	87.1	87.6	86.9	87.1	87.6	87.8	---
315	84.3	84.8	84.5	84.8	85.7	86.8	86.3	87.1	87.6	86.9	87.1	87.6	87.8	---
400	82.2	81.2	81.3	81.5	81.6	82.5	82.6	83.5	84.6	85.2	84.7	83.5	81.9	---
500	82.2	81.2	81.3	81.5	81.6	82.5	82.6	83.5	84.6	85.2	84.7	83.5	81.9	---
630	82.2	81.2	81.3	81.5	81.6	82.5	82.6	83.5	84.6	85.2	84.7	83.5	81.9	---
800	83.7	83.3	81.9	80.2	78.6	78.2	77.6	79.0	78.5	81.6	80.2	78.0	76.5	---
1000	83.7	83.3	81.9	80.2	78.6	78.2	77.6	79.0	78.5	81.6	80.2	78.0	76.5	---
1250	83.7	83.3	81.9	80.2	78.6	78.2	77.6	79.0	78.5	81.6	80.2	78.0	76.5	---
1600	85.0	84.9	84.8	84.5	81.9	82.4	80.8	85.5	84.1	84.4	81.7	79.7	78.0	---
2000	92.7	91.3	93.7	97.3	92.3	93.3	87.8	96.4	96.9	97.7	94.5	89.1	88.7	---
2500	91.0	93.9	94.0	91.5	89.3	86.4	85.6	88.8	89.0	88.6	89.6	83.8	81.5	---
3150	90.5	91.4	90.2	88.5	87.7	85.3	84.5	87.3	88.5	88.2	88.5	83.1	80.8	---
4000	95.5	95.6	97.2	95.9	95.0	94.3	95.4	98.6	101.2	97.1	96.3	93.1	92.1	---
5000	90.8	90.9	91.3	91.0	88.8	87.4	87.8	91.3	91.8	89.9	90.2	87.7	84.9	---
6300	92.3	94.0	94.8	92.4	91.2	88.5	89.0	92.6	93.8	91.2	91.3	87.9	85.0	---
8000	88.8	90.9	90.8	87.6	87.0	86.3	87.4	90.8	90.2	90.1	87.9	85.4	82.4	---

AVERAGE NET REFERRED THRUST, FN/DELTA = 3988.9 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED,N1/VTHETA = 3484.3 RPM
AVERAGE JET EXHAUST VELOCITY = 741.9 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.16

TABLE A-4. – SIMULATED VARIABLE-AREA PRIMARY NOZZLE. EXIT AREA OF CONICAL EXHAUST NOZZLE WAS 80-PERCENT OF EXISTING PRODUCTION NOZZLE. EXISTING INLET AND FAN-EXHAUST DUCTS – Continued.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 053-03, 054-03, AND 055-03.

	ANGLES FROM ENGINE INLET CENTERLINE, DEGREES													
BAND CENTER FREQUENCY, HZ	15	30	40	50	60	75	90	100	110	120	130	140	150	160
50	83.0	81.0	81.5	82.8	83.3	84.0	84.5	85.7	86.5	88.0	90.5	93.2	94.7	---
63	83.0	81.0	81.5	82.8	83.3	84.0	84.5	85.7	86.5	88.0	90.5	93.2	94.7	---
80	83.0	81.0	81.5	82.8	83.3	84.0	84.5	85.7	86.5	88.0	90.5	93.2	94.7	---
100	84.4	84.5	84.7	85.3	86.3	86.0	86.4	87.4	88.1	89.6	92.5	95.4	95.9	---
125	84.4	84.5	84.7	85.3	86.3	86.0	86.4	87.4	88.1	89.6	92.5	95.4	95.9	---
160	84.4	84.5	84.7	85.3	86.3	86.0	86.4	87.4	88.1	89.6	92.5	95.4	95.9	---
200	86.4	86.6	86.3	87.0	87.8	88.8	88.7	89.4	89.9	89.5	90.3	91.1	90.8	---
250	86.4	86.6	86.3	87.0	87.8	88.8	88.7	89.4	89.9	89.5	90.3	91.1	90.8	---
315	86.4	86.6	86.3	87.0	87.8	88.8	88.7	89.4	89.9	89.5	90.3	91.1	90.8	---
400	84.4	83.5	83.7	84.4	84.6	85.3	85.4	86.2	86.9	87.9	88.0	86.8	85.1	---
500	84.4	83.5	83.7	84.4	84.6	85.3	85.4	86.2	86.9	87.9	88.0	86.8	85.1	---
630	84.4	83.5	83.7	84.4	84.6	85.3	85.4	86.2	86.9	87.9	88.0	86.8	85.1	---
800	84.1	84.0	82.6	81.5	80.0	79.6	79.3	81.2	80.3	82.7	81.8	80.3	74.9	---
1000	84.1	84.0	82.6	81.5	80.0	79.6	79.3	81.2	80.3	82.7	81.8	80.3	74.9	---
1250	84.1	84.0	82.6	81.5	80.0	79.6	79.3	81.2	80.3	82.7	81.8	80.3	74.9	---
1600	85.9	84.9	84.7	84.7	83.4	83.1	82.4	86.3	86.2	85.6	81.7	79.6	78.1	---
2000	92.8	94.8	97.7	94.7	94.0	89.9	91.5	94.2	97.2	97.0	91.8	90.8	88.5	---
2500	94.4	96.3	99.4	95.5	95.7	90.5	91.4	94.4	94.9	98.8	91.4	89.9	87.9	---
3150	92.8	93.9	93.9	92.2	90.4	87.4	86.0	88.6	89.7	88.9	86.8	84.5	82.0	---
4000	96.5	95.4	95.6	96.0	93.9	94.0	93.4	98.6	96.0	94.2	93.5	90.8	89.4	---
5000	95.3	95.9	95.6	95.0	93.5	91.6	91.9	96.6	95.5	94.0	93.1	92.3	90.1	---
6300	94.6	95.9	95.3	95.4	94.3	92.0	92.3	95.8	95.0	93.2	92.0	89.9	86.9	---
8000	90.5	91.8	90.8	89.7	90.0	89.0	90.3	92.1	91.5	92.1	88.3	86.3	83.6	---

AVERAGE NET REFERRED THRUST, FN/DELTA = 4995.1 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED,N1/VTHETA = 3813.4 RPM
AVERAGE JET EXHAUST VELOCITY = 836.5 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.21

TABLE A-4. – SIMULATED VARIABLE-AREA PRIMARY NOZZLE. EXIT AREA OF CONICAL EXHAUST NOZZLE WAS 80-PERCENT OF EXISTING PRODUCTION NOZZLE. EXISTING INLET AND FAN-EXHAUST DUCTS – Continued.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 053-04, 054-04, AND 055-04.

BAND CENTER FREQUENCY, HZ	ANGLES FROM ENGINE INLET CENTERLINE, DEGREES 15	30	40	50	60	75	90	100	110	120	130	140	150	160
50	85.0	83.6	83.4	84.2	84.9	85.8	86.7	87.9	88.9	90.7	93.7	96.9	98.7	---
63	85.0	83.6	83.4	84.2	84.9	85.8	86.7	87.9	88.9	90.7	93.7	96.9	98.7	---
80	85.0	83.6	83.4	84.2	84.9	85.8	86.7	87.9	88.9	90.7	93.7	96.9	98.7	---
100	86.3	86.6	86.7	87.4	88.2	87.6	88.3	89.6	90.7	92.7	96.1	99.6	100.3	---
125	86.3	86.6	86.7	87.4	88.2	87.6	88.3	89.6	90.7	92.7	96.1	99.6	100.3	---
160	86.3	86.6	86.7	87.4	88.2	87.6	88.3	89.6	90.7	92.7	96.1	99.6	100.3	---
200	88.6	88.4	88.1	88.8	89.4	90.5	90.4	91.1	91.9	92.1	93.7	95.0	94.3	---
250	88.6	88.4	88.1	88.8	89.4	90.5	90.4	91.1	91.9	92.1	93.7	95.0	94.3	---
315	88.6	88.4	88.1	88.8	89.4	90.5	90.4	91.1	91.9	92.1	93.7	95.0	94.3	---
400	86.8	86.2	86.3	86.7	86.9	87.5	87.8	88.8	89.6	90.9	91.1	90.2	87.9	---
500	86.8	86.2	86.3	86.7	86.9	87.5	87.8	88.8	89.6	90.9	91.1	90.2	87.9	---
630	86.8	86.2	86.3	86.7	86.9	87.5	87.8	88.8	89.6	90.9	91.1	90.2	87.9	---
800	85.8	85.6	84.0	82.8	82.1	81.4	81.5	82.9	82.7	84.9	84.2	82.4	81.0	---
1000	85.8	85.6	84.0	82.8	82.1	81.4	81.5	82.9	82.7	84.9	84.2	82.4	81.0	---
1250	85.8	85.6	84.0	82.8	82.1	81.4	81.5	82.9	82.7	84.9	84.2	82.4	81.0	---
1600	87.7	84.6	85.2	85.3	84.1	85.1	84.2	88.9	88.7	88.7	84.1	82.3	81.1	---
2000	93.4	92.0	94.7	92.5	93.8	92.1	90.6	94.5	97.9	92.8	90.7	90.3	90.5	---
2500	97.3	100.1	107.8	100.2	99.8	100.6	94.2	100.8	103.2	101.4	98.5	94.9	96.0	---
3150	93.1	93.4	93.8	92.7	90.7	89.2	87.1	90.6	91.1	90.8	87.7	86.0	84.0	---
4000	94.0	91.8	92.9	92.6	92.4	91.5	93.8	96.7	95.6	96.9	93.1	89.1	87.7	---
5000	97.1	97.9	97.8	96.3	95.1	93.7	95.7	97.5	99.6	100.5	97.2	94.2	92.8	---
6300	93.2	93.7	93.8	93.0	92.0	92.6	91.8	94.8	94.4	93.3	91.4	88.8	87.2	---
8000	92.9	93.9	94.2	91.8	92.4	92.2	92.7	94.5	94.0	93.9	90.6	87.8	85.9	---

AVERAGE NET REFERRED THRUST, FN/DELTA = 6000.5 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED,N1/VTHETA = 4101.9 RPM
AVERAGE JET EXHAUST VELOCITY = 937.2 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.27

ANALYSIS OF JT3D STATIC NOISE-REDUCTION TESTS AT EDWARDS AFB

TABLE A-4. – SIMULATED VARIABLE-AREA PRIMARY NOZZLE. EXIT AREA OF CONICAL EXHAUST NOZZLE WAS 80-PERCENT OF EXISTING PRODUCTION NOZZLE. EXISTING INLET AND FAN-EXHAUST DUCTS – Continued.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 053-05, 054-05, AND 055-05.

BAND CENTER FREQUENCY, HZ	ANGLES FROM ENGINE INLET CENTERLINE, DEGREES													
	15	30	40	50	60	75	90	100	110	120	130	140	150	160
50	87.3	86.0	86.1	87.2	87.8	88.7	89.8	91.0	91.9	95.2	98.8	102.6	104.5	---
63	87.3	86.0	86.1	87.2	87.8	88.7	89.8	91.0	91.9	95.2	98.8	102.6	104.5	---
80	87.3	86.0	86.1	87.2	87.8	88.7	89.8	91.0	91.9	95.2	98.8	102.6	104.5	---
100	90.3	90.2	90.4	90.8	91.3	90.9	92.3	93.8	94.8	97.6	102.4	106.7	107.3	---
125	90.3	90.2	90.4	90.8	91.3	90.9	92.3	93.8	94.8	97.6	102.4	106.7	107.3	---
160	90.3	90.2	90.4	90.8	91.3	90.9	92.3	93.8	94.8	97.6	102.4	106.7	107.3	---
200	91.5	91.4	91.3	91.3	92.3	93.3	93.5	94.5	95.5	96.7	99.3	101.8	101.0	---
250	91.5	91.4	91.3	91.3	92.3	93.3	93.5	94.5	95.5	96.7	99.3	101.8	101.0	---
315	91.5	91.4	91.3	91.3	92.3	93.3	93.5	94.5	95.5	96.7	99.3	101.8	101.0	---
400	90.3	89.7	90.2	90.6	91.2	91.4	91.8	93.0	94.0	95.3	96.5	95.6	93.0	---
500	90.3	89.7	90.2	90.6	91.2	91.4	91.8	93.0	94.0	95.3	96.5	95.6	93.0	---
630	90.3	89.7	90.2	90.6	91.2	91.4	91.8	93.0	94.0	95.3	96.5	95.6	93.0	---
800	87.3	87.8	86.6	87.1	86.2	85.4	85.2	86.8	86.8	89.1	89.2	87.7	85.7	---
1000	87.3	87.8	86.6	87.1	86.2	85.4	85.2	86.8	86.8	89.1	89.2	87.7	85.7	---
1250	87.3	87.8	86.6	87.1	86.2	85.4	85.2	86.8	86.8	89.1	89.2	87.7	85.7	---
1600	89.2	87.6	86.8	86.3	86.9	88.5	87.8	91.4	91.4	91.8	87.6	85.6	84.4	---
2000	90.3	90.0	89.8	89.9	89.0	89.3	90.0	92.5	92.9	92.8	89.1	86.7	85.6	---
2500	101.0	106.6	103.4	104.5	99.6	99.9	106.7	104.2	105.7	103.4	99.4	96.7	98.6	---
3150	96.2	99.3	97.0	96.6	94.6	93.9	97.5	96.2	98.4	95.9	94.6	92.2	91.3	---
4000	93.5	92.5	92.5	92.8	91.8	92.2	91.0	94.5	94.4	93.5	90.9	88.6	86.8	---
5000	97.1	101.2	97.4	99.1	97.3	97.9	97.1	101.3	102.6	99.8	97.1	95.1	92.9	---
6300	93.9	95.8	94.4	93.2	92.5	92.7	92.3	95.5	96.7	94.4	92.7	91.5	88.8	---
8000	94.7	96.2	95.3	93.8	93.9	95.4	96.4	98.8	97.8	97.1	93.6	91.6	89.9	---

AVERAGE NET REFERRED THRUST, FN/DELTA = 7974.8 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED,N1/VTHETA = 4570.4 RPM
AVERAGE JET EXHAUST VELOCITY = 1117.8 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.38

TABLE A-4. – SIMULATED VARIABLE-AREA PRIMARY NOZZLE. EXIT AREA OF CONICAL EXHAUST NOZZLE WAS 80-PERCENT OF EXISTING PRODUCTION NOZZLE. EXISTING INLET AND FAN-EXHAUST DUCTS – Continued.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 053-06, 054-06, AND 055-06.

		ANGLES FROM ENGINE INLET CENTERLINE, DEGREES													
B		15	30	40	50	60	75	90	100	110	120	130	140	150	160
A	50	89.4	88.0	88.2	89.4	89.8	91.1	92.5	93.3	95.1	99.0	103.4	107.1	109.3	---
N	63	89.4	88.0	88.2	89.4	89.8	91.1	92.5	93.3	95.1	99.0	103.4	107.1	109.3	---
D	80	89.4	88.0	88.2	89.4	89.8	91.1	92.5	93.3	95.1	99.0	103.4	107.1	109.3	---
	100	93.6	93.4	93.5	93.6	93.8	94.0	95.7	97.0	98.6	102.2	108.2	112.7	112.9	---
C	125	93.6	93.4	93.5	93.6	93.8	94.0	95.7	97.0	98.6	102.2	108.2	112.7	112.9	---
E	160	93.6	93.4	93.5	93.6	93.8	94.0	95.7	97.0	98.6	102.2	108.2	112.7	112.9	---
N	200	94.6	94.1	94.0	93.8	94.8	95.6	96.2	97.8	99.2	101.2	104.9	108.3	107.7	---
T	250	94.6	94.1	94.0	93.8	94.8	95.6	96.2	97.8	99.2	101.2	104.9	108.3	107.7	---
E	315	94.6	94.1	94.0	93.8	94.8	95.6	96.2	97.8	99.2	101.2	104.9	108.3	107.7	---
R	400	93.2	92.7	93.3	93.8	94.0	94.1	95.0	96.8	97.7	99.8	101.5	100.6	97.9	---
	500	93.2	92.7	93.3	93.8	94.0	94.1	95.0	96.8	97.7	99.8	101.5	100.6	97.9	---
F	630	93.2	92.7	93.3	93.8	94.0	94.1	95.0	96.8	97.7	99.8	101.5	100.6	97.9	---
R	800	89.3	89.8	90.1	91.4	90.8	90.0	89.4	92.4	91.5	95.2	94.4	92.4	90.7	---
E	1000	89.3	89.8	90.1	91.4	90.8	90.0	89.4	92.4	91.5	95.2	94.4	92.4	90.7	---
Q	1250	89.3	89.8	90.1	91.4	90.8	90.0	89.4	92.4	91.5	95.2	94.4	92.4	90.7	---
U	1600	89.7	89.3	88.4	87.8	88.5	90.1	89.7	92.3	93.2	94.1	91.6	90.9	88.8	---
E	2000	91.8	89.7	89.5	89.9	90.1	91.3	91.5	94.0	94.8	94.4	91.9	90.5	88.5	---
N	2500	102.1	103.0	98.3	97.8	99.6	99.5	101.2	99.8	102.8	103.4	99.0	98.9	97.8	---
C	3150	101.6	105.6	102.0	104.3	102.3	100.4	103.7	102.2	100.7	107.5	101.5	99.5	99.2	---
Y	4000	94.4	93.1	93.6	92.9	94.4	93.6	92.5	95.5	96.6	95.7	92.5	91.0	89.4	---
,	5000	96.1	95.9	95.5	95.6	96.4	98.8	95.8	99.6	100.6	98.0	94.6	93.3	91.0	---
H	6300	99.4	100.0	99.3	97.8	97.5	97.3	96.2	100.0	99.6	98.1	96.3	94.4	91.8	---
Z	8000	94.7	96.7	95.5	95.0	95.2	97.0	96.8	100.2	99.4	98.5	94.4	93.1	90.4	---

AVERAGE NET REFERRED THRUST, FN/DELTA = 9979.3 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED,N1/VTHETA = 4953.5 RPM
AVERAGE JET EXHAUST VELOCITY = 1292.2 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.51

ANALYSIS OF JT3D STATIC NOISE-REDUCTION TESTS AT EDWARDS AFB

TABLE A-4. – SIMULATED VARIABLE-AREA PRIMARY NOZZLE. EXIT AREA OF CONICAL EXHAUST NOZZLE WAS 80-PERCENT OF EXISTING PRODUCTION NOZZLE. EXISTING INLET AND FAN-EXHAUST DUCTS – Continued.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 053-07, 054-07, AND 055-07.

BAND CENTER FREQUENCY, HZ	ANGLES FROM ENGINE INLET CENTERLINE, DEGREES													
	15	30	40	50	60	75	90	100	110	120	130	140	150	160
50	92.0	89.6	90.5	91.6	91.7	93.0	94.4	95.5	97.4	102.2	106.7	110.5	112.7	---
63	92.0	89.6	90.5	91.6	91.7	93.0	94.4	95.5	97.4	102.2	106.7	110.5	112.7	---
80	92.0	89.6	90.5	91.6	91.7	93.0	94.4	95.5	97.4	102.2	106.7	110.5	112.7	---
100	96.7	96.0	96.0	96.1	96.4	96.7	98.5	99.9	101.6	106.0	113.0	117.5	116.9	---
125	96.7	96.0	96.0	96.1	96.4	96.7	98.5	99.9	101.6	106.0	113.0	117.5	116.9	---
160	96.7	96.0	96.0	96.1	96.4	96.7	98.5	99.9	101.6	106.0	113.0	117.5	116.9	---
200	97.8	97.2	96.9	97.0	97.6	98.7	99.5	100.9	102.5	105.3	110.2	114.6	113.8	---
250	97.8	97.2	96.9	97.0	97.6	98.7	99.5	100.9	102.5	105.3	110.2	114.6	113.8	---
315	97.8	97.2	96.9	97.0	97.6	98.7	99.5	100.9	102.5	105.3	110.2	114.6	113.8	---
400	95.8	95.8	96.4	96.4	96.9	96.9	98.0	99.7	101.1	103.5	105.9	105.8	104.5	---
500	95.8	95.8	96.4	96.4	96.9	96.9	98.0	99.7	101.1	103.5	105.9	105.8	104.5	---
630	95.8	95.8	96.4	96.4	96.9	96.9	98.0	99.7	101.1	103.5	105.9	105.8	104.5	---
800	92.1	92.8	93.1	91.7	91.5	92.0	92.5	94.2	95.1	98.0	98.4	96.7	94.4	---
1000	92.1	92.8	93.1	91.7	91.5	92.0	92.5	94.2	95.1	98.0	98.4	96.7	94.4	---
1250	92.1	92.8	93.1	91.7	91.5	92.0	92.5	94.2	95.1	98.0	98.4	96.7	94.4	---
1600	91.0	89.8	90.1	90.2	90.2	92.7	93.1	96.0	96.9	96.5	94.8	93.7	92.4	---
2000	93.4	91.6	92.2	91.7	91.8	93.5	94.3	97.1	97.9	97.1	95.5	93.9	92.1	---
2500	100.6	97.5	96.9	99.6	98.6	100.2	102.8	103.8	100.3	101.7	98.9	97.5	96.4	---
3150	107.0	108.8	108.8	106.4	107.3	105.5	106.4	107.7	106.4	106.7	102.8	102.1	100.9	---
4000	95.4	95.1	95.7	95.5	95.7	96.0	95.2	98.7	98.0	98.1	96.1	94.9	93.9	---
5000	96.0	94.8	96.1	95.2	94.9	96.9	96.4	100.9	100.5	98.6	95.6	94.5	93.5	---
6300	99.1	101.1	101.1	98.9	97.6	102.3	99.5	105.9	105.3	101.7	99.5	97.7	97.0	---
8000	94.8	95.4	95.3	93.9	95.4	97.6	99.4	100.2	98.6	98.7	94.8	94.4	93.3	---

AVERAGE NET REFERRED THRUST, FN/DELTA = 11965.8 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED,N1/VTHETA = 5270.8 RPM
AVERAGE JET EXHAUST VELOCITY = 1456.2 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.66

TABLE A-4. – SIMULATED VARIABLE-AREA PRIMARY NOZLE. EXIT AREA OF CONICAL EXHAUST NOZZLE WAS 80-PERCENT OF EXISTING PRODUCTION NOZZLE. EXISTING INLET AND FAN-EXHAUST DUCTS – Continued.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 053-08, 054-08, AND 055-08.

BAND CENTER FREQUENCY, HZ	ANGLES FROM ENGINE INLET CENTERLINE, DEGREES 15	30	40	50	60	75	90	100	110	120	130	140	150	160
50	92.8	90.6	91.3	92.2	92.7	93.9	95.1	96.1	98.4	103.7	108.4	112.1	114.2	---
63	92.8	90.6	91.3	92.2	92.7	93.9	95.1	96.1	98.4	103.7	108.4	112.1	114.2	---
80	92.8	90.6	91.3	92.2	92.7	93.9	95.1	96.1	98.4	103.7	108.4	112.1	114.2	---
100	97.9	97.2	97.2	97.2	97.6	97.8	99.9	101.2	102.8	107.7	115.3	119.5	118.1	---
125	97.9	97.2	97.2	97.2	97.6	97.8	99.9	101.2	102.8	107.7	115.3	119.5	118.1	---
160	97.9	97.2	97.2	97.2	97.6	97.8	99.9	101.2	102.8	107.7	115.3	119.5	118.1	---
200	99.4	98.8	98.7	98.5	99.2	100.3	101.1	102.4	104.1	100.2	112.8	117.2	116.3	---
250	99.4	98.8	98.7	98.5	99.2	100.3	101.1	102.4	104.1	100.2	112.8	117.2	116.3	---
315	99.4	98.8	98.7	98.5	99.2	100.3	101.1	102.4	104.1	100.2	112.8	117.2	116.3	---
400	97.1	97.2	97.8	97.6	98.4	98.4	97.7	101.5	102.9	94.1	108.4	108.8	107.9	---
500	97.1	97.2	97.8	97.6	98.4	98.4	97.7	101.5	102.9	94.1	108.4	108.8	107.9	---
630	97.1	97.2	97.8	97.6	98.4	98.4	97.7	101.5	102.9	94.1	108.4	108.8	107.9	---
800	93.4	93.3	93.4	93.1	93.1	94.1	94.0	95.7	97.1	103.1	101.2	99.5	97.2	---
1000	93.4	93.3	93.4	93.1	93.1	94.1	94.0	95.7	97.1	103.1	101.2	99.5	97.2	---
1250	93.4	93.3	93.4	93.1	93.1	94.1	94.0	95.7	97.1	103.1	101.2	99.5	97.2	---
1600	93.0	93.4	91.9	91.8	92.5	94.1	94.2	96.6	98.1	98.4	97.5	95.6	94.2	---
2000	95.5	93.2	92.9	92.6	93.4	94.9	95.5	97.5	99.1	98.3	96.8	95.5	93.4	---
2500	101.0	97.5	99.8	96.8	96.6	99.2	100.9	102.8	101.3	102.3	98.4	98.0	96.6	---
3150	107.3	106.6	107.3	105.4	102.6	105.7	106.9	109.7	107.9	108.8	103.6	103.9	102.0	---
4000	96.9	96.7	95.7	96.2	95.3	97.1	96.4	98.9	99.4	98.9	97.4	96.4	94.7	---
5000	97.5	96.4	96.4	95.9	95.7	97.9	97.4	99.8	100.0	98.6	95.9	94.9	93.4	---
6300	101.4	101.3	101.9	100.0	99.3	102.6	99.7	104.5	105.1	103.2	100.0	98.2	96.2	---
8000	95.6	96.0	95.7	94.6	96.4	98.3	99.3	102.0	99.0	99.8	95.7	95.0	93.8	---

AVERAGE NET REFERRED THRUST, FN/DELTA = 12987.1 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED,N1/VTHETA = 5346.0 RPM
AVERAGE JET EXHAUST VELOCITY = 1534.3 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.73

TABLE A-4. – SIMULATED VARIABLE-AREA PRIMARY NOZZLE. EXIT AREA OF CONICAL EXHAUST NOZZLE WAS 80-PERCENT OF EXISTING PRODUCTION NOZZLE. EXISTING INLET AND FAN-EXHAUST DUCTS – Concluded.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 053-09, 054-09, AND 055-09.

BAND CENTER FREQUENCY, HZ	ANGLES FROM ENGINE INLET CENTERLINE, DEGREES													
	15	30	40	50	60	75	90	100	110	120	130	140	150	160
50	95.0	92.3	92.8	93.8	93.8	95.8	96.6	97.4	100.6	106.5	110.7	114.5	116.3	---
63	95.0	92.3	92.8	93.8	93.8	95.8	96.6	97.4	100.6	106.5	110.7	114.5	116.3	---
80	95.0	92.3	92.8	93.8	93.8	95.8	96.6	97.4	100.6	106.5	110.7	114.5	116.3	---
100	99.9	99.5	99.4	99.2	99.7	100.2	102.0	103.4	105.2	111.1	119.3	122.2	120.6	---
125	99.9	99.5	99.4	99.2	99.7	100.2	102.0	103.4	105.2	111.1	119.3	122.2	120.6	---
160	99.9	99.5	99.4	99.2	99.7	100.2	102.0	103.4	105.2	111.1	119.3	122.2	120.6	---
200	101.9	101.6	101.8	101.6	101.9	103.1	104.0	105.3	107.1	110.8	117.1	121.1	119.7	---
250	101.9	101.6	101.8	101.6	101.9	103.1	104.0	105.3	107.1	110.8	117.1	121.1	119.7	---
315	101.9	101.6	101.8	101.6	101.9	103.1	104.0	105.3	107.1	110.8	117.1	121.1	119.7	---
400	99.9	99.7	100.8	100.1	101.2	101.1	102.4	104.8	106.1	109.3	112.7	114.3	113.0	---
500	99.9	99.7	100.8	100.1	101.2	101.1	102.4	104.8	106.1	109.3	112.7	114.3	113.0	---
630	99.9	99.7	100.8	100.1	101.2	101.1	102.4	104.8	106.1	109.3	112.7	114.3	113.0	---
800	95.7	95.3	94.9	95.7	96.1	96.6	97.4	99.2	100.9	104.7	106.3	105.6	102.7	---
1000	95.7	95.3	94.9	95.7	96.1	96.6	97.4	99.2	100.9	104.7	106.3	105.6	102.7	---
1250	95.7	95.3	94.9	95.7	96.1	96.6	97.4	99.2	100.9	104.7	106.3	105.6	102.7	---
1600	97.3	96.0	96.2	95.9	96.8	98.2	98.1	99.3	100.8	101.9	101.1	100.5	98.5	---
2000	99.5	96.8	96.5	96.1	97.4	97.7	98.6	101.3	101.7	101.1	101.0	99.9	97.4	---
2500	100.6	98.8	98.9	98.0	97.9	101.0	101.3	103.3	102.9	102.1	101.3	100.1	98.3	---
3150	108.7	107.1	106.5	107.2	105.3	113.2	109.0	113.4	110.0	109.6	107.9	104.1	103.3	---
4000	98.7	98.4	99.0	98.7	98.4	100.6	99.4	102.8	102.9	102.8	101.8	101.5	99.1	---
5000	99.0	99.1	98.3	98.1	97.7	99.0	98.0	100.8	101.8	100.3	98.7	98.1	96.3	---
6300	101.6	101.4	102.3	101.4	100.8	105.5	103.8	107.0	105.3	104.2	102.1	100.0	97.6	---
8000	96.2	96.7	96.9	96.0	97.1	99.4	101.1	101.6	100.8	100.9	98.5	98.0	96.3	---

AVERAGE NET REFERRED THRUST, FN/DELTA = 14965.4 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED, N1/VTHETA = 5670.0 RPM
AVERAGE JET EXHAUST VELOCITY = 1685.9 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.89

TABLE A-5. – SIMULATED VARIABLE-AREA PRIMARY NOZZLE. EXISTING PRODUCTION PRIMARY NOZZLE WITH 8 TRAPEZOIDAL WEDGES INSIDE TAILPIPE. EXISTING INLET AND FAN-EXHAUST DUCTS.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 058-01, 059-01, AND 060-01.

BAND CENTER FREQUENCY, HZ	ANGLES FROM ENGINE INLET CENTERLINE, DEGREES													
	15	30	40	50	60	75	90	100	110	120	130	140	150	160
50	73.0	71.6	72.4	72.6	74.2	74.7	74.6	74.8	75.2	75.5	76.7	77.0	78.0	---
63	73.0	71.6	72.4	72.6	74.2	74.7	74.6	74.8	75.2	75.5	76.7	77.0	78.0	---
80	73.0	71.6	72.4	72.6	74.2	74.7	74.6	74.8	75.2	75.5	76.7	77.0	78.0	---
100	77.8	78.0	78.8	78.2	78.9	78.7	78.9	79.2	79.5	79.8	81.0	81.9	82.3	---
125	77.8	78.0	78.8	78.2	78.9	78.7	78.9	79.2	79.5	79.8	81.0	81.9	82.3	---
160	77.8	78.0	78.8	78.2	78.9	78.7	78.9	79.2	79.5	79.8	81.0	81.9	82.3	---
200	80.9	81.0	80.2	79.3	80.5	81.2	79.9	80.5	82.0	81.6	81.7	81.5	81.7	---
250	80.9	81.0	80.2	79.3	80.5	81.2	79.9	80.5	82.0	81.6	81.7	81.5	81.7	---
315	80.9	81.0	80.2	79.3	80.5	81.2	79.9	80.5	82.0	81.6	81.7	81.5	81.7	---
400	81.1	81.4	81.7	80.4	81.3	81.8	80.2	80.6	84.7	84.7	84.0	82.0	79.1	---
500	81.1	81.4	81.7	80.4	81.3	81.8	80.2	80.6	84.7	84.7	84.0	82.0	79.1	---
630	81.1	81.4	81.7	80.4	81.3	81.8	80.2	80.6	84.7	84.7	84.0	82.0	79.1	---
800	85.0	84.8	83.3	81.7	81.3	81.4	82.2	81.6	83.8	85.2	83.4	81.0	80.3	---
1000	85.0	84.8	83.3	81.7	81.3	81.4	82.2	81.6	83.8	85.2	83.4	81.0	80.3	---
1250	85.0	84.8	83.3	81.7	81.3	81.4	82.2	81.6	83.8	85.2	83.4	81.0	80.3	---
1600	86.0	85.6	87.6	86.0	83.2	85.8	84.2	86.4	87.3	86.7	85.1	82.0	80.7	---
2000	86.3	85.5	87.1	88.2	86.7	84.8	84.1	86.3	87.6	87.0	86.4	81.8	79.8	---
2500	89.7	93.2	93.9	86.5	86.0	84.7	87.1	88.9	90.3	90.1	91.7	85.6	82.8	---
3150	91.5	95.7	97.3	90.3	88.8	90.6	90.9	93.6	94.0	96.0	95.4	90.6	85.5	---
4000	86.2	86.3	86.4	85.3	84.3	83.1	84.8	86.9	86.8	88.7	86.9	83.8	80.1	---
5000	85.4	84.1	84.8	83.2	81.5	81.1	82.1	84.7	86.5	86.5	85.3	81.9	78.0	---
6300	83.4	85.8	85.8	83.8	80.0	79.4	79.6	82.5	85.9	83.5	83.5	80.6	76.5	---
8000	82.2	80.4	81.1	79.8	79.2	76.9	77.9	80.9	82.2	81.3	81.0	78.0	74.4	---

AVERAGE NET REFERRED THRUST, FN/DELTA = 2008.6 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED,N1/VTHETA = 2587.9 RPM
AVERAGE JET EXHAUST VELOCITY = 680.4 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.14

ANALYSIS OF JT3D STATIC NOISE-REDUCTION TESTS AT EDWARDS AFB

TABLE A-5. – SIMULATED VARIABLE-AREA PRIMARY NOZZLE. EXISTING PRODUCTION PRIMARY NOZZLE WITH 8 TRAPEZOIDAL WEDGES INSIDE TAILPIPE. EXISTING INLET AND FAN-EXHAUST DUCTS – Continued.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 058-02, 059-02, AND 060-02.

BAND CENTER FREQUENCY, HZ	ANGLES FROM ENGINE INLET CENTERLINE, DEGREES													
	15	30	40	50	60	75	90	100	110	120	130	140	150	160
50	79.9	77.3	78.6	79.1	80.6	81.3	81.7	82.6	83.1	84.7	86.8	88.6	90.3	---
63	79.9	77.3	78.6	79.1	80.6	81.3	81.7	82.6	83.1	84.7	86.8	88.6	90.3	---
80	79.9	77.3	78.6	79.1	80.6	81.3	81.7	82.6	83.1	84.7	86.8	88.6	90.3	---
100	83.1	83.2	84.3	83.7	84.7	84.4	84.8	85.7	85.9	87.0	90.1	92.8	93.3	---
125	83.1	83.2	84.3	83.7	84.7	84.4	84.8	85.7	85.9	87.0	90.1	92.8	93.3	---
160	83.1	83.2	84.3	83.7	84.7	84.4	84.8	85.7	85.9	87.0	90.1	92.8	93.3	---
200	87.5	87.0	86.6	86.0	87.5	88.1	87.3	88.5	89.1	88.6	89.5	90.1	90.4	---
250	87.5	87.0	86.6	86.0	87.5	88.1	87.3	88.5	89.1	88.6	89.5	90.1	90.4	---
315	87.5	87.0	86.6	86.0	87.5	88.1	87.3	88.5	89.1	88.6	89.5	90.1	90.4	---
400	86.6	88.0	87.8	86.4	87.7	88.1	88.3	88.8	91.3	92.0	92.0	89.2	86.3	---
500	86.6	88.0	87.8	86.4	87.7	88.1	88.3	88.8	91.3	92.0	92.0	89.2	86.3	---
630	86.6	88.0	87.8	86.4	87.7	88.1	88.3	88.8	91.3	92.0	92.0	89.2	86.3	---
800	89.6	89.4	89.6	87.9	87.9	88.2	90.6	90.0	91.0	93.5	90.9	88.0	86.7	---
1000	89.6	89.4	89.6	87.9	87.9	88.2	90.6	90.0	91.0	93.5	90.9	88.0	86.7	---
1250	89.6	89.4	89.6	87.9	87.9	88.2	90.6	90.0	91.0	93.5	90.9	88.0	86.7	---
1600	91.2	90.6	91.1	92.2	90.5	92.6	93.3	96.5	97.1	96.1	92.7	90.1	89.0	---
2000	94.5	94.5	95.2	98.7	95.4	96.2	95.6	100.3	101.5	100.7	96.8	94.0	91.8	---
2500	93.0	94.5	95.7	94.1	91.9	94.0	97.1	99.3	98.9	98.3	95.8	91.4	89.8	---
3150	91.9	91.7	92.2	92.1	90.2	92.1	95.9	97.6	97.3	98.4	95.2	90.5	88.7	---
4000	95.6	95.3	96.6	95.8	94.9	94.1	97.2	99.8	101.1	99.4	96.9	93.4	91.9	---
5000	90.8	90.6	91.3	91.2	89.3	90.2	92.3	95.1	95.0	94.5	92.6	89.5	86.9	---
6300	92.6	92.5	93.6	93.0	90.7	90.3	91.7	94.7	95.2	94.1	92.9	88.8	85.6	---
8000	88.4	89.9	89.8	88.3	87.3	87.7	88.8	93.0	92.3	92.2	89.7	86.8	84.0	---

AVERAGE NET REFERRED THRUST, FN/DELTA = 4003.2 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED,N1/VTHETA = 3488.7 RPM
AVERAGE JET EXHAUST VELOCITY = 1028.9 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.32

TABLE A-5. – SIMULATED VARIABLE-AREA PRIMARY NOZZLE. EXISTING PRODUCTION PRIMARY NOZZLE WITH 8 TRAPEZOIDAL WEDGES INSIDE TAILPIPE. EXISTING INLET AND FAN-EXHAUST DUCTS – Continued.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 058-03, 059-03, AND 060-03.

BAND CENTER FREQUENCY, HZ	ANGLES FROM ENGINE INLET CENTERLINE, DEGREES													
	15	30	40	50	60	75	90	100	110	120	130	140	150	160
50	81.8	79.9	80.8	82.2	82.8	84.1	84.4	85.0	85.8	87.9	90.5	93.3	94.9	---
63	81.8	79.9	80.8	82.2	82.8	84.1	84.4	85.0	85.8	87.9	90.5	93.3	94.9	---
80	81.8	79.9	80.8	82.2	82.8	84.1	84.4	85.0	85.8	87.9	90.5	93.3	94.9	---
100	85.3	85.3	86.2	86.6	86.8	86.4	87.0	87.9	88.6	90.1	94.6	97.4	98.2	---
125	85.3	85.3	86.2	86.6	86.8	86.4	87.0	87.9	88.6	90.1	94.6	97.4	98.2	---
160	85.3	85.3	86.2	86.6	86.8	86.4	87.0	87.9	88.6	90.1	94.6	97.4	98.2	---
200	90.2	89.2	88.9	89.1	90.0	90.3	89.8	90.7	91.3	91.6	93.4	94.7	94.4	---
250	90.2	89.2	88.9	89.1	90.0	90.3	89.8	90.7	91.3	91.6	93.4	94.7	94.4	---
315	90.2	89.2	88.9	89.1	90.0	90.3	89.8	90.7	91.3	91.6	93.4	94.7	94.4	---
400	88.9	90.6	90.3	89.6	90.1	90.6	90.5	91.3	93.3	94.2	94.4	91.8	89.0	---
500	88.9	90.6	90.3	89.6	90.1	90.6	90.5	91.3	93.3	94.2	94.4	91.8	89.0	---
630	88.9	90.6	90.3	89.6	90.1	90.6	90.5	91.3	93.3	94.2	94.4	91.8	89.0	---
800	91.8	91.8	92.3	91.4	90.7	91.0	93.1	92.6	94.3	96.8	94.0	90.7	89.7	---
1000	91.8	91.8	92.3	91.4	90.7	91.0	93.1	92.6	94.3	96.8	94.0	90.7	89.7	---
1250	91.8	91.8	92.3	91.4	90.7	91.0	93.1	92.6	94.3	96.8	94.0	90.7	89.7	---
1600	92.5	91.8	92.6	93.0	91.8	94.0	94.6	97.2	98.1	98.3	94.9	91.8	90.5	---
2000	96.6	97.2	99.7	100.4	97.6	97.8	99.9	102.9	103.3	102.5	99.3	96.0	94.5	---
2500	96.4	97.8	101.8	100.7	98.3	98.0	100.2	102.5	102.7	102.8	99.0	95.6	93.8	---
3150	95.3	95.0	96.1	96.7	94.5	96.9	100.4	102.3	101.6	102.1	98.8	94.7	93.0	---
4000	96.7	94.5	95.1	96.1	94.9	97.2	99.3	102.1	101.3	101.0	98.3	95.1	93.0	---
5000	96.1	95.1	95.2	95.8	93.7	94.9	97.2	100.1	100.0	99.5	97.1	94.1	91.4	---
6300	94.1	96.0	96.1	94.8	94.3	93.6	96.1	98.2	97.8	97.4	95.2	92.1	88.1	---
8000	91.2	91.3	91.7	91.0	90.8	91.2	93.1	96.2	95.2	96.1	92.8	89.3	86.1	---

AVERAGE NET REFERRED THRUST, FN/DELTA = 5005.8 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED,N1/VTHETA = 3824.1 RPM
AVERAGE JET EXHAUST VELOCITY = 1181.9 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.42

ANALYSIS OF JT3D STATIC NOISE-REDUCTION TESTS AT EDWARDS AFB

TABLE A-5. – SIMULATED VARIABLE-AREA PRIMARY NOZLE. EXISTING PRODUCTION PRIMARY NOZZLE WITH 8 TRAPEZOIDAL WEDGES INSIDE TAILPIPE. EXISTING INLET AND FAN-EXHAUST DUCTS – Continued.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 058-04, 059-04, AND 060-04.

BAND CENTER FREQUENCY, HZ	ANGLES FROM ENGINE INLET CENTERLINE, DEGREES													
	15	30	40	50	60	75	90	100	110	120	130	140	150	160
50	83.8	81.7	82.6	83.9	84.7	85.6	86.6	87.2	88.9	90.9	94.0	96.5	98.5	---
63	83.8	81.7	82.6	83.9	84.7	85.6	86.6	87.2	88.9	90.9	94.0	96.5	98.5	---
80	83.8	81.7	82.6	83.9	84.7	85.6	86.6	87.2	88.9	90.9	94.0	96.5	98.5	---
100	87.0	87.1	87.7	88.2	88.6	88.3	88.9	90.1	91.2	92.9	98.1	101.5	102.0	---
125	87.0	87.1	87.7	88.2	88.6	88.3	88.9	90.1	91.2	92.9	98.1	101.5	102.0	---
160	87.0	87.1	87.7	88.2	88.6	88.3	88.9	90.1	91.2	92.9	98.1	101.5	102.0	---
200	91.7	90.9	90.4	90.7	91.6	91.8	91.6	92.5	93.4	94.1	96.6	98.7	98.6	---
250	91.7	90.9	90.4	90.7	91.6	91.8	91.6	92.5	93.4	94.1	96.6	98.7	98.6	---
315	91.7	90.9	90.4	90.7	91.6	91.8	91.6	92.5	93.4	94.1	96.6	98.7	98.6	---
400	90.9	92.3	91.7	91.3	91.9	92.4	92.2	93.2	95.2	96.2	96.3	94.2	91.8	---
500	90.9	92.3	91.7	91.3	91.9	92.4	92.2	93.2	95.2	96.2	96.3	94.2	91.8	---
630	90.9	92.3	91.7	91.3	91.9	92.4	92.2	93.3	95.2	96.2	96.4	94.3	91.8	---
800	93.7	93.8	94.2	93.3	92.7	92.9	94.8	95.7	96.7	97.4	96.3	92.7	92.0	---
1000	93.7	93.8	94.2	93.3	92.7	92.9	94.8	95.7	96.7	97.4	96.3	92.7	92.0	---
1250	93.7	93.8	94.2	93.3	92.7	92.9	94.8	95.7	96.7	97.4	96.3	92.7	92.0	---
1600	94.0	93.6	94.2	94.5	93.7	95.9	96.2	98.9	100.5	100.3	96.2	93.6	92.7	---
2000	96.3	96.9	98.5	98.4	97.0	99.1	101.5	103.5	104.3	102.9	99.8	96.7	95.6	---
2500	99.4	100.7	105.1	103.6	100.4	102.5	103.8	105.6	106.8	106.4	102.5	100.3	98.1	---
3150	96.9	96.5	97.4	98.3	96.3	99.4	102.5	104.0	104.2	104.4	101.0	97.1	95.6	---
4000	96.8	95.1	96.4	97.9	96.3	98.9	102.4	103.9	104.1	104.4	100.6	97.6	95.7	---
5000	97.8	98.0	98.5	98.2	96.2	97.9	100.8	102.6	103.8	102.8	99.9	96.9	94.8	---
6300	94.0	94.8	95.4	95.0	94.4	96.0	98.6	100.3	100.5	100.5	97.4	94.5	92.3	---
8000	93.1	94.6	95.1	94.2	94.2	94.5	96.5	99.2	99.0	99.2	96.2	92.5	90.5	---

AVERAGE NET REFERRED THRUST, FN/DELTA = 5996.9 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED, N1/VTHETA = 4075.2 RPM
AVERAGE JET EXHAUST VELOCITY = 1304.4 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.52

TABLE A-5. – SIMULATED VARIABLE-AREA PRIMARY NOZZLE. EXISTING PRODUCTION PRIMARY NOZZLE WITH 8 TRAPEZOIDAL WEDGES INSIDE TAILPIPE. EXISTING INLET AND FAN-EXHAUST DUCTS – Continued.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 058-05, 059-05, AND 060-05.

BAND CENTER FREQUENCY, HZ	ANGLES FROM ENGINE INLET CENTERLINE, DEGREES 15	30	40	50	60	75	90	100	110	120	130	140	150	160
50	86.6	84.7	85.4	86.9	87.6	88.8	89.7	90.7	92.1	95.6	99.5	102.4	104.2	---
63	86.6	84.7	85.4	86.9	87.6	88.8	89.7	90.7	92.1	95.6	99.5	102.4	104.2	---
80	86.6	84.7	85.4	86.9	87.6	88.8	89.7	90.7	92.1	95.6	99.5	102.4	104.2	---
100	90.5	90.0	91.0	91.1	91.5	91.4	92.8	94.1	95.3	98.5	104.8	108.3	107.8	---
125	90.5	90.0	91.0	91.1	91.5	91.4	92.8	94.1	95.3	98.5	104.8	108.3	107.8	---
160	90.5	90.0	91.0	91.1	91.5	91.4	92.8	94.1	95.3	98.5	104.8	108.3	107.8	---
200	94.5	93.9	93.7	93.5	94.3	94.7	95.0	96.2	97.3	99.1	103.4	106.4	104.7	---
250	94.5	93.9	93.7	93.5	94.3	94.7	95.0	96.2	97.3	99.1	103.4	106.4	104.7	---
315	94.5	93.9	93.7	93.5	94.3	94.7	95.0	96.2	97.3	99.1	103.4	106.4	104.7	---
400	94.6	96.0	95.2	94.8	95.5	95.4	95.7	96.6	98.7	100.2	101.4	100.4	97.2	---
500	94.6	96.0	95.2	94.8	95.5	95.4	95.7	96.6	98.7	100.2	101.4	100.4	97.2	---
630	94.6	96.0	95.2	94.8	95.5	95.4	95.7	96.6	98.7	100.2	101.4	100.4	97.2	---
800	96.8	96.9	97.7	96.5	95.9	95.9	97.7	98.5	100.2	102.5	99.4	96.2	95.5	---
1000	96.8	96.9	97.7	96.5	95.9	95.9	97.7	98.5	100.2	102.5	99.4	96.2	95.5	---
1250	96.8	96.9	97.7	96.5	95.9	95.9	97.7	98.5	100.2	102.5	99.4	96.2	95.5	---
1600	97.9	97.4	98.4	98.4	97.4	99.8	100.1	102.7	104.3	103.7	99.4	96.8	95.8	---
2000	98.3	98.0	99.5	99.6	98.5	101.2	102.5	104.7	105.8	104.7	101.0	98.1	96.4	---
2500	101.4	106.0	104.1	105.5	101.7	105.3	107.6	107.7	109.3	108.0	104.2	100.8	99.2	---
3150	99.8	100.2	101.0	101.9	99.9	103.5	106.1	107.2	107.4	107.0	104.2	101.3	98.8	---
4000	99.1	97.9	99.6	100.8	99.6	102.6	104.7	106.0	105.7	105.9	103.0	99.9	98.1	---
5000	99.7	101.6	100.4	100.8	99.6	102.2	103.8	106.1	106.2	105.3	102.8	99.9	97.8	---
6300	96.6	97.3	98.0	98.0	96.9	99.7	101.8	103.1	103.8	103.4	100.7	97.6	96.1	---
8000	95.5	97.5	97.9	97.2	97.4	99.1	100.7	102.9	102.5	102.7	99.7	96.5	93.3	---

AVERAGE NET REFERRED THRUST, FN/DELTA = 8000.9 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED,N1/VTHETA = 4518.1 RPM
AVERAGE JET EXHAUST VELOCITY = 1561.9 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.74

ANALYSIS OF JT3D STATIC NOISE-REDUCTION TESTS AT EDWARDS AFB

TABLE A-5. – SIMULATED VARIABLE-AREA PRIMARY NOZZLE. EXISTING PRODUCTION PRIMARY NOZZLE WITH 8 TRAPEZOIDAL WEDGES INSIDE TAILPIPE. EXISTING INLET AND FAN-EXHAUST DUCTS – Concluded.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 058-06, 059-06, AND 060-06.

		ANGLES FROM ENGINE INLET CENTERLINE, DEGREES													
B		15	30	40	50	60	75	90	100	110	120	130	140	150	160
A	50	89.1	87.4	88.4	89.7	90.1	91.5	92.1	93.4	95.4	99.1	103.6	106.6	108.2	---
N	63	89.1	87.4	88.4	89.7	90.1	91.5	92.1	93.4	95.4	99.1	103.6	106.6	108.2	---
D	80	89.1	87.4	88.4	89.7	90.1	91.5	92.1	93.4	95.4	99.1	103.6	106.6	108.2	---
	100	93.4	92.8	93.7	94.0	94.3	94.3	96.0	97.2	98.8	103.0	110.2	113.0	111.5	---
C	125	93.4	92.8	93.7	94.0	94.3	94.3	96.0	97.2	98.8	103.0	110.2	113.0	111.5	---
E	160	93.4	92.8	93.7	94.0	94.3	94.3	96.0	97.2	98.8	103.0	110.2	113.0	111.5	---
N	200	97.1	96.8	96.7	96.5	97.2	97.7	98.2	99.4	100.8	103.8	109.0	111.8	109.2	---
T	250	97.1	96.8	96.7	96.5	97.2	97.7	98.2	99.4	100.8	103.8	109.0	111.8	109.2	---
E	315	97.1	96.8	96.7	96.5	97.2	97.7	98.2	99.4	100.8	103.8	109.0	111.8	109.2	---
R	400	97.7	98.9	98.3	97.5	98.3	98.2	98.5	99.5	101.6	103.6	106.4	106.4	101.8	---
	500	97.7	98.9	98.3	97.5	98.3	98.2	98.5	99.5	101.6	103.6	106.4	106.4	101.8	---
F	630	97.7	98.9	98.3	97.5	98.3	98.2	98.5	99.5	101.6	103.6	106.4	106.4	101.8	---
R	800	98.9	99.5	99.8	98.6	97.7	98.1	98.8	100.3	102.4	104.2	101.7	98.5	97.5	---
E	1000	98.9	99.5	99.8	98.6	97.7	98.1	98.8	100.3	102.4	104.2	101.7	98.5	97.5	---
Q	1250	98.9	99.5	99.8	98.6	97.7	98.1	98.8	100.3	102.4	104.2	101.7	98.5	97.5	---
U	1600	100.4	99.6	100.6	100.5	99.9	102.5	102.9	105.6	107.7	106.2	101.7	99.7	98.9	---
E	2000	100.8	99.8	101.7	101.6	101.0	103.9	105.2	106.9	108.1	106.8	103.2	100.7	98.8	---
N	2500	102.8	103.2	105.0	103.7	104.2	106.6	107.3	108.0	109.7	109.0	105.2	103.0	100.5	---
C	3150	105.0	106.4	107.0	105.0	107.7	108.1	107.7	108.1	108.1	109.5	106.3	102.9	101.2	---
Y	4000	101.3	100.1	101.7	102.8	101.9	104.4	106.1	106.9	106.9	107.4	104.7	102.1	100.4	---
,	5000	100.3	99.9	101.5	102.1	101.2	104.0	105.4	106.6	107.1	106.3	103.9	101.4	100.0	---
H	6300	100.2	100.3	101.3	101.2	100.4	102.7	104.0	105.4	105.2	105.2	103.1	100.5	99.0	---
Z	8000	97.8	98.1	99.2	99.1	99.3	101.9	103.0	104.4	104.2	104.7	101.9	99.5	97.7	---

AVERAGE NET REFERRED THRUST, FN/DELTA = 9998.5 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED,N1/VTHETA = 4876.4 RPM
AVERAGE JET EXHAUST VELOCITY = 1784.0 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.97

TABLE A-6. – BASELINE FOR TREATED-INLET TESTS. EXISITNG PRODUCTION INLET, 24-IN.-LONG FAN-EXHAUST DUCTS, AND PRODUCTION PRIMARY NOZZLE. FAN-EXHAUST NOISE-SUPPRESSOR ENCLOSURE AROUND ENGINE.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 082-01, 083-01, AND 084-01.

		ANGLES FROM ENGINE INLET CENTERLINE, DEGREES														
B		15	30	40	50	60	75	90	100	110	120	130	140	150	160	PWL
A	50	80.4	78.6	79.9	80.9	81.0	82.9	84.0	86.1	---	---	---	---	---	---	132.3
N	63	80.4	78.6	79.9	80.9	81.0	82.9	84.0	86.1	---	---	---	---	---	---	132.3
D	80	80.4	78.6	79.9	80.9	81.0	82.9	84.0	86.1	---	---	---	---	---	---	132.3
	100	77.1	77.6	78.0	77.7	78.7	80.5	82.6	85.4	---	---	---	---	---	---	130.7
C	125	77.1	77.6	78.0	77.7	78.7	80.5	82.6	85.4	---	---	---	---	---	---	130.7
E	160	77.1	77.6	78.0	77.7	78.7	80.5	82.6	85.4	---	---	---	---	---	---	130.7
N	200	78.3	77.8	76.5	76.5	77.6	77.6	78.8	81.2	---	---	---	---	---	---	127.9
T	250	78.3	77.8	76.5	76.5	77.6	77.6	78.8	81.2	---	---	---	---	---	---	127.9
E	315	78.3	77.8	76.5	76.5	77.6	77.6	78.8	81.2	---	---	---	---	---	---	127.9
R	400	77.9	77.1	75.3	74.5	72.9	70.7	72.4	74.5	---	---	---	---	---	---	123.7
	500	77.9	77.1	75.3	74.5	72.9	70.7	72.4	74.5	---	---	---	---	---	---	123.7
F	630	77.9	77.1	75.3	74.5	72.9	70.7	72.4	74.5	---	---	---	---	---	---	123.7
R	800	78.6	77.6	74.1	70.8	68.7	67.9	67.0	67.8	---	---	---	---	---	---	121.7
E	1000	80.2	80.8	80.1	81.5	80.0	78.6	75.3	71.9	---	---	---	---	---	---	128.4
Q	1250	85.0	84.1	83.7	82.5	80.8	77.2	74.3	72.3	---	---	---	---	---	---	130.1
U	1600	85.7	85.1	84.9	84.4	83.2	79.4	75.9	73.5	---	---	---	---	---	---	131.7
E	2000	91.2	94.0	91.9	91.7	88.1	83.8	81.8	76.6	---	---	---	---	---	---	138.3
N	2500	96.6	109.2	104.2	104.1	98.3	92.2	91.6	87.9	---	---	---	---	---	---	150.9
C	3150	93.4	93.4	91.9	91.2	89.5	84.8	80.6	76.7	---	---	---	---	---	---	138.6
Y	4000	93.4	92.2	93.1	90.4	88.5	83.8	80.1	76.0	---	---	---	---	---	---	138.2
,	5000	98.4	99.1	98.4	95.9	92.8	89.4	84.2	80.4	---	---	---	---	---	---	143.7
H	6300	91.7	94.3	93.4	91.1	89.9	85.3	81.1	77.3	---	---	---	---	---	---	139.0
Z	8000	92.4	95.5	93.4	92.6	91.0	86.3	82.0	78.3	---	---	---	---	---	---	139.9

AVERAGE NET REFERRED THRUST, FN/DELTA = 5918.0 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED,N1/VTHETA = 4300.5 RPM
AVERAGE JET EXHAUST VELOCITY = 758.5 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.19

TOTAL PWL= 153.0

ANALYSIS OF JT3D STATIC NOISE-REDUCTION TESTS AT EDWARDS AFB

TABLE A-6. – BASELINE FOR TREATED-INLET TESTS. EXISITNG PRODUCTION INLET, 24-IN.-LONG FAN-EXHAUST DUCTS, AND PRODUCTION PRIMARY NOZZLE. FAN-EXHAUST NOISE-SUPPRESSOR ENCLOSURE AROUND ENGINE – Continued.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 082-02, 083-02, AND 084-02.

		ANGLES FROM ENGINE INLET CENTERLINE, DEGREES														
B		15	30	40	50	60	75	90	100	110	120	130	140	150	160	PWL
A	50	81.3	80.2	82.1	83.5	84.0	85.0	86.7	88.7	---	---	---	---	---	---	134.8
N	63	81.3	80.2	82.1	83.5	84.0	85.0	86.7	88.7	---	---	---	---	---	---	134.8
D	80	81.3	80.2	82.1	83.5	84.0	85.0	86.7	88.7	---	---	---	---	---	---	134.8
	100	79.5	80.2	80.5	80.5	81.7	83.3	85.6	88.4	---	---	---	---	---	---	133.6
C	125	79.5	80.2	80.5	80.5	81.7	83.3	85.6	88.4	---	---	---	---	---	---	133.6
E	160	79.5	80.2	80.5	80.5	81.7	83.3	85.6	88.4	---	---	---	---	---	---	133.6
N	200	80.1	79.9	79.3	79.2	80.3	80.2	82.0	84.4	---	---	---	---	---	---	130.7
T	250	80.1	79.9	79.3	79.2	80.3	80.2	82.0	84.4	---	---	---	---	---	---	130.7
E	315	80.1	79.9	79.3	79.2	80.3	80.2	82.0	84.4	---	---	---	---	---	---	130.7
R	400	79.2	78.4	77.7	76.0	75.1	73.5	75.7	78.0	---	---	---	---	---	---	126.0
	500	79.2	78.4	77.7	76.0	75.1	73.5	75.7	78.0	---	---	---	---	---	---	126.0
F	630	79.2	78.4	77.7	76.0	75.1	73.5	75.7	78.0	---	---	---	---	---	---	126.0
R	800	78.5	76.4	75.3	73.7	70.8	70.4	70.4	71.9	---	---	---	---	---	---	122.8
E	1000	79.9	84.1	82.6	86.9	82.9	83.3	77.9	74.2	---	---	---	---	---	---	132.1
Q	1250	84.1	84.5	84.5	82.4	81.9	79.4	75.8	74.6	---	---	---	---	---	---	130.8
U	1600	87.3	85.2	85.3	84.6	82.8	79.4	76.6	76.1	---	---	---	---	---	---	132.1
E	2000	91.4	89.8	88.7	87.5	86.1	82.6	79.5	76.3	---	---	---	---	---	---	135.6
N	2500	98.8	102.8	103.0	99.9	98.5	95.6	95.3	89.7	---	---	---	---	---	---	148.2
C	3150	92.5	93.7	93.3	90.9	89.2	86.5	84.3	79.3	---	---	---	---	---	---	139.0
Y	4000	92.1	91.5	91.3	90.1	88.2	84.4	80.7	77.3	---	---	---	---	---	---	137.5
,	5000	97.5	98.7	96.5	94.3	93.1	90.9	87.2	83.1	---	---	---	---	---	---	143.1
H	6300	92.3	93.4	92.1	90.4	88.8	84.7	80.8	77.7	---	---	---	---	---	---	138.2
Z	8000	93.7	96.1	93.8	93.1	92.3	88.5	84.6	80.7	---	---	---	---	---	---	140.9

AVERAGE NET REFERRED THRUST, FN/DELTA = 7055.2 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED,N1/VTHETA = 4598.1 RPM
AVERAGE JET EXHAUST VELOCITY = 831.9 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.23

TOTAL PWL= 151.7

TABLE A-6. – BASELINE FOR TREATED-INLET TESTS. EXISITNG PRODUCTION INLET, 24-IN.-LONG FAN-EXHAUST DUCTS, AND PRODUCTION PRIMARY NOZZLE. FAN-EXHAUST NOISE-SUPPRESSOR ENCLOSURE AROUND ENGINE – Continued.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 082-03, 083-03, AND 084-03.

		ANGLES FROM ENGINE INLET CENTERLINE, DEGREES														
B		15	30	40	50	60	75	90	100	110	120	130	140	150	160	PWL
A	50	81.1	82.4	84.1	84.8	85.4	86.4	88.4	91.1	---	---	---	---	---	---	136.6
N	63	81.1	82.4	84.1	84.8	85.4	86.4	88.4	91.1	---	---	---	---	---	---	136.6
D	80	81.1	82.4	84.1	84.8	85.4	86.4	88.4	91.1	---	---	---	---	---	---	136.6
	100	82.0	82.6	82.8	82.9	83.8	86.0	88.2	91.3	---	---	---	---	---	---	136.3
C	125	82.0	82.6	82.8	82.9	83.8	86.0	88.2	91.3	---	---	---	---	---	---	136.3
E	160	82.0	82.6	82.8	82.9	83.8	86.0	88.2	91.3	---	---	---	---	---	---	136.3
N	200	82.4	82.1	81.9	81.5	82.8	83.0	84.8	87.6	---	---	---	---	---	---	133.5
T	250	82.4	82.1	81.9	81.5	82.8	83.0	84.8	87.6	---	---	---	---	---	---	133.5
E	315	82.4	82.1	81.9	81.5	82.8	83.0	84.8	87.6	---	---	---	---	---	---	133.5
R	400	79.9	79.8	79.0	77.5	77.0	76.1	78.9	81.2	---	---	---	---	---	---	128.2
	500	79.9	79.8	79.0	77.5	77.0	76.1	78.9	81.2	---	---	---	---	---	---	128.2
F	630	79.9	79.8	79.0	77.5	77.0	76.1	78.9	81.2	---	---	---	---	---	---	128.2
R	800	78.1	76.9	75.7	73.0	71.6	71.5	72.7	74.1	---	---	---	---	---	---	123.5
E	1000	81.1	82.8	85.9	85.7	84.2	78.9	75.6	75.7	---	---	---	---	---	---	131.6
Q	1250	83.1	83.8	86.4	85.9	84.7	79.2	75.8	76.8	---	---	---	---	---	---	132.2
U	1600	84.7	83.8	83.0	82.6	81.4	78.6	77.2	76.5	---	---	---	---	---	---	130.5
E	2000	93.1	87.8	86.6	86.4	84.1	81.1	79.4	76.7	---	---	---	---	---	---	134.9
N	2500	99.2	102.0	103.2	100.3	98.9	95.9	95.2	89.0	---	---	---	---	---	---	148.2
C	3150	97.4	100.1	100.2	98.1	95.8	94.3	91.0	86.4	---	---	---	---	---	---	145.7
Y	4000	91.2	90.7	91.3	89.2	87.8	83.6	80.5	76.7	---	---	---	---	---	---	136.9
,	5000	96.4	96.3	96.9	94.2	92.6	90.0	86.0	82.2	---	---	---	---	---	---	142.3
H	6300	94.8	95.2	95.9	93.1	91.1	87.8	84.0	80.8	---	---	---	---	---	---	140.9
Z	8000	93.6	95.5	93.0	92.5	91.5	87.6	82.4	80.8	---	---	---	---	---	---	140.2

AVERAGE NET REFERRED THRUST, FN/DELTA = 8299.7 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED,N1/VTHETA = 4904.2 RPM
AVERAGE JET EXHAUST VELOCITY = 873.7 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.25

TOTAL PWL= 152.8

TABLE A-6. – BASELINE FOR TREATED-INLET TESTS. EXISITNG PRODUCTION INLET, 24-IN.-LONG FAN-EXHAUST DUCTS, AND PRODUCTION PRIMARY NOZZLE. FAN-EXHAUST NOISE-SUPPRESSOR ENCLOSURE AROUND ENGINE – Continued.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 082-04, 083-04, AND 084-04.

		ANGLES FROM ENGINE INLET CENTERLINE, DEGREES															
B		15	30	40	50	60	75	90	100	110	120	130	140	150	160	PWL
A	50	85.3	85.8	86.9	87.7	88.5	90.0	91.5	94.2	---	---	---	---	---	---	139.8
N	63	85.3	85.8	86.9	87.7	88.5	90.0	91.5	94.2	---	---	---	---	---	---	139.8
D	80	85.3	85.8	86.9	87.7	88.5	90.0	91.5	94.2	---	---	---	---	---	---	139.8
	100	87.4	86.9	87.0	87.0	88.0	90.5	92.8	95.8	---	---	---	---	---	---	140.8
C	125	87.4	86.9	87.0	87.0	88.0	90.5	92.8	95.8	---	---	---	---	---	---	140.8
E	160	87.4	86.9	87.0	87.0	88.0	90.5	92.8	95.8	---	---	---	---	---	---	140.8
N	200	86.7	86.0	85.9	85.9	87.3	88.0	90.0	93.0	---	---	---	---	---	---	138.5
T	250	86.7	86.0	85.9	85.9	87.3	88.0	90.0	93.0	---	---	---	---	---	---	138.5
E	315	86.7	86.0	85.9	85.9	87.3	88.0	90.0	93.0	---	---	---	---	---	---	138.5
R	400	84.3	83.5	83.7	81.9	82.2	81.1	84.3	86.8	---	---	---	---	---	---	133.2
	500	84.3	83.5	83.7	81.9	82.2	81.1	84.3	86.8	---	---	---	---	---	---	133.2
F	630	84.3	83.5	83.7	81.9	82.2	81.1	84.3	86.8	---	---	---	---	---	---	133.2
R	800	79.7	82.2	79.3	77.0	76.1	76.9	78.1	80.3	---	---	---	---	---	---	128.2
E	1000	81.1	81.2	83.0	82.7	83.9	82.9	80.0	81.0	---	---	---	---	---	---	131.7
Q	1250	83.3	86.5	86.9	85.6	88.0	85.6	83.1	82.5	---	---	---	---	---	---	135.0
U	1600	89.8	86.7	84.9	84.1	82.9	83.3	82.3	82.0	---	---	---	---	---	---	133.9
E	2000	95.3	91.7	88.4	86.0	85.6	83.6	82.1	80.9	---	---	---	---	---	---	137.1
N	2500	98.5	95.6	95.7	94.1	93.2	89.1	85.5	83.3	---	---	---	---	---	---	142.3
C	3150	103.3	105.4	106.5	103.5	104.5	99.8	94.8	90.5	---	---	---	---	---	---	151.9
Y	4000	93.4	93.5	93.0	91.2	90.7	87.3	82.9	80.6	---	---	---	---	---	---	139.4
,	5000	94.8	93.8	92.3	91.4	89.9	85.7	81.6	80.3	---	---	---	---	---	---	139.2
H	6300	97.4	98.9	98.4	97.8	95.8	89.9	86.0	82.8	---	---	---	---	---	---	144.4
Z	8000	93.3	93.5	92.7	91.4	90.1	85.1	81.0	79.4	---	---	---	---	---	---	138.9

AVERAGE NET REFERRED THRUST, FN/DELTA = 10587.4 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED,N1/VTHETA = 5348.4 RPM
AVERAGE JET EXHAUST VELOCITY = 1091.1 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.40

TOTAL PWL= 155.2

TABLE A-6. – BASELINE FOR TREATED-INLET TESTS. EXISITNG PRODUCTION INLET, 24-IN.-LONG FAN-EXHAUST DUCTS, AND PRODUCTION PRIMARY NOZZLE. FAN-EXHAUST NOISE-SUPPRESSOR ENCLOSURE AROUND ENGINE – Continued.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 082-05, 083-05, AND 084-05.

		ANGLES FROM ENGINE INLET CENTERLINE, DEGREES														
B		15	30	40	50	60	75	90	100	110	120	130	140	150	160	PWL
A	50	87.8	89.5	90.1	91.2	92.2	93.8	95.0	98.5	---	---	---	---	---	---	143.6
N	63	87.8	89.5	90.1	91.2	92.2	93.8	95.0	98.5	---	---	---	---	---	---	143.6
D	80	87.8	89.5	90.1	91.2	92.2	93.8	95.0	98.5	---	---	---	---	---	---	143.6
	100	93.3	93.6	92.9	92.9	93.6	96.5	99.0	101.8	---	---	---	---	---	---	146.8
C	125	93.3	93.6	92.9	92.9	93.6	96.5	99.0	101.8	---	---	---	---	---	---	146.8
E	160	93.3	93.6	92.9	92.9	93.6	96.5	99.0	101.8	---	---	---	---	---	---	146.8
N	200	93.2	92.9	92.5	93.2	94.3	95.6	97.0	100.2	---	---	---	---	---	---	145.6
T	250	93.2	92.9	92.5	93.2	94.3	95.6	97.0	100.2	---	---	---	---	---	---	145.6
E	315	93.2	92.9	92.5	93.2	94.3	95.6	97.0	100.2	---	---	---	---	---	---	145.6
R	400	90.8	91.5	92.0	89.4	89.8	89.6	92.1	94.8	---	---	---	---	---	---	141.1
	500	90.8	91.5	92.0	89.4	89.8	89.6	92.1	94.8	---	---	---	---	---	---	141.1
F	630	90.8	91.5	92.0	89.4	89.8	89.6	92.1	94.8	---	---	---	---	---	---	141.1
R	800	86.2	86.4	86.4	85.5	83.9	84.7	86.3	88.7	---	---	---	---	---	---	135.6
E	1000	86.5	87.5	85.9	87.3	87.9	86.8	86.4	89.1	---	---	---	---	---	---	136.8
Q	1250	89.9	92.6	94.1	93.6	92.5	90.5	88.7	90.0	---	---	---	---	---	---	141.1
U	1600	92.4	96.7	96.1	95.6	91.7	90.0	88.7	89.6	---	---	---	---	---	---	142.3
E	2000	97.5	95.8	94.4	92.9	91.8	89.1	87.9	88.4	---	---	---	---	---	---	141.8
N	2500	96.3	95.0	94.4	92.8	90.8	87.9	86.8	87.0	---	---	---	---	---	---	141.0
C	3150	101.9	100.8	99.5	98.5	96.7	93.6	89.8	88.9	---	---	---	---	---	---	146.4
Y	4000	97.7	96.0	95.1	94.3	92.2	90.3	86.4	86.0	---	---	---	---	---	---	142.2
,	5000	96.4	94.6	95.0	93.3	92.4	88.5	84.8	84.3	---	---	---	---	---	---	141.2
H	6300	94.3	94.7	93.2	91.0	89.7	86.2	82.9	82.6	---	---	---	---	---	---	139.6
Z	8000	92.8	92.7	91.4	89.8	88.6	84.8	81.0	81.4	---	---	---	---	---	---	138.0

AVERAGE NET REFERRED THRUST, FN/DELTA = 14650.4 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED,N1/VTHETA = 6000.6 RPM
AVERAGE JET EXHAUST VELOCITY = 1346.7 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.62

TOTAL PWL= 157.1

ANALYSIS OF JT3D STATIC NOISE-REDUCTION TESTS AT EDWARDS AFB

TABLE A-6. – BASELINE FOR TREATED-INLET TESTS. EXISITNG PRODUCTION INLET, 24-IN.-LONG FAN-EXHAUST DUCTS, AND PRODUCTION PRIMARY NOZZLE. FAN-EXHAUST NOISE-SUPPRESSOR ENCLOSURE AROUND ENGINE – Continued.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 082-06, 083-06, AND 084-06.

		ANGLES FROM ENGINE INLET CENTERLINE, DEGREES														
B		15	30	40	50	60	75	90	100	110	120	130	140	150	160	PWL
A	50	86.4	88.1	88.5	89.8	90.5	92.0	93.6	96.6	---	---	---	---	---	---	141.9
N	63	86.4	88.1	88.5	89.8	90.5	92.0	93.6	96.6	---	---	---	---	---	---	141.9
D	80	86.4	88.1	88.5	89.8	90.5	92.0	93.6	96.6	---	---	---	---	---	---	141.9
	100	90.6	90.7	90.4	90.3	91.1	94.0	96.3	99.1	---	---	---	---	---	---	144.2
C	125	90.6	90.7	90.4	90.3	91.1	94.0	96.3	99.1	---	---	---	---	---	---	144.2
E	160	90.6	90.7	90.4	90.3	91.1	94.0	96.3	99.1	---	---	---	---	---	---	144.2
N	200	89.7	89.6	89.4	89.8	91.1	92.2	94.0	96.9	---	---	---	---	---	---	142.4
T	250	89.7	89.6	89.4	89.8	91.1	92.2	94.0	96.9	---	---	---	---	---	---	142.4
E	315	89.7	89.6	89.4	89.8	91.1	92.2	94.0	96.9	---	---	---	---	---	---	142.4
R	400	86.9	87.1	87.0	85.6	86.0	85.3	88.6	91.3	---	---	---	---	---	---	137.2
	500	86.9	87.1	87.0	85.6	86.0	85.3	88.6	91.3	---	---	---	---	---	---	137.2
F	630	86.9	87.1	87.0	85.6	86.0	85.3	88.6	91.3	---	---	---	---	---	---	137.2
R	800	84.0	85.4	84.6	85.9	82.7	84.3	84.2	85.5	---	---	---	---	---	---	134.1
E	1000	82.0	82.5	82.4	82.1	81.7	83.2	83.3	85.7	---	---	---	---	---	---	132.7
Q	1250	85.7	87.6	90.2	89.7	91.8	90.0	87.9	87.5	---	---	---	---	---	---	138.9
U	1600	91.8	94.2	92.2	90.5	92.2	89.8	88.4	88.2	---	---	---	---	---	---	140.4
E	2000	96.6	91.6	89.5	90.3	88.0	86.4	85.7	85.0	---	---	---	---	---	---	139.0
N	2500	97.6	95.6	93.6	93.0	92.5	87.9	86.7	84.9	---	---	---	---	---	---	141.5
C	3150	101.5	104.3	103.0	99.7	97.3	93.2	91.2	88.8	---	---	---	---	---	---	148.2
Y	4000	95.3	95.7	94.5	92.5	90.6	88.5	84.0	83.4	---	---	---	---	---	---	140.8
,	5000	95.9	96.5	95.6	93.1	91.0	88.0	83.9	82.5	---	---	---	---	---	---	141.3
H	6300	95.0	96.4	96.7	92.5	91.4	87.2	83.5	82.4	---	---	---	---	---	---	141.4
Z	8000	92.6	94.5	93.4	90.6	89.3	85.4	81.1	80.3	---	---	---	---	---	---	139.0

AVERAGE NET REFERRED THRUST, FN/DELTA = 12778.4 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED,N1/VTHETA = 5706.6 RPM
AVERAGE JET EXHAUST VELOCITY = 1224.0 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.51

TOTAL PWL= 155.4

TABLE A-6. – BASELINE FOR TREATED-INLET TESTS. EXISITNG PRODUCTION INLET, 24-IN.-LONG FAN-EXHAUST DUCTS, AND PRODUCTION PRIMARY NOZZLE. FAN-EXHAUST NOISE-SUPPRESSOR ENCLOSURE AROUND ENGINE – Concluded.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 082-07, 083-07, AND 084-07.

	ANGLES FROM ENGINE INLET CENTERLINE, DEGREES														
BAND CENTER FREQUENCY, HZ	15	30	40	50	60	75	90	100	110	120	130	140	150	160	PWL
50	89.4	90.9	91.6	92.9	93.7	95.5	97.3	100.0	---	---	---	---	---	---	145.3
63	89.4	90.9	91.6	92.9	93.7	95.5	97.3	100.0	---	---	---	---	---	---	145.3
80	89.4	90.9	91.6	92.9	93.7	95.5	97.3	100.0	---	---	---	---	---	---	145.3
100	95.3	96.0	95.2	95.2	96.0	99.0	101.7	104.0	---	---	---	---	---	---	149.2
125	95.3	96.0	95.2	95.2	96.0	99.0	101.7	104.0	---	---	---	---	---	---	149.2
160	95.3	96.0	95.2	95.2	96.0	99.0	101.7	104.0	---	---	---	---	---	---	149.2
200	96.3	95.9	95.7	96.7	97.6	98.9	100.5	103.5	---	---	---	---	---	---	148.9
250	96.3	95.9	95.7	96.7	97.6	98.9	100.5	103.5	---	---	---	---	---	---	148.9
315	96.3	95.9	95.7	96.7	97.6	98.9	100.5	103.5	---	---	---	---	---	---	148.9
400	93.8	93.6	94.0	92.3	92.7	92.4	95.9	98.3	---	---	---	---	---	---	144.2
500	93.8	93.6	94.0	92.3	92.7	92.4	95.9	98.3	---	---	---	---	---	---	144.2
630	93.8	93.6	94.0	92.3	92.7	92.4	95.9	98.3	---	---	---	---	---	---	144.2
800	87.4	87.2	87.9	86.3	86.1	87.6	90.4	92.4	---	---	---	---	---	---	138.4
1000	86.8	87.0	86.7	86.6	86.6	87.7	89.8	92.4	---	---	---	---	---	---	138.2
1250	88.5	90.0	90.6	89.7	88.8	88.2	89.7	92.9	---	---	---	---	---	---	139.5
1600	92.7	94.6	94.7	92.9	93.2	90.2	91.0	93.4	---	---	---	---	---	---	142.2
2000	97.3	96.7	95.4	95.5	93.2	89.9	90.4	92.3	---	---	---	---	---	---	143.2
2500	96.8	95.2	92.7	92.1	91.1	89.1	88.9	90.3	---	---	---	---	---	---	141.4
3150	95.5	94.4	94.4	93.7	91.5	89.1	88.0	89.6	---	---	---	---	---	---	141.4
4000	97.1	94.7	94.7	94.1	92.8	90.0	87.5	88.5	---	---	---	---	---	---	142.0
5000	94.6	92.2	92.5	90.9	89.5	86.9	85.6	86.1	---	---	---	---	---	---	139.3
6300	92.0	91.6	90.4	88.9	87.6	84.9	83.8	84.5	---	---	---	---	---	---	137.4
8000	91.1	89.8	89.0	87.7	86.9	83.4	82.0	83.0	---	---	---	---	---	---	136.2

AVERAGE NET REFERRED THRUST, FN/DELTA = 16543.3 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED,N1/VTHETA = 6300.3 RPM
AVERAGE JET EXHAUST VELOCITY = 1468.8 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.74

TOTAL PWL = 159.0

TABLE A-7. – NO-RING TREATED INLET. TREATMENT ON WALLS OF INLET DUCT AND CENTERBODY. EXISTING PRODUCTION 24-IN.-LONG FAN-EXHAUST DUCTS, AND PRODUCTION PRIMARY NOZZLE. FAN-EXHAUST NOISE-SUPPRESSOR ENCLOSURE AROUND ENGINE.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 077-01, 080-01, AND 081-01.

BAND CENTER FREQUENCY, HZ	ANGLES FROM ENGINE INLET CENTERLINE, DEGREES 15	30	40	50	60	75	90	100	110	120	130	140	150	160	PWL
50	77.9	79.0	79.1	81.0	81.0	82.5	84.6	86.3	---	---	---	---	---	---	132.4
63	77.9	79.0	79.1	81.0	81.0	82.5	84.6	86.3	---	---	---	---	---	---	132.4
80	77.9	79.0	79.1	81.0	81.0	82.5	84.6	86.3	---	---	---	---	---	---	132.4
100	76.4	77.4	77.7	77.5	78.7	80.5	83.3	85.4	---	---	---	---	---	---	130.8
125	76.4	77.4	77.7	77.5	78.7	80.5	83.3	85.4	---	---	---	---	---	---	130.8
160	76.4	77.4	77.7	77.5	78.7	80.5	83.3	85.4	---	---	---	---	---	---	130.8
200	77.7	77.7	77.0	77.1	78.0	77.8	79.6	81.9	---	---	---	---	---	---	128.3
250	77.7	77.7	77.0	77.1	78.0	77.8	79.6	81.9	---	---	---	---	---	---	128.3
315	77.7	77.7	77.0	77.1	78.0	77.8	79.6	81.9	---	---	---	---	---	---	128.3
400	76.1	75.5	75.4	74.0	73.6	72.1	74.6	76.9	---	---	---	---	---	---	124.2
500	76.1	75.5	75.4	74.0	73.6	72.1	74.6	76.9	---	---	---	---	---	---	124.2
630	76.1	75.5	75.4	74.0	73.6	72.1	74.6	76.9	---	---	---	---	---	---	124.2
800	73.8	72.6	71.4	69.1	68.1	66.5	67.8	69.6	---	---	---	---	---	---	119.1
1000	72.8	73.9	71.4	71.4	68.0	67.2	67.2	69.2	---	---	---	---	---	---	119.5
1250	78.5	78.5	76.7	75.6	72.8	70.1	68.5	70.0	---	---	---	---	---	---	123.6
1600	82.8	81.3	80.7	78.9	75.6	71.7	70.9	71.1	---	---	---	---	---	---	126.8
2000	87.9	88.9	88.2	84.5	83.0	78.1	79.2	75.5	---	---	---	---	---	---	133.5
2500	93.3	100.0	99.3	92.9	94.7	90.3	89.8	85.2	---	---	---	---	---	---	144.0
3150	89.8	90.7	88.8	86.8	84.0	79.0	76.6	73.5	---	---	---	---	---	---	134.8
4000	90.7	90.4	89.9	86.6	83.6	79.2	77.6	74.6	---	---	---	---	---	---	135.1
5000	97.6	94.8	96.1	91.2	89.3	86.6	84.1	79.6	---	---	---	---	---	---	140.9
6300	90.8	92.2	91.3	87.9	86.9	82.2	79.4	75.5	---	---	---	---	---	---	136.7
8000	91.3	93.1	91.7	90.1	89.3	83.1	80.7	77.1	---	---	---	---	---	---	137.9

AVERAGE NET REFERRED THRUST, FN/DELTA = 6010.5 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED,N1/VTHETA = 4303.1 RPM
AVERAGE JET EXHAUST VELOCITY = 758.7 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.19

TOTAL PWL= 148.4

TABLE A-7. – NO-RING TREATED INLET. TREATMENT ON WALLS OF INLET DUCT AND CENTERBODY. EXISTING PRODUCTION 24-IN.-LONG FAN-EXHAUST DUCTS, AND PRODUCTION PRIMARY NOZZLE. FAN-EXHAUST NOISE-SUPPRESSOR ENCLOSURE AROUND ENGINE – Continued.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 077-02, 080-02, AND 081-02.

		ANGLES FROM ENGINE INLET CENTERLINE, DEGREES														
B		15	30	40	50	60	75	90	100	110	120	130	140	150	160	PWL
A	50	79.6	80.4	81.4	83.5	83.5	84.6	87.4	88.7	---	---	---	---	---	---	134.8
N	63	79.6	80.4	81.4	83.5	83.5	84.6	87.4	88.7	---	---	---	---	---	---	134.8
D	80	79.6	80.4	81.4	83.5	83.5	84.6	87.4	88.7	---	---	---	---	---	---	134.8
	100	78.7	79.5	80.0	79.9	81.0	83.2	86.0	88.1	---	---	---	---	---	---	133.4
C	125	78.7	79.5	80.0	79.9	81.0	83.2	86.0	88.1	---	---	---	---	---	---	133.4
E	160	78.7	79.5	80.0	79.9	81.0	83.2	86.0	88.1	---	---	---	---	---	---	133.4
N	200	79.3	79.6	79.1	79.4	80.1	80.4	82.7	84.7	---	---	---	---	---	---	130.9
T	250	79.3	79.6	79.1	79.4	80.1	80.4	82.7	84.7	---	---	---	---	---	---	130.9
E	315	79.3	79.6	79.1	79.4	80.1	80.4	82.7	84.7	---	---	---	---	---	---	130.9
R	400	77.6	77.4	77.3	76.6	76.2	75.0	77.4	79.6	---	---	---	---	---	---	126.7
	500	77.6	77.4	77.3	76.6	76.2	75.0	77.4	79.6	---	---	---	---	---	---	126.7
F	630	77.6	77.4	77.3	76.6	76.2	75.0	77.4	79.6	---	---	---	---	---	---	126.7
R	800	74.9	74.1	73.3	70.5	69.6	69.4	71.1	72.2	---	---	---	---	---	---	121.2
E	1000	73.2	73.9	72.8	70.9	69.4	68.4	69.0	71.1	---	---	---	---	---	---	120.3
Q	1250	79.2	79.5	78.2	75.5	74.7	71.1	70.2	72.0	---	---	---	---	---	---	124.7
U	1600	81.8	80.5	80.2	79.2	76.0	72.4	72.4	72.7	---	---	---	---	---	---	126.7
E	2000	85.9	87.4	86.7	83.1	81.8	77.3	75.8	74.6	---	---	---	---	---	---	132.0
N	2500	97.7	100.2	101.6	95.0	95.3	92.0	90.3	84.8	---	---	---	---	---	---	145.4
C	3150	90.5	91.2	91.6	87.1	85.5	81.6	79.6	75.8	---	---	---	---	---	---	136.2
Y	4000	90.2	89.2	88.7	86.2	84.1	80.7	78.4	74.4	---	---	---	---	---	---	134.6
,	5000	94.9	95.9	93.6	91.8	91.6	88.3	84.7	80.2	---	---	---	---	---	---	140.6
H	6300	90.4	91.5	91.2	88.3	86.0	82.4	79.4	76.3	---	---	---	---	---	---	136.4
Z	8000	92.0	94.0	92.1	89.3	88.1	83.8	81.0	78.0	---	---	---	---	---	---	138.0

AVERAGE NET REFERRED THRUST, FN/DELTA = 7115.5 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED,N1/VTHETA = 4600.9 RPM
AVERAGE JET EXHAUST VELOCITY = 848.6 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.24

TOTAL PWL= 149.4

ANALYSIS OF JT3D STATIC NOISE-REDUCTION TESTS AT EDWARDS AFB

TABLE A-7. – NO-RING TREATED INLET. TREATMENT ON WALLS OF INLET DUCT AND CENTERBODY. EXISTING PRODUCTION 24-IN.-LONG FAN-EXHAUST DUCTS, AND PRODUCTION PRIMARY NOZLE. FAN-EXHAUST NOISE-SUPPRESSOR ENCLOSURE AROUND ENGINE – Continued.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 077-03, 080-03, AND 081-03.

		ANGLES FROM ENGINE INLET CENTERLINE, DEGREES														
B		15	30	40	50	60	75	90	100	110	120	130	140	150	160	PWL
A	50	80.3	82.7	83.5	84.7	85.1	86.9	89.1	90.8	---	---	---	---	---	---	136.7
N	63	80.3	82.7	83.5	84.7	85.1	86.9	89.1	90.8	---	---	---	---	---	---	136.7
D	80	80.3	82.7	83.5	84.7	85.1	86.9	89.1	90.8	---	---	---	---	---	---	136.7
	100	81.6	82.7	82.7	82.7	83.8	86.1	89.1	91.1	---	---	---	---	---	---	136.4
C	125	81.6	82.7	82.7	82.7	83.8	86.1	89.1	91.1	---	---	---	---	---	---	136.4
E	160	81.6	82.7	82.7	82.7	83.8	86.1	89.1	91.1	---	---	---	---	---	---	136.4
N	200	82.0	82.4	82.1	82.5	83.0	83.5	85.8	88.1	---	---	---	---	---	---	134.1
T	250	82.0	82.4	82.1	82.5	83.0	83.5	85.8	88.1	---	---	---	---	---	---	134.1
E	315	82.0	82.4	82.1	82.5	83.0	83.5	85.8	88.1	---	---	---	---	---	---	134.1
R	400	79.2	79.4	79.5	78.4	78.3	77.8	80.5	82.9	---	---	---	---	---	---	129.3
	500	79.2	79.4	79.5	78.4	78.3	77.8	80.5	82.9	---	---	---	---	---	---	129.3
F	630	79.2	79.4	79.5	78.4	78.3	77.8	80.5	82.9	---	---	---	---	---	---	129.3
R	800	74.9	75.1	74.7	72.5	72.2	72.2	74.4	75.2	---	---	---	---	---	---	123.3
E	1000	73.8	76.6	73.5	71.4	70.7	70.9	72.2	74.1	---	---	---	---	---	---	122.4
Q	1250	76.7	77.8	75.7	74.5	73.4	71.9	71.9	74.6	---	---	---	---	---	---	123.8
U	1600	80.5	80.6	80.0	78.3	75.9	74.3	74.3	75.6	---	---	---	---	---	---	126.8
E	2000	88.1	87.8	85.0	84.1	81.7	78.4	77.3	76.7	---	---	---	---	---	---	132.4
N	2500	97.9	104.3	101.6	96.8	94.3	90.9	88.8	83.9	---	---	---	---	---	---	146.7
C	3150	96.7	101.6	98.3	94.5	90.2	88.3	84.9	81.5	---	---	---	---	---	---	143.9
Y	4000	89.2	89.2	88.5	86.0	84.3	80.4	80.0	75.8	---	---	---	---	---	---	134.4
,	5000	95.6	96.3	94.6	92.0	89.8	86.5	83.8	80.7	---	---	---	---	---	---	140.6
H	6300	94.0	95.2	96.0	91.4	88.7	85.2	82.5	79.8	---	---	---	---	---	---	140.1
Z	8000	92.4	93.7	91.7	89.2	87.8	83.9	81.8	78.4	---	---	---	---	---	---	137.9

AVERAGE NET REFERRED THRUST, FN/DELTA = 8415.0 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED,N1/VTHETA = 4901.6 RPM
AVERAGE JET EXHAUST VELOCITY = 932.2 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.29

TOTAL PWL = 151.5

TABLE A-7. – NO-RING TREATED INLET. TREATMENT ON WALLS OF INLET DUCT AND CENTERBODY. EXISTING PRODUCTION 24-IN.-LONG FAN-EXHAUST DUCTS, AND PRODUCTION PRIMARY NOZZLE. FAN-EXHAUST NOISE-SUPPRESSOR ENCLOSURE AROUND ENGINE – Continued.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 077-04, 080-04, AND 081-04.

BAND CENTER FREQUENCY, HZ	ANGLES FROM ENGINE INLET CENTERLINE, DEGREES														
	15	30	40	50	60	75	90	100	110	120	130	140	150	160	PWL
50	83.3	85.6	86.7	87.2	88.1	89.7	92.1	94.0	---	---	---	---	---	---	139.7
63	83.3	85.6	86.7	87.2	88.1	89.7	92.1	94.0	---	---	---	---	---	---	139.7
80	83.3	85.6	86.7	87.2	88.1	89.7	92.1	94.0	---	---	---	---	---	---	139.7
100	86.0	86.9	87.0	86.6	87.8	90.7	93.3	95.8	---	---	---	---	---	---	140.9
125	86.0	86.9	87.0	86.6	87.8	90.7	93.3	95.8	---	---	---	---	---	---	140.9
160	86.0	86.9	87.0	86.6	87.8	90.7	93.3	95.8	---	---	---	---	---	---	140.9
200	85.4	86.0	86.2	86.6	87.5	88.2	90.8	93.1	---	---	---	---	---	---	138.7
250	85.4	86.0	86.2	86.6	87.5	88.2	90.8	93.1	---	---	---	---	---	---	138.7
315	85.4	86.0	86.2	86.6	87.5	88.2	90.8	93.1	---	---	---	---	---	---	138.7
400	82.4	84.4	85.2	85.8	85.2	83.3	86.0	88.3	---	---	---	---	---	---	135.0
500	82.4	84.4	85.2	85.8	85.2	83.3	86.0	88.3	---	---	---	---	---	---	135.0
630	82.4	84.4	85.2	85.8	85.2	83.3	86.0	88.3	---	---	---	---	---	---	135.0
800	78.7	77.3	78.6	78.0	77.7	77.3	79.6	80.3	---	---	---	---	---	---	128.1
1000	77.8	77.4	76.5	75.2	74.8	75.5	77.3	79.2	---	---	---	---	---	---	126.3
1250	78.5	78.4	76.7	76.0	75.5	75.5	77.1	80.2	---	---	---	---	---	---	126.8
1600	83.8	83.3	79.3	79.1	78.7	77.7	78.8	81.2	---	---	---	---	---	---	129.6
2000	90.3	88.6	84.6	83.5	80.7	80.1	81.2	81.4	---	---	---	---	---	---	133.5
2500	97.9	97.2	94.2	90.5	87.7	85.9	85.9	83.8	---	---	---	---	---	---	141.0
3150	106.5	108.4	103.7	99.4	98.6	95.5	92.4	92.0	---	---	---	---	---	---	150.9
4000	92.2	92.9	91.4	90.5	88.2	84.2	83.5	80.2	---	---	---	---	---	---	138.0
5000	93.2	93.9	91.8	89.7	87.7	83.1	81.1	79.6	---	---	---	---	---	---	138.1
6300	97.4	99.8	98.5	96.7	95.4	89.3	86.1	83.2	---	---	---	---	---	---	144.3
8000	92.5	94.3	91.7	89.8	88.3	83.3	81.1	79.1	---	---	---	---	---	---	138.2

AVERAGE NET REFERRED THRUST, FN/DELTA = 10761.3 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED,N1/VTHETA = 5350.0 RPM
AVERAGE JET EXHAUST VELOCITY = 1090.2 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.40

TOTAL PWL= 154.5

ANALYSIS OF JT3D STATIC NOISE-REDUCTION TESTS AT EDWARDS AFB

TABLE A-7. – NO-RING TREATED INLET. TREATMENT ON WALLS OF INLET DUCT AND CENTERBODY. EXISTING PRODUCTION 24-IN.-LONG FAN-EXHAUST DUCTS, AND PRODUCTION PRIMARY NOZZLE. FAN-EXHAUST NOISE-SUPPRESSOR ENCLOSURE AROUND ENGINE – Continued.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 077-05, 080-05, AND 081-05.

		ANGLES FROM ENGINE INLET CENTERLINE, DEGREES														
B		15	30	40	50	60	75	90	100	110	120	130	140	150	160	PWL
A	50	87.3	89.6	90.0	91.2	91.9	93.7	95.9	98.0	---	---	---	---	---	---	143.6
N	63	87.3	89.6	90.0	91.2	91.9	93.7	95.9	98.0	---	---	---	---	---	---	143.6
D	80	87.3	89.6	90.0	91.2	91.9	93.7	95.9	98.0	---	---	---	---	---	---	143.6
	100	92.8	93.6	92.8	92.7	93.7	96.7	99.6	101.4	---	---	---	---	---	---	146.8
C	125	92.8	93.6	92.8	92.7	93.7	96.7	99.6	101.4	---	---	---	---	---	---	146.8
E	160	92.8	93.6	92.8	92.7	93.7	96.7	99.6	101.4	---	---	---	---	---	---	146.8
N	200	92.5	92.3	92.7	93.6	94.5	95.8	98.3	100.5	---	---	---	---	---	---	146.1
T	250	92.5	92.3	92.7	93.6	94.5	95.8	98.3	100.5	---	---	---	---	---	---	146.1
E	315	92.5	92.3	92.7	93.6	94.5	95.8	98.3	100.5	---	---	---	---	---	---	146.1
R	400	89.2	90.3	90.7	89.9	90.5	90.5	93.9	96.1	---	---	---	---	---	---	141.8
	500	89.2	90.3	90.7	89.9	90.5	90.5	93.9	96.1	---	---	---	---	---	---	141.8
F	630	89.2	90.3	90.7	89.9	90.5	90.5	93.9	96.1	---	---	---	---	---	---	141.8
R	800	83.5	84.2	84.8	83.8	84.3	84.7	87.6	87.9	---	---	---	---	---	---	135.2
E	1000	83.5	82.7	82.9	82.2	82.5	83.1	85.3	86.9	---	---	---	---	---	---	133.6
Q	1250	91.5	82.6	83.9	84.2	82.5	83.1	85.1	88.2	---	---	---	---	---	---	135.1
U	1600	87.4	86.7	87.7	88.2	85.1	85.6	87.1	89.0	---	---	---	---	---	---	136.6
E	2000	95.1	90.5	90.3	89.0	86.5	85.8	87.0	88.6	---	---	---	---	---	---	138.5
N	2500	95.9	93.5	92.5	89.6	86.8	84.9	86.3	86.9	---	---	---	---	---	---	139.3
C	3150	100.5	101.4	102.3	99.6	96.0	88.5	88.5	88.6	---	---	---	---	---	---	146.7
Y	4000	95.9	95.9	96.0	93.5	91.3	86.4	85.9	85.7	---	---	---	---	---	---	141.4
,	5000	96.1	94.2	93.4	92.2	89.7	86.6	84.7	83.5	---	---	---	---	---	---	140.1
H	6300	94.4	94.6	94.3	91.3	89.1	85.6	83.0	82.7	---	---	---	---	---	---	139.7
Z	8000	92.3	92.1	91.4	89.3	87.5	83.7	81.0	81.0	---	---	---	---	---	---	137.4

AVERAGE NET REFERRED THRUST, FN/DELTA = 14842.5 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED,N1/VTHETA = 5998.2 RPM
AVERAGE JET EXHAUST VELOCITY = 1381.4 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.62

TOTAL PWL= 157.0

ANALYSIS OF JT3D STATIC NOISE-REDUCTION TESTS AT EDWARDS AFB

TABLE A-7. – NO-RING TREATED INLET. TREATMENT ON WALLS OF INLET DUCT AND CENTERBODY. EXISTING PRODUCTION 24-IN.-LONG FAN-EXHAUST DUCTS, AND PRODUCTION PRIMARY NOZZLE. FAN-EXHAUST NOISE-SUPPRESSOR ENCLOSURE AROUND ENGINE – Continued.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 077-06, 080-06, AND 081-06.

BAND CENTER FREQUENCY, HZ	ANGLES FROM ENGINE INLET CENTERLINE, DEGREES 15	30	40	50	60	75	90	100	110	120	130	140	150	160	PWL
50	85.8	87.7	88.5	89.4	90.0	91.7	94.3	96.3	---	---	---	---	---	---	141.9
63	85.8	87.7	88.5	89.4	90.0	91.7	94.3	96.3	---	---	---	---	---	---	141.9
80	85.8	87.7	88.5	89.4	90.0	91.7	94.3	96.3	---	---	---	---	---	---	141.9
100	89.6	90.5	90.3	90.1	91.0	94.0	96.9	98.7	---	---	---	---	---	---	144.1
125	89.6	90.5	90.3	90.1	91.0	94.0	96.9	98.7	---	---	---	---	---	---	144.1
160	89.6	90.5	90.3	90.1	91.0	94.0	96.9	98.7	---	---	---	---	---	---	144.1
200	88.8	89.0	89.3	90.1	91.2	92.4	94.9	97.3	---	---	---	---	---	---	142.8
250	88.8	89.0	89.3	90.1	91.2	92.4	94.9	97.3	---	---	---	---	---	---	142.8
315	88.8	89.0	89.3	90.1	91.2	92.4	94.9	97.3	---	---	---	---	---	---	142.8
400	86.2	87.3	87.5	86.8	86.9	87.2	90.3	92.6	---	---	---	---	---	---	138.5
500	86.2	87.3	87.5	86.8	86.9	87.2	90.3	92.6	---	---	---	---	---	---	138.5
630	86.2	87.3	87.5	86.8	86.9	87.2	90.3	92.6	---	---	---	---	---	---	138.5
800	81.2	83.0	81.8	80.6	80.7	81.0	83.5	84.2	---	---	---	---	---	---	131.7
1000	79.7	79.6	79.6	78.7	78.5	79.7	82.0	83.3	---	---	---	---	---	---	130.1
1250	82.5	80.5	80.1	78.9	78.5	79.8	82.2	84.7	---	---	---	---	---	---	130.8
1600	85.7	85.6	85.1	84.5	82.8	82.2	83.8	85.9	---	---	---	---	---	---	133.8
2000	92.6	91.6	88.5	88.3	84.8	82.6	83.3	85.0	---	---	---	---	---	---	136.7
2500	98.9	92.5	92.3	89.9	88.5	84.8	84.0	84.5	---	---	---	---	---	---	140.0
3150	102.2	106.8	103.6	100.1	98.2	91.6	89.7	90.3	---	---	---	---	---	---	149.3
4000	94.2	95.3	94.5	92.0	90.1	85.3	85.5	83.1	---	---	---	---	---	---	140.2
5000	94.7	93.6	92.9	91.2	88.7	84.6	82.8	82.0	---	---	---	---	---	---	139.1
6300	96.5	99.0	96.7	93.8	91.3	86.4	83.8	82.3	---	---	---	---	---	---	142.4
8000	93.0	93.4	91.6	89.2	87.8	83.7	80.5	80.0	---	---	---	---	---	---	137.9

AVERAGE NET REFERRED THRUST, FN/DELTA = 12966.6 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED,N1/VTHETA = 5699.1 RPM
AVERAGE JET EXHAUST VELOCITY = 1226.2 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.51

TOTAL PWL= 155.4

TABLE A-7. – NO-RING TREATED INLET. TREATMENT ON WALLS OF INLET DUCT AND CENTERBODY. EXISTING PRODUCTION 24-IN.-LONG FAN-EXHAUST DUCTS, AND PRODUCTION PRIMARY NOZZLE. FAN-EXHAUST NOISE-SUPPRESSOR ENCLOSURE AROUND ENGINE – Concluded.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 077-07, 080-07, AND 081-07.

BAND CENTER FREQUENCY, HZ	ANGLES FROM ENGINE INLET CENTERLINE, DEGREES														
	15	30	40	50	60	75	90	100	110	120	130	140	150	160	PWL
50	88.9	91.0	91.6	92.7	93.2	95.2	97.4	99.6	---	---	---	---	---	---	145.1
63	88.9	91.0	91.6	92.7	93.2	95.2	97.4	99.6	---	---	---	---	---	---	145.1
80	88.9	91.0	91.6	92.7	93.2	95.2	97.4	99.6	---	---	---	---	---	---	145.1
100	94.7	96.0	95.0	94.9	95.9	99.3	102.0	103.9	---	---	---	---	---	---	149.3
125	94.7	96.0	95.0	94.9	95.9	99.3	102.0	103.9	---	---	---	---	---	---	149.3
160	94.7	96.0	95.0	94.9	95.9	99.3	102.0	103.9	---	---	---	---	---	---	149.3
200	95.8	95.6	95.8	96.9	97.8	99.1	101.5	103.9	---	---	---	---	---	---	149.4
250	95.8	95.6	95.8	96.9	97.8	99.1	101.5	103.9	---	---	---	---	---	---	149.4
315	95.8	95.6	95.8	96.9	97.8	99.1	101.5	103.9	---	---	---	---	---	---	149.4
400	90.8	93.3	94.0	93.2	93.7	93.9	97.3	99.6	---	---	---	---	---	---	145.2
500	90.8	93.3	94.0	93.2	93.7	93.9	97.3	99.6	---	---	---	---	---	---	145.2
630	90.8	93.3	94.0	93.2	93.7	93.9	97.3	99.6	---	---	---	---	---	---	145.2
800	86.8	87.4	88.2	87.5	87.9	88.3	91.4	91.9	---	---	---	---	---	---	138.9
1000	85.8	86.0	86.0	85.4	85.4	86.9	89.0	90.4	---	---	---	---	---	---	137.0
1250	85.1	85.0	85.2	85.4	85.2	86.5	88.6	91.8	---	---	---	---	---	---	137.1
1600	91.0	87.7	89.3	89.6	88.6	88.7	90.4	92.9	---	---	---	---	---	---	139.6
2000	95.5	93.6	91.7	92.2	89.7	88.7	90.6	92.4	---	---	---	---	---	---	141.1
2500	95.6	92.6	91.9	90.6	88.7	86.6	88.6	90.1	---	---	---	---	---	---	139.9
3150	96.3	95.2	94.3	91.4	90.7	87.6	87.9	89.6	---	---	---	---	---	---	141.1
4000	97.2	95.5	95.1	93.6	92.7	88.6	88.5	88.6	---	---	---	---	---	---	142.0
5000	93.6	92.0	92.4	91.2	88.9	86.2	85.3	86.0	---	---	---	---	---	---	138.9
6300	91.8	90.9	90.8	88.3	86.6	84.2	83.1	84.2	---	---	---	---	---	---	137.0
8000	90.2	89.5	89.2	87.2	85.6	82.7	81.8	83.0	---	---	---	---	---	---	135.7

AVERAGE NET REFERRED THRUST, FN/DELTA = 16602.4 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED,N1/VTHETA = 6299.8 RPM
AVERAGE JET EXHAUST VELOCITY = 1474.3 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.74

TOTAL PWL= 159.1

TABLE A-8. – ONE-RING TREATED INLET. TREATMENT ON WALLS OF SINGLE CONCENTRIC RING VANE, INLET DUCT, AND CENTERBODY. EXISTING PRODUCTION 24-IN.-LONG FAN-EXHAUST DUCTS, AND PRODUCTION PRIMARY NOZZLE. FAN-EXHAUST NOISE-SUPPRESSOR ENCLOSURE AROUND ENGINE.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 088-01, 089-01, AND 090-01.

BAND CENTER FREQUENCY, HZ	ANGLES FROM ENGINE INLET CENTERLINE, DEGREES														
	15	30	40	50	60	75	90	100	110	120	130	140	150	160	PWL
50	78.4	78.7	79.2	80.9	81.6	82.8	84.7	86.2	---	---	---	---	---	---	132.5
63	78.4	78.7	79.2	80.9	81.6	82.8	84.7	86.2	---	---	---	---	---	---	132.5
80	78.4	78.7	79.2	80.9	81.6	82.8	84.7	86.2	---	---	---	---	---	---	132.5
100	76.7	77.2	78.3	77.6	78.7	80.4	83.5	85.1	---	---	---	---	---	---	130.8
125	76.7	77.2	78.3	77.6	78.7	80.4	83.5	85.1	---	---	---	---	---	---	130.8
160	76.7	77.2	78.3	77.6	78.7	80.4	83.5	85.1	---	---	---	---	---	---	130.8
200	77.6	77.1	76.5	76.3	77.2	77.3	79.2	81.0	---	---	---	---	---	---	127.7
250	77.6	77.1	76.5	76.3	77.2	77.3	79.2	81.0	---	---	---	---	---	---	127.7
315	77.6	77.1	76.5	76.3	77.2	77.3	79.2	81.0	---	---	---	---	---	---	127.7
400	75.4	74.0	73.6	71.4	71.2	69.7	72.3	73.8	---	---	---	---	---	---	122.0
500	75.4	74.0	73.6	71.4	71.2	69.7	72.3	73.8	---	---	---	---	---	---	122.0
630	75.4	74.0	73.6	71.4	71.2	69.7	72.3	73.8	---	---	---	---	---	---	122.0
800	75.0	71.3	70.2	67.5	66.1	65.8	66.8	68.2	---	---	---	---	---	---	118.3
1000	71.6	71.4	71.0	69.7	68.3	67.9	67.5	68.6	---	---	---	---	---	---	118.7
1250	74.3	72.1	73.5	73.6	72.7	69.4	69.1	69.3	---	---	---	---	---	---	121.1
1600	80.0	77.1	76.7	75.3	73.3	70.1	69.4	69.1	---	---	---	---	---	---	123.6
2000	85.2	84.2	83.0	80.5	78.1	75.2	73.6	72.4	---	---	---	---	---	---	129.2
2500	90.5	92.1	91.6	85.8	85.3	86.6	81.2	76.6	---	---	---	---	---	---	136.9
3150	89.2	87.7	86.7	84.9	80.6	77.1	74.8	71.9	---	---	---	---	---	---	132.7
4000	91.5	89.3	87.4	85.2	81.2	77.7	75.3	72.8	---	---	---	---	---	---	134.0
5000	94.2	94.6	93.1	91.0	87.5	84.7	81.5	76.6	---	---	---	---	---	---	139.0
6300	90.6	91.2	89.5	86.5	84.9	80.3	77.0	74.6	---	---	---	---	---	---	135.4
8000	90.8	91.0	88.9	86.4	83.9	80.0	77.3	75.0	---	---	---	---	---	---	135.1

AVERAGE NET REFERRED THRUST, FN/DELTA = 6010.5 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED,N1/VTHETA = 4297.0 RPM
AVERAGE JET EXHAUST VELOCITY = 751.8 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.19

TOTAL PWL= 145.6

ANALYSIS OF JT3D STATIC NOISE-REDUCTION TESTS AT EDWARDS AFB

TABLE A-8. – ONE-RING TREATED INLET. TREATMENT ON WALLS OF SINGLE CONCENTRIC RING VANE, INLET DUCT, AND CENTERBODY. EXISTING PRODUCTION 24-IN.-LONG FAN-EXHAUST DUCTS, AND PRODUCTION PRIMARY NOZZLE. FAN-EXHAUST NOISE-SUPPRESSOR ENCLOSURE AROUND ENGINE – Continued.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 088-02, 089-02, AND 090-02.

		ANGLES FROM ENGINE INLET CENTERLINE, DEGREES														
B		15	30	40	50	60	75	90	100	110	120	130	140	150	160	PWL
A	50	79.2	80.1	81.3	84.5	84.8	84.9	87.7	88.8	---	---	---	---	---	---	135.1
N	63	79.2	80.1	81.3	84.5	84.8	84.9	87.7	88.8	---	---	---	---	---	---	135.1
D	80	79.2	80.1	81.3	84.5	84.8	84.9	87.7	88.8	---	---	---	---	---	---	135.1
	100	78.9	79.7	80.7	79.8	81.0	83.0	86.1	88.0	---	---	---	---	---	---	133.4
C	125	78.9	79.7	80.7	79.8	81.0	83.0	86.1	88.0	---	---	---	---	---	---	133.4
E	160	78.9	79.7	80.7	79.8	81.0	83.0	86.1	88.0	---	---	---	---	---	---	133.4
N	200	79.4	79.2	78.7	78.5	79.7	80.1	82.1	84.1	---	---	---	---	---	---	130.4
T	250	79.4	79.2	78.7	78.5	79.7	80.1	82.1	84.1	---	---	---	---	---	---	130.4
E	315	79.4	79.2	78.7	78.5	79.7	80.1	82.1	84.1	---	---	---	---	---	---	130.4
R	400	77.3	76.2	75.7	74.2	73.9	72.5	75.5	76.9	---	---	---	---	---	---	124.7
	500	77.3	76.2	75.7	74.2	73.9	72.5	75.5	76.9	---	---	---	---	---	---	124.7
F	630	77.3	76.2	75.7	74.2	73.9	72.5	75.5	76.9	---	---	---	---	---	---	124.7
R	800	73.8	73.3	72.3	68.8	67.7	68.3	69.5	71.5	---	---	---	---	---	---	120.0
E	1000	72.0	70.5	69.8	69.6	68.3	68.8	69.5	71.6	---	---	---	---	---	---	119.4
Q	1250	75.0	72.0	73.0	73.4	72.9	70.7	71.0	72.4	---	---	---	---	---	---	121.9
U	1600	80.5	77.1	76.9	76.1	74.5	71.6	71.2	71.8	---	---	---	---	---	---	124.4
E	2000	84.8	83.8	82.4	80.1	78.4	74.0	72.3	72.5	---	---	---	---	---	---	128.8
N	2500	91.0	93.3	91.6	88.4	86.5	81.0	81.3	78.2	---	---	---	---	---	---	137.1
C	3150	89.8	88.0	85.5	83.4	81.8	77.8	76.0	73.7	---	---	---	---	---	---	132.7
Y	4000	89.9	87.9	86.7	83.7	81.7	78.4	76.2	72.6	---	---	---	---	---	---	133.0
,	5000	94.5	92.6	92.8	88.7	88.1	85.1	82.7	77.5	---	---	---	---	---	---	138.3
H	6300	90.3	90.9	89.5	86.5	84.6	80.6	77.7	74.6	---	---	---	---	---	---	135.3
Z	8000	91.8	91.1	89.7	87.5	85.5	81.5	79.0	76.7	---	---	---	---	---	---	136.0

AVERAGE NET REFERRED THRUST, FN/DELTA = 7091.9 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED,N1/VTHETA = 4590.7 RPM
AVERAGE JET EXHAUST VELOCITY = 826.4 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.23

TOTAL PWL= 146.5

TABLE A-8. – ONE-RING TREATED INLET. TREATMENT ON WALLS OF SINGLE CONCENTRIC RING VANE, INLET DUCT, AND CENTERBODY. EXISTING PRODUCTION 24-IN.-LONG FAN-EXHAUST DUCTS, AND PRODUCTION PRIMARY NOZZLE. FAN-EXHAUST NOISE-SUPPRESSOR ENCLOSURE AROUND ENGINE – Continued.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 088-03, 089-03, AND 090-03.

BAND CENTER FREQUENCY, HZ	ANGLES FROM ENGINE INLET CENTERLINE, DEGREES														
	15	30	40	50	60	75	90	100	110	120	130	140	150	160	PWL
50	81.3	82.0	83.5	84.7	86.1	87.0	89.0	90.8	---	---	---	---	---	---	136.8
63	81.3	82.0	83.5	84.7	86.1	87.0	89.0	90.8	---	---	---	---	---	---	136.8
80	81.3	82.0	83.5	84.7	86.1	87.0	89.0	90.8	---	---	---	---	---	---	136.8
100	82.0	82.2	83.3	82.8	84.2	86.0	89.2	90.9	---	---	---	---	---	---	136.4
125	82.0	82.2	83.3	82.8	84.2	86.0	89.2	90.9	---	---	---	---	---	---	136.4
160	82.0	82.2	83.3	82.8	84.2	86.0	89.2	90.9	---	---	---	---	---	---	136.4
200	82.3	81.8	81.5	81.3	82.6	83.1	85.3	87.3	---	---	---	---	---	---	133.5
250	82.3	81.8	81.5	81.3	82.6	83.1	85.3	87.3	---	---	---	---	---	---	133.5
315	82.3	81.8	81.5	81.3	82.6	83.1	85.3	87.3	---	---	---	---	---	---	133.5
400	79.4	78.6	78.3	76.8	76.6	75.8	79.0	80.6	---	---	---	---	---	---	127.7
500	79.4	78.6	78.3	76.8	76.6	75.8	79.0	80.6	---	---	---	---	---	---	127.7
630	79.4	78.6	78.3	76.8	76.6	75.8	79.0	80.6	---	---	---	---	---	---	127.7
800	74.9	73.3	73.0	71.7	70.9	71.3	73.0	74.9	---	---	---	---	---	---	122.3
1000	71.9	71.7	71.4	70.9	69.8	71.1	72.5	75.2	---	---	---	---	---	---	121.6
1250	73.2	71.0	71.4	72.0	72.0	71.7	72.9	75.5	---	---	---	---	---	---	122.2
1600	80.1	76.4	76.0	75.0	74.1	72.6	73.7	75.1	---	---	---	---	---	---	124.7
2000	84.6	82.9	80.0	78.5	76.5	74.0	73.9	74.6	---	---	---	---	---	---	127.9
2500	93.4	92.3	91.4	88.8	88.5	81.5	80.0	81.0	---	---	---	---	---	---	137.6
3150	90.9	89.6	88.2	85.1	85.0	78.9	77.8	78.0	---	---	---	---	---	---	134.6
4000	89.1	88.1	86.1	82.8	81.4	77.9	76.6	73.5	---	---	---	---	---	---	132.6
5000	94.2	93.2	91.8	90.8	88.4	84.1	82.0	78.7	---	---	---	---	---	---	138.5
6300	92.2	92.1	90.7	89.0	86.8	82.6	80.1	77.3	---	---	---	---	---	---	137.0
8000	92.3	91.5	89.5	88.1	86.1	81.3	78.7	76.6	---	---	---	---	---	---	136.3

AVERAGE NET REFERRED THRUST, FN/DELTA = 8410.9 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED,N1/VTHETA = 4900.4 RPM
AVERAGE JET EXHAUST VELOCITY = 924.6 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.29

TOTAL PWL= 148.1

TABLE A-8. – ONE-RING TREATED INLET. TREATMENT ON WALLS OF SINGLE CONCENTRIC RING VANE, INLET DUCT, AND CENTERBODY. EXISTING PRODUCTION 24-IN.-LONG FAN-EXHAUST DUCTS, AND PRODUCTION PRIMARY NOZZLE. FAN-EXHAUST NOISE-SUPPRESSOR ENCLOSURE AROUND ENGINE – Continued.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 088-04, 089-04, AND 090-04.

BAND CENTER FREQUENCY, HZ	ANGLES FROM ENGINE INLET CENTERLINE, DEGREES 15	30	40	50	60	75	90	100	110	120	130	140	150	160	PWL
50	84.9	85.6	86.7	87.5	88.7	89.9	92.1	94.2	---	---	---	---	---	---	139.9
63	84.9	85.6	86.7	87.5	88.7	89.9	92.1	94.2	---	---	---	---	---	---	139.9
80	84.9	85.6	86.7	87.5	88.7	89.9	92.1	94.2	---	---	---	---	---	---	139.9
100	86.9	86.5	87.3	86.7	87.9	90.3	93.3	95.6	---	---	---	---	---	---	140.8
125	86.9	86.5	87.3	86.7	87.9	90.3	93.3	95.6	---	---	---	---	---	---	140.8
160	86.9	86.5	87.3	86.7	87.9	90.3	93.3	95.6	---	---	---	---	---	---	140.8
200	86.4	85.8	85.8	85.8	87.0	87.9	90.4	92.7	---	---	---	---	---	---	138.4
250	86.4	85.8	85.8	85.8	87.0	87.9	90.4	92.7	---	---	---	---	---	---	138.4
315	86.4	85.8	85.8	85.8	87.0	87.9	90.4	92.7	---	---	---	---	---	---	138.4
400	83.3	82.2	82.5	80.9	81.6	81.1	84.5	86.4	---	---	---	---	---	---	132.8
500	83.3	82.2	82.5	80.9	81.6	81.1	84.5	86.4	---	---	---	---	---	---	132.8
630	83.3	82.3	82.6	80.9	81.6	81.2	84.5	86.5	---	---	---	---	---	---	132.8
800	77.5	76.0	76.4	75.3	74.8	76.6	78.9	80.9	---	---	---	---	---	---	127.1
1000	75.4	74.9	74.7	74.8	73.8	76.1	78.1	81.4	---	---	---	---	---	---	126.7
1250	75.2	74.7	74.3	74.8	74.7	76.8	78.3	81.3	---	---	---	---	---	---	126.8
1600	80.2	77.6	77.6	79.2	77.6	76.6	79.6	81.2	---	---	---	---	---	---	128.3
2000	85.2	83.5	81.0	78.1	77.5	77.5	78.6	80.0	---	---	---	---	---	---	129.6
2500	90.9	93.7	90.0	84.5	83.2	81.7	81.7	82.5	---	---	---	---	---	---	136.5
3150	99.1	99.7	95.5	91.3	95.0	90.4	86.7	85.5	---	---	---	---	---	---	143.6
4000	92.3	92.0	91.9	90.0	85.7	82.9	82.0	79.6	---	---	---	---	---	---	137.4
5000	94.2	91.2	91.0	88.4	86.7	82.8	80.8	79.0	---	---	---	---	---	---	137.3
6300	99.9	97.7	99.7	95.7	90.8	87.4	86.6	81.5	---	---	---	---	---	---	143.8
8000	93.1	92.0	89.6	88.3	86.7	82.0	79.5	78.9	---	---	---	---	---	---	136.8

AVERAGE NET REFERRED THRUST, FN/DELTA = 10790.5 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED,N1/VTHETA = 5346.4 RPM
AVERAGE JET EXHAUST VELOCITY = 1081.7 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.40

TOTAL PWL= 152.1

TABLE A-8. – ONE-RING TREATED INLET. TREATMENT ON WALLS OF SINGLE CONCENTRIC RING VANE, INLET DUCT, AND CENTERBODY. EXISTING PRODUCTION 24-IN.-LONG FAN-EXHAUST DUCTS, AND PRODUCTION PRIMARY NOZZLE. FAN-EXHAUST NOISE-SUPPRESSOR ENCLOSURE AROUND ENGINE – Continued.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 088-05, 089-05, AND 090-05.

		ANGLES FROM ENGINE INLET CENTERLINE, DEGREES														
B		15	30	40	50	60	75	90	100	110	120	130	140	150	160	PWL
A	50	87.9	89.6	89.9	91.6	92.3	93.8	96.0	98.4	---	---	---	---	---	---	143.8
N	63	87.9	89.6	89.9	91.6	92.3	93.8	96.0	98.4	---	---	---	---	---	---	143.8
D	80	87.9	89.6	89.9	91.6	92.3	93.8	96.0	98.4	---	---	---	---	---	---	143.8
	100	92.5	93.2	93.6	92.7	94.1	96.6	99.6	101.6	---	---	---	---	---	---	146.9
C	125	92.5	93.2	93.6	92.7	94.1	96.6	99.6	101.6	---	---	---	---	---	---	146.9
E	160	92.5	93.2	93.6	92.7	94.1	96.6	99.6	101.6	---	---	---	---	---	---	146.9
N	200	92.7	92.6	92.4	93.1	94.2	95.4	97.8	100.2	---	---	---	---	---	---	145.7
T	250	92.7	92.6	92.4	93.1	94.2	95.4	97.8	100.2	---	---	---	---	---	---	145.7
E	315	92.7	92.6	92.4	93.1	94.2	95.4	97.8	100.2	---	---	---	---	---	---	145.7
R	400	89.5	89.3	89.8	88.3	89.1	88.6	92.4	94.2	---	---	---	---	---	---	140.3
	500	89.5	89.3	89.8	88.3	89.1	88.6	92.4	94.2	---	---	---	---	---	---	140.3
F	630	89.5	89.3	89.8	88.3	89.1	88.6	92.4	94.2	---	---	---	---	---	---	140.3
R	800	83.6	82.7	83.2	82.8	82.4	84.6	86.8	89.1	---	---	---	---	---	---	134.9
E	1000	82.2	81.5	81.8	82.4	81.7	84.5	86.6	89.8	---	---	---	---	---	---	134.8
Q	1250	81.1	81.1	81.3	81.8	81.8	84.4	86.7	89.8	---	---	---	---	---	---	134.7
U	1600	84.3	85.8	84.0	83.5	83.5	84.7	87.0	89.4	---	---	---	---	---	---	135.4
E	2000	90.2	86.1	86.8	82.8	83.5	83.3	85.9	87.9	---	---	---	---	---	---	135.4
N	2500	89.0	90.7	88.2	87.1	83.4	83.2	85.0	86.8	---	---	---	---	---	---	136.1
C	3150	100.9	99.6	97.8	95.7	89.6	87.6	87.8	88.1	---	---	---	---	---	---	144.1
Y	4000	95.7	92.7	92.6	90.7	87.8	84.2	84.9	85.4	---	---	---	---	---	---	139.1
,	5000	94.2	92.6	91.4	89.0	88.0	83.8	82.9	83.5	---	---	---	---	---	---	138.1
H	6300	94.4	93.7	90.9	89.5	87.3	83.6	81.3	82.5	---	---	---	---	---	---	138.2
Z	8000	92.3	90.8	89.5	86.8	85.0	82.2	79.9	81.0	---	---	---	---	---	---	136.0

AVERAGE NET REFERRED THRUST, FN/DELTA = 14811.7 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED,N1/VTHETA = 6002.4 RPM
AVERAGE JET EXHAUST VELOCITY = 1335.0 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.62

TOTAL PWL = 156.4

ANALYSIS OF JT3D STATIC NOISE-REDUCTION TESTS AT EDWARDS AFB

TABLE A-8. – ONE-RING TREATED INLET. TREATMENT ON WALLS OF SINGLE CONCENTRIC RING VANE, INLET DUCT, AND CENTERBODY. EXISTING PRODUCTION 24-IN.-LONG FAN-EXHAUST DUCTS, AND PRODUCTION PRIMARY NOZZLE. FAN-EXHAUST NOISE-SUPPRESSOR ENCLOSURE AROUND ENGINE – Continued.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 088-06, 089-06, AND 090-06.

BAND CENTER FREQUENCY, HZ	ANGLES FROM ENGINE INLET CENTERLINE, DEGREES														
	15	30	40	50	60	75	90	100	110	120	130	140	150	160	PWL
50	86.0	87.9	88.6	89.9	90.6	92.2	94.2	96.8	---	---	---	---	---	---	142.2
63	86.0	87.9	88.6	89.9	90.6	92.2	94.2	96.8	---	---	---	---	---	---	142.2
80	86.0	87.9	88.6	89.9	90.6	92.2	94.2	96.8	---	---	---	---	---	---	142.2
100	90.0	90.5	91.1	90.3	91.4	94.0	97.3	99.2	---	---	---	---	---	---	144.5
125	90.0	90.5	91.1	90.3	91.4	94.0	97.3	99.2	---	---	---	---	---	---	144.5
160	90.0	90.5	91.1	90.3	91.4	94.0	97.3	99.2	---	---	---	---	---	---	144.5
200	89.4	89.3	89.1	89.7	91.0	92.1	94.7	97.0	---	---	---	---	---	---	142.5
250	89.4	89.3	89.1	89.7	91.0	92.1	94.7	97.0	---	---	---	---	---	---	142.5
315	89.4	89.3	89.1	89.7	91.0	92.1	94.7	97.0	---	---	---	---	---	---	142.5
400	86.3	85.9	86.6	85.0	85.5	85.2	89.1	90.9	---	---	---	---	---	---	137.0
500	86.3	85.9	86.6	85.0	85.5	85.2	89.1	90.9	---	---	---	---	---	---	137.0
630	86.3	85.9	86.6	85.0	85.5	85.2	89.1	90.9	---	---	---	---	---	---	137.0
800	80.3	79.6	79.8	79.4	79.0	81.5	83.7	85.3	---	---	---	---	---	---	131.5
1000	78.9	78.1	78.2	78.8	78.5	81.0	83.2	85.8	---	---	---	---	---	---	131.2
1250	77.9	77.6	77.9	78.5	78.8	81.1	83.0	86.1	---	---	---	---	---	---	131.2
1600	81.4	81.7	80.8	82.4	81.0	81.5	83.7	86.0	---	---	---	---	---	---	132.3
2000	88.5	86.1	83.8	82.7	79.6	80.4	82.5	84.3	---	---	---	---	---	---	132.9
2500	92.8	92.3	91.5	86.5	84.0	81.9	83.7	84.1	---	---	---	---	---	---	137.1
3150	99.3	100.2	99.7	97.3	90.9	90.9	90.3	88.1	---	---	---	---	---	---	144.9
4000	93.9	92.6	94.7	90.6	86.6	83.1	84.3	83.0	---	---	---	---	---	---	138.9
5000	93.9	91.2	90.4	88.5	87.1	82.8	82.1	81.7	---	---	---	---	---	---	137.2
6300	95.4	96.6	93.6	91.2	89.7	85.5	82.7	82.2	---	---	---	---	---	---	140.3
8000	93.6	91.4	90.0	87.3	85.9	82.4	79.5	80.5	---	---	---	---	---	---	136.7

AVERAGE NET REFERRED THRUST, FN/DELTA = 13363.8 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED,N1/VTHETA = 5703.8 RPM
AVERAGE JET EXHAUST VELOCITY = 1215.1 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.51

TOTAL PWL= 154.4

TABLE A-8. – ONE-RING TREATED INLET. TREATMENT ON WALLS OF SINGLE CONCENTRIC RING VANE, INLET DUCT, AND CENTERBODY. EXISTING PRODUCTION 24-IN.-LONG FAN-EXHAUST DUCTS, AND PRODUCTION PRIMARY NOZZLE. FAN-EXHAUST NOISE-SUPPRESSOR ENCLOSURE AROUND ENGINE – Concluded.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 088-07, 089-07, AND 090-07.

BAND CENTER FREQUENCY, HZ	ANGLES FROM ENGINE INLET CENTERLINE, DEGREES 15	30	40	50	60	75	90	100	110	120	130	140	150	160	PWL
50	89.0	91.0	91.7	93.0	94.0	95.5	97.7	100.0	---	---	---	---	---	---	145.5
63	89.0	91.0	91.7	93.0	94.0	95.5	97.7	100.0	---	---	---	---	---	---	145.5
80	89.0	91.0	91.7	93.0	94.0	95.5	97.7	100.0	---	---	---	---	---	---	145.5
100	95.1	95.6	95.8	94.8	96.2	99.1	102.3	104.1	---	---	---	---	---	---	149.4
125	95.1	95.6	95.8	94.8	96.2	99.1	102.3	104.1	---	---	---	---	---	---	149.4
160	95.1	95.6	95.8	94.8	96.2	99.1	102.3	104.1	---	---	---	---	---	---	149.4
200	96.1	95.8	95.6	96.3	97.4	98.8	101.0	103.3	---	---	---	---	---	---	148.9
250	96.1	95.8	95.6	96.3	97.4	98.8	101.0	103.3	---	---	---	---	---	---	148.9
315	96.1	95.8	95.6	96.3	97.4	98.8	101.0	103.3	---	---	---	---	---	---	148.9
400	93.0	92.5	93.1	91.5	92.3	91.8	95.8	97.6	---	---	---	---	---	---	143.7
500	93.0	92.5	93.1	91.5	92.3	91.8	95.8	97.6	---	---	---	---	---	---	143.7
630	93.0	92.5	93.1	91.5	92.3	91.8	95.8	97.6	---	---	---	---	---	---	143.7
800	86.7	85.9	86.7	86.2	86.1	88.0	90.8	92.9	---	---	---	---	---	---	138.6
1000	85.7	84.9	85.2	85.9	85.2	87.8	90.3	93.7	---	---	---	---	---	---	138.5
1250	83.9	84.5	84.5	85.3	85.4	88.0	90.6	93.7	---	---	---	---	---	---	138.5
1600	84.9	84.6	84.7	85.2	85.8	87.5	90.3	93.2	---	---	---	---	---	---	138.2
2000	87.4	87.8	86.3	85.3	85.5	85.9	89.1	91.4	---	---	---	---	---	---	137.4
2500	89.9	86.9	88.0	85.3	84.3	84.4	87.7	89.7	---	---	---	---	---	---	136.6
3150	94.7	93.5	91.2	92.8	88.2	86.9	88.4	89.5	---	---	---	---	---	---	140.0
4000	95.3	93.9	92.2	93.6	88.8	87.2	87.8	88.5	---	---	---	---	---	---	140.4
5000	91.6	89.1	88.9	87.1	86.1	83.8	84.2	86.2	---	---	---	---	---	---	136.4
6300	90.0	89.4	88.3	86.2	85.2	82.2	82.4	84.4	---	---	---	---	---	---	135.4
8000	89.9	88.6	86.7	85.9	84.6	81.3	81.2	83.3	---	---	---	---	---	---	134.6

AVERAGE NET REFERRED THRUST, FN/DELTA = 16625.3 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED,N1/VTHETA = 6128.5 RPM
AVERAGE JET EXHAUST VELOCITY = 1456.2 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.74

TOTAL PWL= 158.7

TABLE A-9.– TWO-RING TREATED INLET. TREATMENT ON WALLS OF TWO CONCENTRIC RING VANES, INLET DUCT, AND CENTERBODY. EXISTING PRODUCTION 24-IN.-LONG FAN-EXHAUST DUCTS, AND PRODUCTION PRIMARY NOZZLE. FAN-EXHAUST NOISE-SUPPRESSOR ENCLOSURE AROUND ENGINE.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 085-01, 086-01, AND 087-01.

BAND CENTER FREQUENCY, HZ	ANGLES FROM ENGINE INLET CENTERLINE, DEGREES														PWL
	15	30	40	50	60	75	90	100	110	120	130	140	150	160	
50	78.7	79.6	79.3	81.0	81.4	83.1	84.4	86.0	---	---	---	---	---	---	132.4
63	78.7	79.6	79.3	81.0	81.4	83.1	84.4	86.0	---	---	---	---	---	---	132.4
80	78.7	79.6	79.3	81.0	81.4	83.1	84.4	86.0	---	---	---	---	---	---	132.4
100	77.1	77.5	79.2	77.7	79.1	80.6	83.6	85.4	---	---	---	---	---	---	131.1
125	77.1	77.5	79.2	77.7	79.1	80.6	83.6	85.4	---	---	---	---	---	---	131.1
160	77.1	77.5	79.2	77.7	79.1	80.6	83.6	85.4	---	---	---	---	---	---	131.1
200	77.7	77.0	76.6	76.5	77.5	77.2	79.2	81.0	---	---	---	---	---	---	127.8
250	77.7	77.0	76.6	76.5	77.5	77.2	79.2	81.0	---	---	---	---	---	---	127.8
315	77.7	77.0	76.6	76.5	77.5	77.2	79.2	81.0	---	---	---	---	---	---	127.8
400	75.8	74.3	73.5	71.8	71.3	70.0	72.7	74.4	---	---	---	---	---	---	122.3
500	75.8	74.3	73.5	71.8	71.3	70.0	72.7	74.4	---	---	---	---	---	---	122.3
630	75.8	74.3	73.5	71.8	71.3	70.0	72.7	74.4	---	---	---	---	---	---	122.3
800	74.9	70.5	69.7	68.5	66.2	65.8	66.3	67.1	---	---	---	---	---	---	118.1
1000	71.7	70.7	68.9	68.8	66.7	66.9	66.2	68.0	---	---	---	---	---	---	117.7
1250	71.4	70.0	71.1	69.3	68.7	67.3	66.7	68.5	---	---	---	---	---	---	118.4
1600	72.0	70.0	69.0	67.5	67.3	66.0	67.0	68.5	---	---	---	---	---	---	117.6
2000	75.9	74.7	73.8	70.1	70.0	68.9	70.2	71.6	---	---	---	---	---	---	121.2
2500	89.5	89.5	87.3	79.9	79.7	75.1	77.4	75.6	---	---	---	---	---	---	132.9
3150	86.4	86.0	83.8	81.7	77.4	73.9	72.6	70.3	---	---	---	---	---	---	130.1
4000	89.3	87.2	85.8	82.2	80.0	76.0	73.7	72.0	---	---	---	---	---	---	132.0
5000	93.2	93.1	91.7	88.2	85.8	82.9	80.1	76.6	---	---	---	---	---	---	137.4
6300	89.1	90.0	88.3	85.5	83.1	78.6	75.8	74.2	---	---	---	---	---	---	134.1
8000	90.2	91.8	88.3	86.7	83.8	80.2	75.9	74.8	---	---	---	---	---	---	135.1

AVERAGE NET REFERRED THRUST, FN/DELTA = 5998.8 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED,N1/VTHETA = 4301.1 RPM
AVERAGE JET EXHAUST VELOCITY = 763.5 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.19

TOTAL PWL= 144.4

TABLE A-9. – TWO-RING TREATED INLET. TREATMENT ON WALLS OF TWO CONCENTRIC RING VANES, INLET DUCT, AND CENTERBODY. EXISTING PRODUCTION 24-IN.-LONG FAN-EXHAUST DUCTS, AND PRODUCTION PRIMARY NOZZLE. FAN-EXHAUST NOISE-SUPPRESSOR ENCLOSURE AROUND ENGINE – Continued.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 085-02, 086-02, AND 087-02.

BAND CENTER FREQUENCY, HZ	ANGLES FROM ENGINE INLET CENTERLINE, DEGREES														
	15	30	40	50	60	75	90	100	110	120	130	140	150	160	PWL
50	78.7	80.2	80.9	83.2	83.6	84.7	86.9	88.5	---	---	---	---	---	---	134.5
63	78.7	80.2	80.9	83.2	83.6	84.7	86.9	88.5	---	---	---	---	---	---	134.5
80	78.7	80.2	80.9	83.2	83.6	84.7	86.9	88.5	---	---	---	---	---	---	134.5
100	79.1	80.0	81.3	80.1	81.3	83.3	86.4	88.2	---	---	---	---	---	---	133.7
125	79.1	80.0	81.3	80.1	81.3	83.3	86.4	88.2	---	---	---	---	---	---	133.7
160	79.1	80.0	81.3	80.1	81.3	83.3	86.4	88.2	---	---	---	---	---	---	133.7
200	79.7	79.3	78.9	78.6	79.7	80.1	82.1	84.1	---	---	---	---	---	---	130.5
250	79.7	79.3	78.9	78.6	79.7	80.1	82.1	84.1	---	---	---	---	---	---	130.5
315	79.7	79.3	78.9	78.6	79.7	80.1	82.1	84.1	---	---	---	---	---	---	130.5
400	77.4	76.8	76.2	74.1	73.8	72.9	75.4	77.1	---	---	---	---	---	---	124.9
500	77.4	76.8	76.2	74.1	73.8	72.9	75.4	77.1	---	---	---	---	---	---	124.9
630	77.4	76.8	76.2	74.1	73.8	72.9	75.4	77.1	---	---	---	---	---	---	124.9
800	73.7	72.3	71.5	69.6	67.2	67.8	69.1	70.5	---	---	---	---	---	---	119.5
1000	70.5	70.3	68.9	69.0	67.5	67.8	68.5	71.0	---	---	---	---	---	---	118.6
1250	71.1	70.2	69.3	68.9	69.3	68.2	69.5	71.2	---	---	---	---	---	---	119.1
1600	71.6	70.4	69.0	68.2	68.3	68.0	69.7	71.3	---	---	---	---	---	---	119.0
2000	74.6	73.4	71.6	68.9	68.4	67.8	69.6	71.6	---	---	---	---	---	---	120.1
2500	87.6	94.3	90.8	82.6	80.4	79.0	78.3	77.8	---	---	---	---	---	---	135.9
3150	86.8	86.7	83.5	79.7	77.8	73.9	73.1	72.6	---	---	---	---	---	---	130.2
4000	89.2	86.7	84.7	82.1	78.7	75.8	74.2	72.3	---	---	---	---	---	---	131.5
5000	95.4	93.8	91.3	89.5	85.1	81.9	79.5	77.3	---	---	---	---	---	---	138.1
6300	89.1	90.2	88.5	85.4	82.4	78.8	76.6	74.5	---	---	---	---	---	---	134.1
8000	91.2	90.5	88.9	85.3	83.9	79.0	76.9	75.2	---	---	---	---	---	---	134.9

AVERAGE NET REFERRED THRUST, FN/DELTA = 7093.4 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED,N1/VTHETA = 4597.7 RPM
AVERAGE JET EXHAUST VELOCITY = 839.3 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.23

TOTAL PWL= 145.9

ANALYSIS OF JT3D STATIC NOISE-REDUCTION TESTS AT EDWARDS AFB

TABLE A-9.– TWO-RING TREATED INLET. TREATMENT ON WALLS OF TWO CONCENTRIC RING VANES, INLET DUCT, AND CENTERBODY. EXISTING PRODUCTION 24-IN.-LONG FAN-EXHAUST DUCTS, AND PRODUCTION PRIMARY NOZZLE. FAN-EXHAUST NOISE-SUPPRESSOR ENCLOSURE AROUND ENGINE – Continued.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 085-03, 086-03, AND 087-03.

		ANGLES FROM ENGINE INLET CENTERLINE, DEGREES																
B		15	30	40	50	60	75	90	100	110	120	130	140	150	160	PWL
A	50	81.6	82.3	83.2	84.5	85.4	86.9	88.6	91.0	---	---	---	---	---	---	136.6
N	63	81.6	82.3	83.2	84.5	85.4	86.9	88.6	91.0	---	---	---	---	---	---	136.6
D	80	81.6	82.3	83.2	84.5	85.4	86.9	88.6	91.0	---	---	---	---	---	---	136.6
	100	82.3	82.6	84.0	82.3	83.7	86.2	89.5	91.3	---	---	---	---	---	---	136.7
C	125	82.3	82.6	84.0	82.3	83.7	86.2	89.5	91.3	---	---	---	---	---	---	136.7
E	160	82.3	82.6	84.0	82.3	83.7	86.2	89.5	91.3	---	---	---	---	---	---	136.7
N	200	82.8	82.0	81.9	81.5	82.6	83.0	85.5	87.6	---	---	---	---	---	---	133.7
T	250	82.8	82.0	81.9	81.5	82.6	83.0	85.5	87.6	---	---	---	---	---	---	133.7
E	315	82.8	82.0	81.9	81.5	82.6	83.0	85.5	87.6	---	---	---	---	---	---	133.7
R	400	79.6	79.0	78.7	76.8	77.1	76.0	79.1	81.0	---	---	---	---	---	---	128.0
	500	79.6	79.0	78.7	76.8	77.1	76.0	79.1	81.0	---	---	---	---	---	---	128.0
F	630	79.6	79.0	78.7	76.8	77.1	76.0	79.1	81.0	---	---	---	---	---	---	128.0
R	800	74.7	72.8	73.1	71.2	70.7	71.2	72.5	73.9	---	---	---	---	---	---	121.9
E	1000	71.0	70.5	69.9	70.4	68.8	70.8	71.9	74.9	---	---	---	---	---	---	121.0
Q	1250	69.7	69.9	69.4	70.4	69.5	70.9	72.5	75.3	---	---	---	---	---	---	121.2
U	1600	70.3	70.0	69.1	68.3	69.1	70.7	72.6	75.0	---	---	---	---	---	---	121.0
E	2000	76.0	71.9	70.8	69.7	69.6	70.2	72.3	74.4	---	---	---	---	---	---	121.5
N	2500	89.8	90.8	88.2	83.0	83.4	77.9	78.7	79.0	---	---	---	---	---	---	134.4
C	3150	90.7	90.8	86.9	83.1	83.1	78.4	78.4	77.3	---	---	---	---	---	---	134.3
Y	4000	87.8	85.7	83.8	80.5	79.6	76.3	75.7	73.6	---	---	---	---	---	---	130.7
,	5000	92.4	91.9	89.4	88.4	85.8	82.9	80.3	77.7	---	---	---	---	---	---	136.6
H	6300	93.3	92.5	90.1	87.9	86.4	82.4	79.7	77.7	---	---	---	---	---	---	137.0
Z	8000	91.1	89.8	87.7	84.5	82.3	78.8	76.7	76.4	---	---	---	---	---	---	134.2

AVERAGE NET REFERRED THRUST, FN/DELTA = 8363.4 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED,N1/VTHETA = 4903.6 RPM
AVERAGE JET EXHAUST VELOCITY = 939.8 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.29

TOTAL PWL= 147.5

TABLE A-9.– TWO-RING TREATED INLET. TREATMENT ON WALLS OF TWO CONCENTRIC RING VANES, INLET DUCT, AND CENTERBODY. EXISTING PRODUCTION 24-IN.-LONG FAN-EXHAUST DUCTS, AND PRODUCTION PRIMARY NOZZLE. FAN-EXHAUST NOISE-SUPPRESSOR ENCLOSURE AROUND ENGINE – Continued.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 085-04, 086-04, AND 087-04.

BAND CENTER FREQUENCY, HZ	ANGLES FROM ENGINE INLET CENTERLINE, DEGREES 15	30	40	50	60	75	90	100	110	120	130	140	150	160	PWL
50	83.8	85.8	86.1	87.7	88.4	90.0	92.0	94.2	---	---	---	---	---	---	139.9
63	83.8	85.8	86.1	87.7	88.4	90.0	92.0	94.2	---	---	---	---	---	---	139.9
80	83.8	85.8	86.1	87.7	88.4	90.0	92.0	94.2	---	---	---	---	---	---	139.9
100	86.4	86.8	88.0	87.8	88.3	90.7	93.9	95.8	---	---	---	---	---	---	141.1
125	86.4	86.8	88.0	87.8	88.3	90.7	93.9	95.8	---	---	---	---	---	---	141.1
160	86.4	86.8	88.0	87.8	88.3	90.7	93.9	95.8	---	---	---	---	---	---	141.1
200	85.7	85.8	85.7	86.0	87.1	88.0	90.5	92.7	---	---	---	---	---	---	138.4
250	85.7	85.8	85.7	86.0	87.1	88.0	90.5	92.7	---	---	---	---	---	---	138.4
315	85.7	85.8	85.7	86.0	87.1	88.0	90.5	92.7	---	---	---	---	---	---	138.4
400	83.0	83.0	82.9	80.9	81.5	81.1	84.6	86.4	---	---	---	---	---	---	132.8
500	83.0	83.0	82.9	80.9	81.5	81.1	84.6	86.4	---	---	---	---	---	---	132.8
630	83.0	83.0	82.9	80.9	81.5	81.1	84.6	86.4	---	---	---	---	---	---	132.8
800	77.8	75.8	75.8	75.6	74.9	76.4	78.3	80.0	---	---	---	---	---	---	126.7
1000	75.0	74.3	74.4	74.7	73.5	76.2	78.0	81.2	---	---	---	---	---	---	126.5
1250	73.4	74.4	73.9	74.1	74.5	76.1	78.5	81.4	---	---	---	---	---	---	126.7
1600	73.6	74.3	73.7	73.3	74.5	76.4	78.4	80.7	---	---	---	---	---	---	126.4
2000	79.1	77.4	75.4	73.9	74.4	74.7	77.4	79.8	---	---	---	---	---	---	126.3
2500	87.7	88.6	86.3	81.8	83.4	79.9	80.7	81.7	---	---	---	---	---	---	133.4
3150	97.1	101.7	97.1	95.5	92.5	89.6	88.7	85.8	---	---	---	---	---	---	144.3
4000	92.4	92.3	94.2	88.2	85.3	84.4	83.2	80.1	---	---	---	---	---	---	138.0
5000	92.5	90.5	90.4	87.1	84.6	80.8	79.6	78.6	---	---	---	---	---	---	136.0
6300	96.7	97.4	94.6	91.8	90.3	84.7	83.7	81.2	---	---	---	---	---	---	141.1
8000	91.3	90.9	88.5	86.4	84.1	79.4	77.9	77.4	---	---	---	---	---	---	135.2

AVERAGE NET REFERRED THRUST, FN/DELTA = 10647.1 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED,N1/VTHETA = 5351.3 RPM
AVERAGE JET EXHAUST VELOCITY = 1098.9 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.40

TOTAL PWL= 151.8

TABLE A-9. – TWO-RING TREATED INLET. TREATMENT ON WALLS OF TWO CONCENTRIC RING VANES, INLET DUCT, AND CENTERBODY. EXISTING PRODUCTION 24-IN.-LONG FAN-EXHAUST DUCTS, AND PRODUCTION PRIMARY NOZZLE. FAN-EXHAUST NOISE-SUPPRESSOR ENCLOSURE AROUND ENGINE – Continued.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 085-05, 086-05, AND 087-05.

		ANGLES FROM ENGINE INLET CENTERLINE, DEGREES														
B		15	30	40	50	60	75	90	100	110	120	130	140	150	160	PWL
A	50	87.4	89.4	89.9	90.9	92.5	93.6	95.6	98.3	---	---	---	---	---	---	143.6
N	63	87.4	89.4	89.9	90.9	92.5	93.6	95.6	98.3	---	---	---	---	---	---	143.6
D	80	87.4	89.4	89.9	90.9	92.5	93.6	95.6	98.3	---	---	---	---	---	---	143.6
	100	92.5	93.1	93.6	92.5	93.7	96.6	100.1	101.6	---	---	---	---	---	---	147.0
C	125	92.5	93.1	93.6	92.5	93.7	96.6	100.1	101.6	---	---	---	---	---	---	147.0
E	160	92.5	93.1	93.6	92.5	93.7	96.6	100.1	101.6	---	---	---	---	---	---	147.0
N	200	92.6	92.6	92.1	92.9	94.3	95.4	97.7	100.4	---	---	---	---	---	---	145.7
T	250	92.6	92.6	92.1	92.9	94.3	95.4	97.7	100.4	---	---	---	---	---	---	145.7
E	315	92.6	92.6	92.1	92.9	94.3	95.4	97.7	100.4	---	---	---	---	---	---	145.7
R	400	89.5	89.5	89.6	87.9	89.0	88.8	92.4	94.5	---	---	---	---	---	---	140.4
	500	89.5	89.5	89.6	87.9	89.0	88.8	92.4	94.5	---	---	---	---	---	---	140.4
F	630	89.5	89.5	89.6	87.9	89.0	88.8	92.4	94.5	---	---	---	---	---	---	140.4
R	800	83.6	82.6	82.7	82.0	82.0	83.6	86.1	87.9	---	---	---	---	---	---	134.1
E	1000	82.3	81.3	81.6	81.7	81.1	83.7	85.8	88.6	---	---	---	---	---	---	134.0
Q	1250	80.4	80.8	80.4	80.9	81.3	83.5	86.2	89.3	---	---	---	---	---	---	134.2
U	1600	79.6	80.7	80.2	80.2	81.4	83.8	86.6	88.9	---	---	---	---	---	---	134.1
E	2000	82.4	82.5	81.1	80.3	80.7	82.3	85.3	87.9	---	---	---	---	---	---	133.3
N	2500	88.4	88.7	84.7	82.5	81.1	81.8	84.4	86.8	---	---	---	---	---	---	134.5
C	3150	101.4	98.8	98.1	93.5	90.5	86.6	88.1	88.5	---	---	---	---	---	---	143.9
Y	4000	96.1	94.4	92.9	89.3	86.4	84.2	84.0	85.2	---	---	---	---	---	---	139.3
,	5000	92.7	90.9	90.1	88.2	86.0	81.6	81.1	82.8	---	---	---	---	---	---	136.6
H	6300	92.1	92.7	90.1	86.9	85.3	81.3	80.4	82.1	---	---	---	---	---	---	136.6
Z	8000	90.7	90.2	87.5	84.7	83.4	80.1	78.0	80.3	---	---	---	---	---	---	134.5

AVERAGE NET REFERRED THRUST, FN/DELTA = 14599.9 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED,N1/VTHETA = 5990.1 RPM
AVERAGE JET EXHAUST VELOCITY = 1349.1 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.61

TOTAL PWL= 156.3

TABLE A-9. – TWO-RING TREATED INLET. TREATMENT ON WALLS OF TWO CONCENTRIC RING VANES, INLET DUCT, AND CENTERBODY. EXISTING PRODUCTION 24-IN.-LONG FAN-EXHAUST DUCTS, AND PRODUCTION PRIMARY NOZZLE. FAN-EXHAUST NOISE-SUPPRESSOR ENCLOSURE AROUND ENGINE – Continued.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 085-06, 086-06, AND 087-06.

	ANGLES FROM ENGINE INLET CENTERLINE, DEGREES														
BAND CENTER FREQUENCY, HZ	15	30	40	50	60	75	90	100	110	120	130	140	150	160	PWL
50	85.8	87.6	87.9	89.3	90.4	92.2	93.7	96.5	---	---	---	---	---	---	141.9
63	85.8	87.6	87.9	89.3	90.4	92.2	93.7	96.5	---	---	---	---	---	---	141.9
80	85.8	87.6	87.9	89.3	90.4	92.2	93.7	96.5	---	---	---	---	---	---	141.9
100	89.7	90.4	91.3	89.9	91.3	93.9	97.3	99.1	---	---	---	---	---	---	144.4
125	89.7	90.4	91.3	89.9	91.3	93.9	97.3	99.1	---	---	---	---	---	---	144.4
160	89.7	90.4	91.3	89.9	91.3	93.9	97.3	99.1	---	---	---	---	---	---	144.4
200	89.3	89.3	89.1	89.5	90.9	91.9	94.6	96.7	---	---	---	---	---	---	142.3
250	89.3	89.3	89.1	89.5	90.9	91.9	94.6	96.7	---	---	---	---	---	---	142.3
315	89.3	89.3	89.1	89.5	90.9	91.9	94.6	96.7	---	---	---	---	---	---	142.3
400	86.5	86.1	86.6	85.1	85.6	85.5	89.0	91.0	---	---	---	---	---	---	137.1
500	86.5	86.1	86.6	85.1	85.6	85.5	89.0	91.0	---	---	---	---	---	---	137.1
630	86.5	86.1	86.6	85.1	85.6	85.5	89.0	91.0	---	---	---	---	---	---	137.1
800	80.2	79.3	79.7	78.9	78.6	81.0	82.7	84.2	---	---	---	---	---	---	130.8
1000	78.8	78.0	77.8	78.2	78.0	80.6	81.7	84.8	---	---	---	---	---	---	130.4
1250	77.0	77.5	77.3	77.6	77.9	80.6	82.2	85.1	---	---	---	---	---	---	130.4
1600	76.7	77.4	77.0	77.2	78.4	80.1	82.3	85.0	---	---	---	---	---	---	130.3
2000	81.7	79.5	77.7	77.3	77.7	78.8	81.5	84.2	---	---	---	---	---	---	130.0
2500	90.8	92.5	85.3	84.8	82.2	80.8	82.2	83.8	---	---	---	---	---	---	135.4
3150	101.7	100.2	98.5	96.9	92.3	88.1	86.3	86.4	---	---	---	---	---	---	144.9
4000	93.0	92.6	94.1	90.2	86.7	83.4	82.8	82.6	---	---	---	---	---	---	138.4
5000	92.9	91.3	89.4	87.3	85.1	81.7	81.3	80.6	---	---	---	---	---	---	136.3
6300	94.6	95.6	92.0	89.6	87.7	83.2	81.0	81.1	---	---	---	---	---	---	138.9
8000	91.3	90.1	88.2	86.0	84.1	80.3	77.4	78.5	---	---	---	---	---	---	134.9

AVERAGE NET REFERRED THRUST, FN/DELTA = 12808.8 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED,N1/VTHETA = 5701.8 RPM
AVERAGE JET EXHAUST VELOCITY = 1235.0 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.51

TOTAL PWL= 154.1

TABLE A-9. – TWO-RING TREATED INLET. TREATMENT ON WALLS OF TWO CONCENTRIC RING VANES, INLET DUCT, AND CENTERBODY. EXISTING PRODUCTION 24-IN.-LONG FAN-EXHAUST DUCTS, AND PRODUCTION PRIMARY NOZZLE. FAN-EXHAUST NOISE-SUPPRESSOR ENCLOSURE AROUND ENGINE – *Concluded.*

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 085-07, 086-07, AND 087-07.

BAND CENTER FREQUENCY, HZ	ANGLES FROM ENGINE INLET CENTERLINE, DEGREES														
	15	30	40	50	60	75	90	100	110	120	130	140	150	160	PWL
50	89.2	90.8	91.3	92.6	93.5	95.0	97.1	99.5	---	---	---	---	---	---	145.0
63	89.2	90.8	91.3	92.6	93.5	95.0	97.1	99.5	---	---	---	---	---	---	145.0
80	89.2	90.8	91.3	92.6	93.5	95.0	97.1	99.5	---	---	---	---	---	---	145.0
100	95.0	95.6	96.3	94.8	96.0	99.2	102.3	103.6	---	---	---	---	---	---	149.3
125	95.0	95.6	96.3	94.8	96.0	99.2	102.3	103.6	---	---	---	---	---	---	149.3
160	95.0	95.6	96.3	94.8	96.0	99.2	102.3	103.6	---	---	---	---	---	---	149.3
200	96.1	95.8	95.7	96.4	97.4	98.6	100.7	103.1	---	---	---	---	---	---	148.8
250	96.1	95.8	95.7	96.4	97.4	98.6	100.7	103.1	---	---	---	---	---	---	148.8
315	96.1	95.8	95.7	96.4	97.4	98.6	100.7	103.1	---	---	---	---	---	---	148.8
400	93.0	92.7	93.2	91.7	92.1	92.0	95.6	97.6	---	---	---	---	---	---	143.7
500	93.0	92.7	93.2	91.7	92.1	92.0	95.6	97.6	---	---	---	---	---	---	143.7
630	93.0	92.7	93.2	91.7	92.1	92.0	95.6	97.6	---	---	---	---	---	---	143.7
800	86.8	85.4	86.1	85.6	85.5	86.7	90.2	91.6	---	---	---	---	---	---	137.7
1000	86.0	84.5	84.7	85.7	84.7	87.2	88.9	92.2	---	---	---	---	---	---	137.4
1250	83.8	83.9	84.2	84.5	84.6	86.8	89.3	92.6	---	---	---	---	---	---	137.4
1600	83.1	84.1	83.3	83.7	84.8	87.0	89.7	92.5	---	---	---	---	---	---	137.5
2000	84.8	84.2	83.6	83.0	84.0	86.0	88.9	91.7	---	---	---	---	---	---	136.8
2500	89.2	85.9	87.3	84.0	83.4	84.4	87.1	89.9	---	---	---	---	---	---	136.2
3150	91.6	91.3	90.1	88.7	86.2	85.1	86.3	89.1	---	---	---	---	---	---	137.8
4000	94.9	92.9	92.2	90.5	88.2	86.6	86.1	87.9	---	---	---	---	---	---	139.3
5000	89.7	87.9	87.8	85.2	83.4	81.7	83.0	85.1	---	---	---	---	---	---	134.8
6300	88.8	87.8	86.0	83.3	82.2	80.0	80.6	83.6	---	---	---	---	---	---	133.5
8000	88.6	87.5	85.9	82.6	81.3	79.1	79.1	81.5	---	---	---	---	---	---	132.8

AVERAGE NET REFERRED THRUST, FN/DELTA = 16560.8 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED,N1/VTHETA = 6303.0 RPM
AVERAGE JET EXHAUST VELOCITY = 1479.5 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.74

TOTAL PWL= 158.4

TABLE A-10. – 47-PERCENT LIGHTBULB INLET. TREATMENT ON WALLS OF CONCENTRIC RING VANE, INLET DUCT, AND LIGHTBULB CENTERBODY. EXISTING PRODUCTION 24-IN.-LONG FAN-EXHAUST DUCTS, AND PRODUCTION PRIMARY NOZZLE. FAN-EXHAUST NOISE-SUPPRESSOR ENCLOSURE AROUND ENGINE.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 095-01, 096-01, AND 099-01.

		ANGLES FROM ENGINE INLET CENTERLINE, DEGREES														
B		15	30	40	50	60	75	90	100	110	120	130	140	150	160	PWL
A	50	81.9	81.9	79.7	81.3	82.2	83.5	84.7	86.1	---	---	---	---	---	---	132.9
N	63	81.9	81.9	79.7	81.3	82.2	83.5	84.7	86.1	---	---	---	---	---	---	132.9
D	80	81.9	81.9	79.7	81.3	82.2	83.5	84.7	86.1	---	---	---	---	---	---	132.9
	100	77.9	78.0	78.2	77.9	78.8	81.1	83.2	85.4	---	---	---	---	---	---	131.0
C	125	77.9	78.0	78.2	77.9	78.8	81.1	83.2	85.4	---	---	---	---	---	---	131.0
E	160	77.9	78.0	78.2	77.9	78.8	81.1	83.2	85.4	---	---	---	---	---	---	131.0
N	200	77.6	77.1	76.8	76.4	77.4	77.9	79.4	81.3	---	---	---	---	---	---	128.0
T	250	77.6	77.1	76.8	76.4	77.4	77.9	79.4	81.3	---	---	---	---	---	---	128.0
E	315	77.6	77.1	76.8	76.4	77.4	77.9	79.4	81.3	---	---	---	---	---	---	128.0
R	400	74.7	74.9	74.0	72.4	71.4	70.4	73.2	74.5	---	---	---	---	---	---	122.5
	500	74.7	74.9	74.0	72.4	71.4	70.4	73.2	74.5	---	---	---	---	---	---	122.5
F	630	74.7	74.9	74.0	72.4	71.4	70.4	73.2	74.5	---	---	---	---	---	---	122.5
R	800	70.0	69.2	68.1	65.4	64.4	65.9	68.1	69.5	---	---	---	---	---	---	117.1
E	1000	68.3	67.2	68.0	65.7	63.9	66.1	67.4	69.5	---	---	---	---	---	---	116.6
Q	1250	70.3	68.8	68.3	66.8	65.8	66.6	67.7	69.4	---	---	---	---	---	---	117.3
U	1600	69.8	69.9	69.2	67.0	66.1	66.2	67.6	69.5	---	---	---	---	---	---	117.5
E	2000	74.9	75.1	73.4	74.2	70.1	70.3	71.2	72.4	---	---	---	---	---	---	121.9
N	2500	84.4	85.9	84.2	81.3	79.3	75.3	76.0	76.6	---	---	---	---	---	---	130.2
C	3150	82.4	85.0	83.4	80.6	77.3	73.9	72.0	72.1	---	---	---	---	---	---	128.9
Y	4000	86.3	86.8	84.5	81.5	78.1	75.2	74.1	74.0	---	---	---	---	---	---	130.6
,	5000	90.3	91.1	90.0	88.8	86.3	82.6	80.0	79.3	---	---	---	---	---	---	136.2
H	6300	86.8	89.9	87.8	84.9	83.6	80.2	78.4	77.7	---	---	---	---	---	---	133.8
Z	8000	88.1	89.2	87.7	85.6	84.1	80.6	79.7	77.6	---	---	---	---	---	---	134.1

AVERAGE NET REFERRED THRUST, FN/DELTA = 5949.4 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED,N1/VTHETA = 4302.6 RPM
AVERAGE JET EXHAUST VELOCITY = 770.0 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.20

TOTAL PWL= 143.9

TABLE A-10. – 47-PERCENT LIGHTBULB INLET. TREATMENT ON WALLS OF CONCENTRIC RING VANE, INLET DUCT, AND LIGHTBULB CENTERBODY. EXISTING PRODUCTION 24-IN.-LONG FAN-EXHAUST DUCTS, AND PRODUCTION PRIMARY NOZZLE. FAN-EXHAUST NOISE-SUPPRESSOR ENCLOSURE AROUND ENGINE – Continued.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 095-02, 096-02, AND 099-02.

	ANGLES FROM ENGINE INLET CENTERLINE, DEGREES														
BAND CENTER FREQUENCY, HZ	15	30	40	50	60	75	90	100	110	120	130	140	150	160	PWL
50	79.7	80.4	81.3	83.2	83.8	85.3	87.3	88.7	---	---	---	---	---	---	134.9
63	79.7	80.4	81.3	83.2	83.8	85.3	87.3	88.7	---	---	---	---	---	---	134.9
80	79.7	80.4	81.3	83.2	83.8	85.3	87.3	88.7	---	---	---	---	---	---	134.9
100	79.2	79.8	80.3	80.2	81.4	83.3	85.8	88.1	---	---	---	---	---	---	133.5
125	79.2	79.8	80.3	80.2	81.4	83.3	85.8	88.1	---	---	---	---	---	---	133.5
160	79.2	79.8	80.3	80.2	81.4	83.3	85.8	88.1	---	---	---	---	---	---	133.5
200	79.8	79.1	79.2	79.1	80.1	80.4	82.2	84.2	---	---	---	---	---	---	130.7
250	79.8	79.1	79.2	79.1	80.1	80.4	82.2	84.2	---	---	---	---	---	---	130.7
315	79.8	79.1	79.2	79.1	80.1	80.4	82.2	84.2	---	---	---	---	---	---	130.7
400	76.5	76.6	76.1	74.9	74.0	73.5	76.5	78.1	---	---	---	---	---	---	125.3
500	76.5	76.6	76.1	74.9	74.0	73.5	76.5	78.1	---	---	---	---	---	---	125.3
630	76.5	76.6	76.1	74.9	74.0	73.5	76.5	78.1	---	---	---	---	---	---	125.3
800	70.3	70.5	69.8	67.9	66.7	68.5	71.2	72.6	---	---	---	---	---	---	119.5
1000	68.5	68.3	67.8	67.3	65.7	68.0	69.8	72.4	---	---	---	---	---	---	118.5
1250	68.7	69.1	68.5	67.7	67.2	68.5	70.0	72.1	---	---	---	---	---	---	118.8
1600	69.8	69.7	68.7	67.6	67.1	67.8	69.7	71.6	---	---	---	---	---	---	118.6
2000	74.0	74.2	73.0	70.1	68.4	68.7	70.8	72.2	---	---	---	---	---	---	120.8
2500	84.9	86.2	86.1	81.8	79.5	76.8	77.9	78.0	---	---	---	---	---	---	131.2
3150	82.8	84.6	82.6	80.8	77.9	75.5	74.0	73.9	---	---	---	---	---	---	129.0
4000	85.8	85.9	85.1	82.5	79.4	77.1	75.1	74.5	---	---	---	---	---	---	130.8
5000	90.7	91.5	91.1	88.1	85.6	83.7	81.8	79.9	---	---	---	---	---	---	136.6
6300	87.7	90.1	88.7	86.1	83.9	80.5	79.4	78.0	---	---	---	---	---	---	134.4
8000	88.5	90.2	88.7	86.7	84.2	80.3	80.5	78.9	---	---	---	---	---	---	134.7

AVERAGE NET REFERRED THRUST, FN/DELTA = 7066.5 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED, N1/VTHETA = 4602.1 RPM
AVERAGE JET EXHAUST VELOCITY = 838.3 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.23

TOTAL PWL = 145.4

ANALYSIS OF JT3D STATIC NOISE-REDUCTION TESTS AT EDWARDS AFB

TABLE A-10. – 47-PERCENT LIGHTBULB INLET. TREATMENT ON WALLS OF CONCENTRIC RING VANE, INLET DUCT, AND LIGHTBULB CENTERBODY. EXISTING PRODUCTION 24-IN.-LONG FAN-EXHAUST DUCTS, AND PRODUCTION PRIMARY NOZZLE. FAN-EXHAUST NOISE-SUPPRESSOR ENCLOSURE AROUND ENGINE – Continued.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 095-03, 096-03, AND 099-03.

BAND CENTER FREQUENCY, HZ	ANGLES FROM ENGINE INLET CENTERLINE, DEGREES														
	15	30	40	50	60	75	90	100	110	120	130	140	150	160	PWL
50	82.1	82.6	84.0	84.8	85.3	87.4	88.8	90.6	---	---	---	---	---	---	136.7
63	82.1	82.6	84.0	84.8	85.3	87.4	88.8	90.6	---	---	---	---	---	---	136.7
80	82.1	82.6	84.0	84.8	85.3	87.4	88.8	90.6	---	---	---	---	---	---	136.7
100	81.7	82.4	82.7	82.8	83.8	86.3	88.7	90.8	---	---	---	---	---	---	136.2
125	81.7	82.4	82.7	82.8	83.8	86.3	88.7	90.8	---	---	---	---	---	---	136.2
160	81.7	82.4	82.7	82.8	83.8	86.3	88.7	90.8	---	---	---	---	---	---	136.2
200	82.1	81.3	81.7	81.5	82.4	83.2	85.1	87.2	---	---	---	---	---	---	133.4
250	82.1	81.3	81.7	81.5	82.4	83.2	85.1	87.2	---	---	---	---	---	---	133.4
315	82.1	81.3	81.7	81.5	82.4	83.2	85.1	87.2	---	---	---	---	---	---	133.4
400	78.0	78.4	78.4	77.7	76.8	76.4	79.8	81.3	---	---	---	---	---	---	128.1
500	78.0	78.4	78.4	77.7	76.8	76.4	79.8	81.3	---	---	---	---	---	---	128.1
630	78.0	78.4	78.4	77.7	76.8	76.4	79.8	81.3	---	---	---	---	---	---	128.1
800	71.4	72.1	72.0	70.5	69.8	72.0	74.8	76.0	---	---	---	---	---	---	122.5
1000	71.2	70.8	70.8	70.1	68.4	71.5	73.4	75.9	---	---	---	---	---	---	121.8
1250	70.9	70.5	70.2	70.0	69.4	71.6	73.4	75.6	---	---	---	---	---	---	121.7
1600	70.4	70.6	69.6	69.1	69.3	70.8	73.3	74.9	---	---	---	---	---	---	121.2
2000	75.3	74.8	73.2	70.8	70.0	70.4	73.2	74.5	---	---	---	---	---	---	122.2
2500	86.6	93.7	88.4	84.6	83.7	80.6	80.7	82.3	---	---	---	---	---	---	135.7
3150	86.0	90.7	86.1	84.3	82.0	79.3	79.0	79.9	---	---	---	---	---	---	133.5
4000	85.9	86.0	84.7	82.5	79.8	77.7	76.4	75.8	---	---	---	---	---	---	131.0
5000	91.6	91.8	91.5	88.7	87.1	84.9	83.4	81.0	---	---	---	---	---	---	137.3
6300	90.0	91.6	90.4	88.6	86.8	83.5	83.4	80.5	---	---	---	---	---	---	136.7
8000	88.3	89.8	88.5	86.4	84.4	81.0	81.3	79.1	---	---	---	---	---	---	134.7

AVERAGE NET REFERRED THRUST, FN/DELTA = 8292.7 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED,N1/VTHETA = 4899.0 RPM
AVERAGE JET EXHAUST VELOCITY = 932.5 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.29

TOTAL PWL= 147.5

TABLE A-10. – 47-PERCENT LIGHTBULB INLET. TREATMENT ON WALLS OF CONCENTRIC RING VANE, INLET DUCT, AND LIGHTBULB CENTERBODY. EXISTING PRODUCTION 24-IN.-LONG FAN-EXHAUST DUCTS, AND PRODUCTION PRIMARY NOZZLE. FAN-EXHAUST NOISE-SUPPRESSOR ENCLOSURE AROUND ENGINE – Continued.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 095-04, 096-04, AND 099-04.

		ANGLES FROM ENGINE INLET CENTERLINE, DEGREES														
B		15	30	40	50	60	75	90	100	110	120	130	140	150	160	PWL
A	50	84.0	85.5	86.4	87.7	88.5	90.2	91.8	94.1	---	---	---	---	---	---	139.8
N	63	84.0	85.5	86.4	87.7	88.5	90.2	91.8	94.1	---	---	---	---	---	---	139.8
D	80	84.0	85.5	86.4	87.7	88.5	90.2	91.8	94.1	---	---	---	---	---	---	139.8
	100	86.0	86.4	86.6	86.8	88.0	90.5	92.9	95.4	---	---	---	---	---	---	140.6
C	125	86.0	86.4	86.6	86.8	88.0	90.5	92.9	95.4	---	---	---	---	---	---	140.6
E	160	86.0	86.4	86.6	86.8	88.0	90.5	92.9	95.4	---	---	---	---	---	---	140.6
N	200	84.9	85.1	85.2	85.6	86.7	87.7	90.0	92.7	---	---	---	---	---	---	138.1
T	250	84.9	85.1	85.2	85.6	86.7	87.7	90.0	92.7	---	---	---	---	---	---	138.1
E	315	84.9	85.1	85.2	85.6	86.7	87.7	90.0	92.7	---	---	---	---	---	---	138.1
R	400	82.0	82.2	82.6	81.1	81.4	81.2	85.0	86.8	---	---	---	---	---	---	132.9
	500	82.0	82.2	82.6	81.1	81.4	81.2	85.0	86.8	---	---	---	---	---	---	132.9
F	630	82.0	82.2	82.6	81.1	81.4	81.2	85.0	86.8	---	---	---	---	---	---	132.9
R	800	75.8	76.1	76.4	74.9	74.7	76.9	80.0	81.9	---	---	---	---	---	---	127.6
E	1000	74.9	74.5	74.8	74.3	73.5	76.3	78.9	81.8	---	---	---	---	---	---	126.9
Q	1250	74.8	73.9	73.9	74.0	74.1	76.3	79.0	81.4	---	---	---	---	---	---	126.8
U	1600	75.2	74.0	73.3	73.0	73.8	75.5	78.4	80.9	---	---	---	---	---	---	126.3
E	2000	78.3	77.3	75.8	73.9	74.1	75.1	77.9	79.5	---	---	---	---	---	---	126.3
N	2500	89.0	88.7	87.4	83.1	82.2	80.5	80.8	82.7	---	---	---	---	---	---	133.9
C	3150	95.7	101.7	96.2	91.9	90.6	88.4	87.8	87.8	---	---	---	---	---	---	143.5
Y	4000	88.6	90.6	90.3	87.8	84.7	82.5	81.5	80.8	---	---	---	---	---	---	135.7
,	5000	90.8	89.1	89.3	87.2	84.4	81.7	81.1	81.2	---	---	---	---	---	---	135.3
H	6300	93.5	94.8	93.0	92.0	88.5	84.5	84.0	83.2	---	---	---	---	---	---	139.4
Z	8000	88.3	89.8	88.1	86.4	84.7	81.1	81.7	80.4	---	---	---	---	---	---	134.7

AVERAGE NET REFERRED THRUST, FN/DELTA = 10559.4 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED, N1/VTHETA = 5352.3 RPM
AVERAGE JET EXHAUST VELOCITY = 1082.1 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.39

TOTAL PWL= 151.3

ANALYSIS OF JT3D STATIC NOISE-REDUCTION TESTS AT EDWARDS AFB

TABLE A-10. – 47-PERCENT LIGHTBULB INLET. TREATMENT ON WALLS OF CONCENTRIC RING VANE, INLET DUCT, AND LIGHTBULB CENTERBODY. EXISTING PRODUCTION 24-IN.-LONG FAN-EXHAUST DUCTS, AND PRODUCTION PRIMARY NOZZLE. FAN-EXHAUST NOISE-SUPPRESSOR ENCLOSURE AROUND ENGINE – Continued.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 095-05, 096-05, AND 099-05.

		ANGLES FROM ENGINE INLET CENTERLINE, DEGREES														
B		15	30	40	50	60	75	90	100	110	120	130	140	150	160	PWL
A	50	87.5	89.3	89.9	91.1	91.8	93.4	95.5	97.9	---	---	---	---	---	---	143.4
N	63	87.5	89.3	89.9	91.1	91.8	93.4	95.5	97.9	---	---	---	---	---	---	143.4
D	80	87.5	89.3	89.9	91.1	91.8	93.4	95.5	97.9	---	---	---	---	---	---	143.4
	100	92.0	92.6	92.3	92.2	93.4	96.0	98.9	101.1	---	---	---	---	---	---	146.3
C	125	92.0	92.6	92.3	92.2	93.4	96.0	98.9	101.1	---	---	---	---	---	---	146.3
E	160	92.0	92.6	92.3	92.2	93.4	96.0	98.9	101.1	---	---	---	---	---	---	146.3
N	200	92.0	91.9	91.8	92.3	93.4	94.8	97.0	99.8	---	---	---	---	---	---	145.1
T	250	92.0	91.9	91.8	92.3	93.4	94.8	97.0	99.8	---	---	---	---	---	---	145.1
E	315	92.0	91.9	91.8	92.3	93.4	94.8	97.0	99.8	---	---	---	---	---	---	145.1
R	400	88.9	89.2	89.5	88.2	88.2	88.5	92.4	94.2	---	---	---	---	---	---	140.2
	500	88.9	89.2	89.5	88.2	88.2	88.5	92.4	94.2	---	---	---	---	---	---	140.2
F	630	88.9	89.2	89.5	88.2	88.2	88.5	92.4	94.2	---	---	---	---	---	---	140.2
R	800	82.9	82.7	83.2	82.0	81.9	84.1	87.4	89.5	---	---	---	---	---	---	135.0
E	1000	82.1	81.1	81.8	81.5	80.8	83.8	86.5	89.5	---	---	---	---	---	---	134.5
Q	1250	80.1	80.9	81.3	81.0	81.0	83.7	86.6	89.3	---	---	---	---	---	---	134.3
U	1600	79.6	81.2	80.8	80.4	81.3	83.3	86.7	88.7	---	---	---	---	---	---	134.0
E	2000	86.3	83.6	81.6	80.4	80.2	82.0	85.4	87.4	---	---	---	---	---	---	133.5
N	2500	89.2	85.8	84.5	82.2	80.9	81.4	84.6	86.1	---	---	---	---	---	---	133.9
C	3150	94.1	96.5	93.4	92.2	87.7	87.5	88.0	88.3	---	---	---	---	---	---	140.6
Y	4000	90.4	91.2	90.6	88.7	85.9	83.1	84.0	85.1	---	---	---	---	---	---	136.9
,	5000	89.1	89.6	88.3	86.4	84.1	81.5	82.2	83.2	---	---	---	---	---	---	135.0
H	6300	88.7	90.4	88.1	85.2	84.0	80.9	82.2	83.1	---	---	---	---	---	---	134.9
Z	8000	87.2	87.8	86.1	84.4	83.3	80.8	81.6	82.2	---	---	---	---	---	---	133.5

AVERAGE NET REFERRED THRUST, FN/DELTA = 14420.2 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED,N1/VTHETA = 5994.1 RPM
AVERAGE JET EXHAUST VELOCITY = 1335.1 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.61

TOTAL PWL= 155.6

TABLE A-10. – 47-PERCENT LIGHTBULB INLET. TREATMENT ON WALLS OF CONCENTRIC RING VANE, INLET DUCT, AND LIGHTBULB CENTERBODY. EXISTING PRODUCTION 24-IN.-LONG FAN-EXHAUST DUCTS, AND PRODUCTION PRIMARY NOZZLE. FAN-EXHAUST NOISE-SUPPRESSOR ENCLOSURE AROUND ENGINE – Continued.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 095-06, 096-06, AND 099-06.

		ANGLES FROM ENGINE INLET CENTERLINE, DEGREES														
B		15	30	40	50	60	75	90	100	110	120	130	140	150	160	PWL
A	50	86.1	87.9	88.5	89.7	90.3	92.2	93.8	96.3	---	---	---	---	---	---	141.8
N	63	86.1	87.9	88.5	89.7	90.3	92.2	93.8	96.3	---	---	---	---	---	---	141.8
D	80	86.1	87.9	88.5	89.7	90.3	92.2	93.8	96.3	---	---	---	---	---	---	141.8
	100	89.3	90.2	90.0	89.8	91.1	93.7	96.2	98.8	---	---	---	---	---	---	143.9
C	125	89.3	90.2	90.0	89.8	91.1	93.7	96.2	98.8	---	---	---	---	---	---	143.9
E	160	89.3	90.2	90.0	89.8	91.1	93.7	96.2	98.8	---	---	---	---	---	---	143.9
N	200	88.8	88.9	88.8	89.3	90.4	91.8	94.0	96.5	---	---	---	---	---	---	142.0
T	250	88.8	88.9	88.8	89.3	90.4	91.8	94.0	96.5	---	---	---	---	---	---	142.0
E	315	88.8	88.9	88.8	89.3	90.4	91.8	94.0	96.5	---	---	---	---	---	---	142.0
R	400	85.9	86.0	86.1	85.0	85.1	85.1	89.2	90.8	---	---	---	---	---	---	136.9
	500	85.9	86.0	86.1	85.0	85.1	85.1	89.2	90.8	---	---	---	---	---	---	136.9
F	630	85.9	86.0	86.1	85.0	85.1	85.1	89.2	90.8	---	---	---	---	---	---	136.9
R	800	79.7	79.9	80.0	79.1	78.9	81.2	84.0	86.0	---	---	---	---	---	---	131.7
E	1000	79.1	78.5	78.9	78.7	77.9	80.8	83.2	86.2	---	---	---	---	---	---	131.3
Q	1250	77.4	78.1	77.8	78.1	78.2	80.7	83.3	85.9	---	---	---	---	---	---	131.1
U	1600	78.0	78.6	77.8	77.4	78.2	80.2	83.0	85.0	---	---	---	---	---	---	130.6
E	2000	83.3	80.4	79.5	77.8	77.6	78.9	82.0	83.7	---	---	---	---	---	---	130.3
N	2500	92.3	87.8	85.3	83.1	80.6	80.1	82.3	84.1	---	---	---	---	---	---	134.4
C	3150	96.5	101.0	95.6	93.2	90.8	87.2	86.3	87.3	---	---	---	---	---	---	143.1
Y	4000	90.8	91.6	92.2	89.2	85.5	82.9	83.0	83.4	---	---	---	---	---	---	137.1
,	5000	90.5	89.5	88.7	86.7	84.5	81.0	81.5	82.0	---	---	---	---	---	---	135.2
H	6300	91.1	94.2	91.6	88.5	87.1	83.4	83.3	83.3	---	---	---	---	---	---	137.8
Z	8000	88.7	89.4	87.7	85.7	85.0	81.5	82.3	81.9	---	---	---	---	---	---	134.8

AVERAGE NET REFERRED THRUST, FN/DELTA = 12624.3 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED,N1/VTHETA = 5699.0 RPM
AVERAGE JET EXHAUST VELOCITY = 1214.3 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.50

TOTAL PWL= 153.6

TABLE A-10. – 47-PERCENT LIGHTBULB INLET. TREATMENT ON WALLS OF CONCENTRIC RING VANE, INLET DUCT, AND LIGHTBULB CENTERBODY. EXISTING PRODUCTION 24-IN.-LONG FAN-EXHAUST DUCTS, AND PRODUCTION PRIMARY NOZZLE. FAN-EXHAUST NOISE-SUPPRESSOR ENCLOSURE AROUND ENGINE – Concluded.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 095-07, 096-07, AND 099-07.

		ANGLES FROM ENGINE INLET CENTERLINE, DEGREES														
B		15	30	40	50	60	75	90	100	110	120	130	140	150	160	PWL
A	50	89.1	90.9	91.5	92.7	93.3	94.9	97.3	99.4	---	---	---	---	---	---	145.0
N	63	89.1	90.9	91.5	92.7	93.3	94.9	97.3	99.4	---	---	---	---	---	---	145.0
D	80	89.1	90.9	91.5	92.7	93.3	94.9	97.3	99.4	---	---	---	---	---	---	145.0
	100	94.4	95.1	94.8	94.6	95.7	98.7	101.7	103.4	---	---	---	---	---	---	148.8
C	125	94.4	95.1	94.8	94.6	95.7	98.7	101.7	103.4	---	---	---	---	---	---	148.8
E	160	94.4	95.1	94.8	94.6	95.7	98.7	101.7	103.4	---	---	---	---	---	---	148.8
N	200	95.4	95.3	95.0	95.7	96.6	98.3	100.3	102.7	---	---	---	---	---	---	148.3
T	250	95.4	95.3	95.0	95.7	96.6	98.3	100.3	102.7	---	---	---	---	---	---	148.3
E	315	95.4	95.3	95.0	95.7	96.6	98.3	100.3	102.7	---	---	---	---	---	---	148.3
R	400	92.2	92.4	92.8	91.4	91.4	91.6	95.3	96.9	---	---	---	---	---	---	143.1
	500	92.2	92.4	92.8	91.4	91.4	91.6	95.3	96.9	---	---	---	---	---	---	143.1
F	630	92.2	92.4	92.8	91.4	91.4	91.6	95.3	96.9	---	---	---	---	---	---	143.1
R	800	85.6	86.0	86.5	85.6	85.2	87.9	91.1	93.2	---	---	---	---	---	---	138.6
E	1000	85.1	84.7	85.0	85.0	84.4	87.5	90.3	93.4	---	---	---	---	---	---	138.2
Q	1250	83.2	84.2	83.6	84.3	84.6	86.7	90.0	93.0	---	---	---	---	---	---	137.7
U	1600	83.0	84.2	83.5	83.7	84.4	86.8	89.9	91.8	---	---	---	---	---	---	137.2
E	2000	84.4	85.7	84.5	83.4	83.2	85.3	88.6	90.5	---	---	---	---	---	---	136.2
N	2500	85.8	86.0	84.6	84.3	82.6	83.8	87.0	89.1	---	---	---	---	---	---	135.3
C	3150	87.8	88.1	87.6	85.9	84.4	83.7	86.6	88.5	---	---	---	---	---	---	136.0
Y	4000	89.9	89.4	89.4	86.7	85.1	83.4	85.5	87.1	---	---	---	---	---	---	136.3
,	5000	86.5	86.6	85.4	83.4	82.0	80.7	82.6	84.8	---	---	---	---	---	---	133.3
H	6300	84.9	86.0	84.5	82.2	81.0	79.5	80.6	83.0	---	---	---	---	---	---	132.0
Z	8000	84.0	84.8	83.1	81.4	79.9	78.3	79.5	81.9	---	---	---	---	---	---	130.9

AVERAGE NET REFERRED THRUST, FN/DELTA = 16180.2 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED,N1/VTHETA = 6298.6 RPM
AVERAGE JET EXHAUST VELOCITY = 1451.0 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.72

TOTAL PWL= 158.0

TABLE A-11. – BASELINE FOR TREATED FAN-DUCT TESTS. EXISTING PRODUCTION INLET, 24-IN.-LONG FAN-EXHAUST DUCTS, AND PRODUCTION PRIMARY NOZZLE. INLET-NOISE-SUPPRESSOR ENCLOSURE AROUND INLET DUCT.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 100-01, 102-01, AND 103-01.

BAND CENTER FREQUENCY, HZ	ANGLES FROM ENGINE INLET CENTERLINE, DEGREES														
	15	30	40	50	60	75	90	100	110	120	130	140	150	160	PWL
50	---	---	---	---	---	87.5	88.3	88.9	89.8	90.7	93.5	95.0	95.9	93.5	141.4
63	---	---	---	---	---	87.5	88.3	88.9	89.8	90.7	93.5	95.0	95.9	93.5	141.4
80	---	---	---	---	---	97.5	88.3	88.9	89.8	90.7	93.5	95.0	95.9	93.5	141.4
100	---	---	---	---	---	88.2	88.1	88.8	89.7	90.8	93.6	95.9	94.6	89.9	141.2
125	---	---	---	---	---	88.2	88.1	88.8	89.7	90.8	93.6	95.9	94.6	89.9	141.2
160	---	---	---	---	---	88.2	88.1	88.8	89.7	90.8	93.6	95.9	94.6	89.9	141.2
200	---	---	---	---	---	86.2	86.3	87.6	89.1	89.1	90.2	90.6	89.6	85.8	138.2
250	---	---	---	---	---	86.2	86.3	87.6	89.1	89.1	90.2	90.6	89.6	85.8	138.2
315	---	---	---	---	---	86.2	86.3	87.6	89.1	89.1	90.2	90.6	89.6	85.8	138.2
400	---	---	---	---	---	83.0	84.0	84.9	86.6	87.4	86.8	86.3	83.3	80.3	135.1
500	---	---	---	---	---	83.0	84.0	84.9	86.6	87.4	86.8	86.3	83.3	80.3	135.1
630	---	---	---	---	---	83.0	84.0	84.9	86.6	87.4	86.8	86.3	83.3	80.3	135.1
800	---	---	---	---	---	82.4	79.8	79.6	79.8	83.4	83.9	82.8	79.3	76.4	131.4
1000	---	---	---	---	---	78.7	79.5	81.0	81.9	84.7	84.0	82.4	77.9	76.5	131.3
1250	---	---	---	---	---	80.6	82.6	84.5	84.4	86.4	84.0	81.7	78.1	77.3	133.1
1600	---	---	---	---	---	93.8	85.5	88.5	88.9	88.3	84.5	83.1	80.1	79.4	136.0
2000	---	---	---	---	---	92.5	93.8	91.8	98.4	96.3	91.4	92.3	86.4	84.9	143.9
2500	---	---	---	---	---	98.1	101.1	99.3	105.4	101.9	97.0	99.0	93.5	91.1	150.5
3150	---	---	---	---	---	86.8	90.0	91.3	93.1	91.7	89.1	86.6	83.0	82.4	139.7
4000	---	---	---	---	---	91.1	94.2	96.0	96.6	94.7	91.8	87.8	84.8	82.0	143.4
5000	---	---	---	---	---	94.2	99.2	101.4	102.2	100.5	98.1	92.9	90.2	88.7	148.7
6300	---	---	---	---	---	91.2	94.7	94.7	95.9	93.9	92.3	88.5	84.1	83.8	143.0
8000	---	---	---	---	---	91.5	94.7	95.1	96.6	94.3	93.3	89.0	84.8	83.7	143.4

AVERAGE NET REFERRED THRUST, FN/DELTA = 5685.2 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED, N1/VTHETA = 4298.5 RPM
AVERAGE JET EXHAUST VELOCITY = 764.0 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.19

TOTAL PWL= 156.1

TABLE A-11.– BASELINE FOR TREATED FAN-DUCT TESTS. EXISTING PRODUCTION INLET, 24-IN.-LONG FAN-EXHAUST DUCTS, AND PRODUCTION PRIMARY NOZZLE. INLET-NOISE-SUPPRESSOR ENCLOSURE AROUND INLET DUCT – Continued.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 100-02, 102-02, AND 103-02.

		A N G L E S F R O M E N G I N E I N L E T C E N T E R L I N E , D E G R E E S													
B		15	30	40	50	60	75	90	100	110	120	130	140	150	160	PWL
A	50	---	---	---	---	---	88.7	90.1	91.3	91.8	92.9	95.8	98.1	99.3	96.8	144.1
N	63	---	---	---	---	---	88.7	90.1	91.3	91.8	92.9	95.8	98.1	99.3	96.8	144.1
D	80	---	---	---	---	---	88.7	90.1	91.3	91.8	92.9	95.8	98.1	99.3	96.8	144.1
	100	---	---	---	---	---	89.8	90.1	91.1	91.9	93.4	96.7	99.3	98.1	93.1	144.1
C	125	---	---	---	---	---	89.8	90.1	91.1	91.9	93.4	96.7	99.3	98.1	93.1	144.1
E	160	---	---	---	---	---	89.8	90.1	91.1	91.9	93.4	96.7	99.3	98.1	93.1	144.1
N	200	---	---	---	---	---	88.1	88.6	89.8	91.4	91.3	92.9	93.7	92.6	89.1	140.7
T	250	---	---	---	---	---	88.1	88.6	89.8	91.4	91.3	92.9	93.7	92.6	89.1	140.7
E	315	---	---	---	---	---	88.1	88.6	89.8	91.4	91.3	92.9	93.7	92.6	89.1	140.7
R	400	---	---	---	---	---	85.2	86.3	87.1	88.6	89.3	89.4	88.9	85.9	84.1	137.4
	500	---	---	---	---	---	85.2	86.3	87.1	88.6	89.3	89.4	88.9	85.9	84.1	137.4
F	630	---	---	---	---	---	85.2	86.3	87.1	88.6	89.3	89.4	88.9	85.9	84.1	137.4
R	800	---	---	---	---	---	80.0	81.8	81.6	82.8	85.2	86.6	85.6	82.2	78.6	133.1
E	1000	---	---	---	---	---	79.6	81.5	82.4	84.1	85.9	86.3	84.2	80.6	77.7	133.0
Q	1250	---	---	---	---	---	82.6	83.8	86.1	86.5	88.3	86.1	82.8	80.9	77.6	134.9
U	1600	---	---	---	---	---	84.0	85.9	88.5	89.2	89.2	86.1	84.7	81.4	78.0	136.5
E	2000	---	---	---	---	---	88.3	91.4	91.6	93.0	94.1	88.8	86.2	83.6	80.7	140.6
N	2500	---	---	---	---	---	100.6	107.9	104.2	106.7	105.1	100.2	99.3	94.3	91.4	154.1
C	3150	---	---	---	---	---	90.6	95.5	93.5	96.0	94.0	92.4	90.1	87.5	82.4	143.1
Y	4000	---	---	---	---	---	90.2	93.3	94.6	94.1	93.7	90.4	87.3	84.4	80.5	142.0
,	5000	---	---	---	---	---	96.8	102.7	100.6	105.3	101.8	97.4	94.7	90.5	87.5	150.6
H	6300	---	---	---	---	---	91.7	94.6	95.3	96.4	95.0	92.8	89.2	85.3	82.2	143.5
Z	8000	---	---	---	---	---	94.8	97.3	98.3	100.3	97.9	94.5	90.9	87.2	83.3	146.5

AVERAGE NET REFERRED THRUST, FN/DELTA = 6811.4 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED,N1/VTHETA = 4597.2 RPM
AVERAGE JET EXHAUST VELOCITY = 848.9 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.24

TOTAL PWL= 158.5

TABLE A-11.– BASELINE FOR TREATED FAN-DUCT TESTS. EXISTING PRODUCTION INLET, 24-IN.-LONG FAN-EXHAUST DUCTS, AND PRODUCTION PRIMARY NOZZLE. INLET-NOISE-SUPPRESSOR ENCLOSURE AROUND INLET DUCT – Continued.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 100-03, 102-03, AND 103-03.

	ANGLES FROM ENGINE INLET CENTERLINE, DEGREES														
BAND CENTER FREQUENCY, HZ	15	30	40	50	60	75	90	100	110	120	130	140	150	160	PWL
50	---	---	---	---	---	90.5	91.9	92.5	93.3	95.1	98.9	101.0	102.5	99.7	146.7
63	---	---	---	---	---	90.5	91.9	92.5	93.3	95.1	98.9	101.0	102.5	99.7	146.7
80	---	---	---	---	---	90.5	91.9	92.5	93.3	95.1	98.9	101.0	102.5	99.7	146.7
100	---	---	---	---	---	92.0	92.1	93.3	94.5	96.2	100.0	102.9	101.7	96.8	147.2
125	---	---	---	---	---	92.0	92.1	93.3	94.5	96.2	100.0	102.9	101.7	96.8	147.2
160	---	---	---	---	---	92.0	92.1	93.3	94.5	96.2	100.0	102.9	101.7	96.8	147.2
200	---	---	---	---	---	90.3	90.8	92.1	94.0	94.0	95.9	97.3	95.6	92.3	143.5
250	---	---	---	---	---	90.3	90.8	92.1	94.0	94.0	95.9	97.3	95.6	92.3	143.5
315	---	---	---	---	---	90.3	90.8	92.1	94.0	94.0	95.9	97.3	95.6	92.3	143.5
400	---	---	---	---	---	87.4	88.2	89.4	90.7	91.8	91.9	91.5	88.2	86.8	139.7
500	---	---	---	---	---	87.4	88.2	89.4	90.7	91.8	91.9	91.5	88.2	86.8	139.7
630	---	---	---	---	---	87.4	88.2	89.4	90.7	91.8	91.9	91.5	88.2	86.8	139.7
800	---	---	---	---	---	82.6	83.8	83.7	84.5	87.5	88.2	87.2	83.7	81.4	135.0
1000	---	---	---	---	---	82.5	83.3	84.9	85.9	87.9	87.5	86.1	82.4	80.8	135.0
1250	---	---	---	---	---	85.8	87.2	87.9	90.3	90.9	87.2	86.5	83.6	81.4	137.7
1600	---	---	---	---	---	85.9	87.1	88.9	88.9	89.3	86.5	85.1	82.2	81.6	137.1
2000	---	---	---	---	---	89.0	90.5	92.3	92.2	92.0	88.5	86.8	83.4	82.5	140.1
2500	---	---	---	---	---	99.3	100.8	103.1	106.1	106.5	101.1	99.3	95.7	93.9	152.4
3150	---	---	---	---	---	95.6	97.7	98.5	98.1	102.5	97.3	96.8	93.3	90.6	147.9
4000	---	---	---	---	---	90.6	93.6	94.8	94.7	94.4	90.5	88.0	84.8	83.2	142.4
5000	---	---	---	---	---	97.7	101.6	102.5	100.4	100.3	95.8	93.5	88.8	88.5	149.3
6300	---	---	---	---	---	94.6	96.2	99.1	97.7	96.6	94.5	91.4	86.8	85.9	145.7
8000	---	---	---	---	---	97.2	98.5	98.5	99.6	97.6	95.1	92.1	87.9	86.9	147.0

AVERAGE NET REFERRED THRUST, FN/DELTA = 7997.3 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED,N1/VTHETA = 4901.6 RPM
AVERAGE JET EXHAUST VELOCITY = 942.0 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.29

TOTAL PWL= 159.3

TABLE A-11. – BASELINE FOR TREATED FAN-DUCT TESTS. EXISTING PRODUCTION INLET, 24-IN.-LONG FAN-EXHAUST DUCTS, AND PRODUCTION PRIMARY NOZZLE. INLET-NOISE-SUPPRESSOR ENCLOSURE AROUND INLET DUCT – Continued.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 100-04, 102-04, AND 103-04.

BAND CENTER FREQUENCY, HZ	ANGLES FROM ENGINE INLET CENTERLINE, DEGREES														
	15	30	40	50	60	75	90	100	110	120	130	140	150	160	PWL
50	---	---	---	---	---	92.3	94.1	94.6	96.1	98.8	103.6	106.2	107.9	104.2	151.2
63	---	---	---	---	---	92.3	94.1	94.6	96.1	98.8	103.6	106.2	107.9	104.2	151.2
80	---	---	---	---	---	92.3	94.1	94.6	96.1	98.8	103.6	106.2	107.9	104.2	151.2
100	---	---	---	---	---	94.5	95.4	96.9	98.3	100.7	105.7	108.9	107.7	102.7	152.6
125	---	---	---	---	---	94.5	95.4	96.9	98.3	100.7	105.7	108.9	107.7	102.7	152.6
160	---	---	---	---	---	94.5	95.4	96.9	98.3	100.7	105.7	108.9	107.7	102.7	152.6
200	---	---	---	---	---	93.6	94.2	95.8	97.8	98.7	101.5	103.2	101.1	97.2	148.4
250	---	---	---	---	---	93.6	94.2	95.8	97.8	98.7	101.5	103.2	101.1	97.2	148.4
315	---	---	---	---	---	93.6	94.2	95.8	97.8	98.7	101.5	103.2	101.1	97.2	148.4
400	---	---	---	---	---	90.7	92.1	93.1	94.6	96.0	97.2	96.3	92.6	90.2	143.9
500	---	---	---	---	---	90.7	92.1	93.1	94.6	96.0	97.2	96.3	92.6	90.2	143.9
630	---	---	---	---	---	90.7	92.1	93.1	94.6	96.0	97.2	96.3	92.6	90.2	143.9
800	---	---	---	---	---	86.3	87.3	87.8	88.8	91.9	93.2	91.5	87.8	85.0	139.3
1000	---	---	---	---	---	85.9	87.1	88.4	89.1	91.3	91.9	89.2	85.7	83.5	138.6
1250	---	---	---	---	---	88.0	89.5	90.9	92.0	93.1	91.0	88.5	85.7	83.3	140.0
1600	---	---	---	---	---	88.5	89.5	91.7	92.0	91.9	89.7	87.8	85.2	84.2	139.8
2000	---	---	---	---	---	91.7	92.0	92.8	93.5	92.2	90.5	88.8	85.6	84.6	141.4
2500	---	---	---	---	---	100.6	107.3	103.8	105.8	106.3	98.7	98.5	98.8	95.9	153.9
3150	---	---	---	---	---	104.5	106.8	104.7	105.7	106.3	101.9	100.9	99.4	97.1	154.5
4000	---	---	---	---	---	93.9	95.8	96.5	96.6	96.7	94.3	92.0	88.9	86.6	144.9
5000	---	---	---	---	---	97.6	100.4	102.7	100.3	100.4	95.8	93.4	91.0	89.1	149.1
6300	---	---	---	---	---	97.9	101.2	103.0	103.6	102.3	99.5	96.8	92.9	91.0	150.6
8000	---	---	---	---	---	99.1	99.9	100.1	100.8	99.4	95.8	92.8	89.7	87.9	148.5

AVERAGE NET REFERRED THRUST, FN/DELTA = 10201.3 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED,N1/VTHETA = 5348.6 RPM
AVERAGE JET EXHAUST VELOCITY = 1104.8 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.41

TOTAL PWL= 163.2

TABLE A-11. – BASELINE FOR TREATED FAN-DUCT TESTS. EXISTING PRODUCTION INLET, 24-IN.-LONG FAN-EXHAUST DUCTS, AND PRODUCTION PRIMARY NOZZLE. INLET-NOISE-SUPPRESSOR ENCLOSURE AROUND INLET DUCT – Continued.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 100-05, 102-05, AND 103-05.

BAND CENTER FREQUENCY, HZ	ANGLES FROM ENGINE INLET CENTERLINE, DEGREES 15	30	40	50	60	75	90	100	110	120	130	140	150	160	PWL
50	---	---	---	---	---	95.0	96.8	98.0	100.0	103.9	109.3	112.9	113.8	109.1	156.9
63	---	---	---	---	---	95.0	96.8	98.0	100.0	103.9	109.3	112.9	113.8	109.1	156.9
80	---	---	---	---	---	95.0	96.8	98.0	100.0	103.9	109.3	112.9	113.8	109.1	156.9
100	---	---	---	---	---	98.5	100.5	102.0	103.6	107.4	113.9	117.6	114.7	109.5	160.3
125	---	---	---	---	---	98.5	100.5	102.0	103.6	107.4	113.9	117.6	114.7	109.5	160.3
160	---	---	---	---	---	98.5	100.5	102.0	103.6	107.4	113.9	117.6	114.7	109.5	160.3
200	---	---	---	---	---	98.7	99.8	101.9	103.8	105.8	110.3	113.6	111.3	105.1	157.0
250	---	---	---	---	---	98.7	99.8	101.9	103.8	105.8	110.3	113.6	111.3	105.1	157.0
315	---	---	---	---	---	98.7	99.8	101.9	103.8	105.8	110.3	113.6	111.3	105.1	157.0
400	---	---	---	---	---	95.6	96.9	98.8	100.2	102.6	104.5	104.7	100.6	96.7	150.6
500	---	---	---	---	---	95.6	96.9	98.8	100.2	102.6	104.5	104.7	100.6	96.7	150.6
630	---	---	---	---	---	95.6	96.9	98.8	100.2	102.6	104.5	104.7	100.6	96.7	150.6
800	---	---	---	---	---	91.2	92.5	93.2	94.4	98.5	100.4	97.7	93.9	90.2	145.5
1000	---	---	---	---	---	90.6	91.7	93.3	94.6	97.0	98.4	94.6	91.6	88.8	144.1
1250	---	---	---	---	---	92.4	95.0	96.3	96.4	97.7	95.8	92.9	91.3	87.5	144.9
1600	---	---	---	---	---	93.2	94.6	96.9	97.1	96.6	94.5	93.2	90.9	88.3	144.8
2000	---	---	---	---	---	94.8	95.4	96.4	96.9	96.1	95.2	93.9	90.6	88.7	145.1
2500	---	---	---	---	---	98.7	100.6	100.2	98.9	99.2	97.3	95.1	92.4	90.8	148.5
3150	---	---	---	---	---	106.0	105.6	112.2	108.9	110.2	107.1	104.4	100.2	101.5	157.9
4000	---	---	---	---	---	98.9	100.5	102.7	102.7	103.0	101.6	99.7	96.3	93.4	150.8
5000	---	---	---	---	---	97.0	98.6	99.5	98.9	98.4	96.1	94.3	90.9	88.7	147.4
6300	---	---	---	---	---	102.7	104.6	104.8	103.8	102.7	99.6	98.5	94.3	92.7	152.5
8000	---	---	---	---	---	98.6	99.5	100.2	99.8	98.9	97.4	95.4	91.3	89.0	148.3

AVERAGE NET REFERRED THRUST, FN/DELTA = 14072.0 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED,N1/VTHETA = 6003.5 RPM
AVERAGE JET EXHAUST VELOCITY = 1359.3 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.62

TOTAL PWL= 168.9

TABLE A-11. – BASELINE FOR TREATED FAN-DUCT TESTS. EXISTING PRODUCTION INLET, 24-IN.-LONG FAN-EXHAUST DUCTS, AND PRODUCTION PRIMARY NOZZLE. INLET-NOISE-SUPPRESSOR ENCLOSURE AROUND INLET DUCT – Continued.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 100-06, 102-06, AND 103-06.

BAND CENTER FREQUENCY, HZ	ANGLES FROM ENGINE INLET CENTERLINE, DEGREES														
	15	30	40	50	60	75	90	100	110	120	130	140	150	160	PWL
50	---	---	---	---	---	94.3	96.0	96.6	98.4	101.8	107.1	109.9	111.5	107.9	154.7
63	---	---	---	---	---	94.3	96.0	96.6	98.4	101.8	107.1	109.9	111.5	107.9	154.7
80	---	---	---	---	---	94.3	96.0	96.6	98.4	101.8	107.1	109.9	111.5	107.9	154.7
100	---	---	---	---	---	97.1	98.6	99.9	101.4	104.5	110.7	114.2	112.0	107.6	157.3
125	---	---	---	---	---	97.1	98.6	99.9	101.4	104.5	110.7	114.2	112.0	107.6	157.3
160	---	---	---	---	---	97.1	98.6	99.9	101.4	104.5	110.7	114.2	112.0	107.6	157.3
200	---	---	---	---	---	96.5	97.8	99.4	101.2	102.8	106.4	109.0	107.1	102.1	153.2
250	---	---	---	---	---	96.5	97.8	99.4	101.2	102.8	106.4	109.0	107.1	102.1	153.2
315	---	---	---	---	---	96.5	97.8	99.4	101.2	102.8	106.4	109.0	107.1	102.1	153.2
400	---	---	---	---	---	93.7	95.3	96.8	98.2	99.9	101.6	101.1	97.0	94.0	147.9
500	---	---	---	---	---	93.7	95.3	96.8	98.2	99.9	101.6	101.1	97.0	94.0	147.9
630	---	---	---	---	---	93.7	95.3	96.8	98.2	99.9	101.6	101.1	97.0	94.0	147.9
800	---	---	---	---	---	89.7	91.4	91.9	92.7	96.3	97.5	95.4	91.3	88.5	143.4
1000	---	---	---	---	---	89.2	90.2	91.6	92.7	95.3	96.0	92.4	89.0	86.8	142.2
1250	---	---	---	---	---	90.4	92.7	94.6	94.9	95.6	94.8	91.1	88.4	86.2	143.1
1600	---	---	---	---	---	91.5	93.0	94.6	95.3	94.9	92.9	91.0	88.6	87.6	143.0
2000	---	---	---	---	---	93.9	94.6	95.2	95.8	94.4	93.4	91.9	88.9	87.2	143.9
2500	---	---	---	---	---	102.3	102.1	102.6	101.1	99.7	97.4	95.4	93.7	92.3	150.5
3150	---	---	---	---	---	112.3	109.6	111.7	109.2	108.3	105.1	104.1	102.2	101.3	159.3
4000	---	---	---	---	---	97.4	99.9	100.5	99.7	99.5	98.4	96.0	93.0	90.3	148.5
5000	---	---	---	---	---	97.5	99.8	100.5	99.3	98.2	95.3	93.0	89.7	88.9	147.9
6300	---	---	---	---	---	101.4	104.1	108.0	104.5	104.3	100.5	98.0	94.0	94.6	153.5
8000	---	---	---	---	---	100.4	100.0	101.8	100.6	98.6	96.6	94.1	90.4	88.8	149.1

AVERAGE NET REFERRED THRUST, FN/DELTA = 12134.7 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED,N1/VTHETA = 5700.1 RPM
AVERAGE JET EXHAUST VELOCITY = 1224.6 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.52

TOTAL PWL= 166.8

ANALYSIS OF JT3D STATIC NOISE-REDUCTION TESTS AT EDWARDS AFB

TABLE A-11.– BASELINE FOR TREATED FAN-DUCT TESTS. EXISTING PRODUCTION INLET, 24-IN.-LONG FAN-EXHAUST DUCTS, AND PRODUCTION PRIMARY NOZZLE. INLET-NOISE-SUPPRESSOR ENCLOSURE AROUND INLET DUCT – Concluded.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 100-07, 102-07, AND 103-07.

BAND CENTER FREQUENCY, HZ	ANGLES FROM ENGINE INLET CENTERLINE, DEGREES														
	15	30	40	50	60	75	90	100	110	120	130	140	150	160	PWL
50	---	---	---	---	---	96.8	98.7	99.6	101.6	106.3	112.5	115.8	116.6	111.2	159.7
63	---	---	---	---	---	96.8	98.7	99.6	101.6	106.3	112.5	115.8	116.6	111.2	159.7
80	---	---	---	---	---	96.8	98.7	99.6	101.6	106.3	112.5	115.8	116.6	111.2	159.7
100	---	---	---	---	---	100.6	102.6	104.2	105.9	110.3	117.8	121.2	117.8	111.6	163.7
125	---	---	---	---	---	100.6	102.6	104.2	105.9	110.3	117.8	121.2	117.8	111.6	163.7
160	---	---	---	---	---	100.6	102.6	104.2	105.9	110.3	117.8	121.2	117.8	111.6	163.7
200	---	---	---	---	---	101.3	102.7	104.7	106.6	109.1	114.7	118.0	115.7	108.1	161.1
250	---	---	---	---	---	101.3	102.7	104.7	106.6	109.1	114.7	118.0	115.7	108.1	161.1
315	---	---	---	---	---	101.3	102.7	104.7	106.6	109.1	114.7	118.0	115.7	108.1	161.1
400	---	---	---	---	---	98.2	99.7	101.8	103.3	106.1	108.7	109.3	105.8	99.5	154.5
500	---	---	---	---	---	98.2	99.7	101.8	103.3	106.1	108.7	109.3	105.8	99.5	154.5
630	---	---	---	---	---	98.2	99.7	101.8	103.3	106.1	108.7	109.3	105.8	99.5	154.5
800	---	---	---	---	---	94.0	95.5	96.7	98.2	102.4	104.2	102.4	97.7	93.5	149.3
1000	---	---	---	---	---	93.4	94.7	96.1	98.1	101.1	102.4	99.2	94.9	91.6	147.8
1250	---	---	---	---	---	94.1	95.7	97.7	99.1	100.4	100.1	96.6	93.7	89.4	147.3
1600	---	---	---	---	---	95.5	97.1	99.2	100.2	99.5	98.7	96.4	93.5	91.3	147.7
2000	---	---	---	---	---	96.4	97.6	99.0	100.0	98.6	98.7	96.6	93.0	90.1	147.6
2500	---	---	---	---	---	98.2	99.4	99.8	99.8	99.3	98.8	95.9	93.2	90.6	148.4
3150	---	---	---	---	---	103.6	107.1	106.4	106.2	105.8	102.0	100.4	98.5	97.3	154.7
4000	---	---	---	---	---	103.5	107.9	107.6	105.4	107.1	102.7	99.7	97.4	95.9	155.2
5000	---	---	---	---	---	97.7	99.4	100.9	100.2	99.3	97.8	95.5	92.0	89.4	148.5
6300	---	---	---	---	---	101.3	102.6	103.2	103.4	101.5	98.7	96.4	92.5	90.5	151.2
8000	---	---	---	---	---	99.6	100.9	101.3	101.2	100.1	98.9	96.1	91.9	90.1	149.5

AVERAGE NET REFERRED THRUST, FN/DELTA = 15879.7 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED,N1/VTHETA = 6298.7 RPM
AVERAGE JET EXHAUST VELOCITY = 1488.3 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.75

TOTAL PWL= 172.0

ANALYSIS OF JT3D STATIC NOISE-REDUCTION TESTS AT EDWARDS AFB

TABLE A-12. – 48-IN.-LONG, TREATED FAN-EXHAUST DUCTS. EXISTING, PRODUCTION INLET DUCT AND PRODUCTION PRIMARY NOZZLE. INLET-NOISE-SUPPRESSOR ENCLOSURE AROUND INLET DUCT.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 107-01, 108-01, AND 109-01.

		ANGLES FROM ENGINE INLET CENTERLINE, DEGREES														
BAND CENTER FREQUENCY, HZ		15	30	40	50	60	75	90	100	110	120	130	140	150	160	PWL
B																
A	50	---	---	---	---	---	88.2	88.5	89.8	90.3	91.7	94.1	96.2	97.8	95.7	142.6
N	63	---	---	---	---	---	88.2	88.5	89.8	90.3	91.7	94.1	96.2	97.8	95.7	142.6
D	80	---	---	---	---	---	88.2	88.5	89.8	90.3	91.7	94.1	96.2	97.8	95.7	142.6
	100	---	---	---	---	---	88.9	89.6	90.4	91.3	92.5	95.5	97.7	96.4	90.9	142.8
C	125	---	---	---	---	---	88.9	89.6	90.4	91.3	92.5	95.5	97.7	96.4	90.9	142.8
E	160	---	---	---	---	---	88.9	89.6	90.4	91.3	92.5	95.5	97.7	96.4	90.9	142.8
N	200	---	---	---	---	---	86.9	87.7	88.7	89.8	89.4	90.4	91.1	90.1	86.0	138.8
T	250	---	---	---	---	---	86.9	87.7	88.7	89.8	89.4	90.4	91.1	90.1	86.0	138.8
E	315	---	---	---	---	---	86.9	87.7	88.7	89.8	89.4	90.4	91.1	90.1	86.0	138.8
R	400	---	---	---	---	---	83.4	83.8	84.8	85.8	85.9	85.9	85.5	83.0	81.0	134.5
	500	---	---	---	---	---	83.4	83.8	84.8	85.8	85.9	85.9	85.5	83.0	81.0	134.5
F	630	---	---	---	---	---	83.4	83.8	84.8	85.8	85.9	85.9	85.5	83.0	81.0	134.5
R	800	---	---	---	---	---	77.9	79.1	78.6	78.6	80.9	82.0	80.4	78.6	76.6	129.3
E	1000	---	---	---	---	---	76.3	78.0	78.0	78.5	80.5	80.7	78.1	76.5	75.1	128.2
Q	1250	---	---	---	---	---	76.6	77.7	78.8	80.1	79.9	78.4	76.7	75.6	73.9	128.0
U	1600	---	---	---	---	---	77.5	78.7	80.4	80.6	80.3	78.7	77.3	75.7	73.9	128.7
E	2000	---	---	---	---	---	79.0	79.8	81.2	81.1	81.4	80.0	78.4	75.8	74.1	129.7
N	2500	---	---	---	---	---	81.6	82.1	85.0	82.5	83.1	82.2	81.9	80.3	76.7	132.3
C	3150	---	---	---	---	---	76.8	78.5	78.8	78.2	79.0	77.5	75.6	73.4	70.6	127.4
Y	4000	---	---	---	---	---	78.3	79.7	81.2	81.5	85.8	79.8	77.1	75.7	73.3	130.7
,	5000	---	---	---	---	---	82.0	83.8	87.9	87.8	92.2	85.8	82.1	80.6	78.1	136.5
H	6300	---	---	---	---	---	84.1	85.0	86.6	86.0	87.4	83.9	81.0	79.1	77.0	134.7
Z	8000	---	---	---	---	---	84.8	86.7	88.9	88.5	90.8	86.1	82.8	81.5	79.1	137.0

AVERAGE NET REFERRED THRUST, FN/DELTA = 5702.4 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED,N1/VTHETA = 4298.7 RPM
AVERAGE JET EXHAUST VELOCITY = 764.2 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.19

TOTAL PWL= 152.1

ANALYSIS OF JT3D STATIC NOISE-REDUCTION TESTS AT EDWARDS AFB

TABLE A-12. – 48-IN.-LONG, TREATED FAN-EXHAUST DUCTS. EXISTING, PRODUCTION INLET DUCT AND PRODUCTION PRIMARY NOZZLE. INLET-NOISE-SUPPRESSOR ENCLOSURE AROUND INLET DUCT – Continued.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 107-02, 108-02, AND 109-02.

		ANGLES FROM ENGINE INLET CENTERLINE, DEGREES														
B		15	30	40	50	60	75	90	100	110	120	130	140	150	160	PWL
A	50	---	---	---	---	---	89.5	90.8	91.7	92.4	94.1	97.0	99.5	101.0	98.2	145.3
N	63	---	---	---	---	---	89.5	90.8	91.7	92.4	94.1	97.0	99.5	101.0	98.2	145.3
D	80	---	---	---	---	---	89.5	90.8	91.7	92.4	94.1	97.0	99.5	101.0	98.2	145.3
	100	---	---	---	---	---	91.2	91.8	92.9	94.3	95.8	98.8	101.1	99.7	93.9	145.9
C	125	---	---	---	---	---	91.2	91.8	92.9	94.3	95.8	98.8	101.1	99.7	93.9	145.9
E	160	---	---	---	---	---	91.2	91.8	92.9	94.3	95.8	98.8	101.1	99.7	93.9	145.9
N	200	---	---	---	---	---	89.4	90.2	91.4	92.6	92.2	93.6	95.1	92.9	88.7	141.8
T	250	---	---	---	---	---	89.4	90.2	91.4	92.6	92.2	93.6	95.1	92.9	88.7	141.8
E	315	---	---	---	---	---	89.4	90.2	91.4	92.6	92.2	93.6	95.1	92.9	88.7	141.8
R	400	---	---	---	---	---	85.8	86.0	87.5	88.4	88.5	88.7	88.3	65.3	83.5	137.1
	500	---	---	---	---	---	85.8	86.0	87.5	88.4	88.5	88.7	88.3	85.3	83.5	137.1
F	630	---	---	---	---	---	85.8	86.0	87.5	88.4	88.5	88.7	88.3	85.3	83.5	137.1
R	800	---	---	---	---	---	79.7	81.0	80.2	81.0	83.0	83.8	82.4	80.7	79.0	131.2
E	1000	---	---	---	---	---	78.7	79.7	80.4	81.1	82.1	81.4	80.0	79.0	77.6	130.1
Q	1250	---	---	---	---	---	79.3	80.5	81.4	82.9	82.6	80.5	79.0	78.3	77.0	130.6
U	1600	---	---	---	---	---	80.4	81.3	83.3	83.2	82.1	80.6	80.3	78.4	76.3	131.3
E	2000	---	---	---	---	---	80.8	82.0	82.3	82.3	82.8	81.6	80.4	77.4	75.4	131.3
N	2500	---	---	---	---	---	82.1	84.2	84.7	83.5	88.5	82.7	82.0	80.0	77.7	133.9
C	3150	---	---	---	---	---	78.7	79.8	80.4	80.5	81.1	79.6	73.1	76.1	73.4	129.3
Y	4000	---	---	---	---	---	79.1	80.2	81.2	81.4	82.5	79.7	77.7	75.4	72.9	129.9
,	5000	---	---	---	---	---	81.4	83.6	86.3	86.6	89.3	83.6	80.3	78.0	76.4	134.7
H	6300	---	---	---	---	---	83.8	84.8	85.8	85.5	86.2	82.8	79.9	77.8	76.5	134.0
Z	8000	---	---	---	---	---	86.7	88.3	90.3	89.5	90.6	85.7	82.9	80.8	78.7	137.8

AVERAGE NET REFERRED THRUST, FN/DELTA = 6764.9 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED,N1/VTHETA = 4595.6 RPM
AVERAGE JET EXHAUST VELOCITY = 856.6 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.24

TOTAL PWL= 154.8

ANALYSIS OF JT3D STATIC NOISE-REDUCTION TESTS AT EDWARDS AFB

TABLE A-12. – 48-IN.-LONG, TREATED FAN-EXHAUST DUCTS. EXISTING, PRODUCTION INLET DUCT AND PRODUCTION PRIMARY NOZZLE. INLET-NOISE-SUPPRESSOR ENCLOSURE AROUND INLET DUCT – Continued.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 107-03, 108-03, AND 109-03.

		ANGLES FROM ENGINE INLET CENTERLINE, DEGREES														
B		15	30	40	50	60	75	90	100	110	120	130	140	150	160	PWL
A	50	---	---	---	---	---	90.7	92.2	93.3	94.3	96.4	100.0	102.4	104.2	101.2	148.0
N	63	---	---	---	---	---	90.7	92.2	93.3	94.3	96.4	100.0	102.4	104.2	101.2	148.0
D	80	---	---	---	---	---	90.7	92.2	93.3	94.3	96.4	100.0	102.4	104.2	101.2	148.0
	100	---	---	---	---	---	92.8	93.9	95.0	96.7	98.4	102.0	104.7	102.3	97.5	148.8
C	125	---	---	---	---	---	92.8	93.9	95.0	96.7	98.4	102.0	104.7	102.3	97.5	148.8
E	160	---	---	---	---	---	92.8	93.9	95.0	96.7	98.4	102.0	104.7	102.3	97.5	148.8
N	200	---	---	---	---	---	91.6	92.4	93.9	95.2	95.1	96.8	98.6	94.4	91.2	144.5
T	250	---	---	---	---	---	91.6	92.4	93.9	95.2	95.1	96.8	98.6	94.4	91.2	144.5
E	315	---	---	---	---	---	91.6	92.4	93.9	95.2	95.1	96.8	98.6	94.4	91.2	144.5
R	400	---	---	---	---	---	88.2	88.5	89.7	90.8	91.4	91.6	91.4	87.6	85.8	139.7
	500	---	---	---	---	---	88.2	88.5	89.7	90.8	91.4	91.6	91.4	87.6	85.8	139.7
F	630	---	---	---	---	---	88.2	88.5	89.7	90.8	91.4	91.6	91.4	87.6	85.8	139.7
R	800	---	---	---	---	---	82.5	83.1	83.6	83.6	85.8	86.7	85.4	83.3	81.3	134.0
E	1000	---	---	---	---	---	81.1	82.2	82.8	83.6	84.9	84.7	82.7	81.1	79.6	132.7
Q	1250	---	---	---	---	---	81.8	83.4	84.2	85.2	85.0	83.3	81.7	80.4	78.6	133.2
U	1600	---	---	---	---	---	82.8	83.8	85.0	85.5	84.7	82.9	82.2	80.4	78.4	133.5
E	2000	---	---	---	---	---	83.4	84.2	84.7	84.8	84.7	83.7	82.6	79.7	77.8	133.6
N	2500	---	---	---	---	---	83.7	85.5	84.7	84.8	86.2	84.9	82.5	80.2	78.2	134.3
C	3150	---	---	---	---	---	81.6	82.8	82.9	83.3	84.0	82.5	81.0	78.6	75.6	132.2
Y	4000	---	---	---	---	---	81.3	82.1	83.2	83.1	84.0	81.5	79.6	76.7	74.3	131.8
,	5000	---	---	---	---	---	82.6	84.4	86.4	86.7	89.5	84.9	81.3	78.3	75.8	135.1
H	6300	---	---	---	---	---	84.4	85.6	86.3	87.1	87.8	84.0	81.4	79.0	76.8	135.1
Z	8000	---	---	---	---	---	87.4	89.2	90.1	90.5	92.0	86.3	83.1	81.2	79.0	138.6

AVERAGE NET REFERRED THRUST, FN/DELTA = 8017.2 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED,N1/VTHETA = 4901.6 RPM
AVERAGE JET EXHAUST VELOCITY = 954.2 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.30

TOTAL PWL= 157.5

ANALYSIS OF JT3D STATIC NOISE-REDUCTION TESTS AT EDWARDS AFB

TABLE A-12. – 48-IN.-LONG, TREATED FAN-EXHAUST DUCTS. EXISTING, PRODUCTION INLET DUCT AND PRODUCTION PRIMARY NOZZLE. INLET-NOISE-SUPPRESSOR ENCLOSURE AROUND INLET DUCT – Continued.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 107-04, 108-04, AND 109-04.

BAND CENTER FREQUENCY, HZ	ANGLES FROM ENGINE INLET CENTERLINE, DEGREES														
	15	30	40	50	60	75	90	100	110	120	130	140	150	160	PWL
50	---	---	---	---	---	92.8	94.5	95.6	96.9	99.9	104.7	107.6	109.0	105.3	152.4
63	---	---	---	---	---	92.8	94.5	95.6	96.9	99.9	104.7	107.6	109.0	105.3	152.4
80	---	---	---	---	---	92.8	94.5	95.6	96.9	99.9	104.7	107.6	109.0	105.3	152.4
100	---	---	---	---	---	95.6	97.3	98.4	100.4	102.5	107.8	110.8	108.4	103.3	154.2
125	---	---	---	---	---	95.6	97.3	98.4	100.4	102.5	107.8	110.8	108.4	103.3	154.2
160	---	---	---	---	---	95.6	97.3	98.4	100.4	102.5	107.8	110.8	108.4	103.3	154.2
200	---	---	---	---	---	95.2	96.2	97.7	99.3	99.7	102.5	104.7	100.5	96.2	149.5
250	---	---	---	---	---	95.2	96.2	97.7	99.3	99.7	102.5	104.7	100.5	96.2	149.5
315	---	---	---	---	---	95.2	96.2	97.7	99.3	99.7	102.5	104.7	100.5	96.2	149.5
400	---	---	---	---	---	92.0	92.6	93.9	94.9	95.8	97.0	96.4	92.6	90.0	144.2
500	---	---	---	---	---	92.0	92.6	93.9	94.9	95.8	97.0	96.4	92.6	90.0	144.2
630	---	---	---	---	---	92.0	92.6	93.9	94.9	95.8	97.0	96.4	92.6	90.0	144.2
800	---	---	---	---	---	87.1	87.5	87.6	88.6	90.6	91.6	90.2	88.1	85.9	138.7
1000	---	---	---	---	---	85.3	86.0	87.2	88.2	89.5	89.7	87.5	86.1	84.5	137.3
1250	---	---	---	---	---	86.3	87.3	88.1	89.9	89.6	88.1	86.7	85.5	83.3	137.6
1600	---	---	---	---	---	86.7	87.6	88.8	89.7	89.3	87.7	86.7	84.7	82.8	137.7
2000	---	---	---	---	---	87.2	87.8	88.4	88.9	88.7	88.1	86.7	83.9	81.8	137.5
2500	---	---	---	---	---	87.2	88.7	89.5	88.7	90.0	88.7	86.1	84.5	81.3	138.0
3150	---	---	---	---	---	86.6	88.2	90.4	89.4	89.2	88.4	86.9	85.4	83.0	138.1
4000	---	---	---	---	---	85.2	85.8	86.7	86.9	87.3	85.6	83.8	81.4	78.4	135.5
5000	---	---	---	---	---	86.2	87.5	89.9	90.1	91.2	86.4	84.3	82.3	79.6	137.9
6300	---	---	---	---	---	87.5	89.5	93.1	93.4	97.8	89.5	86.6	83.9	82.9	141.8
8000	---	---	---	---	---	88.3	90.0	90.8	90.6	91.6	87.2	84.4	82.8	80.5	139.0

AVERAGE NET REFERRED THRUST, FN/DELTA = 10168.1 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED,N1/VTHETA = 5349.4 RPM
AVERAGE JET EXHAUST VELOCITY = 1104.4 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.40

TOTAL PWL= 162.4

ANALYSIS OF JT3D STATIC NOISE-REDUCTION TESTS AT EDWARDS AFB

TABLE A-12. – 48-IN.-LONG, TREATED FAN-EXHAUST DUCTS. EXISTING, PRODUCTION INLET DUCT AND PRODUCTION PRIMARY NOZZLE. INLET-NOISE-SUPPRESSOR ENCLOSURE AROUND INLET DUCT – Continued.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 107-05, 108-05, AND 109-05.

BAND CENTER FREQUENCY, HZ	ANGLES FROM ENGINE INLET CENTERLINE, DEGREES														
	15	30	40	50	60	75	90	100	110	120	130	140	150	160	PWL
50	---	---	---	---	---	94.9	97.2	98.8	100.7	105.1	110.3	113.4	114.3	110.3	157.6
63	---	---	---	---	---	94.9	97.2	98.8	100.7	105.1	110.3	113.4	114.3	110.3	157.6
80	---	---	---	---	---	94.9	97.2	98.8	100.7	105.1	110.3	113.4	114.3	110.3	157.6
100	---	---	---	---	---	99.6	101.6	103.4	105.4	109.5	116.1	118.8	114.1	109.7	161.5
125	---	---	---	---	---	99.6	101.6	103.4	105.4	109.5	116.1	118.8	114.1	109.7	161.5
160	---	---	---	---	---	99.6	101.6	103.4	105.4	109.5	116.1	118.8	114.1	109.7	161.5
200	---	---	---	---	---	100.2	101.4	103.4	105.3	106.8	111.5	114.2	109.0	103.6	157.5
250	---	---	---	---	---	100.2	101.4	103.4	105.3	106.8	111.5	114.2	109.0	103.6	157.5
315	---	---	---	---	---	100.2	101.4	103.4	105.3	106.8	111.5	114.2	109.0	103.6	157.5
400	---	---	---	---	---	97.2	98.1	99.9	101.2	102.9	104.7	104.9	99.6	96.5	151.1
500	---	---	---	---	---	97.2	98.1	99.9	101.2	102.9	104.7	104.9	99.6	96.5	151.1
630	---	---	---	---	---	97.2	98.1	99.9	101.2	102.9	104.7	104.9	99.6	96.5	151.1
800	---	---	---	---	---	92.5	93.3	94.1	94.9	97.9	99.2	98.0	94.5	92.0	145.5
1000	---	---	---	---	---	91.3	91.8	93.1	94.3	96.0	97.1	94.9	92.5	90.6	143.8
1250	---	---	---	---	---	91.7	92.4	94.2	94.8	95.0	94.6	93.0	91.5	89.3	143.3
1600	---	---	---	---	---	92.4	93.4	95.2	95.7	95.0	94.2	93.2	91.2	88.7	143.7
2000	---	---	---	---	---	93.0	93.5	94.5	95.0	94.8	94.2	93.0	90.3	87.6	143.5
2500	---	---	---	---	---	92.5	93.2	93.4	93.7	94.5	93.7	92.1	89.6	86.0	142.8
3150	---	---	---	---	---	92.5	93.9	94.2	95.0	96.8	93.3	91.8	89.3	86.3	143.6
4000	---	---	---	---	---	90.3	91.1	92.3	92.3	92.6	91.7	90.1	87.4	84.3	141.0
5000	---	---	---	---	---	88.7	90.2	91.5	92.1	91.5	89.7	88.2	85.5	82.7	139.9
6300	---	---	---	---	---	90.1	92.7	95.2	99.5	95.2	90.8	88.6	85.9	83.8	143.9
8000	---	---	---	---	---	90.0	90.8	92.1	92.5	92.9	89.9	87.7	85.4	82.3	140.6

AVERAGE NET REFERRED THRUST, FN/DELTA = 14049.8 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED,N1/VTHETA = 5992.8 RPM
AVERAGE JET EXHAUST VELOCITY = 1366.3 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.63

TOTAL PWL= 169.2

TABLE A-12. – 48-IN.-LONG, TREATED FAN-EXHAUST DUCTS. EXISTING, PRODUCTION INLET DUCT AND PRODUCTION PRIMARY NOZZLE. INLET-NOISE-SUPPRESSOR ENCLOSURE AROUND INLET DUCT – Continued.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 107-06, 108-06, AND 109-06.

		ANGLES FROM ENGINE INLET CENTERLINE, DEGREES														
B		15	30	40	50	60	75	90	100	110	120	130	140	150	160	PWL
A	50	---	---	---	---	---	93.9	96.2	97.5	99.0	103.2	108.1	110.4	111.9	108.1	155.3
N	63	---	---	---	---	---	93.9	96.2	97.5	99.0	103.2	108.1	110.4	111.9	108.1	155.3
D	80	---	---	---	---	---	93.9	96.2	97.5	99.0	103.2	108.1	110.4	111.9	108.1	155.3
	100	---	---	---	---	---	98.0	99.6	101.2	103.2	106.7	112.5	115.1	111.3	107.1	158.2
C	125	---	---	---	---	---	98.0	99.6	101.2	103.2	106.7	112.5	115.1	111.3	107.1	158.2
E	160	---	---	---	---	---	98.0	99.6	101.2	103.2	106.7	112.5	115.1	111.3	107.1	158.2
N	200	---	---	---	---	---	98.0	99.2	100.8	102.5	103.7	107.3	109.9	104.6	100.0	153.7
T	250	---	---	---	---	---	98.0	99.2	100.8	102.5	103.7	107.3	109.9	104.6	100.0	153.7
E	315	---	---	---	---	---	98.0	99.2	100.8	102.5	103.7	107.3	109.9	104.6	100.0	153.7
R	400	---	---	---	---	---	95.0	95.7	96.9	98.2	99.8	101.0	100.8	96.0	93.3	147.8
	500	---	---	---	---	---	95.0	95.7	96.9	98.2	99.8	101.0	100.8	96.0	93.3	147.8
F	630	---	---	---	---	---	95.0	95.7	96.9	98.2	99.8	101.0	100.8	96.0	93.3	147.8
R	800	---	---	---	---	---	89.6	90.6	91.2	91.8	94.4	95.7	94.5	91.2	89.1	142.3
E	1000	---	---	---	---	---	88.8	88.9	90.1	91.3	92.9	93.1	91.6	89.4	87.9	140.6
Q	1250	---	---	---	---	---	89.2	89.8	91.7	92.3	92.2	91.6	89.6	88.4	86.7	140.5
U	1600	---	---	---	---	---	90.0	90.7	92.2	93.1	92.4	90.9	90.1	88.3	86.3	141.0
E	2000	---	---	---	---	---	90.6	91.4	91.6	92.1	92.4	91.7	90.1	87.4	85.1	140.9
N	2500	---	---	---	---	---	90.0	91.0	90.8	90.9	92.0	91.0	89.2	86.8	84.0	140.2
C	3150	---	---	---	---	---	90.5	90.6	92.1	92.6	92.8	91.3	88.9	87.4	84.2	140.9
Y	4000	---	---	---	---	---	87.9	88.7	89.7	89.5	89.9	88.7	87.0	84.4	81.4	133.3
,	5000	---	---	---	---	---	87.5	89.3	91.8	91.9	90.6	87.7	85.7	83.2	80.8	139.1
H	6300	---	---	---	---	---	89.6	92.3	95.7	97.8	97.7	91.6	88.0	85.1	83.2	143.8
Z	8000	---	---	---	---	---	88.9	90.1	91.0	91.2	91.9	88.2	86.0	83.9	80.5	139.4

AVERAGE NET REFERRED THRUST, FN/DELTA = 12192.6 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED,N1/VTHETA = 5697.7 RPM
AVERAGE JET EXHAUST VELOCITY = 1238.8 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.51

TOTAL PWL= 166.0

TABLE A-12. – 48-IN.-LONG, TREATED FAN-EXHAUST DUCTS. EXISTING, PRODUCTION INLET DUCT AND PRODUCTION PRIMARY NOZZLE. INLET-NOISE-SUPPRESSOR ENCLOSURE AROUND INLET DUCT – Concluded.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 107-07, 108-07, AND 109-07.

		ANGLES FROM ENGINE INLET CENTERLINE, DEGREES														
B		15	30	40	50	60	75	90	100	110	120	130	140	150	160	PWL
A	50	---	---	---	---	---	96.0	98.3	100.6	102.5	107.0	112.5	115.8	116.3	112.1	159.8
N	63	---	---	---	---	---	96.0	98.3	100.6	102.5	107.0	112.5	115.8	116.3	112.1	159.8
D	80	---	---	---	---	---	96.0	98.3	100.6	102.5	107.0	112.5	115.8	116.3	112.1	159.8
	100	---	---	---	---	---	101.3	103.8	105.5	107.8	112.3	119.3	125.6	116.4	112.9	166.5
C	125	---	---	---	---	---	101.3	103.8	105.5	107.8	112.3	119.3	125.6	116.4	112.9	166.5
E	160	---	---	---	---	---	101.3	103.8	105.5	107.8	112.3	119.3	125.6	116.4	112.9	166.5
N	200	---	---	---	---	---	102.5	103.8	106.2	107.9	110.1	116.1	118.0	112.6	107.7	161.2
T	250	---	---	---	---	---	102.5	103.8	106.2	107.9	110.1	116.1	118.0	112.6	107.7	161.2
E	315	---	---	---	---	---	102.5	103.8	106.2	107.9	110.1	116.1	118.0	112.6	107.7	161.2
R	400	---	---	---	---	---	99.4	100.4	102.2	103.7	105.8	108.6	109.5	102.8	100.1	154.4
	500	---	---	---	---	---	99.4	100.4	102.2	103.7	105.8	108.6	109.5	102.8	100.1	154.4
F	630	---	---	---	---	---	99.4	100.4	102.2	103.7	105.8	108.6	109.5	102.8	100.1	154.4
R	800	---	---	---	---	---	94.9	95.5	96.7	97.8	100.7	103.0	101.9	97.7	96.0	148.7
E	1000	---	---	---	---	---	94.0	94.4	96.4	97.7	99.4	100.7	98.7	95.9	94.7	147.1
Q	1250	---	---	---	---	---	94.4	95.3	97.1	98.2	98.4	98.2	97.0	95.0	93.6	146.5
U	1600	---	---	---	---	---	95.2	96.5	98.3	98.7	97.9	97.7	96.8	94.8	93.0	146.9
E	2000	---	---	---	---	---	95.5	96.5	97.4	97.7	97.7	97.5	96.5	93.5	91.8	146.5
N	2500	---	---	---	---	---	94.6	95.5	95.9	96.0	97.1	96.8	95.0	92.3	90.1	145.3
C	3150	---	---	---	---	---	93.3	95.3	96.5	95.9	95.9	95.5	93.9	91.2	89.2	144.7
Y	4000	---	---	---	---	---	92.7	93.7	95.2	94.8	95.4	94.3	92.9	90.1	88.1	143.7
,	5000	---	---	---	---	---	90.8	92.0	94.0	93.6	93.6	92.5	90.9	88.2	86.3	142.1
H	6300	---	---	---	---	---	91.6	93.6	96.5	96.4	95.6	92.3	90.1	87.4	85.8	143.7
Z	8000	---	---	---	---	---	91.5	92.3	94.7	95.4	94.8	92.0	89.6	87.7	85.0	142.7

AVERAGE NET REFERRED THRUST, FN/DELTA = 15863.4 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED,N1/VTHETA = 6295.1 RPM
AVERAGE JET EXHAUST VELOCITY = 1490.8 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.75

TOTAL PWL= 173.3

ANALYSIS OF JT3D STATIC NOISE-REDUCTION TESTS AT EDWARDS AFB

TABLE A-13. – ACOUSTICALLY TREATED NACELLE WITH COMBINATION OF ONE-RING TREATED INLET AND 48-IN.-LONG TREATED FAN-EXHAUST DUCTS. PRODUCTION PRIMARY NOZZLE. NO NOISE-SUPPRESSOR ENCLOSURES.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 111-01, 112-01, AND 113-01.

BAND CENTER FREQUENCY, HZ	ANGLES FROM ENGINE INLET CENTERLINE, DEGREES 15	30	40	50	60	75	90	100	110	120	130	140	150	157	PWL
50	86.5	84.2	84.2	85.4	86.7	88.2	89.0	89.9	91.0	91.7	94.0	96.1	97.3	95.0	142.8
63	86.5	84.2	84.2	85.4	86.7	88.2	89.0	89.9	91.0	91.7	94.0	96.1	97.3	95.0	142.8
80	86.5	84.2	84.2	85.4	86.7	88.2	89.0	89.9	91.0	91.7	94.0	96.1	97.3	95.0	142.8
100	86.3	87.5	88.0	88.8	89.2	89.0	89.7	90.5	91.5	92.4	95.3	97.2	95.6	90.3	143.2
125	86.3	87.5	88.0	88.8	89.2	89.0	89.7	90.5	91.5	92.4	95.3	97.2	95.6	90.3	143.2
160	86.3	87.5	88.0	88.8	89.2	89.0	89.7	90.5	91.5	92.4	95.3	97.2	95.6	90.3	143.2
200	86.3	86.2	85.9	86.0	86.7	86.7	87.6	88.7	89.7	89.1	90.1	90.8	89.3	85.4	139.6
250	86.3	86.2	85.9	86.0	86.7	86.7	87.6	88.7	89.7	89.1	90.1	90.8	89.3	85.4	139.6
315	86.3	86.2	85.9	86.0	86.7	86.7	87.6	88.7	89.7	89.1	90.1	90.8	89.3	85.4	139.6
400	82.3	83.0	82.5	82.3	82.8	83.3	84.1	85.2	86.3	86.4	86.4	86.0	82.5	81.0	135.8
500	82.3	83.0	82.5	82.3	82.8	83.3	84.1	85.2	86.3	86.4	86.4	86.0	82.5	81.0	135.8
630	82.3	83.0	82.5	82.3	82.8	83.3	84.1	85.2	86.3	86.4	86.4	86.0	82.5	81.0	135.9
800	80.5	79.5	78.6	78.4	78.1	78.8	80.4	79.8	80.6	82.8	83.6	82.0	78.9	75.4	131.8
1000	79.4	79.4	77.9	77.2	77.0	77.9	79.6	80.3	80.5	82.4	82.7	79.7	76.9	74.6	131.0
1250	79.3	78.7	78.1	78.0	77.8	78.3	78.9	79.7	81.1	81.7	80.7	77.8	75.6	73.2	130.6
1600	80.6	77.9	77.8	78.0	77.9	78.9	79.5	81.1	81.9	80.8	79.5	77.7	75.4	72.6	130.8
2000	84.3	81.3	81.3	79.5	79.8	79.4	79.7	80.6	80.8	80.3	78.9	77.6	74.8	72.1	131.5
2500	89.9	90.7	93.3	85.5	91.2	86.8	82.5	82.8	83.8	83.1	80.2	79.2	76.9	74.8	138.6
3150	88.7	87.9	86.2	84.2	81.9	80.3	79.3	79.7	79.2	79.1	78.1	75.2	73.3	70.5	133.8
4000	90.1	87.6	85.5	83.6	82.3	80.7	80.3	81.3	81.6	84.1	79.1	76.6	74.5	71.3	134.5
5000	93.0	94.1	91.8	87.9	87.9	86.4	85.9	89.0	87.6	90.8	85.5	81.3	80.6	76.5	140.2
6300	89.7	90.4	89.5	87.5	85.1	86.0	85.6	87.1	86.8	87.7	83.9	81.3	79.3	75.2	138.1
8000	91.3	90.8	90.1	89.2	87.4	87.6	88.3	89.6	90.0	90.1	86.0	83.6	82.1	77.6	140.0

AVERAGE NET REFERRED THRUST, FN/DELTA = 6114.7 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED,N1/VTHETA = 4299.7 RPM
AVERAGE JET EXHAUST VELOCITY = 772.5 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.19

TOTAL PWL= 153.1

TABLE A-13. – ACOUSTICALLY TREATED NACELLE WITH COMBINATION OF ONE-RING TREATED INLET AND 48-IN.-LONG TREATED FAN-EXHAUST DUCTS. PRODUCTION PRIMARY NOZZLE. NO NOISE-SUPPRESSOR ENCLOSURES – Continued.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 111-02, 112-02, AND 113-02.

BAND CENTER FREQUENCY, HZ	15	30	40	50	60	75	90	100	110	120	130	140	150	157	PWL
	ANGLES FROM ENGINE INLET CENTERLINE, DEGREES														
50	87.3	85.6	85.5	86.8	87.9	89.7	90.8	91.6	92.8	93.9	96.9	99.4	100.2	98.3	145.4
63	87.3	85.6	85.5	86.8	87.9	89.7	90.8	91.6	92.8	93.9	96.9	99.4	100.2	98.3	145.4
80	87.3	85.6	85.5	86.8	87.9	89.7	90.8	91.6	92.8	93.9	96.9	99.4	100.2	98.3	145.4
100	88.7	89.6	90.3	90.9	91.2	91.1	91.8	92.8	94.1	95.3	98.5	100.6	98.7	94.0	146.0
125	88.7	89.6	90.3	90.9	91.2	91.1	91.8	92.8	94.1	95.3	98.5	100.6	98.7	94.0	146.0
160	88.7	89.6	90.3	90.9	91.2	91.1	91.8	92.8	94.1	95.3	98.5	100.6	98.7	94.0	146.0
200	88.7	88.2	88.4	88.3	89.1	89.1	90.0	91.2	92.2	91.9	93.0	94.4	91.7	88.2	142.2
250	88.7	88.2	88.4	88.3	89.1	89.1	90.0	91.2	92.2	91.9	93.0	94.4	91.7	88.2	142.2
315	88.7	88.2	88.4	88.3	89.1	89.1	90.0	91.2	92.2	91.9	93.0	94.4	91.7	88.2	142.2
400	84.3	85.0	84.6	84.8	85.1	85.9	86.3	87.6	88.5	88.9	88.9	88.8	85.1	83.5	138.2
500	84.3	85.0	84.6	84.8	85.1	85.9	86.3	87.6	88.5	88.9	88.9	88.8	85.1	83.5	138.3
630	84.3	85.0	84.6	84.8	85.1	85.9	86.3	87.6	88.5	88.9	88.9	88.8	85.1	83.5	138.3
800	81.5	81.3	80.3	79.9	80.2	81.1	82.1	82.5	83.3	85.1	85.5	83.9	81.1	78.7	133.9
1000	81.2	80.1	79.3	78.8	79.3	79.6	81.2	81.7	82.2	84.1	84.0	81.9	79.1	76.4	132.7
1250	81.6	79.8	79.2	79.4	79.4	80.0	81.2	81.4	83.1	83.2	82.4	79.8	77.8	76.2	132.4
1600	82.5	79.9	79.2	79.4	79.8	81.2	81.8	83.0	83.4	81.6	80.8	79.3	77.4	75.2	132.5
2000	84.6	82.2	81.4	80.4	80.3	81.5	81.6	82.0	82.6	81.7	79.8	79.0	76.2	73.6	132.7
2500	92.3	94.9	92.1	90.9	87.4	86.5	85.6	83.5	83.5	86.4	84.6	80.8	78.4	76.7	139.7
3150	89.2	88.7	85.8	85.1	83.2	81.5	81.0	80.8	80.9	81.4	80.0	76.9	75.3	71.6	134.7
4000	89.6	87.2	85.8	83.8	82.6	81.6	80.7	81.3	81.6	82.4	79.3	77.0	74.4	71.1	134.4
5000	93.9	93.3	90.4	89.5	88.5	85.4	85.4	86.8	87.5	88.8	83.6	79.3	77.1	75.1	139.6
6300	89.7	89.9	88.9	87.8	85.0	85.5	85.1	85.7	86.1	86.4	82.3	79.6	77.4	74.5	137.5
8000	91.1	91.0	89.8	89.4	87.1	88.5	88.6	90.1	91.2	90.4	85.6	83.3	80.6	78.7	140.4

AVERAGE NET REFERRED THRUST, FN/DELTA = 7224.9 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED,N1/VTHETA = 4599.5 RPM
AVERAGE JET EXHAUST VELOCITY = 859.7 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.24

TOTAL PWL= 155.4

TABLE A-13. – ACOUSTICALLY TREATED NACELLE WITH COMBINATION OF ONE-RING TREATED INLET AND 48-IN.-LONG TREATED FAN-EXHAUST DUCTS. PRODUCTION PRIMARY NOZZLE. NO NOISE-SUPPRESSOR ENCLOSURES – Continued.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 111-03, 112-03, AND 113-03.

BAND CENTER FREQUENCY, HZ	ANGLES FROM ENGINE INLET CENTERLINE, DEGREES														
	15	30	40	50	60	75	90	100	110	120	130	140	150	157	PWL
50	87.9	86.4	86.8	87.8	89.0	90.9	92.4	93.2	94.5	96.3	99.7	102.7	103.2	100.9	147.9
63	87.9	86.4	86.8	87.8	89.0	90.9	92.4	93.2	94.5	96.3	99.7	102.7	103.2	100.9	147.9
80	87.9	86.4	86.8	87.8	89.0	90.9	92.4	93.2	94.5	96.3	99.7	102.7	103.2	100.9	147.9
100	90.7	91.3	92.2	92.8	93.5	93.0	94.0	95.0	96.5	98.2	101.8	104.2	101.6	97.0	148.9
125	90.7	91.3	92.2	92.8	93.5	93.0	94.0	95.0	96.5	98.2	101.8	104.2	101.6	97.0	148.9
160	90.7	91.3	92.2	92.8	93.5	93.0	94.0	95.0	96.5	98.2	101.8	104.2	101.6	97.0	148.9
200	91.2	90.6	90.6	90.7	91.3	91.4	92.5	93.8	95.0	94.8	96.4	97.6	93.7	91.0	145.0
250	91.2	90.6	90.6	90.7	91.3	91.4	92.5	93.8	95.0	94.8	96.4	97.6	93.7	91.0	145.0
315	91.2	90.6	90.6	90.7	91.3	91.4	92.5	93.8	95.0	94.8	96.4	97.6	93.7	91.0	145.0
400	87.0	87.4	87.1	87.2	87.6	88.1	88.6	89.9	90.7	91.6	92.0	91.6	87.4	85.8	140.8
500	87.0	87.4	87.1	87.2	87.6	88.1	88.6	89.9	90.7	91.6	92.0	91.6	87.4	85.8	140.8
630	87.0	87.4	87.1	87.2	87.6	88.1	88.6	89.9	90.7	91.6	92.0	91.6	87.4	85.8	140.8
800	83.8	83.6	82.9	82.3	82.4	83.1	84.0	83.9	84.8	87.0	88.0	86.5	83.7	81.3	136.0
1000	83.3	81.9	81.5	81.3	81.4	81.9	83.0	83.5	84.1	85.5	85.9	84.1	81.2	79.5	134.6
1250	83.0	81.5	81.4	81.7	81.8	82.5	84.0	84.5	85.5	85.4	84.2	82.3	79.8	77.9	134.7
1600	83.0	80.9	80.4	81.3	81.4	82.9	83.7	84.8	85.2	84.2	82.4	81.3	78.5	76.0	134.3
2000	84.4	82.8	81.6	82.0	81.9	83.3	83.7	84.2	84.9	83.7	82.7	81.1	77.6	74.6	134.4
2500	90.1	93.4	93.4	91.0	86.8	85.4	84.9	84.9	85.3	85.4	83.9	83.3	79.4	76.7	139.3
3150	91.3	95.2	94.8	92.0	86.8	84.6	83.3	83.3	83.8	84.1	83.7	82.1	78.9	75.8	139.9
4000	89.2	86.6	85.5	83.8	83.2	82.9	82.8	83.1	83.4	83.6	81.5	79.6	76.1	72.3	135.0
5000	92.5	91.2	90.1	88.2	85.6	86.2	84.9	86.3	87.1	87.9	83.9	80.7	77.9	74.6	138.6
6300	92.9	91.9	91.7	89.5	88.2	87.8	86.6	86.9	87.5	87.9	84.0	81.4	78.6	75.7	139.6
8000	91.7	90.5	90.0	89.0	88.2	89.0	89.4	90.1	91.5	92.0	86.0	83.1	81.0	77.7	140.8

AVERAGE NET REFERRED THRUST, FN/DELTA = 8551.4 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED,N1/VTHETA = 4902.8 RPM
AVERAGE JET EXHAUST VELOCITY = 959.7 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.30

TOTAL PWL = 157.9

TABLE A-13. – ACOUSTICALLY TREATED NACELLE WITH COMBINATION OF ONE-RING TREATED INLET AND 48-IN.-LONG TREATED FAN-EXHAUST DUCTS. PRODUCTION PRIMARY NOZZLE. NO NOISE-SUPPRESSOR ENCLOSURES – Continued.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 111-04, 112-04, AND 113-04.

BAND CENTER FREQUENCY, HZ	ANGLES FROM ENGINE INLET CENTERLINE, DEGREES 15	30	40	50	60	75	90	100	110	120	130	140	150	157	PWL
50	89.0	88.0	89.0	89.5	90.7	92.8	94.7	95.7	97.2	100.0	104.6	107.5	108.0	105.8	152.2
63	89.0	88.0	89.0	89.5	90.7	92.8	94.7	95.7	97.2	100.0	104.6	107.5	108.0	105.8	152.2
80	89.0	88.0	89.0	89.5	90.7	92.8	94.7	95.7	97.2	100.0	104.6	107.5	108.0	105.8	152.2
100	94.0	94.1	95.0	95.9	95.9	95.7	97.1	98.8	100.3	102.6	107.5	110.9	107.3	103.7	154.3
125	94.0	94.1	95.0	95.9	95.9	95.7	97.1	98.8	100.3	102.6	107.5	110.9	107.3	103.7	154.3
160	94.0	94.1	95.0	95.9	95.9	95.7	97.1	98.8	100.3	102.6	107.5	110.9	107.3	103.7	154.3
200	94.9	94.0	94.0	94.1	94.6	94.9	96.3	97.6	99.0	99.5	102.2	104.1	99.2	95.8	149.7
250	94.9	94.0	94.0	94.1	94.6	94.9	96.3	97.6	99.0	99.5	102.2	104.1	99.2	95.8	149.7
315	94.9	94.0	94.0	94.1	94.6	94.9	96.3	97.6	99.0	99.5	102.2	104.1	99.2	95.8	149.7
400	90.4	90.8	90.7	91.0	91.1	91.9	92.9	94.2	95.0	95.9	97.1	96.7	92.2	89.8	145.1
500	90.4	90.8	90.7	91.0	91.1	91.9	92.9	94.2	95.0	95.9	97.1	96.7	92.2	89.8	145.1
630	90.4	90.8	90.7	91.0	91.1	91.9	92.9	94.2	95.0	95.9	97.1	96.7	92.2	89.8	145.1
800	87.6	87.2	86.9	86.4	86.5	87.4	88.3	88.9	89.7	91.6	92.5	91.0	88.2	86.1	140.4
1000	87.0	85.8	85.7	85.2	85.6	86.1	87.3	88.0	89.2	90.2	90.6	88.7	86.2	84.4	139.1
1250	86.4	85.2	84.9	85.1	85.8	86.4	87.5	88.8	90.6	89.5	89.6	87.1	84.5	82.7	139.0
1600	86.7	86.0	84.6	85.3	85.8	87.1	87.6	88.9	89.6	88.9	87.7	86.3	84.3	82.2	138.7
2000	86.1	85.9	84.9	84.9	85.5	87.2	87.4	88.3	88.8	88.1	87.1	85.9	83.5	80.5	138.3
2500	90.6	92.4	90.9	86.8	86.6	87.7	88.3	89.8	88.1	89.3	87.8	85.7	84.4	80.0	140.0
3150	99.6	102.7	97.8	95.4	90.5	90.3	89.1	90.4	88.9	90.3	89.3	87.6	85.0	80.6	145.6
4000	91.4	90.9	91.9	91.0	88.1	87.4	86.5	87.0	87.6	87.2	85.7	83.9	81.5	78.4	139.6
5000	93.2	92.7	89.9	88.5	86.8	86.6	87.5	90.1	90.4	90.8	86.1	84.4	81.6	78.5	140.3
6300	99.6	96.6	96.0	93.9	90.9	89.6	90.0	93.8	94.3	97.4	89.4	86.6	83.5	81.4	145.0
8000	92.4	92.1	91.4	90.1	88.4	89.5	90.8	91.9	91.1	91.9	87.1	84.9	83.3	81.3	141.6

AVERAGE NET REFERRED THRUST, FN/DELTA = 10842.9 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED, N1/VTHETA = 5347.6 RPM
AVERAGE JET EXHAUST VELOCITY = 1117.9 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.41

TOTAL PWL = 162.6

ANALYSIS OF JT3D STATIC NOISE-REDUCTION TESTS AT EDWARDS AFB

TABLE A-13.– ACOUSTICALLY TREATED NACELLE WITH COMBINATION OF ONE-RING TREATED INLET AND 48-IN.-LONG TREATED FAN-EXHAUST DUCTS. PRODUCTION PRIMARY NOZZLE. NO NOISE-SUPPRESSOR ENCLOSURES – Continued.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 111-05, 112-05, AND 113-05.

		ANGLES FROM ENGINE INLET CENTERLINE, DEGREES														
B		15	30	40	50	60	75	90	100	110	120	130	140	150	157	PWL
A	50	91.7	90.6	91.8	92.4	93.6	95.3	98.2	99.4	101.3	105.5	110.5	113.9	113.9	111.2	157.9
N	63	91.7	90.6	91.8	92.4	93.6	95.3	98.2	99.4	101.3	105.5	110.5	113.9	113.9	111.2	157.9
D	80	91.7	90.6	91.8	92.4	93.6	95.3	98.2	99.4	101.3	105.5	110.5	113.9	113.9	111.2	157.9
	100	99.2	97.8	98.9	99.3	99.2	99.6	102.0	103.6	105.6	109.7	116.2	119.0	113.8	111.4	161.7
C	125	99.2	97.8	98.9	99.3	99.2	99.6	102.0	103.6	105.6	109.7	116.2	119.0	113.8	111.4	161.7
E	160	99.2	97.8	98.9	99.3	99.2	99.6	102.0	103.6	105.6	109.7	116.2	119.0	113.8	111.4	161.7
N	200	100.7	99.3	99.5	99.4	99.8	100.1	101.9	103.7	105.2	106.9	112.0	114.2	108.9	104.7	158.0
T	250	100.7	99.3	99.5	99.4	99.8	100.1	101.9	103.7	105.2	106.9	112.0	114.2	108.9	104.7	158.0
E	315	100.7	99.3	99.5	99.4	99.8	100.1	101.9	103.7	105.2	106.9	112.0	114.2	108.9	104.7	158.0
R	400	95.9	96.2	96.4	96.6	96.7	97.4	98.9	100.6	101.5	103.5	105.3	105.6	99.9	98.2	152.2
	500	95.9	96.2	96.4	96.6	96.7	97.4	98.9	100.6	101.5	103.5	105.3	105.6	99.9	98.2	152.2
F	630	95.9	96.2	96.4	96.6	96.7	97.4	98.9	100.6	101.5	103.5	105.3	105.6	99.9	98.2	152.2
R	800	93.3	92.9	92.8	92.3	92.6	93.5	94.9	95.7	97.3	99.8	100.9	99.4	95.6	94.2	147.8
E	1000	92.4	91.3	91.5	91.1	91.7	92.2	93.9	94.8	96.1	97.6	98.7	96.8	93.6	92.3	146.1
Q	1250	91.9	90.5	90.7	91.0	91.3	92.4	93.7	95.3	96.1	96.3	96.7	94.6	92.2	90.6	145.3
U	1600	91.5	90.5	90.2	91.1	91.5	92.9	94.3	95.8	96.4	95.7	95.2	93.9	91.6	89.9	145.2
E	2000	92.0	90.0	90.6	90.9	91.7	92.9	94.0	95.0	95.5	94.7	94.0	93.3	90.5	88.4	144.7
N	2500	93.0	91.9	90.1	91.1	90.9	92.2	93.6	94.2	94.2	94.2	93.4	91.8	89.6	87.8	144.1
C	3150	97.8	98.4	95.9	96.0	92.6	93.0	94.2	96.2	95.3	95.8	93.9	91.9	89.4	87.8	146.3
Y	4000	94.2	93.8	93.6	93.1	91.1	90.7	91.5	93.1	92.7	93.0	91.7	89.9	87.8	85.9	143.5
,	5000	94.0	92.4	91.9	90.2	90.4	90.1	91.5	92.6	93.0	91.3	89.9	88.6	86.2	84.8	142.6
H	6300	93.3	92.4	92.3	91.4	90.2	91.2	94.5	96.5	98.4	94.5	90.8	89.2	87.0	84.8	145.0
Z	8000	93.0	91.5	90.8	90.8	89.2	91.1	92.5	93.7	94.5	93.4	90.8	89.4	88.1	87.2	143.3

AVERAGE NET REFERRED THRUST, FN/DELTA = 14923.5 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED,N1/VTHETA = 6000.3 RPM
AVERAGE JET EXHAUST VELOCITY = 1374.7 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.63

TOTAL PWL= 169.6

TABLE A-13. – ACOUSTICALLY TREATED NACELLE WITH COMBINATION OF ONE-RING TREATED INLET AND 48-IN.-LONG TREATED FAN-EXHAUST DUCTS. PRODUCTION PRIMARY NOZZLE. NO NOISE-SUPPRESSOR ENCLOSURES – Continued.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 111-06, 112-06, AND 113-06.

		ANGLES FROM ENGINE INLET CENTERLINE, DEGREES														
B		15	30	40	50	60	75	90	100	110	120	130	140	150	157	PWL
A	50	90.4	89.3	91.0	91.2	92.2	94.3	96.8	98.0	99.6	103.3	107.9	110.7	111.4	107.8	155.2
N	63	90.4	89.3	91.0	91.2	92.2	94.3	96.8	98.0	99.6	103.3	107.9	110.7	111.4	107.8	155.2
D	80	90.4	89.3	91.0	91.2	92.2	94.3	96.8	98.0	99.6	103.3	107.9	110.7	111.4	107.8	155.2
	100	96.9	96.1	97.1	97.9	97.9	97.9	100.0	101.5	103.2	106.7	112.3	114.8	110.4	106.8	158.0
C	125	96.9	96.1	97.1	97.9	97.9	97.9	100.0	101.5	103.2	106.7	112.3	114.8	110.4	106.8	158.0
E	160	96.9	96.1	97.1	97.9	97.9	97.9	100.0	101.5	103.2	106.7	112.3	114.8	110.4	106.8	158.0
N	200	98.1	96.9	96.7	97.1	97.4	97.7	99.4	100.8	102.3	103.4	107.3	109.2	103.5	99.7	153.8
T	250	98.1	96.9	96.7	97.1	97.4	97.7	99.4	100.8	102.3	103.4	107.3	109.2	103.5	99.7	153.8
E	315	98.1	96.9	96.7	97.1	97.4	97.7	99.4	100.8	102.3	103.4	107.3	109.2	103.5	99.7	153.8
R	400	93.1	93.6	93.6	93.9	94.0	94.6	96.0	97.5	98.3	99.9	101.2	100.6	95.6	93.5	148.5
	500	93.1	93.6	93.6	93.9	94.0	94.6	96.0	97.5	98.3	99.9	101.2	100.6	95.6	93.5	148.6
F	630	93.1	93.6	93.6	93.9	94.0	94.6	96.0	97.5	98.3	99.9	101.2	100.6	95.6	93.5	148.6
R	800	90.6	89.9	89.9	89.4	89.2	90.5	91.9	92.5	93.3	95.9	96.9	94.6	91.8	90.0	144.1
E	1000	89.9	88.6	88.6	88.2	88.7	89.3	90.7	91.6	92.4	94.2	94.8	92.2	89.5	87.9	142.6
Q	1250	89.0	87.9	87.6	88.1	88.5	89.6	91.0	92.3	92.8	93.2	92.7	90.6	88.1	86.0	142.1
U	1600	88.8	87.6	87.3	88.3	88.9	90.4	91.3	92.5	93.3	92.5	92.1	89.7	87.5	85.3	142.1
E	2000	88.8	87.6	87.5	88.0	88.4	89.9	90.8	91.8	92.0	91.8	90.7	89.4	86.9	84.0	141.4
N	2500	95.9	92.8	90.8	89.7	88.7	89.6	90.7	90.8	91.1	91.2	90.3	88.7	86.3	83.4	142.1
C	3150	104.1	100.0	100.7	98.9	95.5	95.6	95.7	93.1	93.8	94.9	92.2	91.2	87.6	84.3	148.2
Y	4000	95.4	92.5	93.8	92.2	90.6	89.7	89.5	89.9	89.8	90.1	89.0	87.1	84.2	81.6	142.1
,	5000	94.8	92.3	91.2	89.3	89.0	88.6	89.8	92.2	92.3	90.1	87.6	85.6	83.1	81.0	141.6
H	6300	96.1	95.8	95.3	92.6	91.3	91.3	93.5	97.1	99.3	96.7	90.6	87.9	85.4	82.8	146.0
Z	8000	93.9	92.2	90.9	90.5	88.8	90.6	91.3	92.1	92.4	92.5	88.5	86.4	84.7	81.6	142.3

AVERAGE NET REFERRED THRUST, FN/DELTA = 12942.3 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED,N1/VTHETA = 5693.5 RPM
AVERAGE JET EXHAUST VELOCITY = 1250.3 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.52

TOTAL PWL= 166.1

ANALYSIS OF JT3D STATIC NOISE-REDUCTION TESTS AT EDWARDS AFB

TABLE A-13. – ACOUSTICALLY TREATED NACELLE WITH COMBINATION OF ONE-RING TREATED INLET AND 48-IN.-LONG TREATED FAN-EXHAUST DUCTS. PRODUCTION PRIMARY NOZZLE. NO NOISE-SUPPRESSOR ENCLOSURES – Concluded.

1/3 OCTAVE-BAND SPLs IN dB re 0.0002 DYNES/SQUARE CM.

TABULATED SPLs ARE THE AVERAGE OF THE SPLs MEASURED AT 150 FT DURING RUNS 111-07, 112-07, AND 113-07.

BAND CENTER FREQUENCY, HZ	15	30	40	50	60	75	90	100	110	120	130	140	150	157	PWL
	ANGLES FROM ENGINE INLET CENTERLINE, DEGREES														
50	93.1	91.8	93.1	93.3	94.6	96.2	98.9	100.5	102.8	107.0	112.4	115.6	115.5	111.6	159.4
63	93.1	91.8	93.1	93.3	94.6	96.2	98.9	100.5	102.8	107.0	112.4	115.6	115.5	111.6	159.4
80	93.1	91.8	93.1	93.3	94.6	96.2	98.9	100.5	102.8	107.0	112.4	115.6	115.5	111.6	159.4
100	101.6	99.7	100.1	100.3	100.7	101.3	103.9	105.4	107.5	112.1	119.1	120.8	115.0	111.6	163.8
125	101.6	99.7	100.1	100.3	100.7	101.3	103.9	105.4	107.5	112.1	119.1	120.8	115.0	111.6	163.8
160	101.6	99.7	100.1	100.3	100.7	101.3	103.9	105.4	107.5	112.1	119.1	120.8	115.0	111.6	163.8
200	103.0	101.3	101.3	101.6	101.8	102.3	104.1	105.8	107.5	109.8	115.6	116.7	110.9	106.1	160.6
250	103.0	101.3	101.3	101.6	101.8	102.3	104.1	105.8	107.5	109.8	115.6	116.7	110.9	106.1	160.6
315	103.0	101.3	101.3	101.6	101.8	102.3	104.1	105.8	107.5	109.8	115.6	116.7	110.9	106.1	160.6
400	98.4	98.5	98.4	99.0	99.0	99.4	101.0	102.7	103.9	106.4	108.8	108.4	102.4	100.0	154.9
500	98.4	98.5	98.4	99.0	99.0	99.4	101.0	102.7	103.9	106.4	108.8	108.4	102.4	100.0	154.9
630	98.4	98.5	98.4	99.0	99.0	99.4	101.0	102.7	103.9	106.4	108.8	108.4	102.4	100.0	154.9
800	95.2	95.1	94.7	94.5	94.8	95.4	97.0	97.8	99.4	102.6	104.3	102.3	97.7	95.2	150.4
1000	94.6	93.5	93.6	93.4	93.9	94.7	95.6	96.9	98.2	100.4	102.0	99.8	96.0	93.3	148.6
1250	94.3	92.7	92.4	93.4	93.5	94.7	95.5	97.2	98.1	99.0	99.7	97.1	94.0	90.9	147.6
1600	93.7	92.5	91.9	93.1	93.8	95.1	96.5	97.9	98.7	98.1	98.0	96.0	93.2	89.3	147.4
2000	93.7	91.8	91.6	93.0	93.6	95.2	96.3	97.4	98.0	97.1	96.5	95.1	92.1	88.6	146.9
2500	94.4	91.9	91.5	92.8	92.9	94.5	95.9	96.3	96.8	96.7	95.9	93.8	90.8	87.5	146.2
3150	94.1	94.1	92.2	93.5	92.9	93.6	95.4	96.7	97.0	96.1	95.1	93.3	90.6	86.7	146.0
4000	96.2	96.4	93.4	95.3	93.7	93.2	94.0	95.3	95.3	95.5	94.1	92.5	89.2	85.6	145.8
5000	92.9	91.9	89.5	90.8	91.1	90.9	92.3	94.4	94.3	93.5	92.3	90.7	87.9	83.8	143.5
6300	91.8	91.6	89.3	91.3	91.1	91.9	94.1	96.4	97.3	95.6	91.7	90.1	87.1	83.8	144.8
8000	92.3	91.3	88.1	91.4	90.4	92.5	93.9	95.9	96.2	94.9	92.3	90.7	88.2	85.6	144.5

AVERAGE NET REFERRED THRUST, FN/DELTA = 16760.0 LB
AVERAGE REFERRED LOW PRESSURE ROTOR SPEED, N1/VTHETA = 6299.0 RPM
AVERAGE JET EXHAUST VELOCITY = 1504.1 FT/SEC
AVERAGE ENGINE PRESSURE RATIO = 1.75

TOTAL PWL = 171.7

TABLE I. – SCHEDULE OF NOMINAL ENGINE-POWER SETTINGS FOR ONE ACOUSTICAL DATA RUN[a]

Subrun number	Nominal referred low-pressure rotor speed, $N_1/\sqrt{\theta_{t_2}}$, rpm	Nominal referred gross thrust, F_g/δ_{am}, lb	Nominal engine pressure ratio, EPR, p_{t_7}/p_{t_0}
01	4300	6000	1.19
02	4600	7200	1.24
03	4900	8400	1.29
04	5350	10 900	1.41
05	6000	15 000	1.64
06	5700	13 200	1.53
07	6300	16 800	1.75
08	2200	1600	1.04
09	3500	3700	1.11

[a]Nominal referred low-pressure rotor speeds were used as the reference parameter in running the tests with the treated inlet and treated fan-exhaust ducts. The nominal thrusts and EPR's, however, apply only to the baseline configuration with no noise-suppressor enclosures around the engine.

TABLE II. – INSTRUMENTATION FOR ENGINE-PERFORMANCE TESTS

Parameter	Units	Range low/high	Manufacturers' tolerance (uncorrected readings)
Ambient air pressure	in. Hg	25/32	± 0.005 in. Hg
Static pressure along wall of inlet duct	in. Hg	0/60	1 part per 1000 or less
Total pressure at engine inlet	in. H_2O	0/60	1 part per 1000 or less
Total temperature at engine inlet	^{o}C	−100/1200	± 0.2% of reading
Total pressure at inlet to fan-exhaust duct	in. Hg	0/60	1 part per 1000 or less
Low-pressure rotor speed	counts/sec	0/999 999	± 1 count/sec
High-pressure rotor speed	counts/sec	0/999 999	± 1 count/sec
High-pressure compressor exit static pressure	in. Hg	0/400	± 0.25% of reading
Fuel flow rate	counts/10 sec	0/999 999	± 1 count/sec
Fuel temperature	^{o}C	−100/1200	± 0.2% of reading
Total pressure at inlet to primary exhaust duct	in. Hg	0/40	1 part per 1000 or less
Total temperature at inlet to primary exhaust duct	^{o}C	0/1000	± 0.5% of reading
Gross thrust	millivolts	0/5	± 0.01 millivolts

TABLE III. – ACOUSTICAL DUCT-LINING PARAMETERS FOR TWO-RING AND 47-PERCENT LIGHTBULB INLETS

Parameter	Value
Nominal flow resistance of porous surfaces at 0.2 meter/second, cgs rayls	10
Cavity depth on inlet duct wall and centerbody, inches	0.75
Cavity depth on either side of impervious steel septum for rings, inches	0.50
Node spacing (cell size) for fiberglass honeycomb, inches	0.75
Design frequency range for maximum noise reduction, Hertz	2200 to 2800
Treated area for two-ring inlet, square feet:	
Inlet duct wall	35.5
Outer ring	24.0
Inner ring	9.0
Centerbody	4.5
Total	73.0
Treated area for 47-percent lightbulb, square feet:	
Inlet duct wall	63.0
Ring	23.0
Centerbody	14.5
Total	100.5

TABLE IV. – ACOUSTICAL DUCT-LINING PARAMETERS FOR 48-INCH FAN-EXHAUST DUCTS

Parameter	Value
Nominal flow resistance of porous surfaces at 0.2 meter/second, cgs rayls	8
Cavity depth, inches:	
Outer duct wall	0.75
Inner duct wall	0.5
Flow splitters, either side of impervious septum	0.5
Duct ends (between inner and outer duct walls)	0.5
Node spacing (cell size) for fiberglass honeycomb, inches	0.75
Design frequency range for maximum noise reduction, Hertz	2300 to 2900
Treated area, square feet:	
Outer duct wall	24.5
Inner duct wall	24.0
Flow splitters	19.5
Duct ends	2.5
Total	70.5

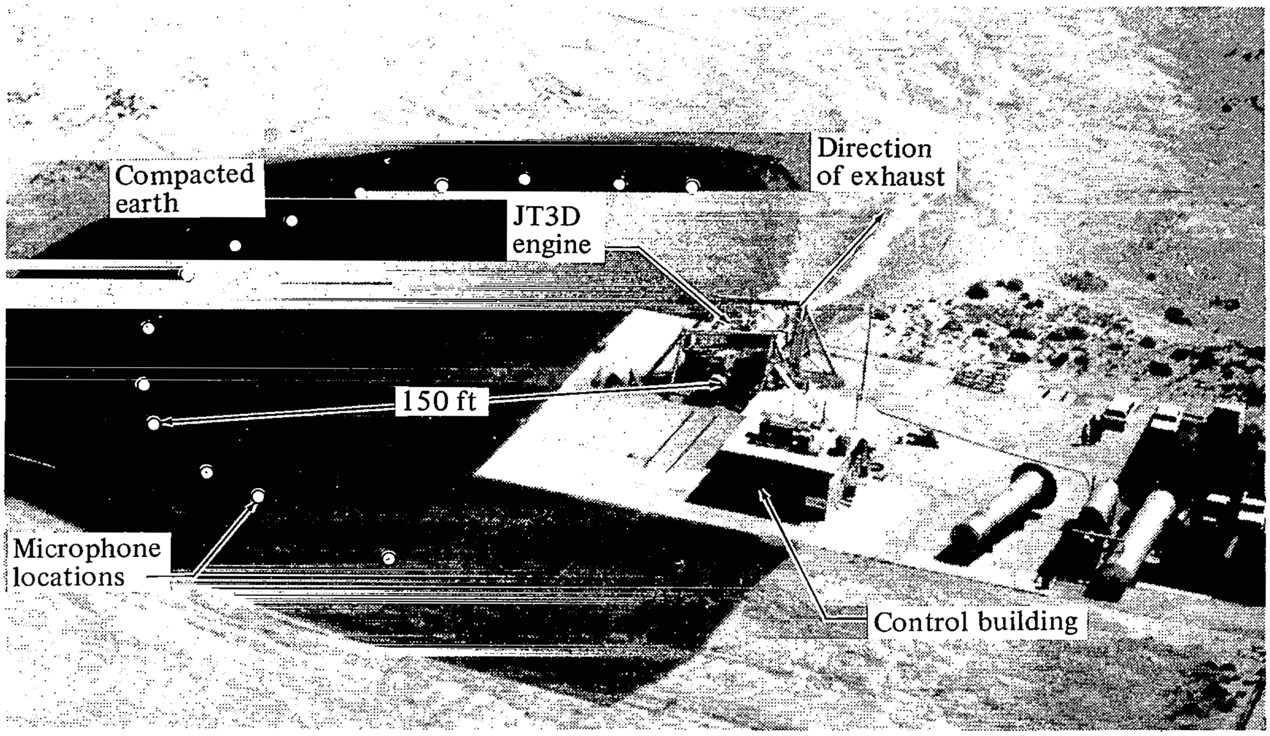


Figure 1. – Aerial view of JT3D engine test stand.

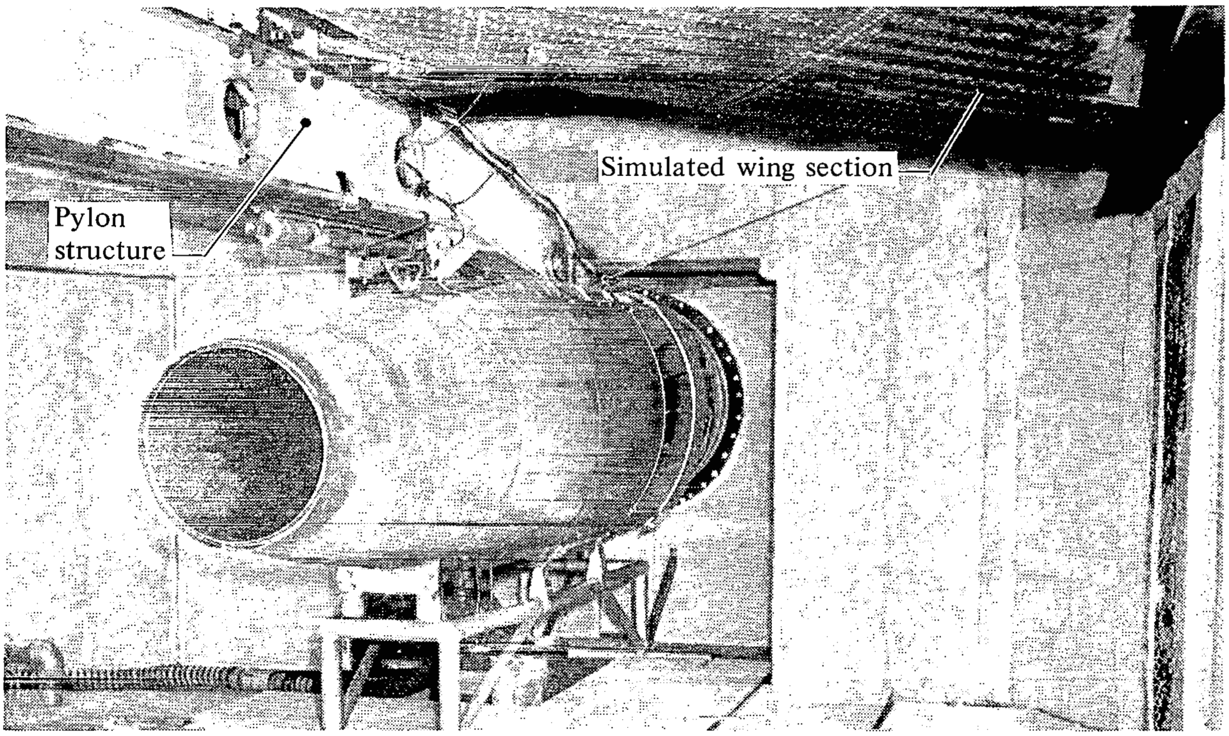


Figure 2. – Interior of fan-exhaust noise-suppressor enclosure.

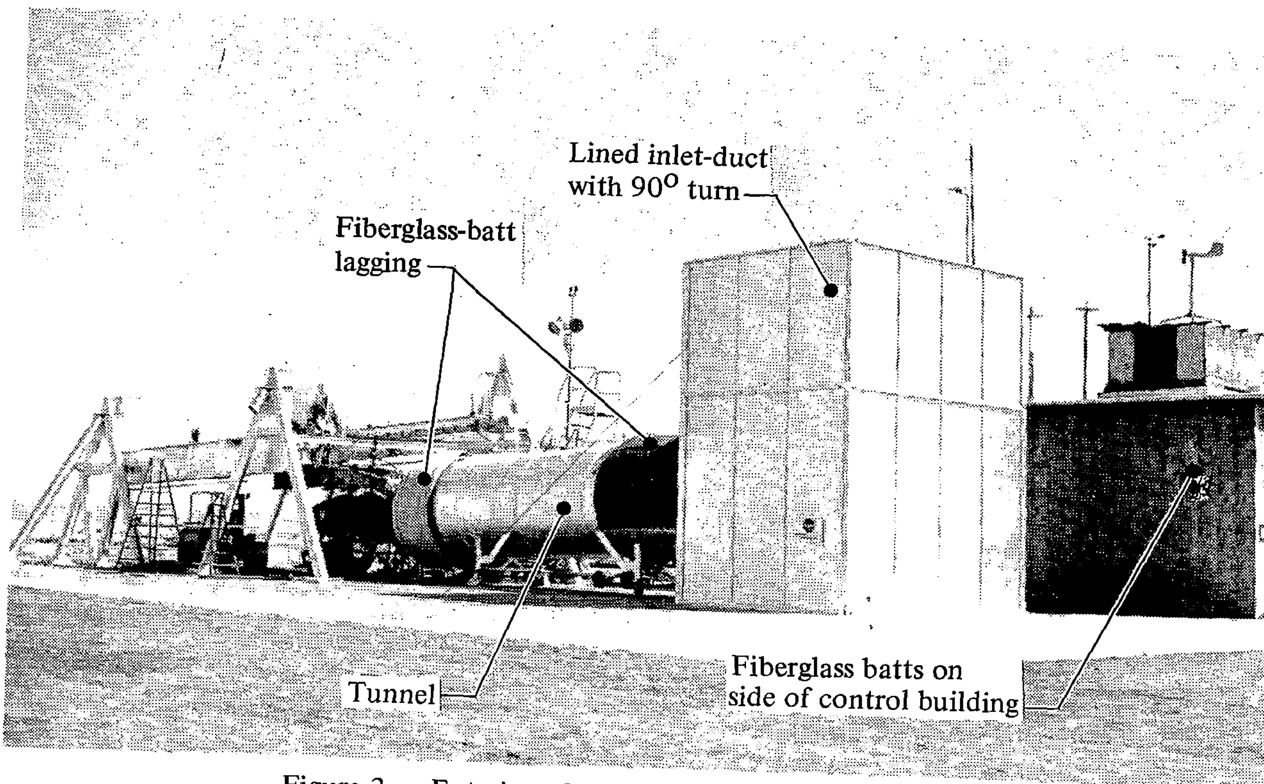


Figure 3. – Exterior of inlet-noise-suppressor enclosure

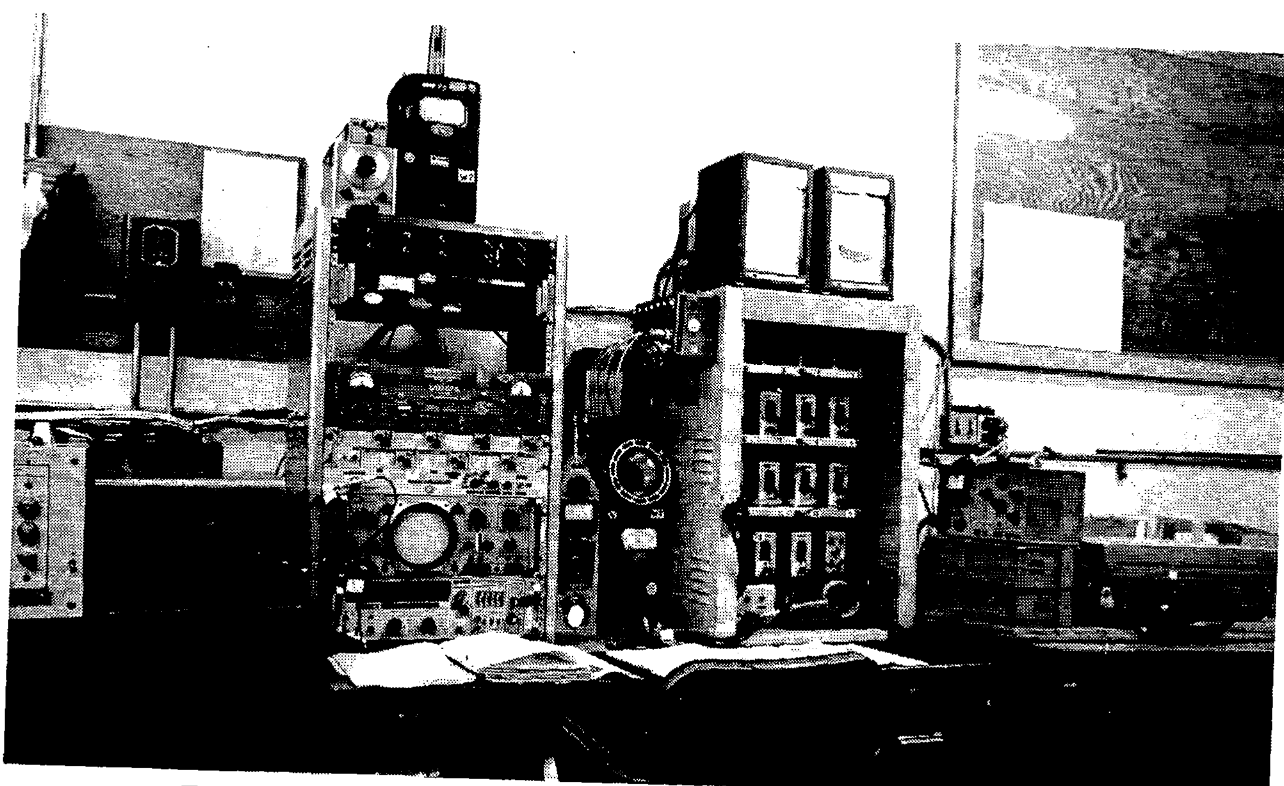


Figure 4. – Acoustical data acquisition system in control building.

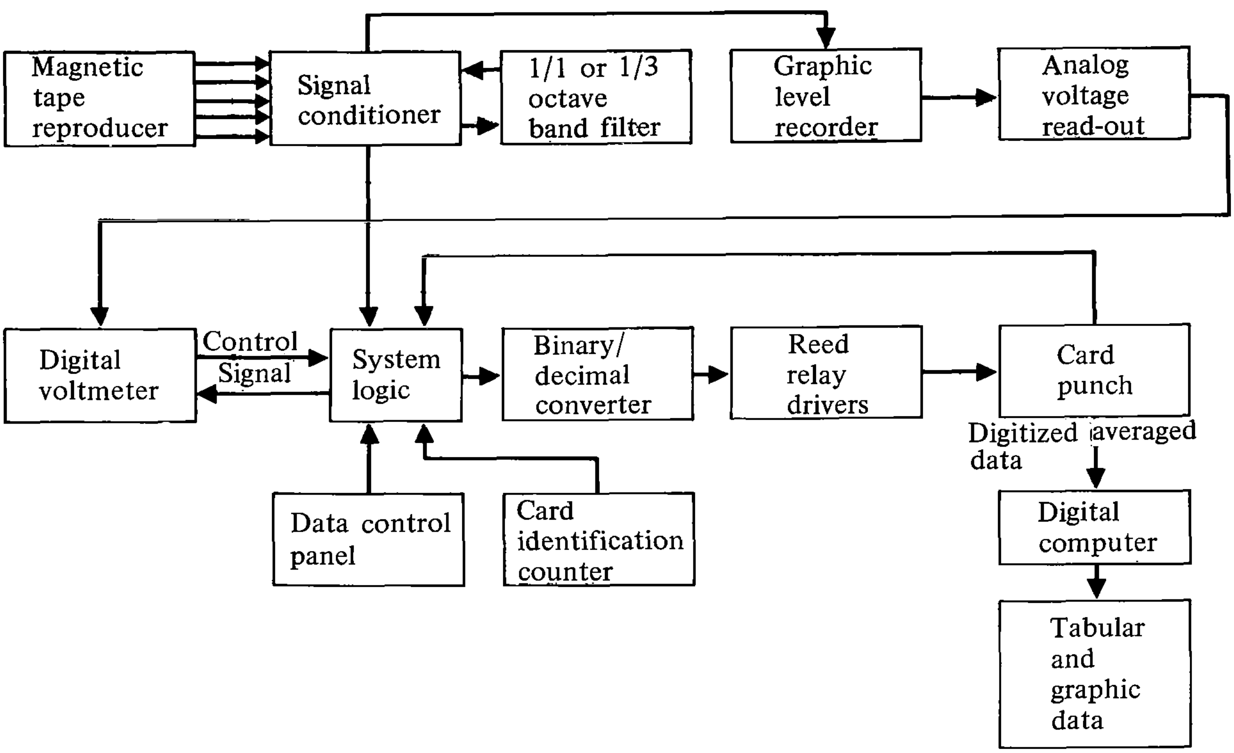
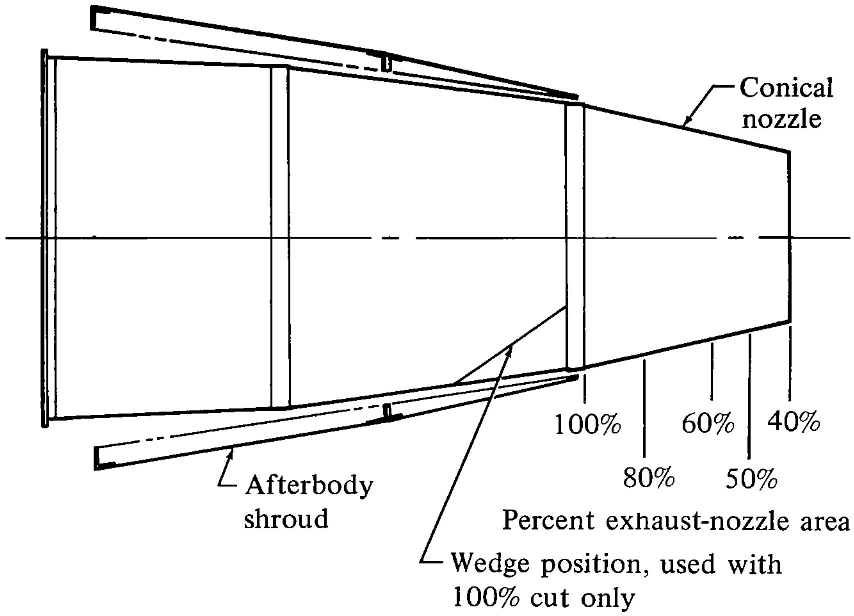
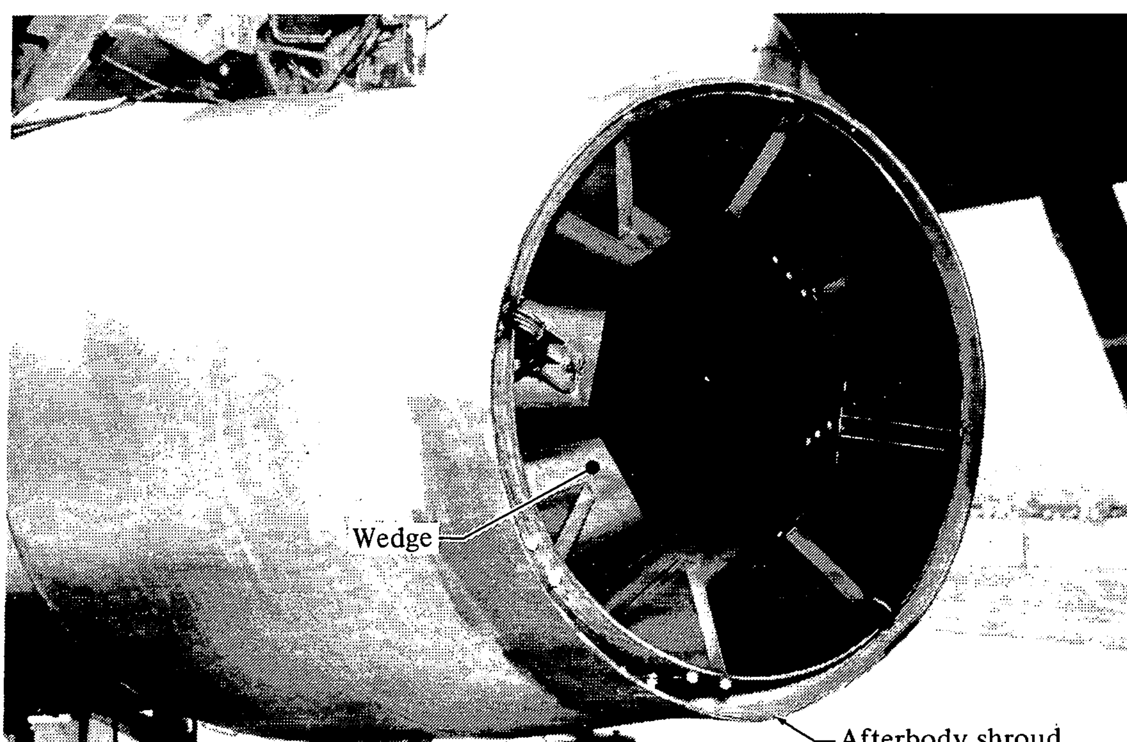


Figure 5. – Block diagram of automated processing system for acoustical data.

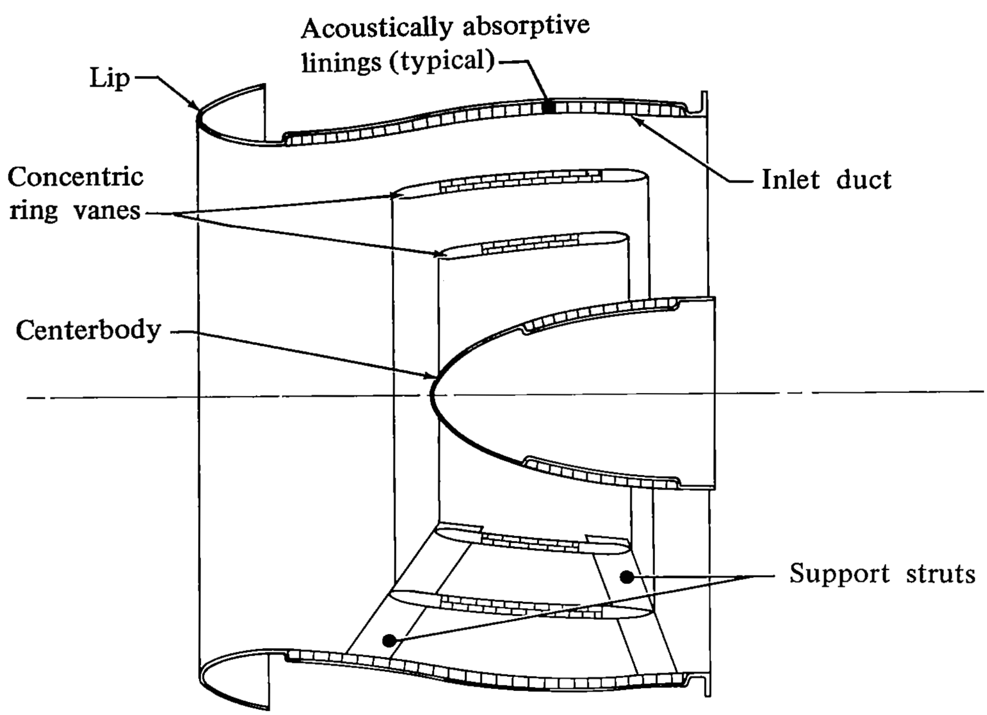


(a) Sketch showing reduced-area conical nozzles and wedges.

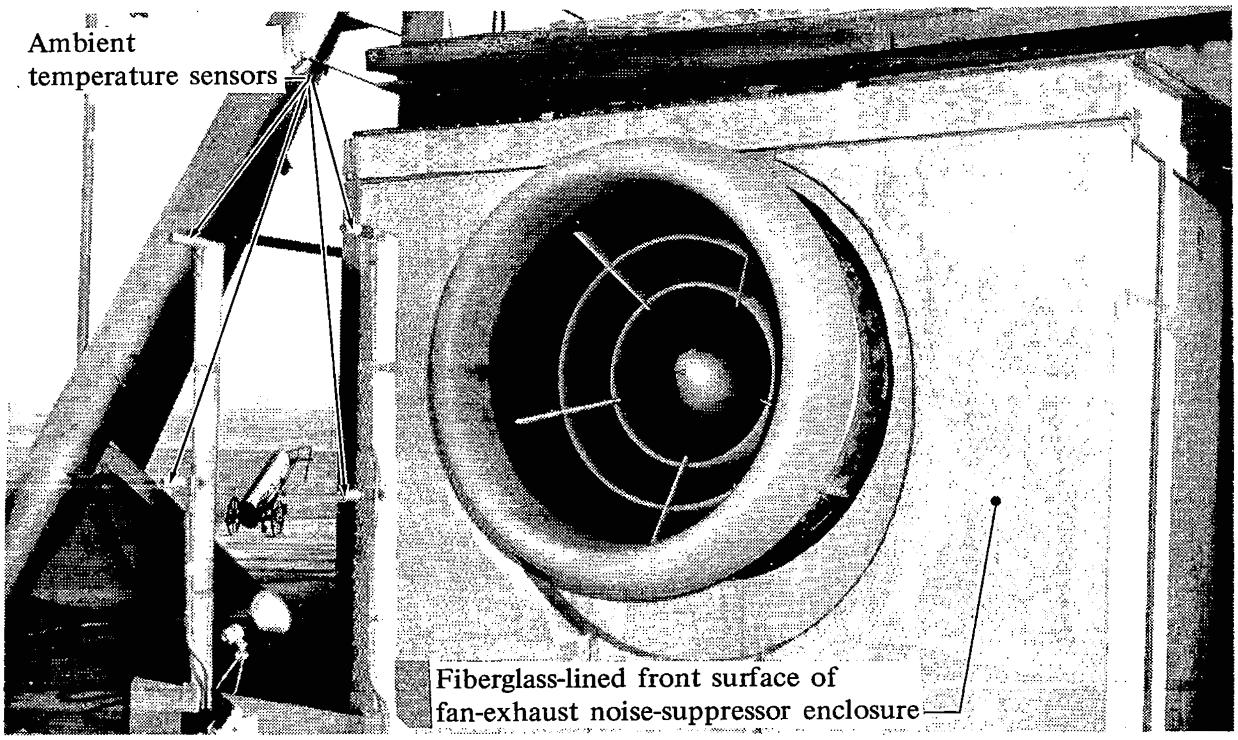


(b) Eight wedges inside existing production primary nozzle.

Figure 6. – Simulated variable-area primary nozzles.

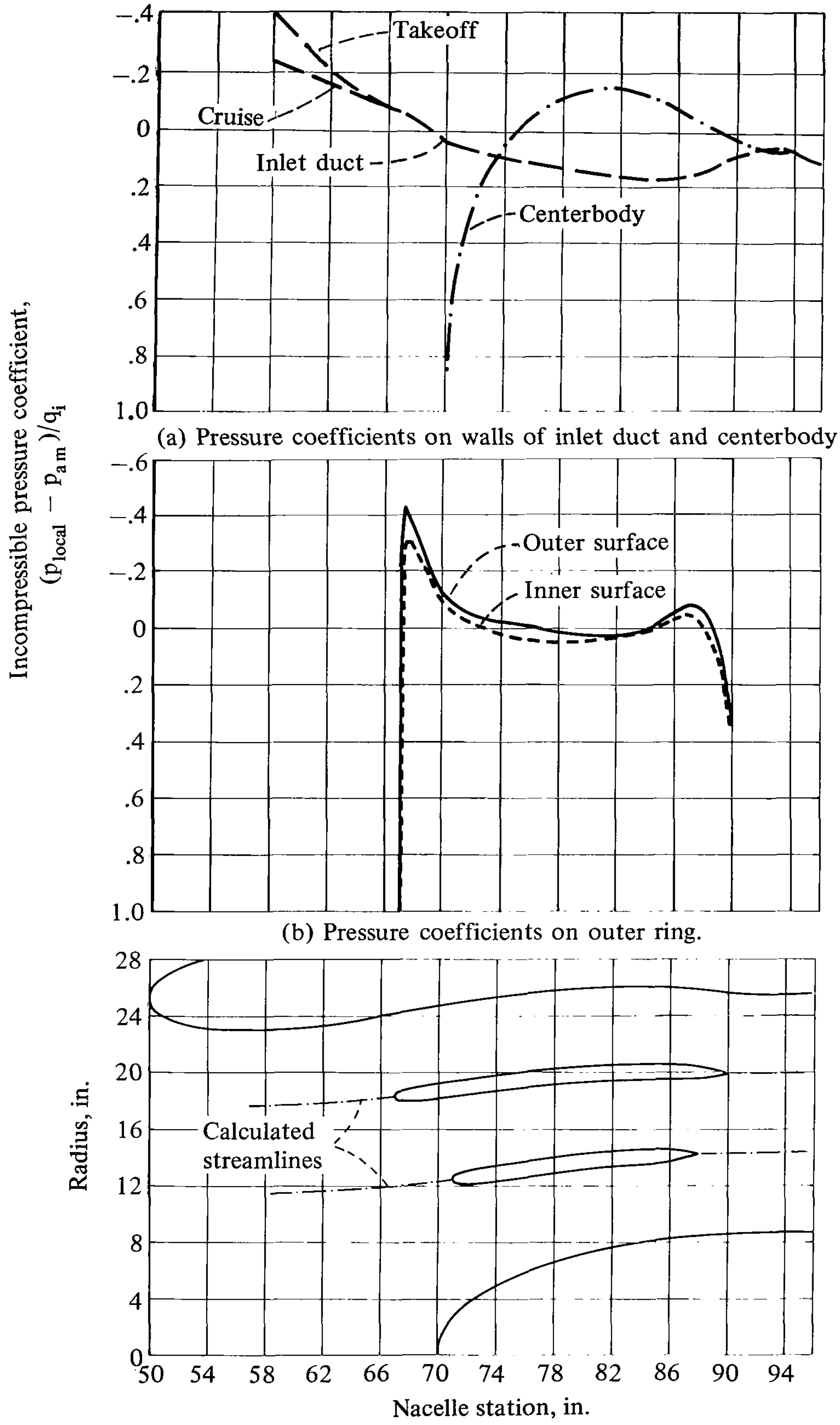


(a) Cross-section



(b) Front view of installation on engine test stand.

Figure 7. – Two-ring treated inlet.

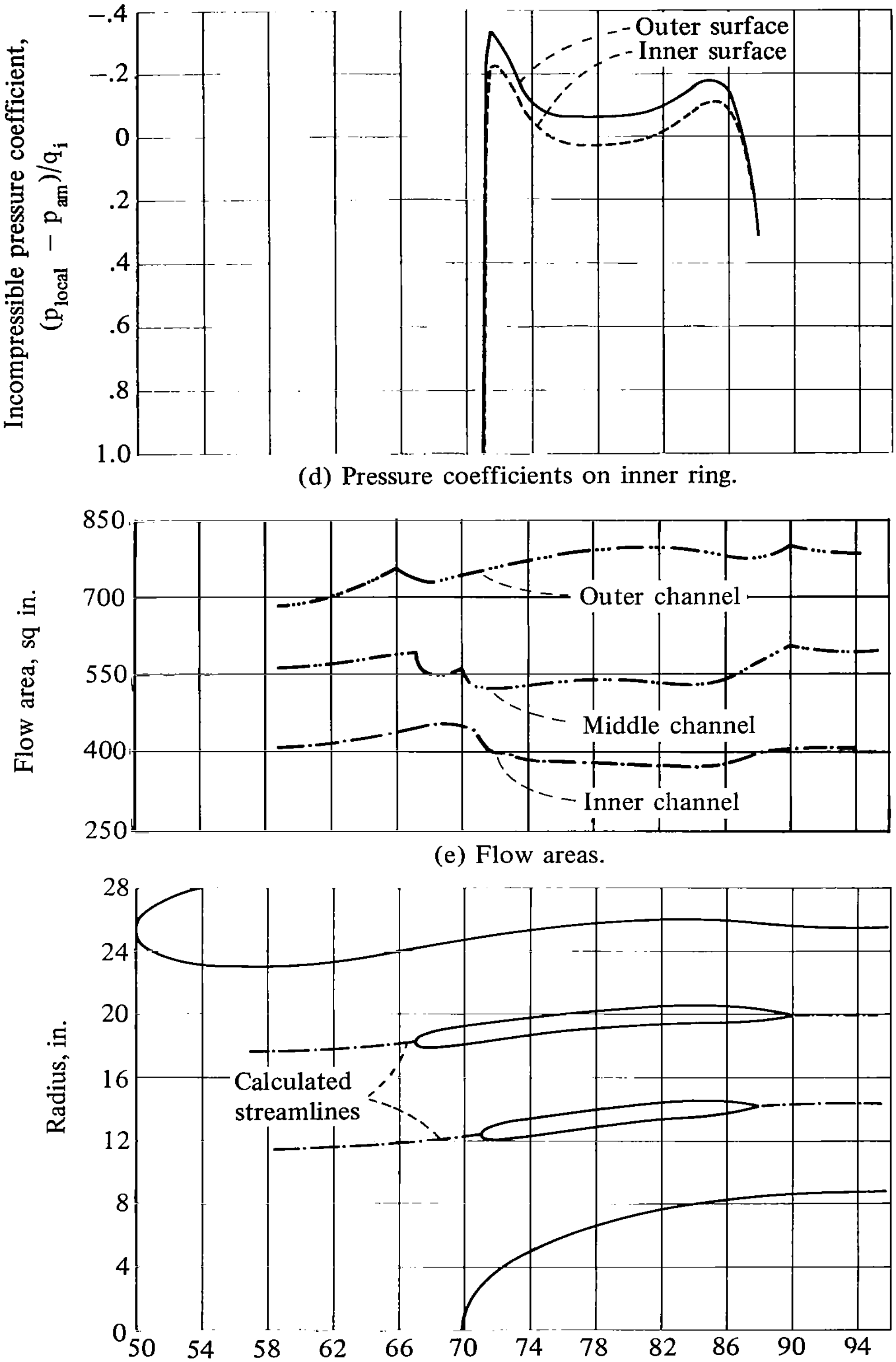


(a) Pressure coefficients on walls of inlet duct and centerbody.

(b) Pressure coefficients on outer ring.

(c) Dimensions.

Figure 8. – Dimensions and predicted distributions of pressure coefficients and flow areas for two-ring inlet.



(d) Pressure coefficients on inner ring.

(e) Flow areas.

(f) Dimensions.

Figure 8. – Concluded.

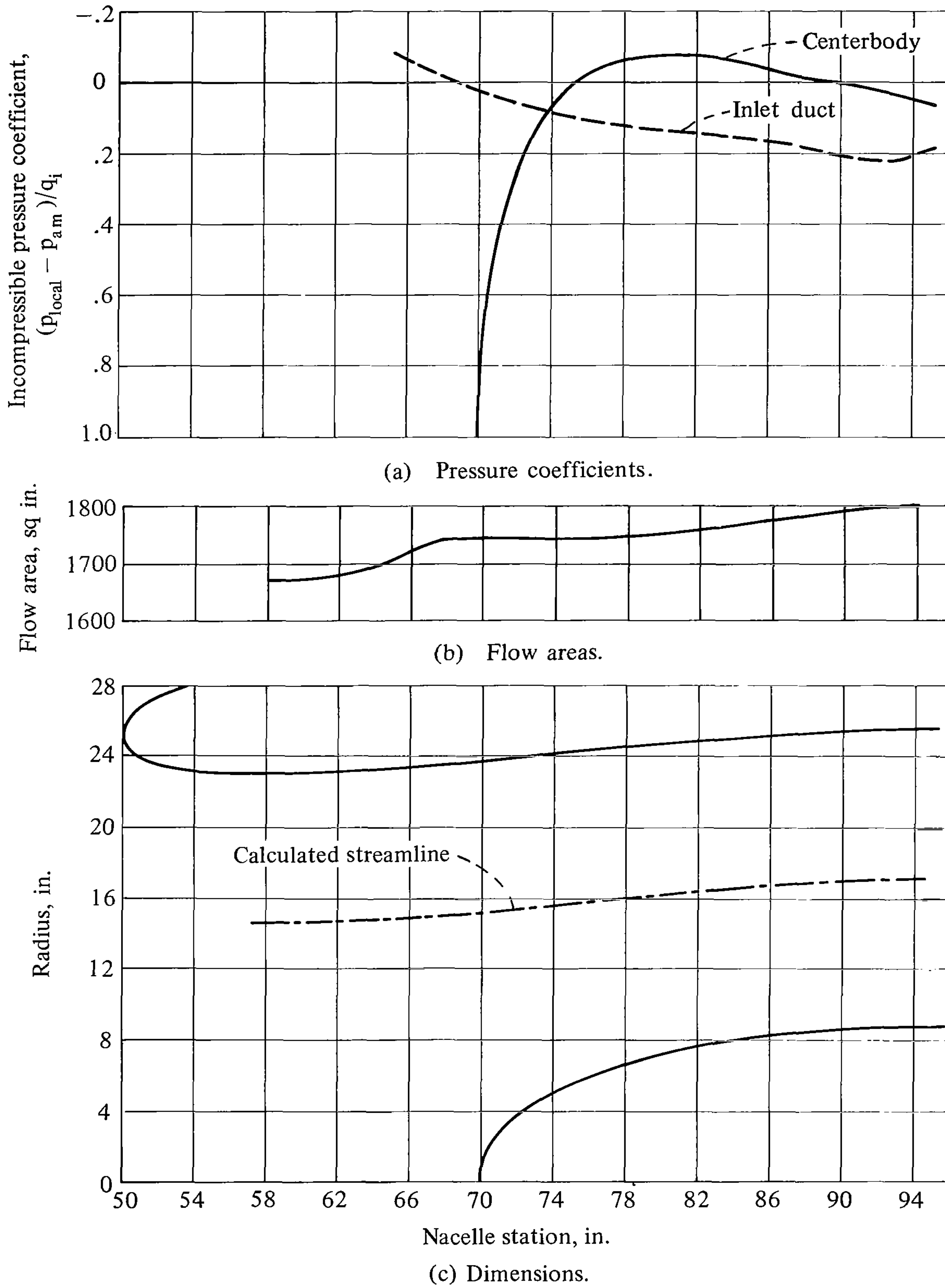


Figure 9. – Dimensions and predicted distributions of pressure coefficients and flow areas for existing inlet.

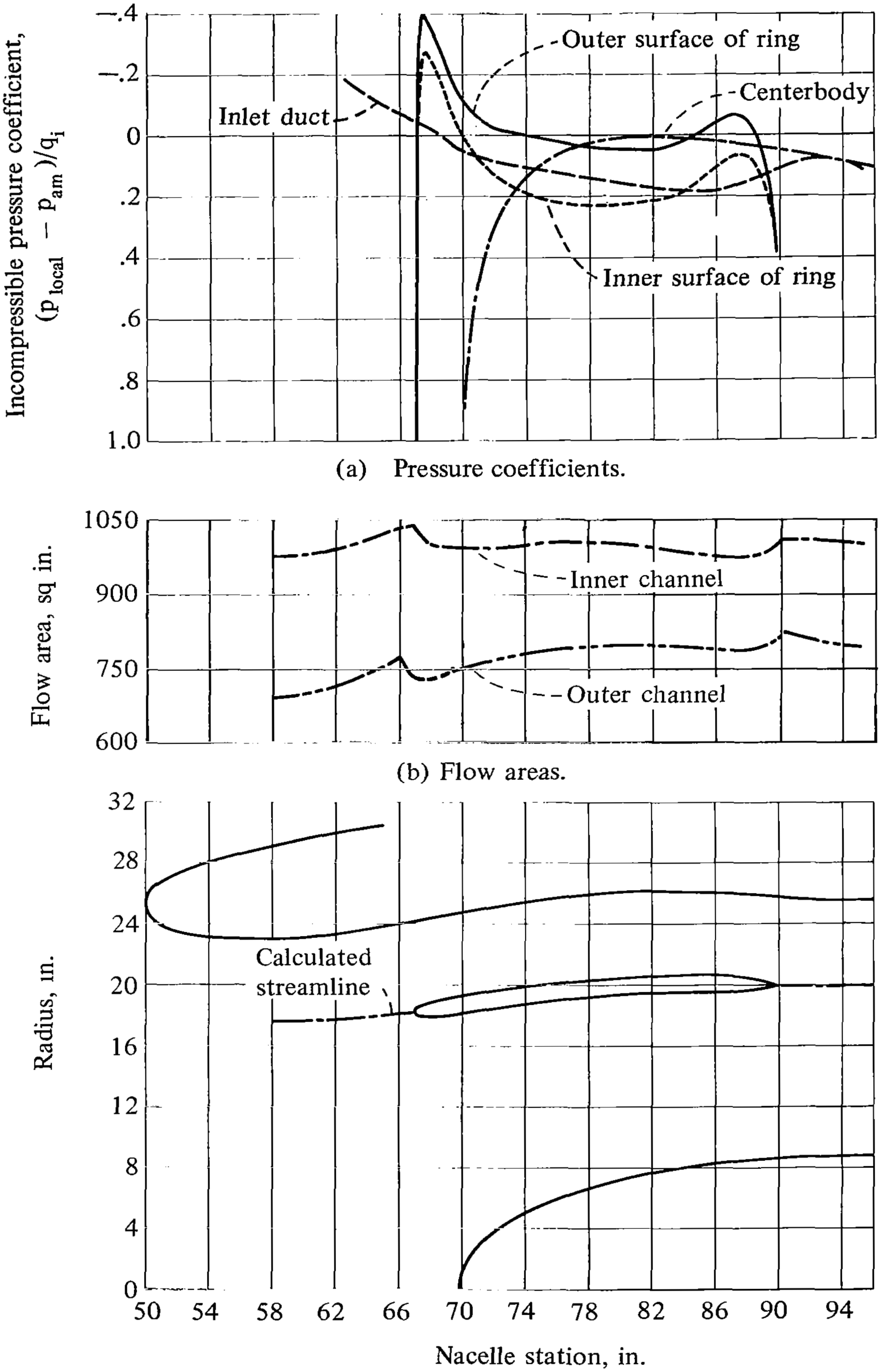


Figure 10. — Dimensions and predicted distributions of pressure coefficients and flow areas the one-ring inlet.

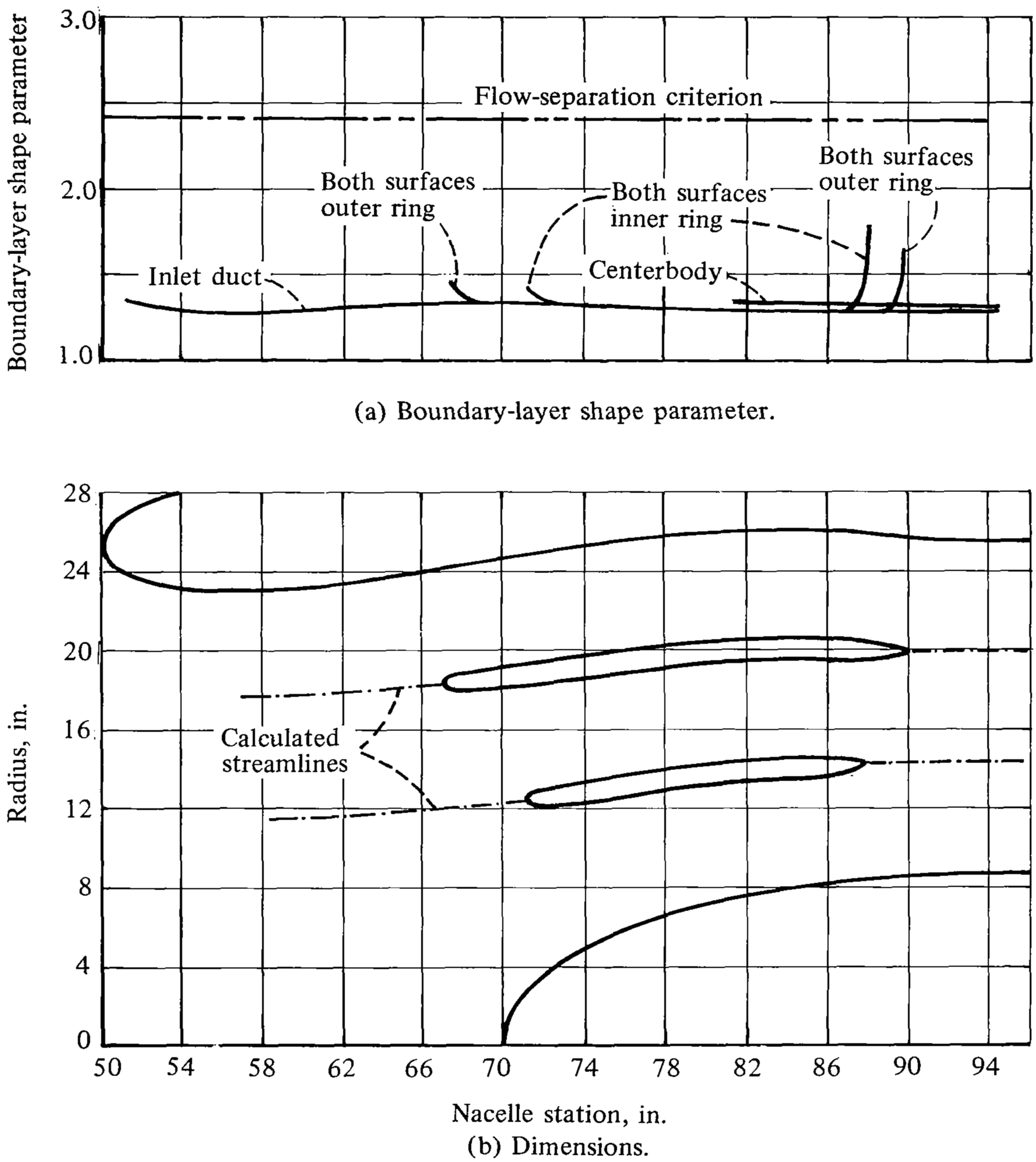
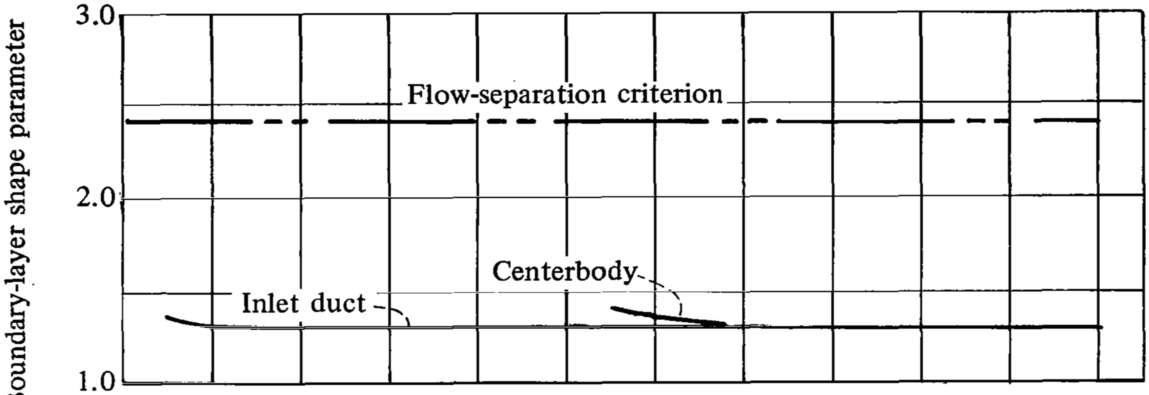
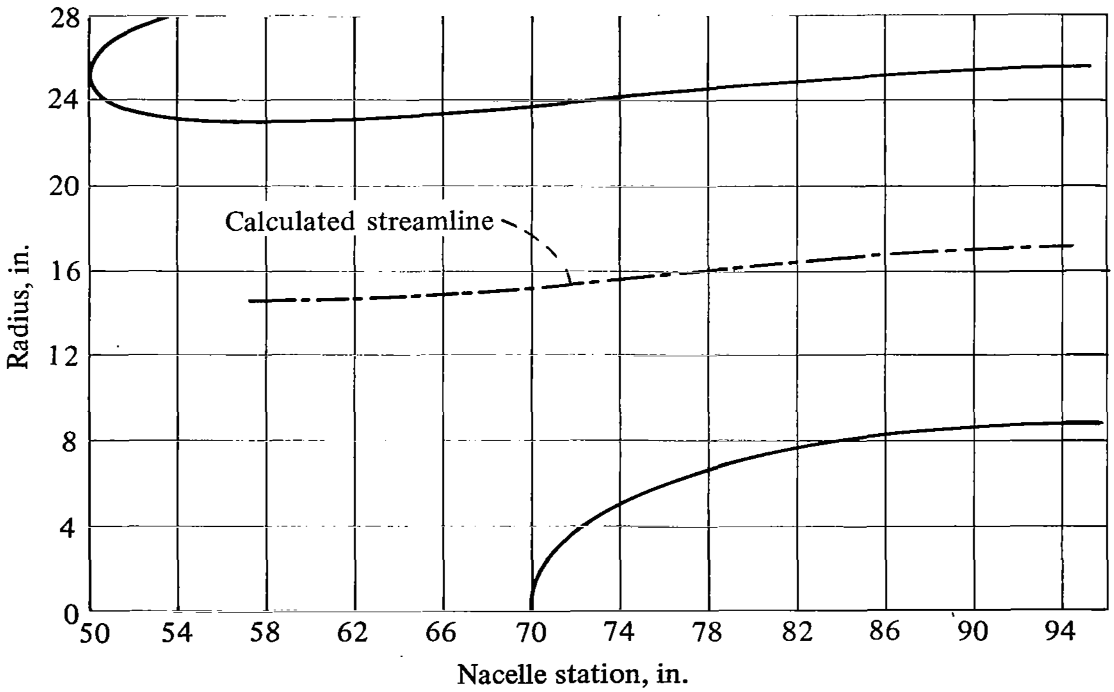


Figure 11. – Dimensions and predicted boundary-layer shape parameter for two-ring inlet.

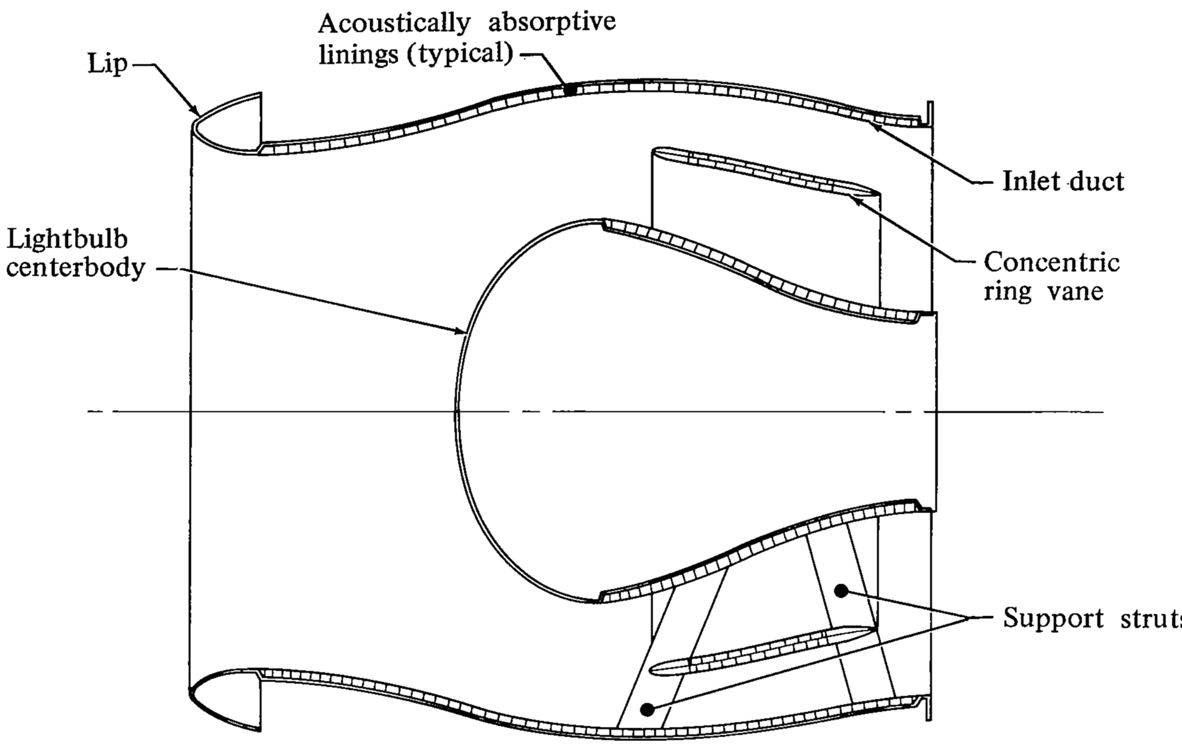


(a) Boundary-layer shape parameter.

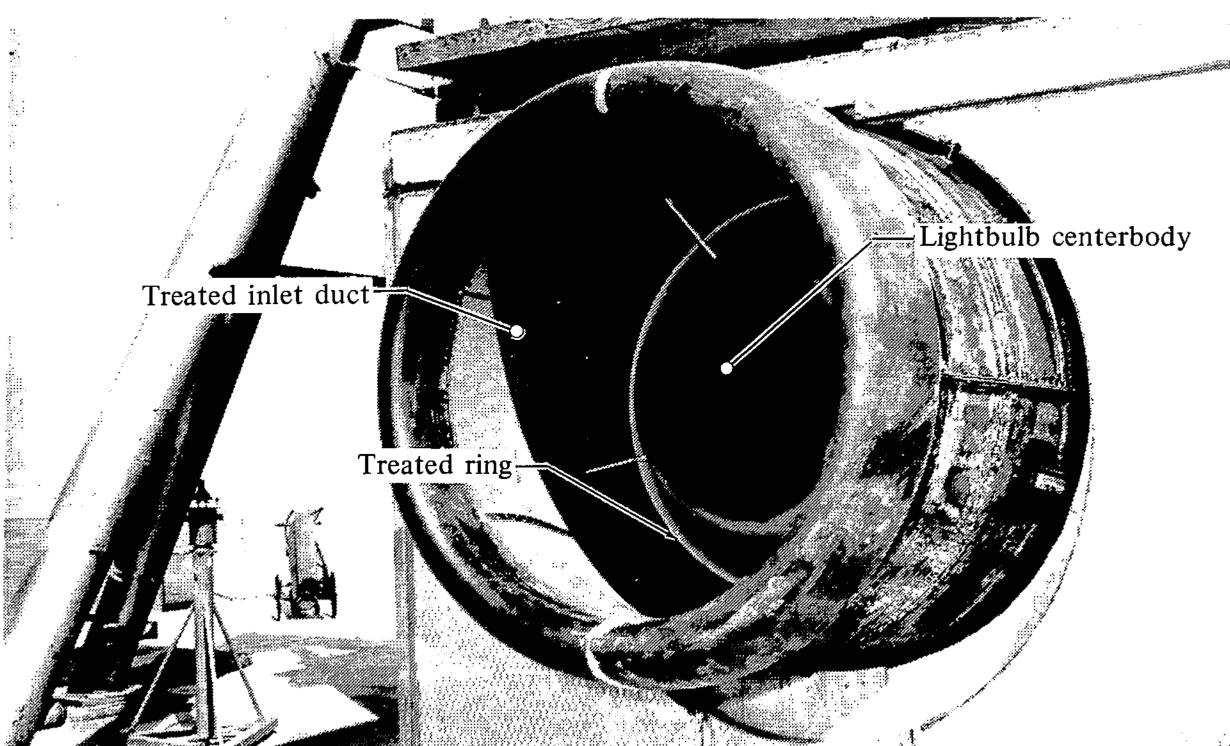


(b) Dimensions.

Figure 12. – Dimensions and predicted boundary-layer shape parameter for existing inlet.



(a) Cross-section.



(b) Front view of installation on engine test stand.

Figure 13. – 47-percent lightbulb inlet.

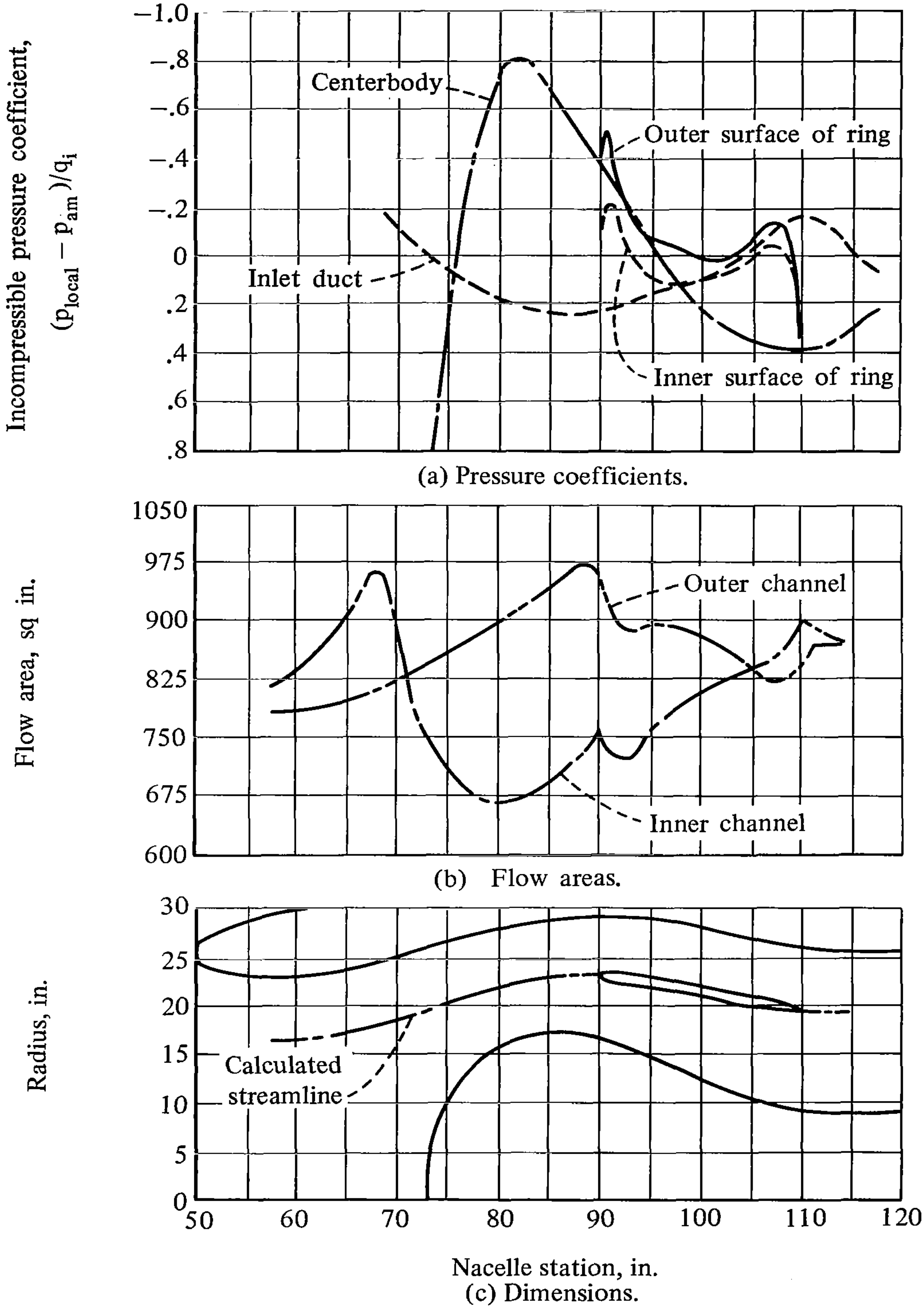
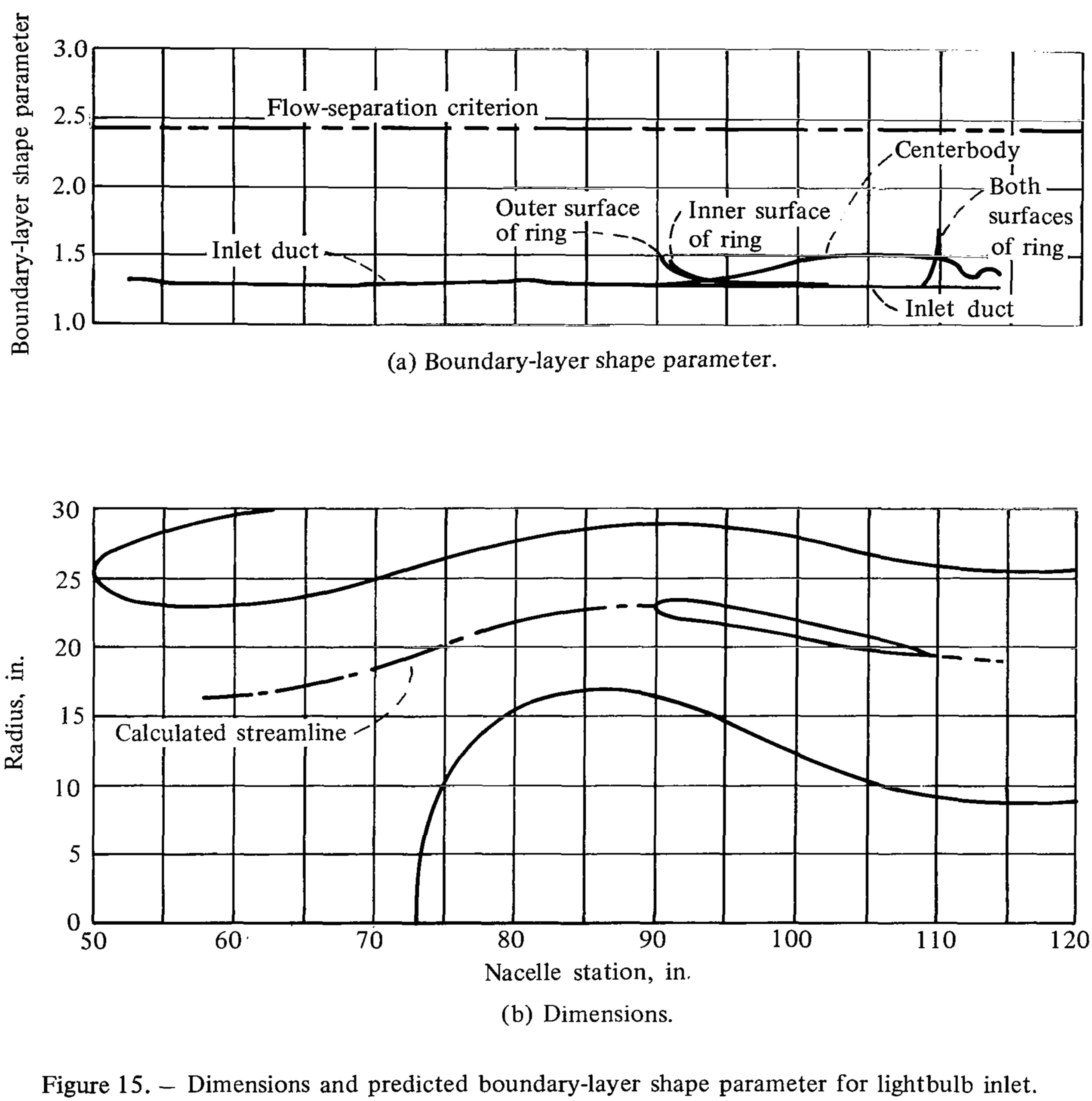


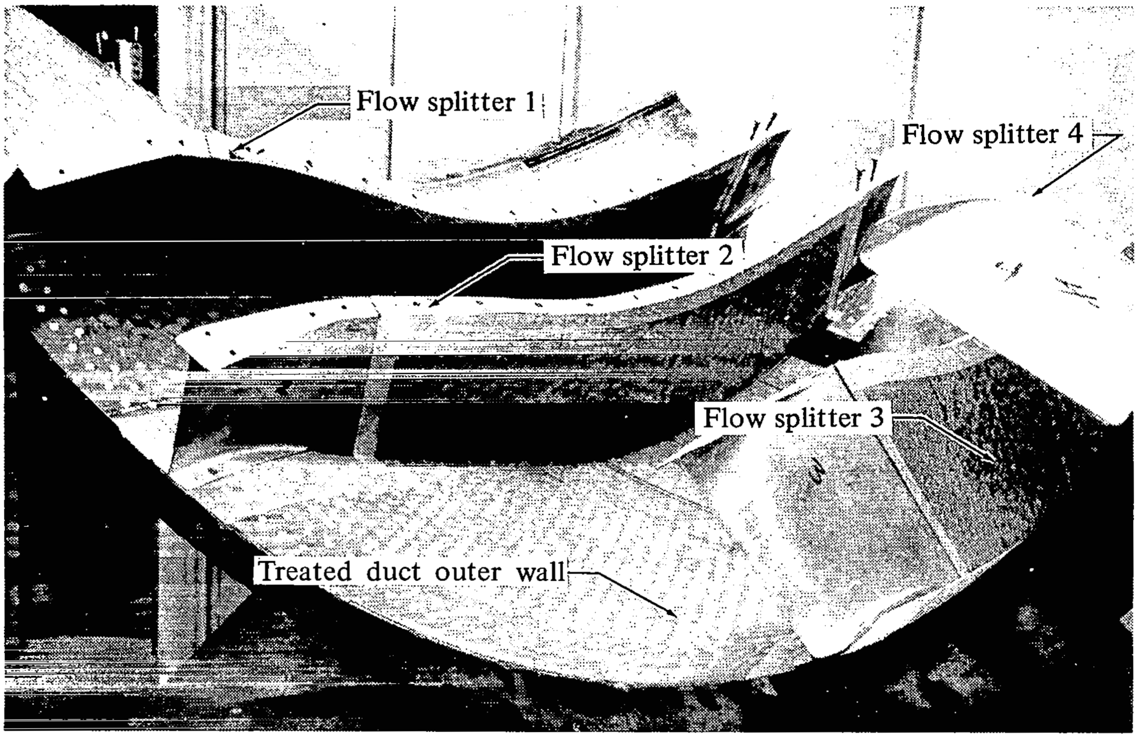
Figure 14. – Dimensions and predicted pressure coefficients and flow areas for lightbulb inlet.



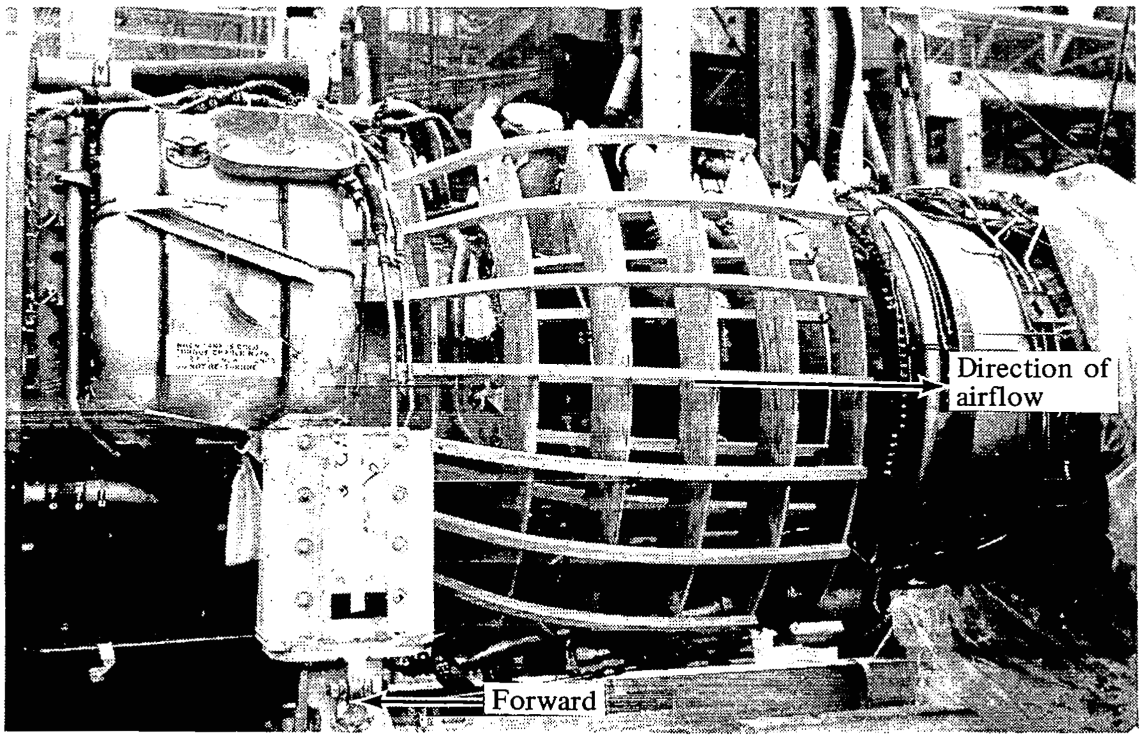
(a) Boundary-layer shape parameter.

(b) Dimensions.

Figure 15. – Dimensions and predicted boundary-layer shape parameter for lightbulb inlet.

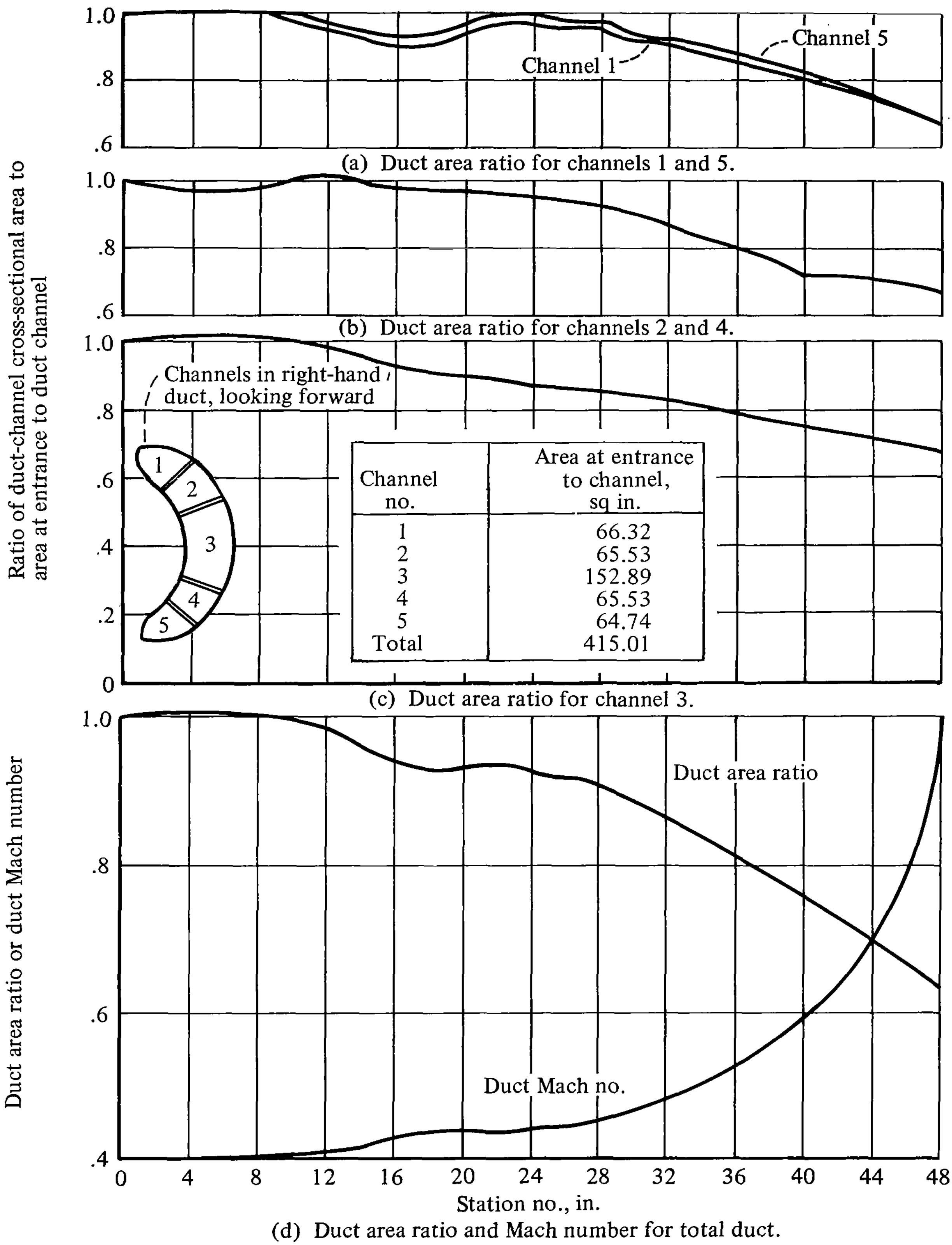


(a) Flow splitters and outer duct wall.



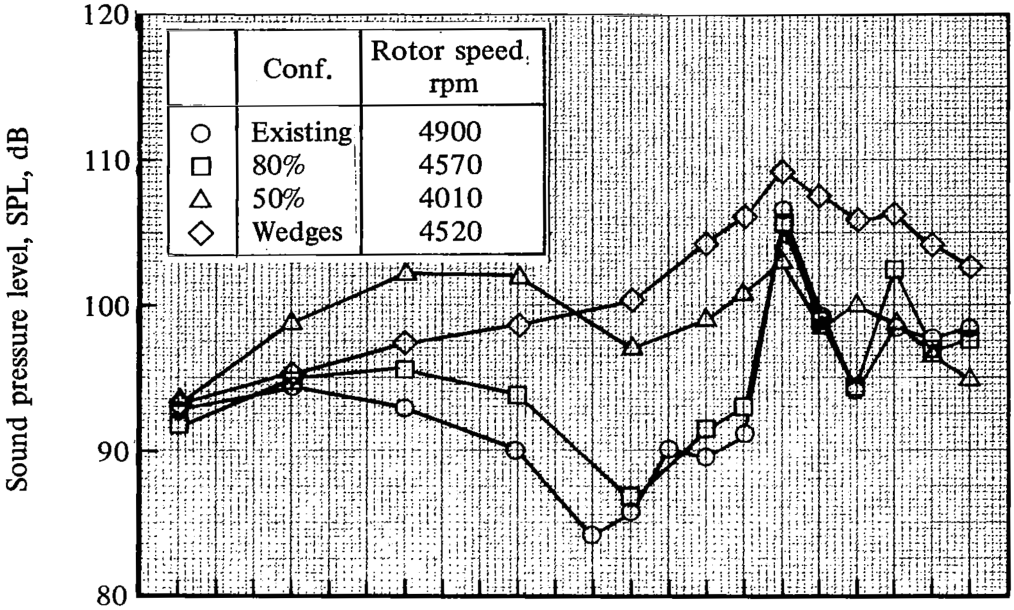
(b) Mockup duct on JT3D engine, left side.

Figure 16. – 48-in. treated fan-exhaust ducts.

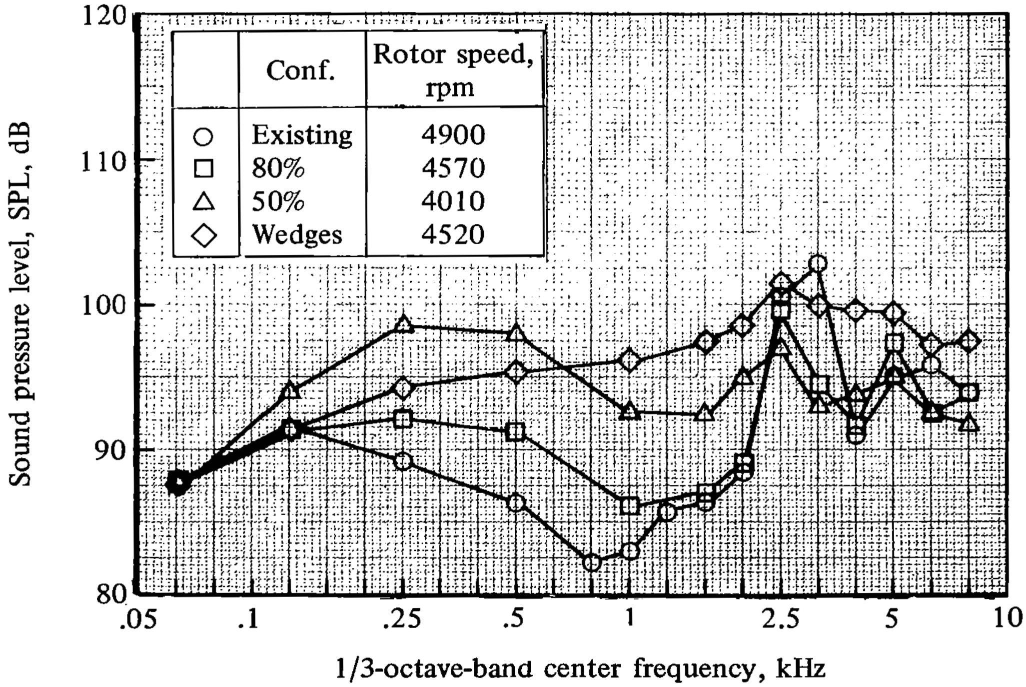


Channel no.	Area at entrance to channel, sq in.
1	66.32
2	65.53
3	152.89
4	65.53
5	64.74
Total	415.01

Figure 17. – Predicted duct area ratios and Mach numbers for the 48-in.-long fan-exhaust ducts.

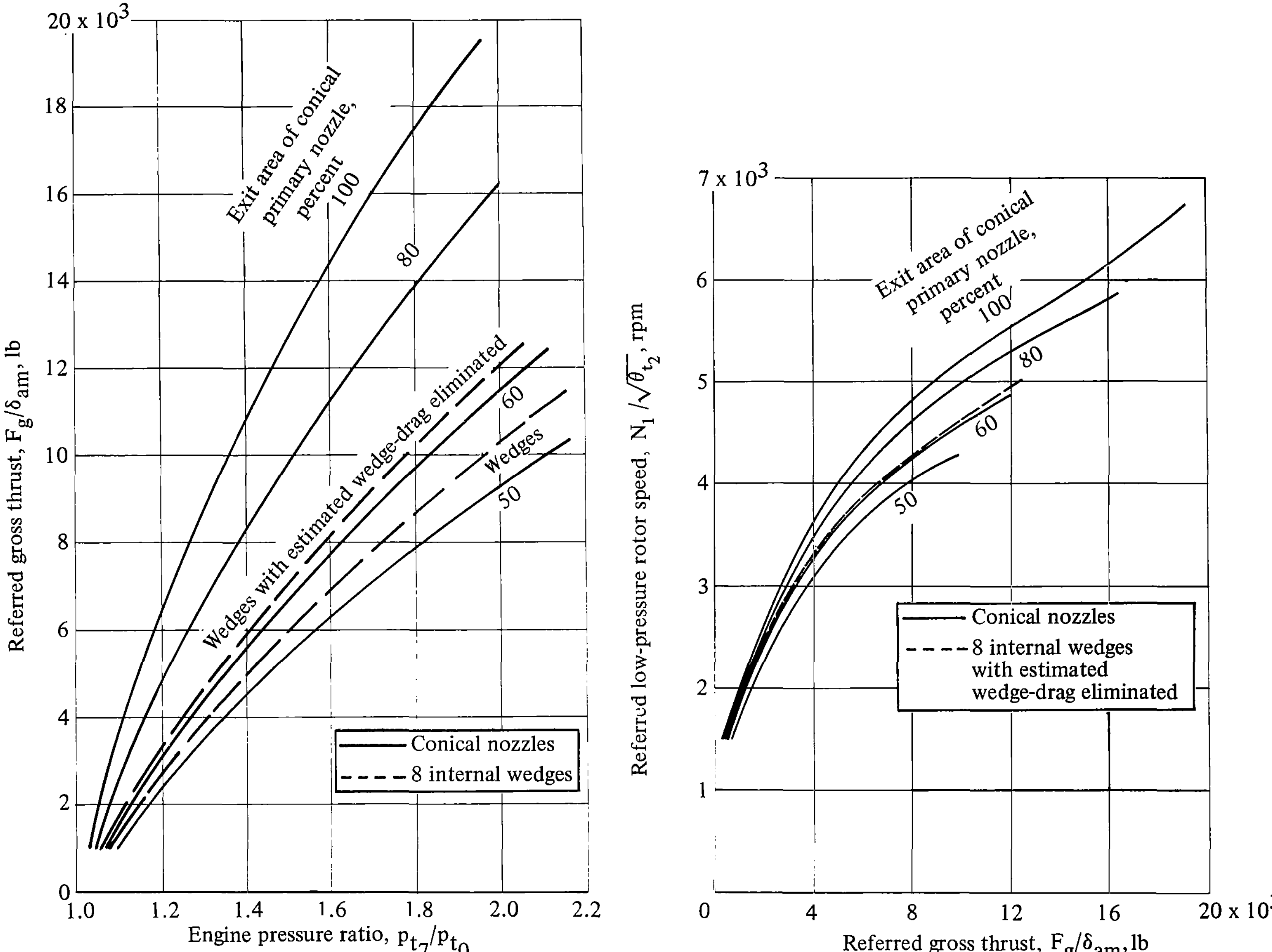


(a) 110 degrees.



(b) 60 degrees.

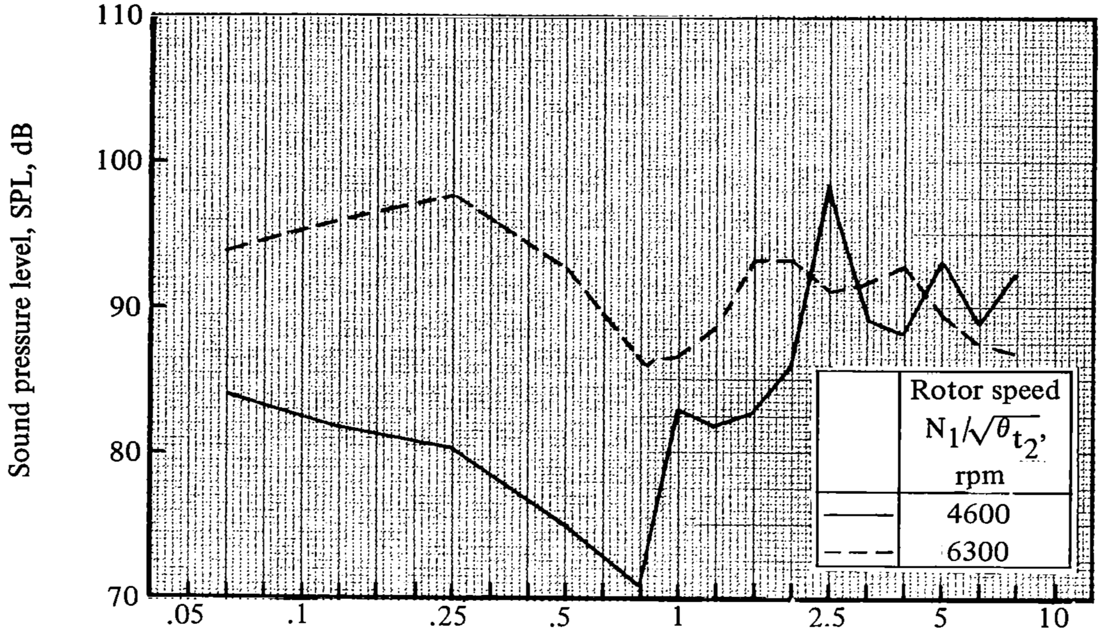
Figure 18. – SPL spectra at 150 ft for simulated variable-area primary nozzle tests. Nominal referred gross thrust was 8000 lb. No noise-suppressor enclosures around engine.



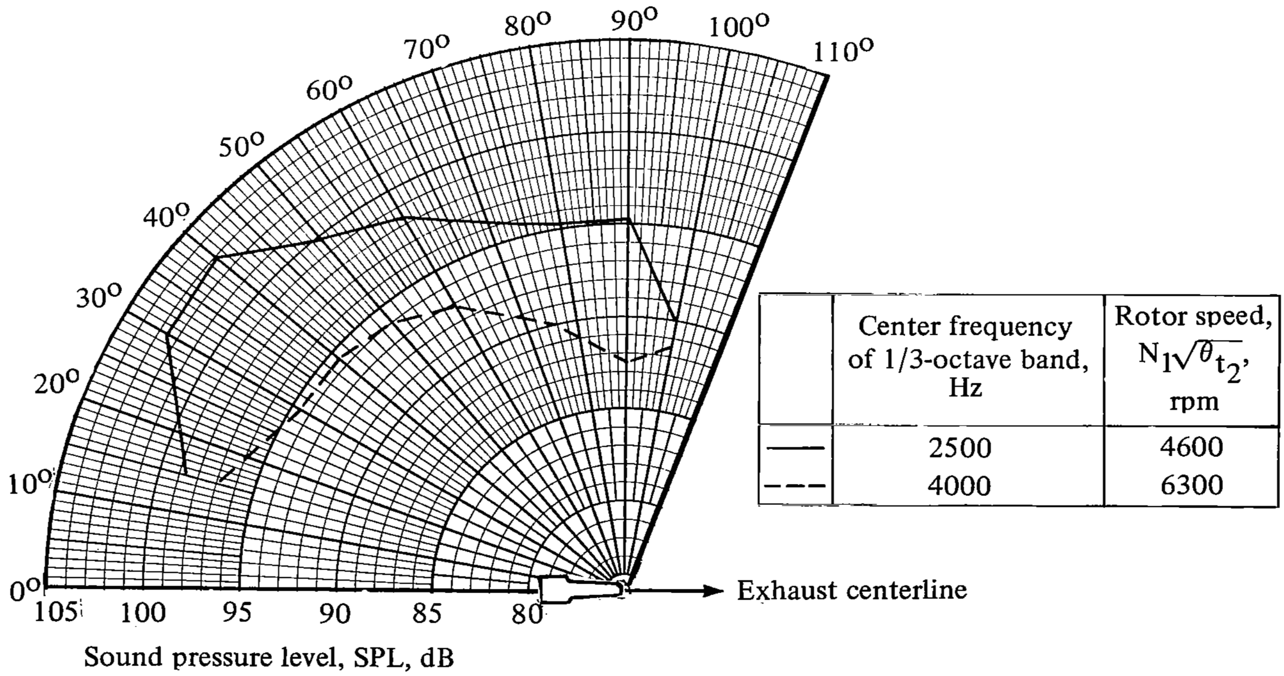
(a) Gross thrust.

(b) Fan rotor speed.

Figure 19. – Performance of JT3D engine with simulated variable-area primary nozzles.

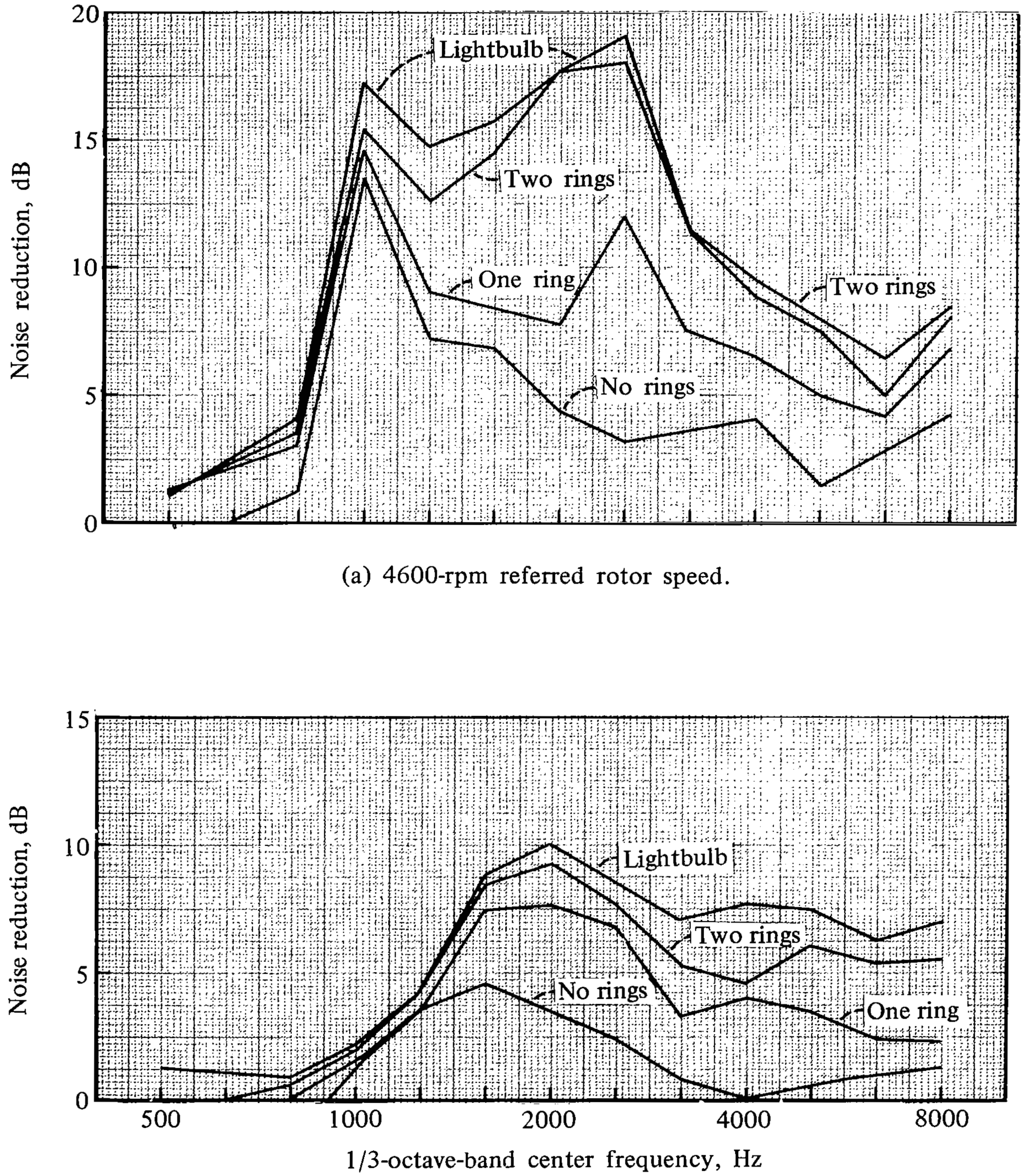


(a) SPL spectra at 60 deg.



(b) Polar distribution of 1/3-octave-band SPL.

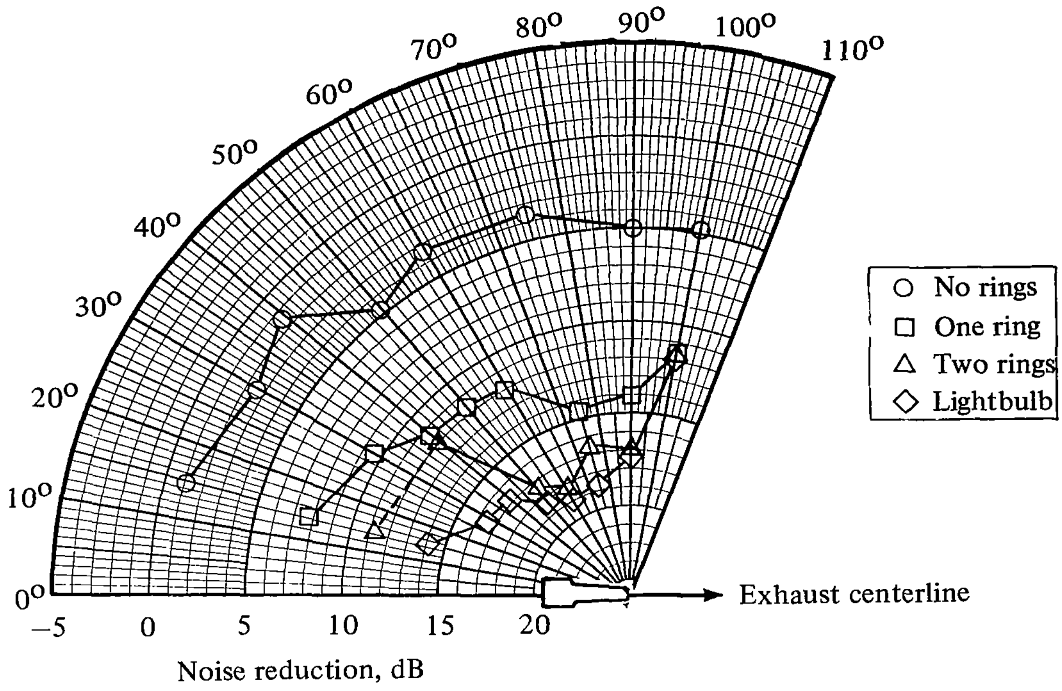
Figure 20. – Baseline SPLs at 150 ft with the fan-exhaust noise-suppressor enclosure around the engine.



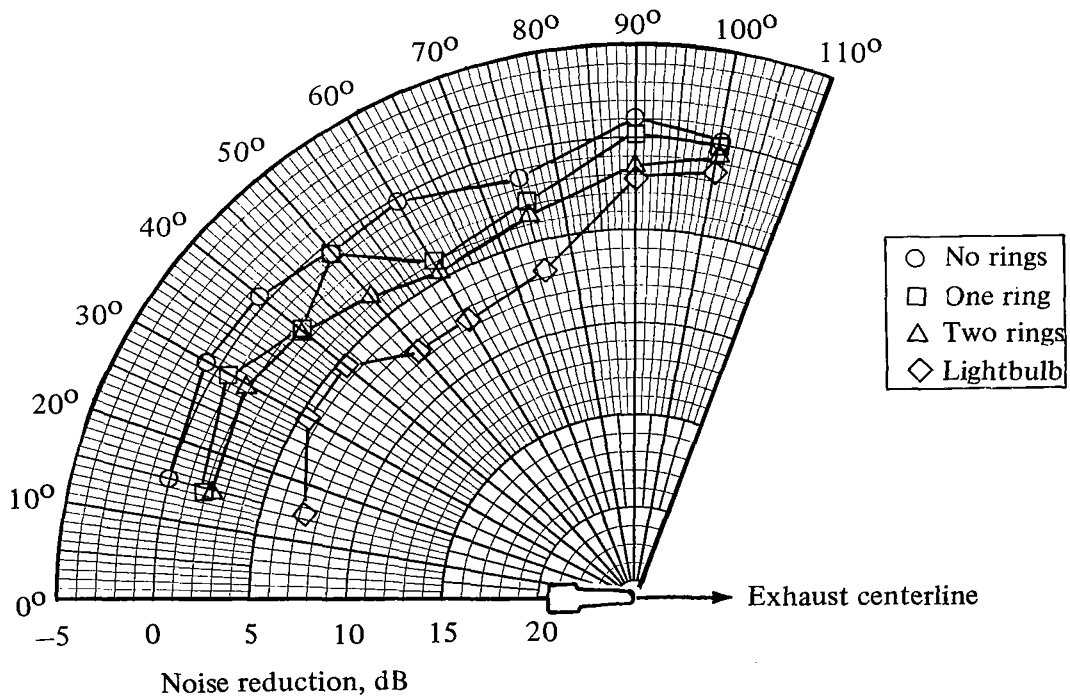
(a) 4600-rpm referred rotor speed.

(b) 6300-rpm referred rotor speed.

Figure 21. – Noise-reduction achieved at a distance of 150 ft and at the 60-degree azimuth by the treated inlets; fan-exhaust noise-suppressor enclosure around engine.



(a) 2500-Hz band; 4600-rpm referred rotor speed.



(b) 4000-Hz band; 6300-rpm referred rotor speed.

Figure 22. – Polar distribution of noise reduction achieved at a distance of 150 ft by the treated inlets; fan-exhaust noise-suppressor enclosure around engine.

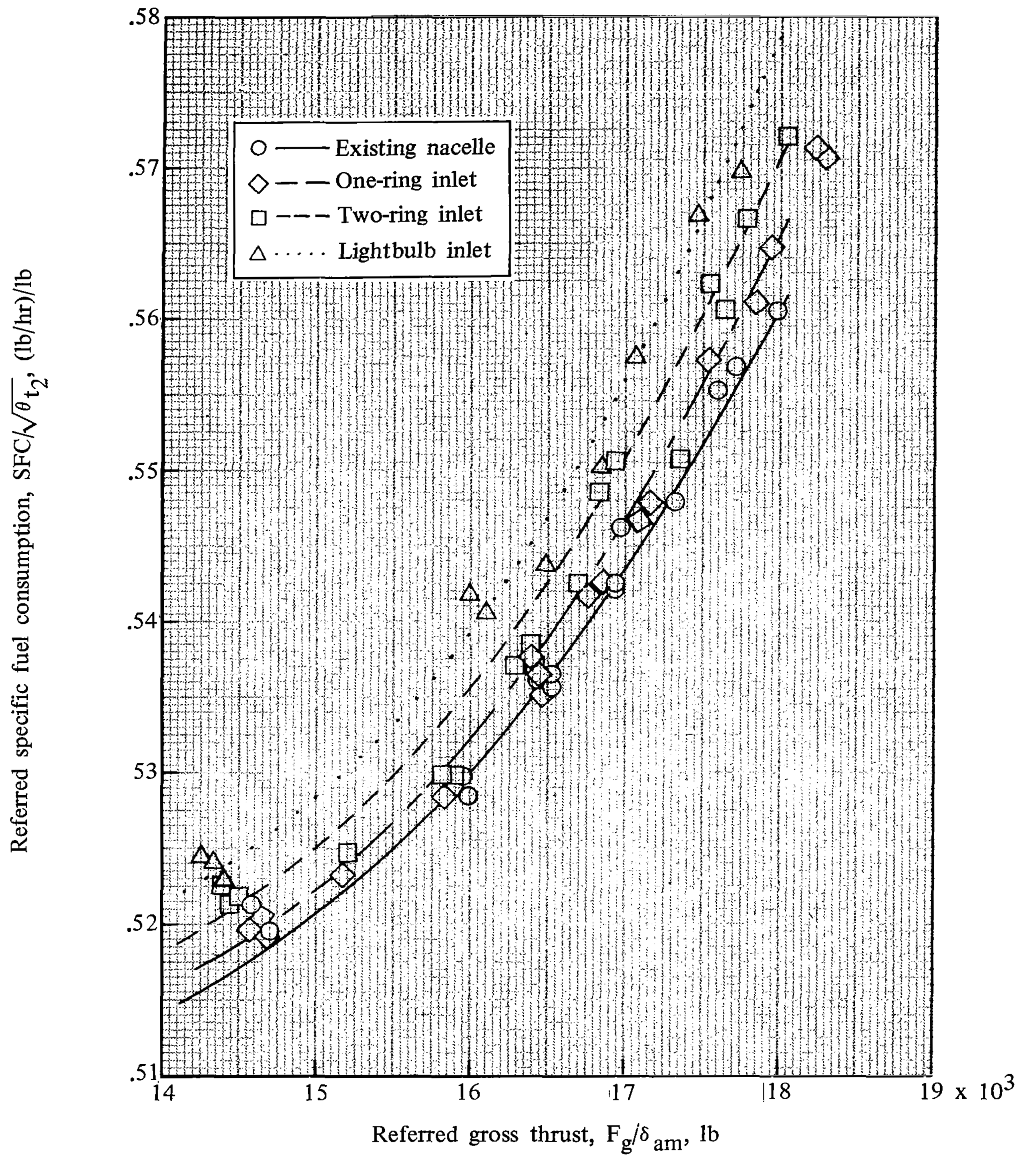
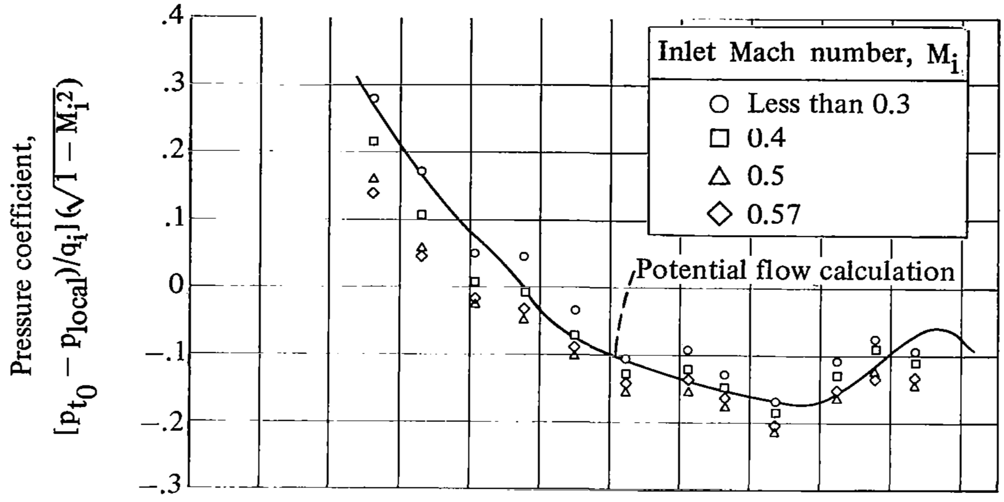
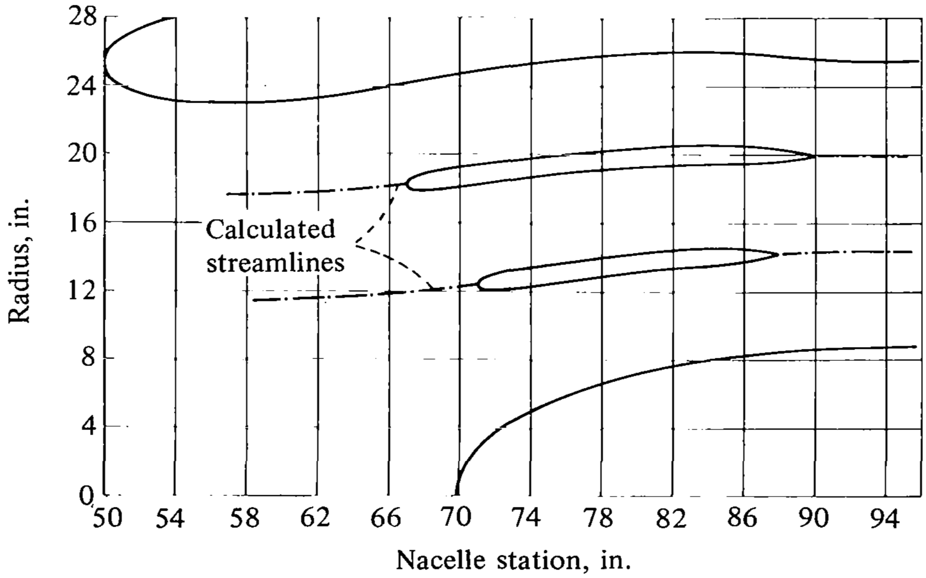


Figure 23. – Performance of JT3D engine with treated inlets, existing production 24-in.-long fan-exhaust ducts and production primary nozzle; fan-exhaust noise-suppressor enclosure around engine.

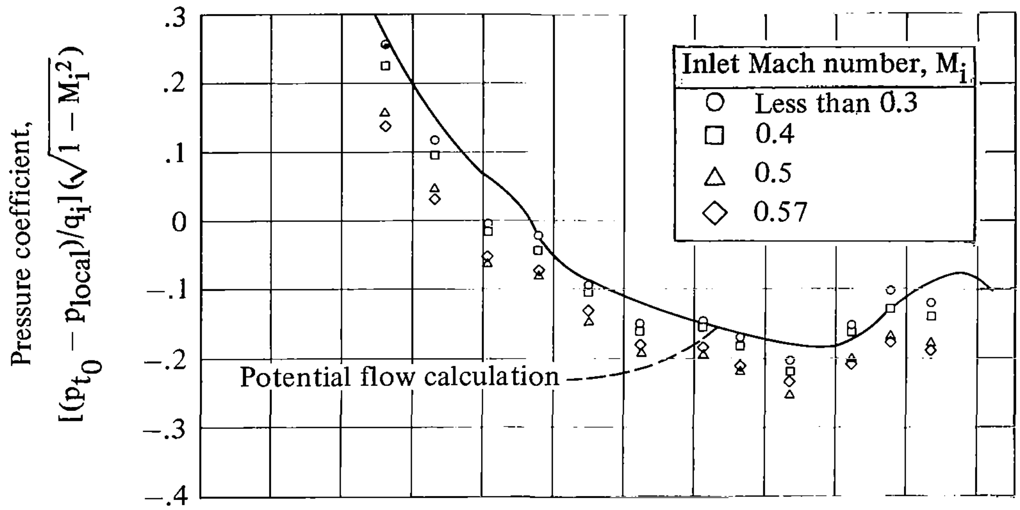


(a) Pressure coefficients with two rings installed.

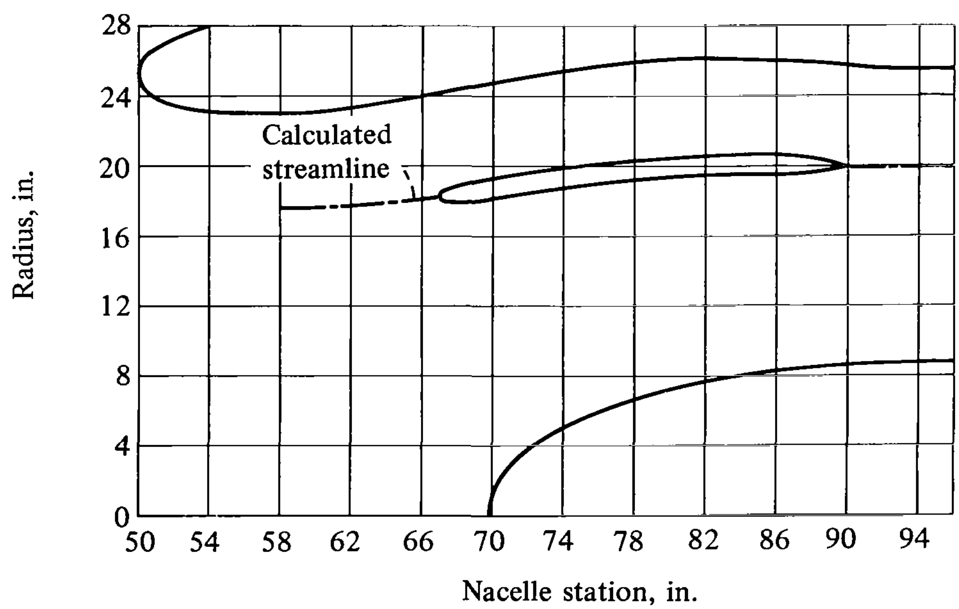


(b) Dimensions.

Figure 24. – Measured and calculated pressure coefficients for the two-ring inlet.

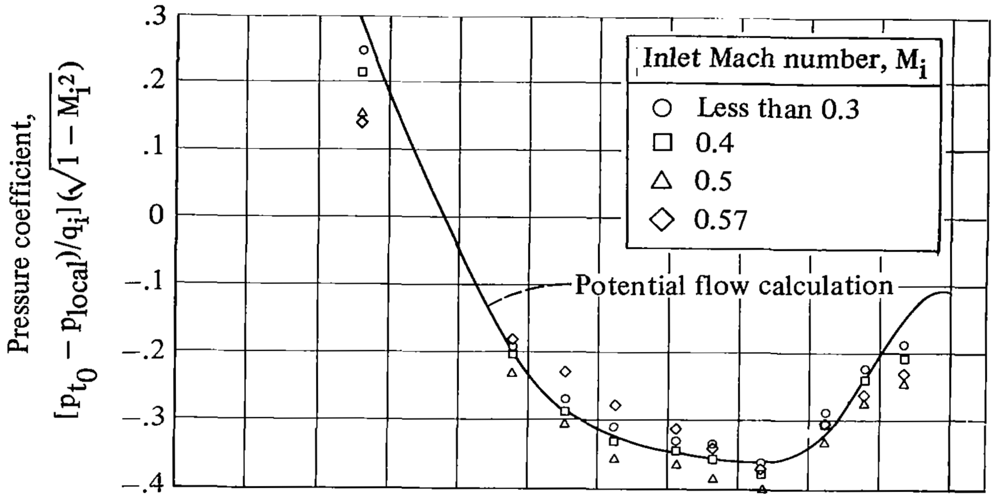


(c) Pressure coefficients with one ring installed.

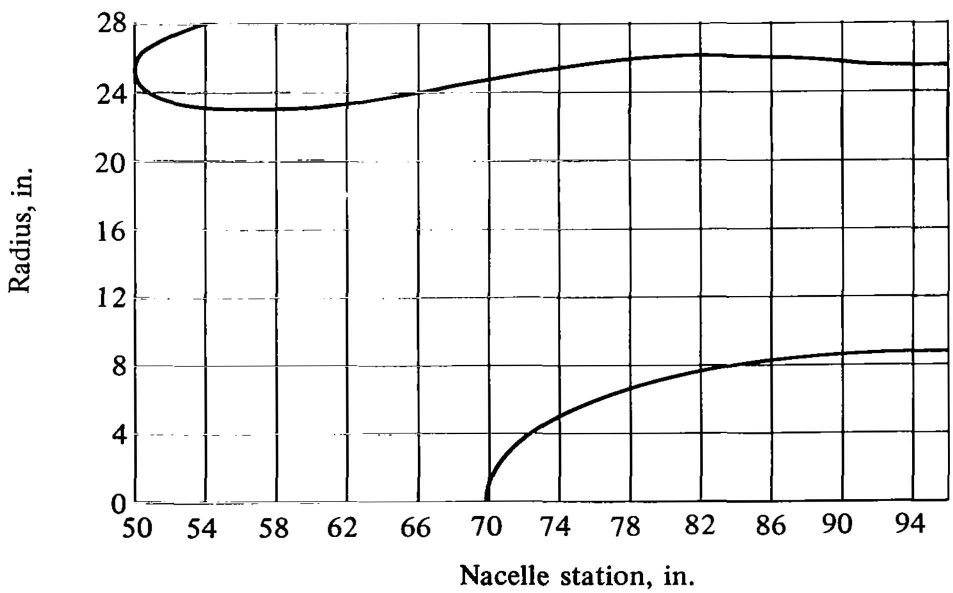


(d) Dimensions.

Figure 24. – Continued.



(e) Pressure coefficients with both rings removed.



(f) Dimensions.

Figure 24. – Concluded.

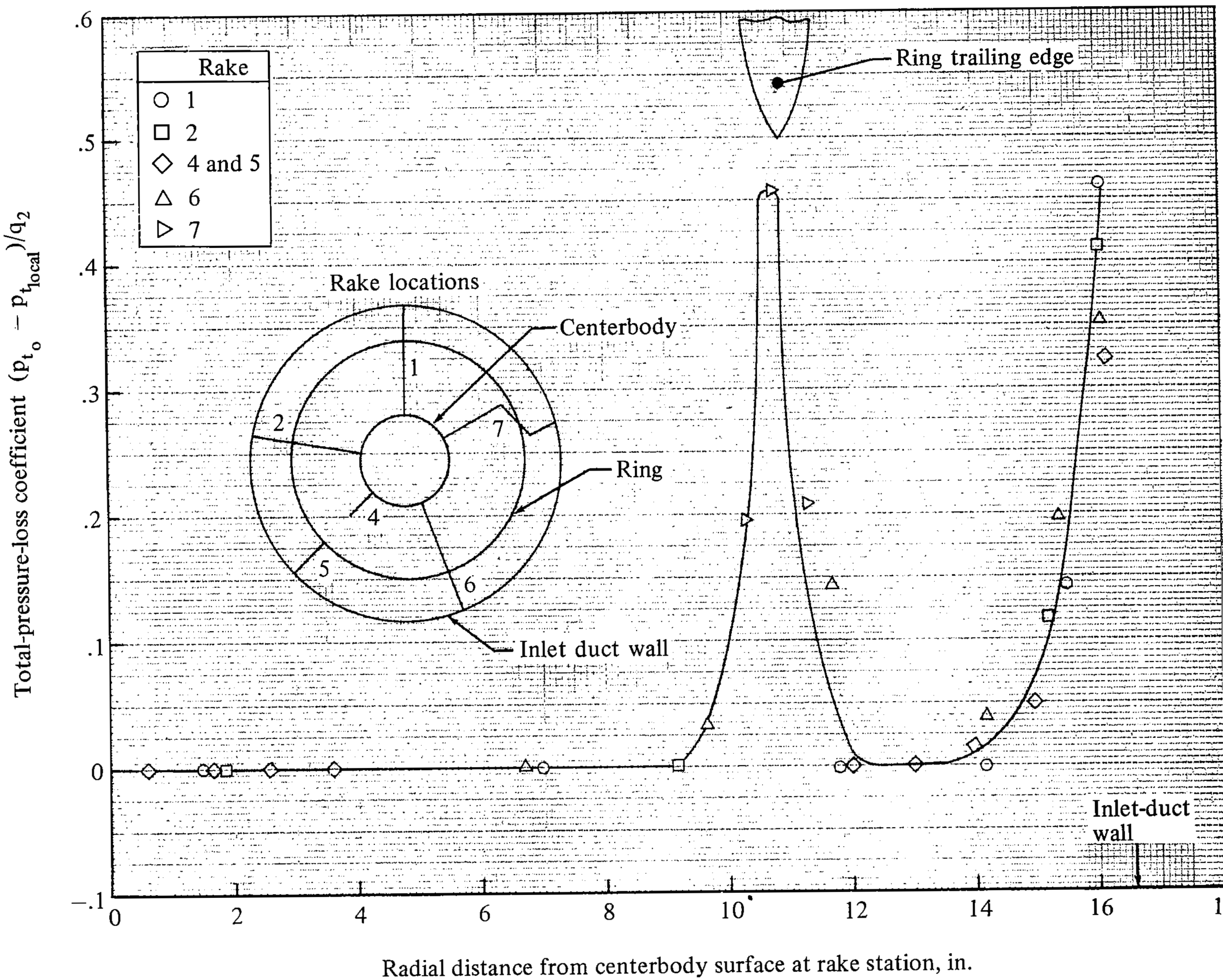


Figure 25. – Total-pressure-loss profile for one-ring inlet at an EPR of 1.79.

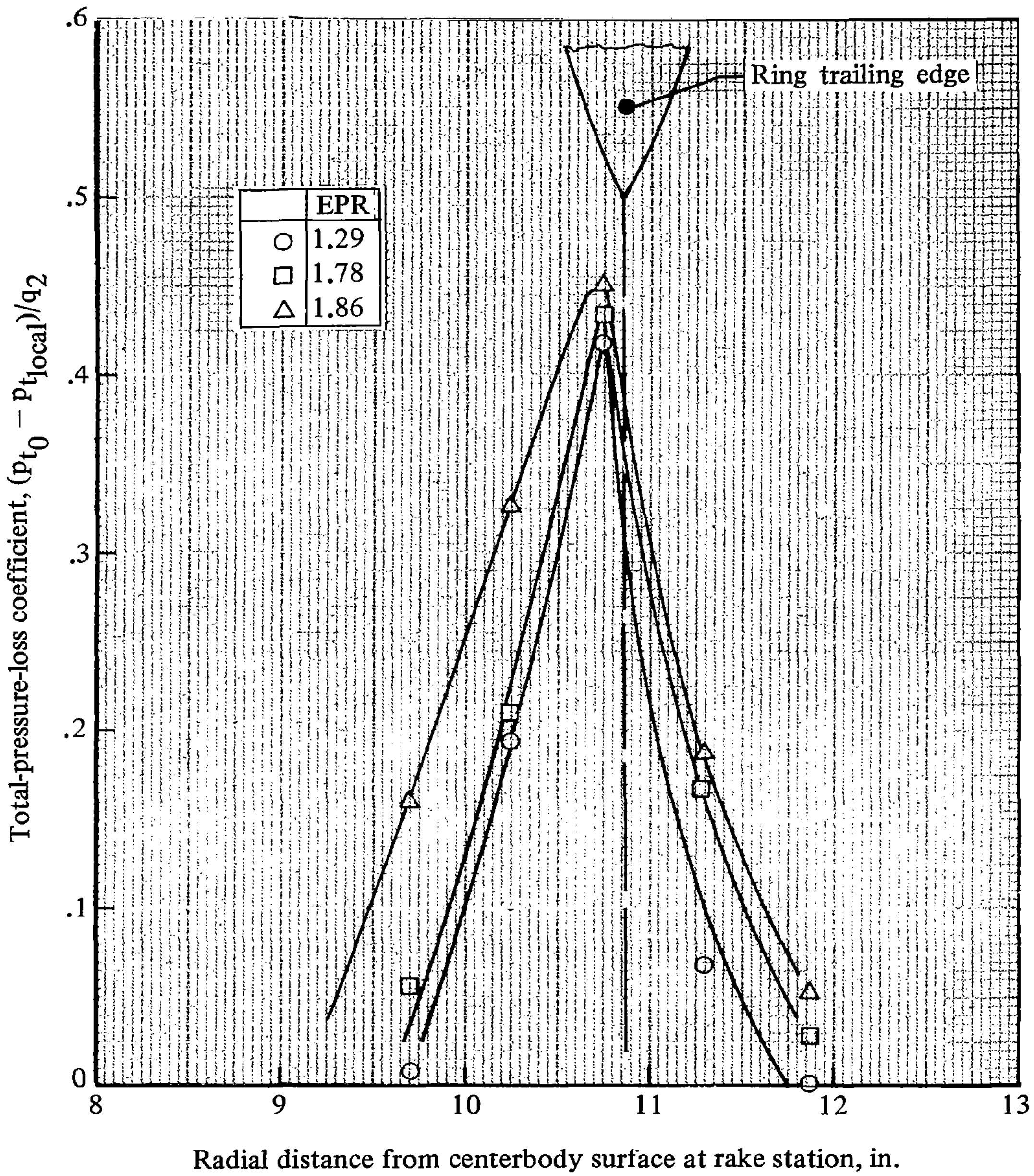


Figure 26. – Total-pressure-loss profiles in the wake of the concentric ring vane in the one-ring inlet.

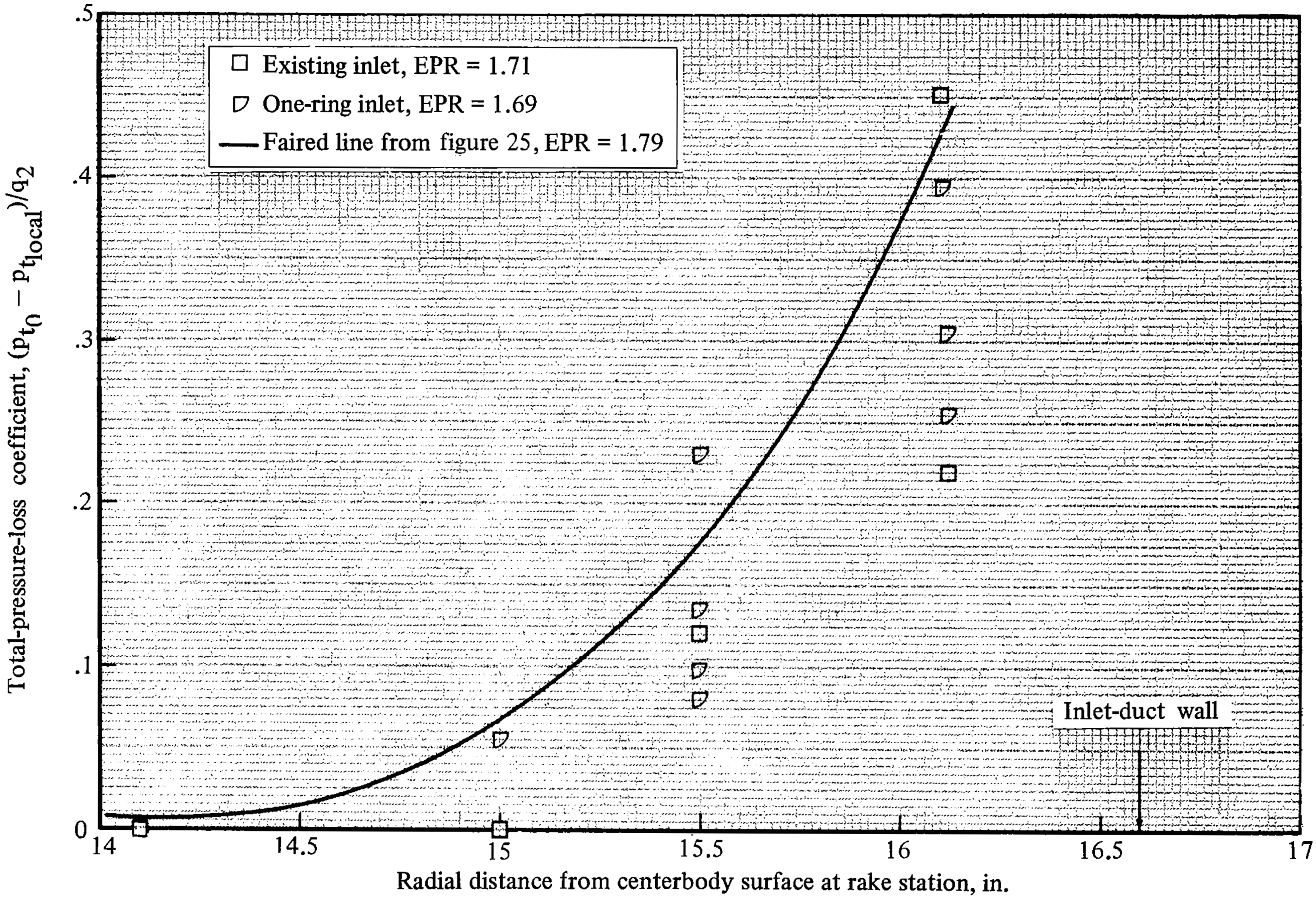


Figure 27. – Total-pressure-loss profiles in wall boundary layer at engine inlet station for the one-ring inlet and the existing inlet.

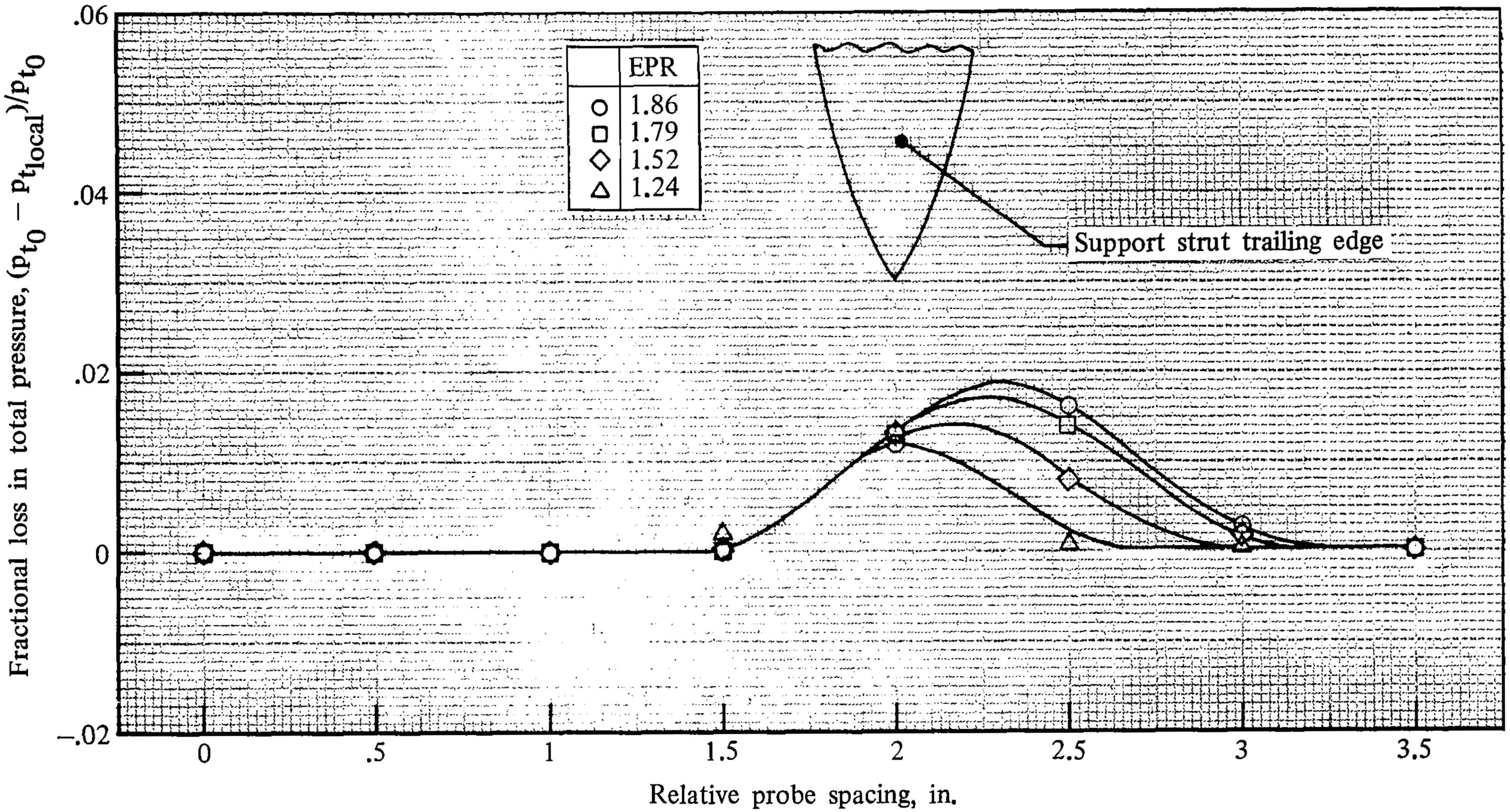
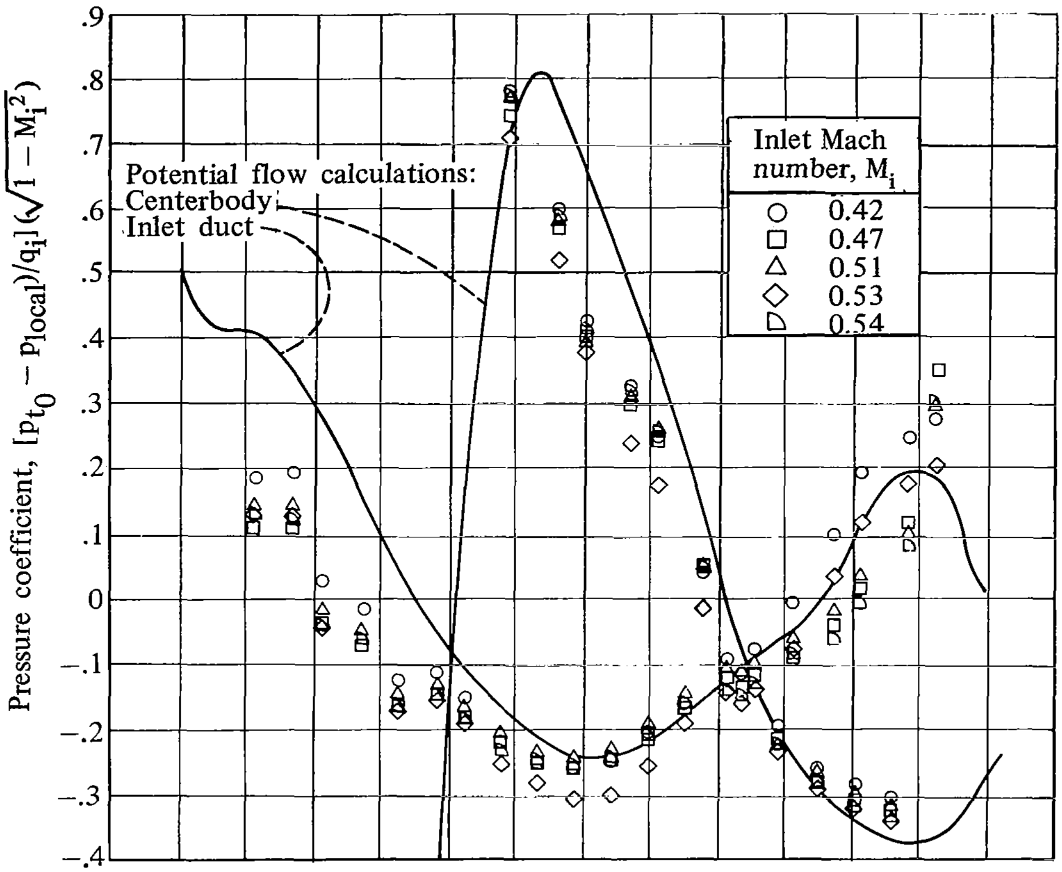
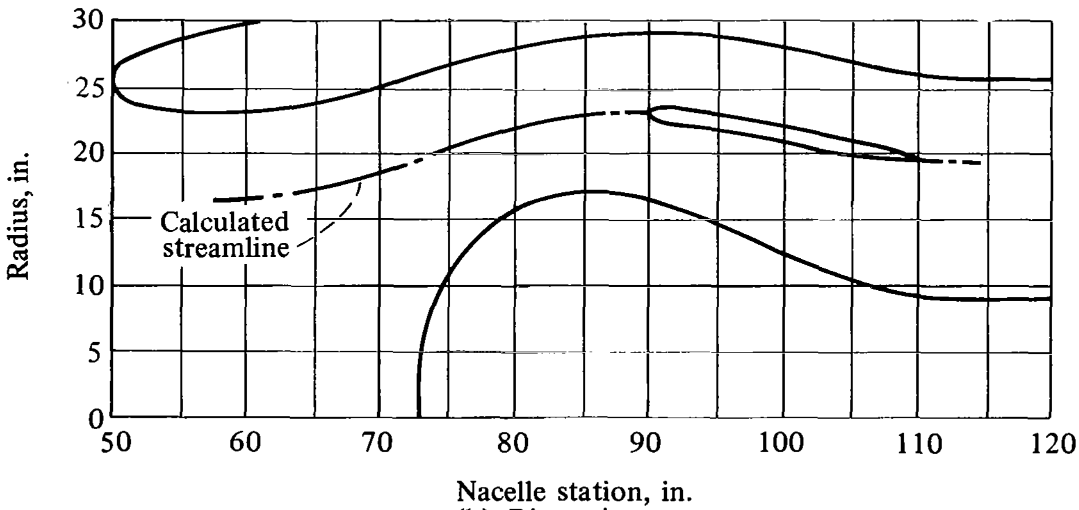


Figure 28. – Fractional loss in total pressure in wake behind aft-support strut.



(a) Pressure coefficients.



(b) Dimensions.

Figure 29. – Measured and calculated pressure coefficients for the 47-percent lightbulb inlet.

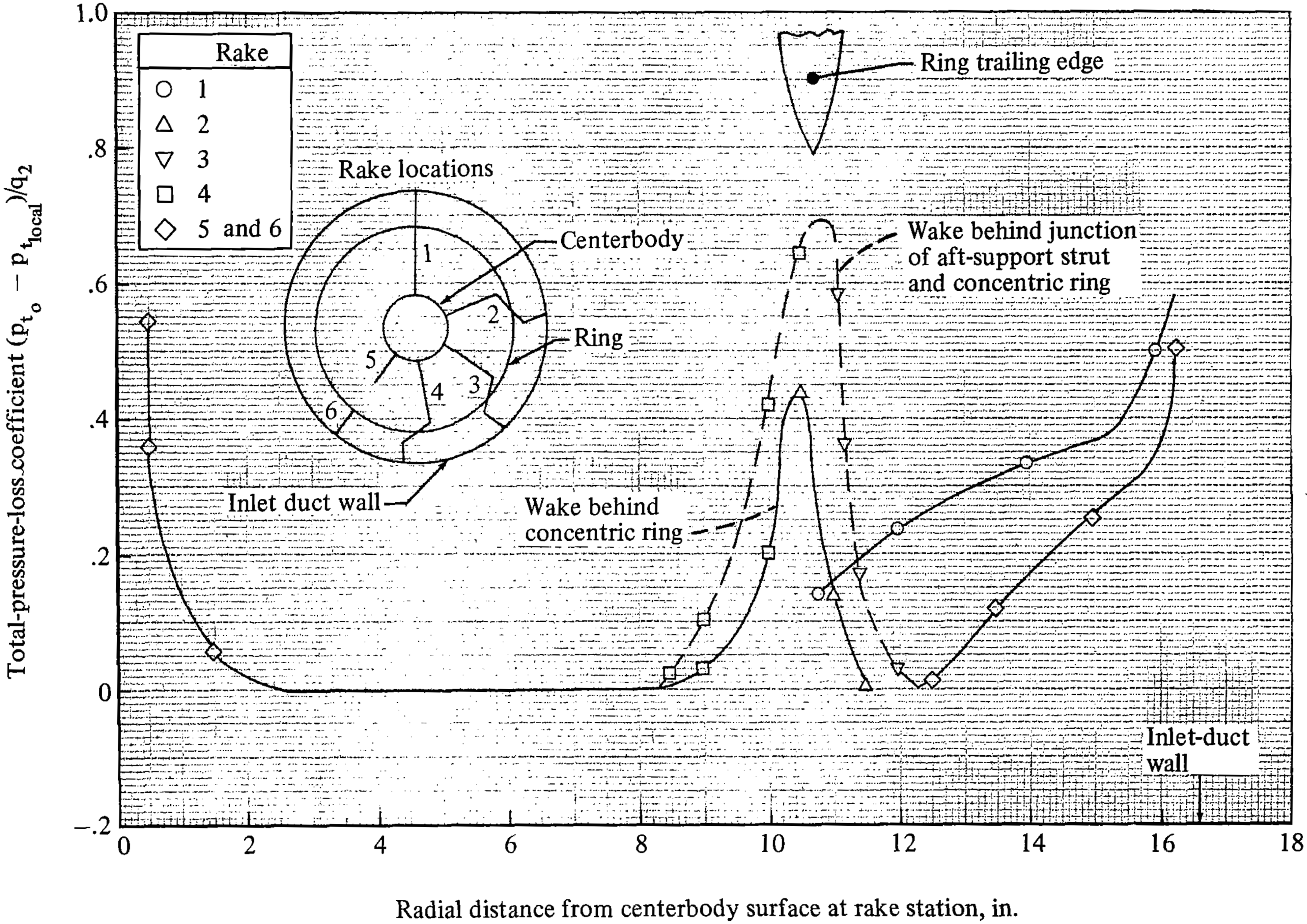


Figure 30. – Total-pressure-loss profile for 47 percent lightbulb inlet at an EPR of 1.75.

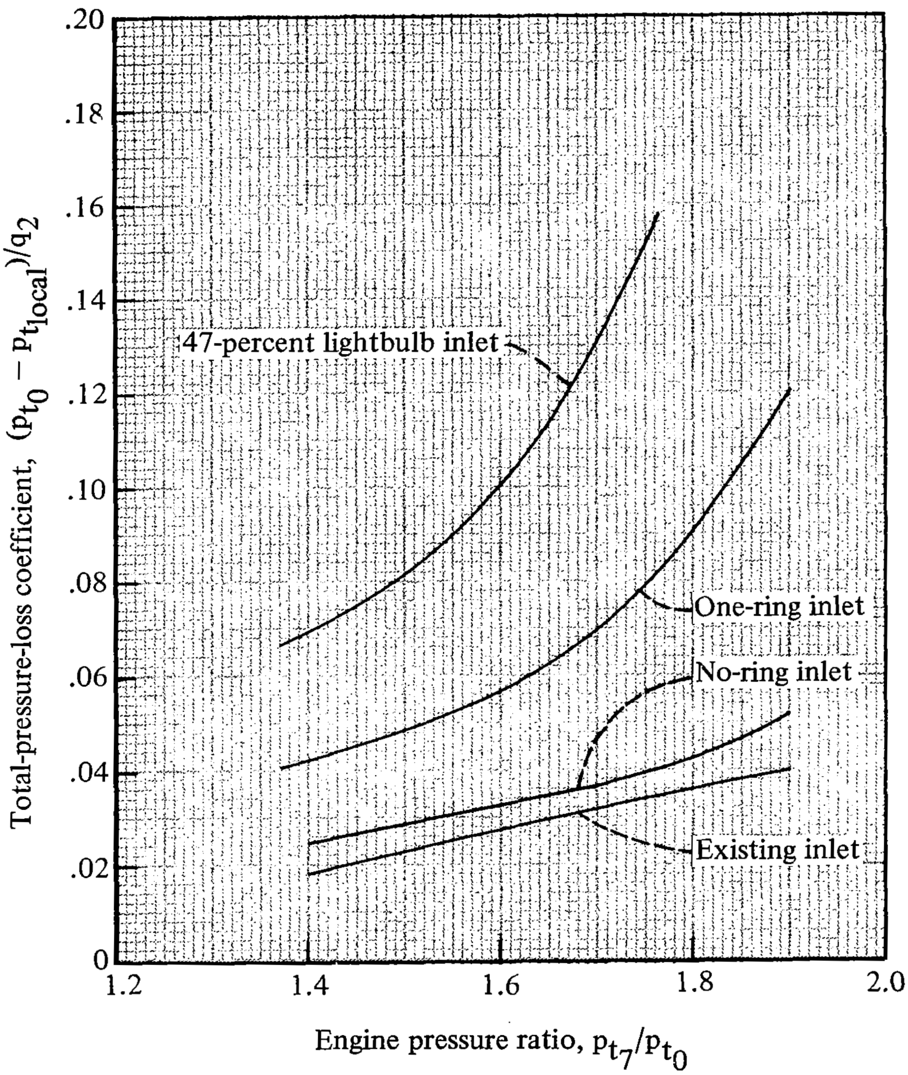
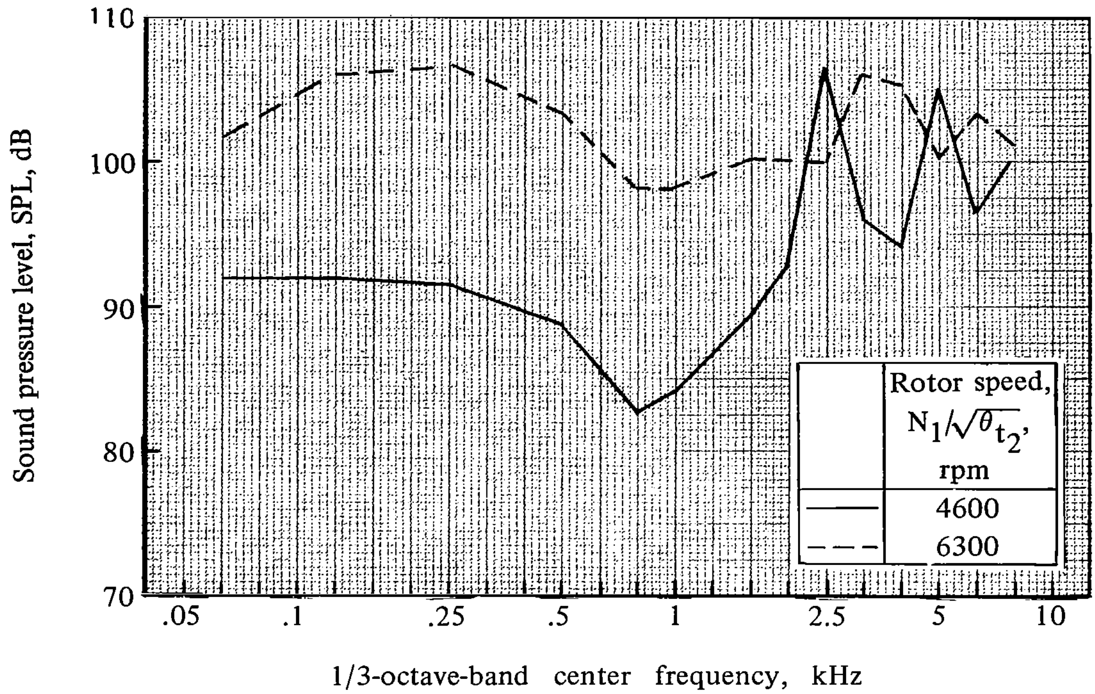
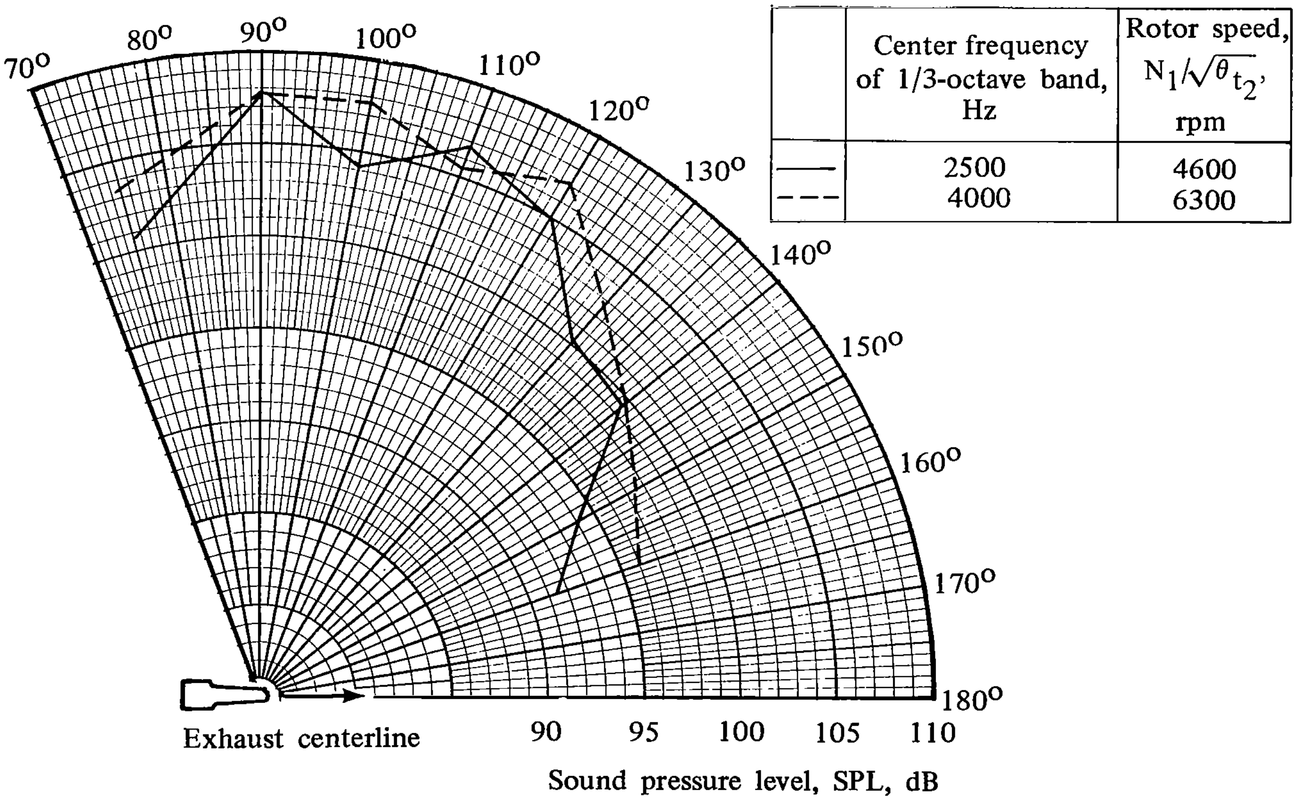


Figure 31. – Integrated total-pressure-loss coefficients for existing and modified inlets.

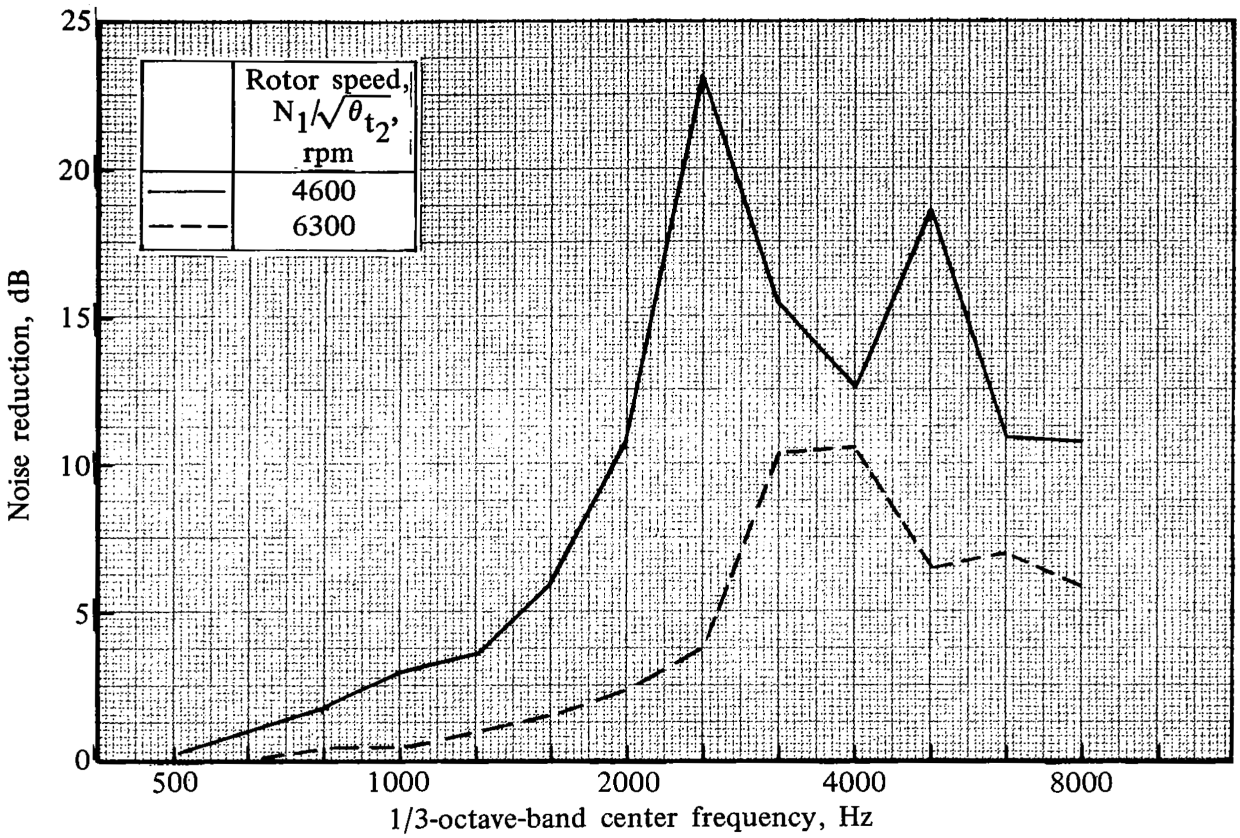


(a) SPL spectra at 110 deg.

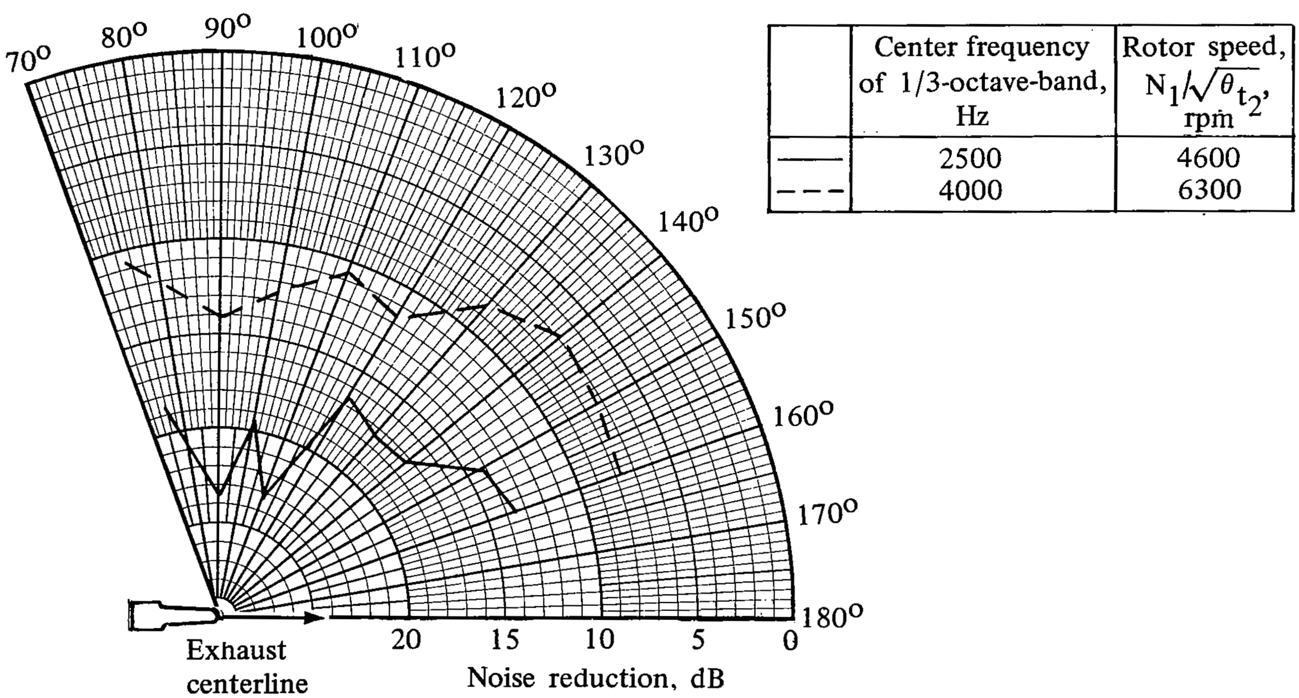


(b) Polar distribution of 1/3-octave-band SPL.

Figure 32. – Baseline SPLs at 150 ft with the inlet-noise suppressor enclosure around the inlet.



(a) Spectra of noise reduction at 110 deg.



(b) Polar distribution of noise reduction.

Figure 33. – Noise reduction in 1/3-octave bands achieved at a distance of 150 ft by the 48-in.-long fan-exhaust ducts; inlet-noise-suppressor enclosure around inlet.

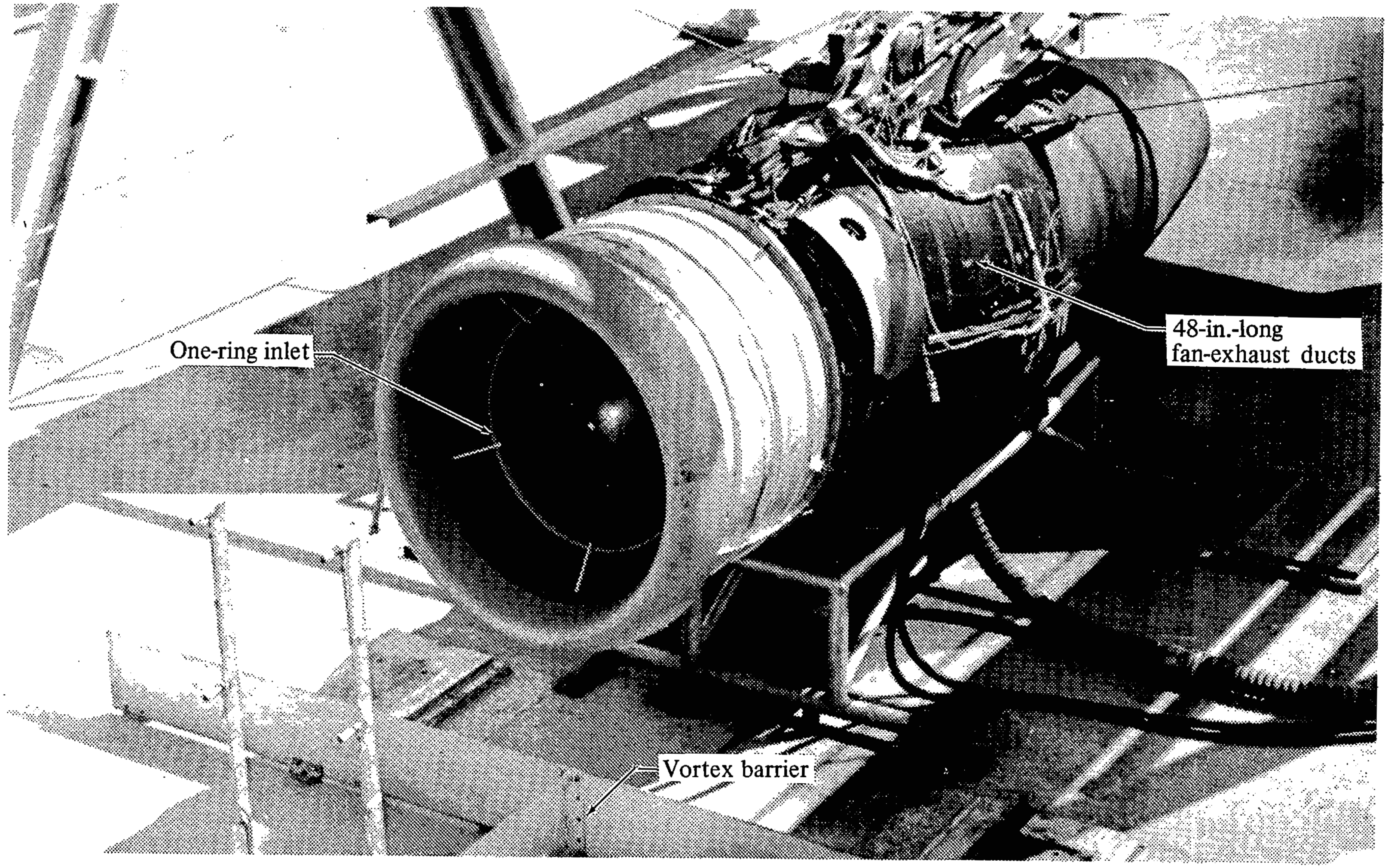
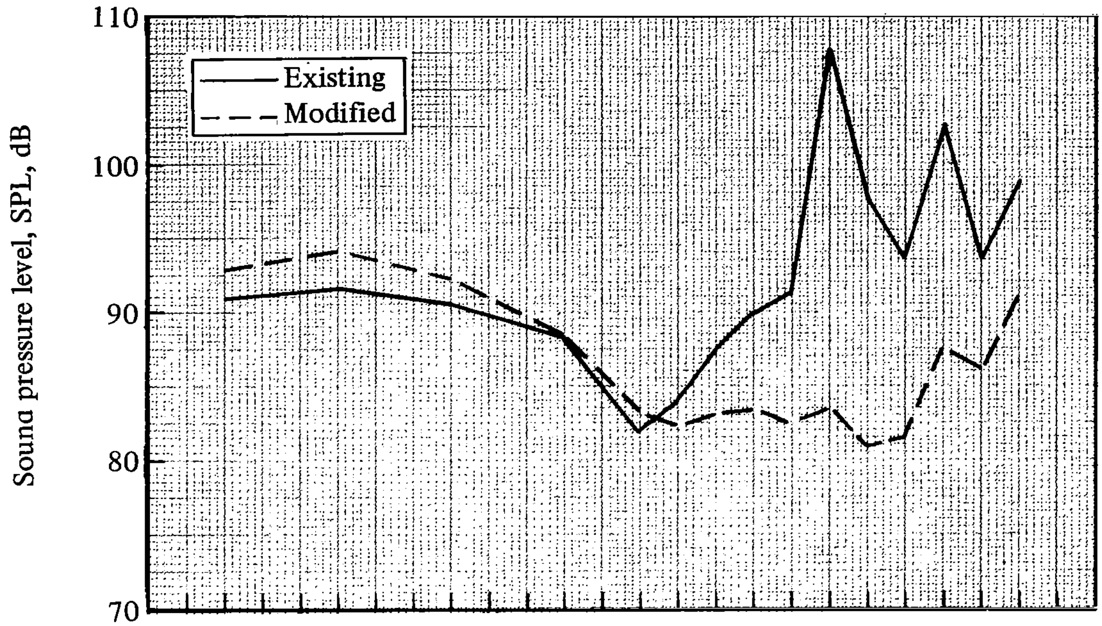
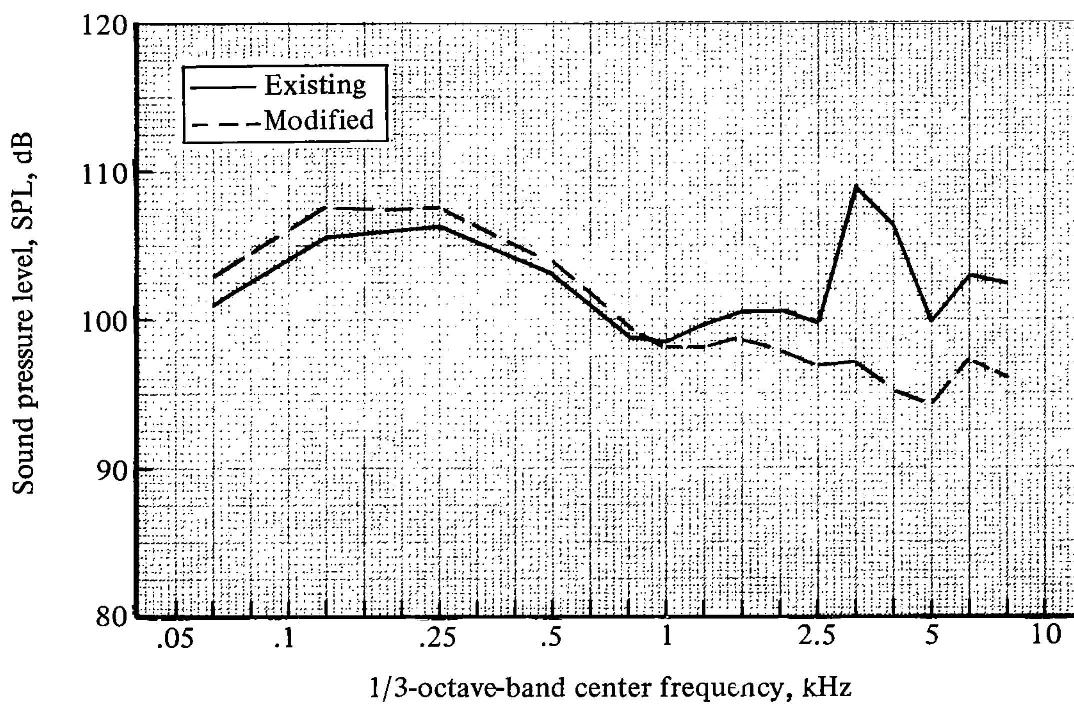


Figure 34. – Combination of one-ring treated inlet and 48-in.-long treated fan-exhaust ducts installed on the JT3D engine.



(a) 4600-rpm referred rotor speed.



(b) 6300-rpm referred rotor speed.

Figure 35. – SPLs at 110 degrees and 150 ft for the existing and the modified nacelles. The modified nacelle consisted of the one-ring treated inlet and the 48-in.-long treated fan-exhaust ducts. No noise-suppressor enclosures were installed around the engine.

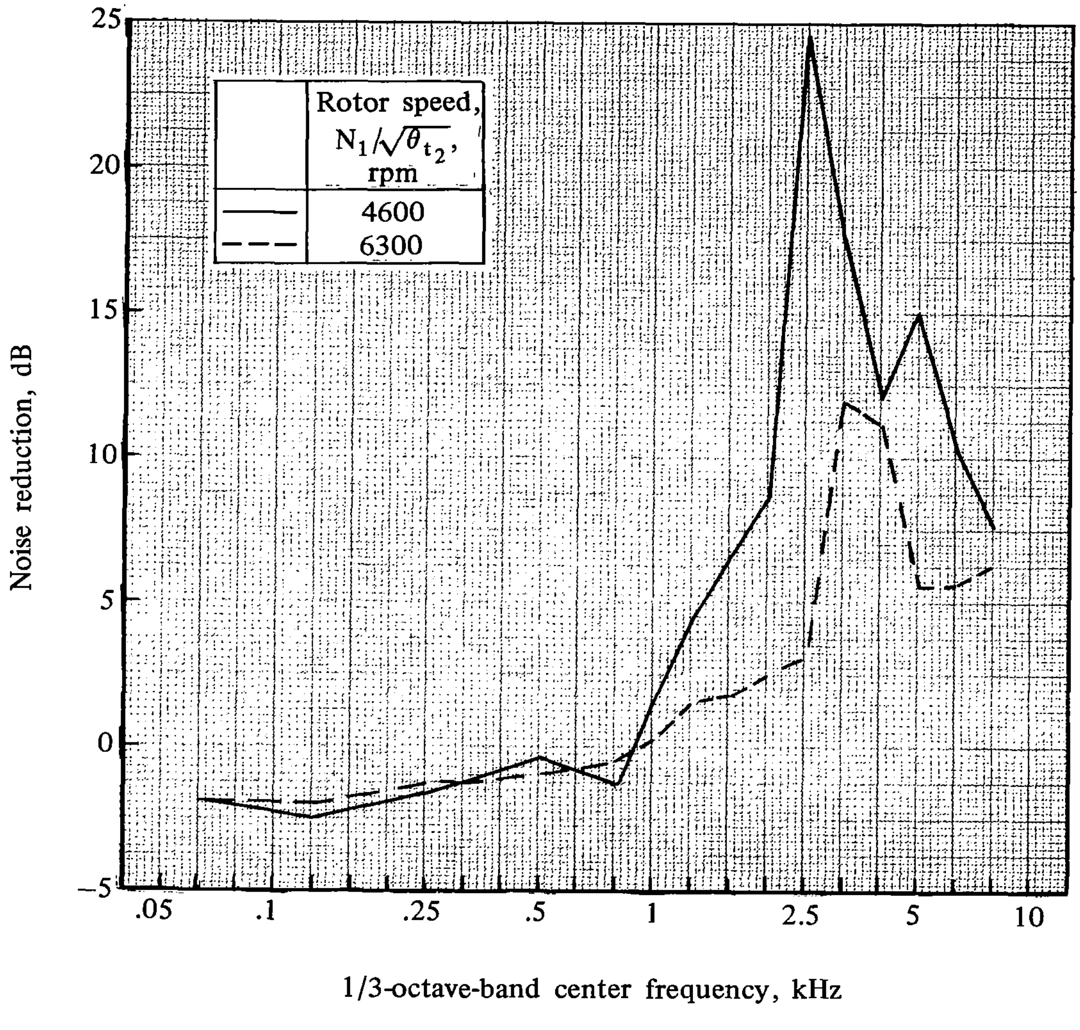
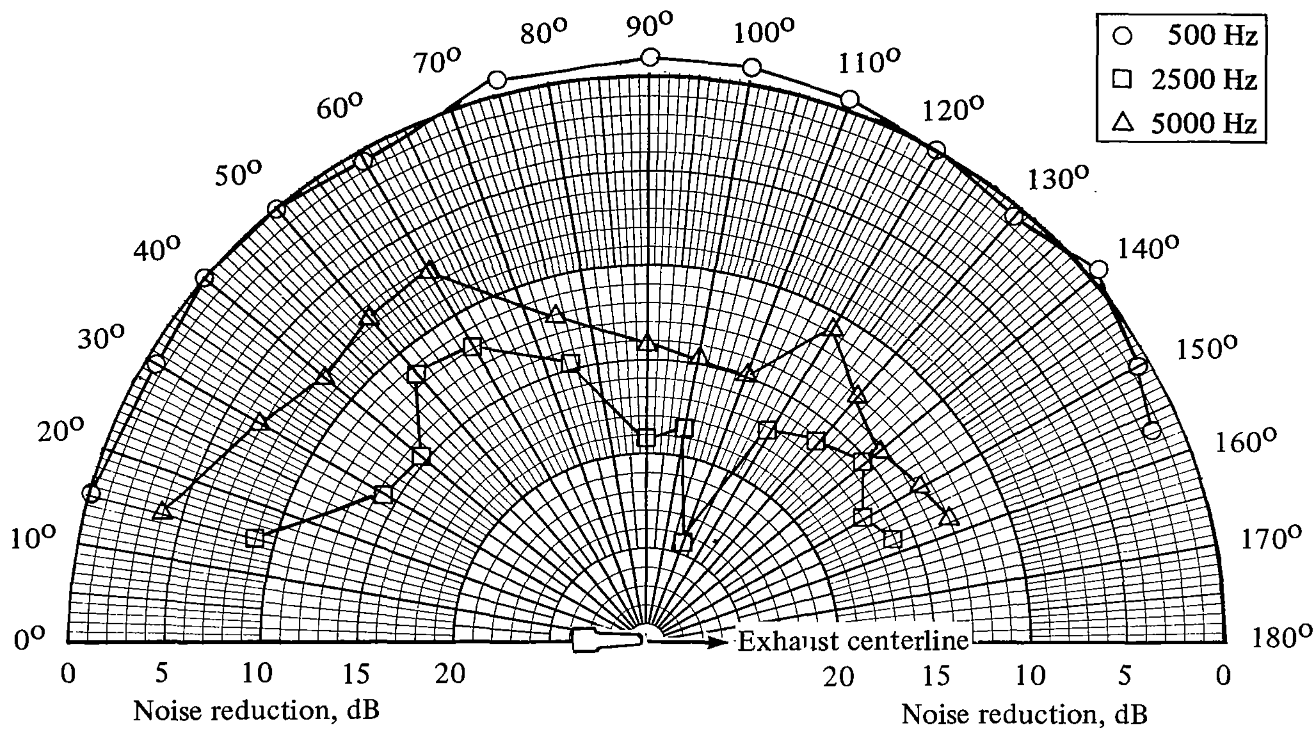
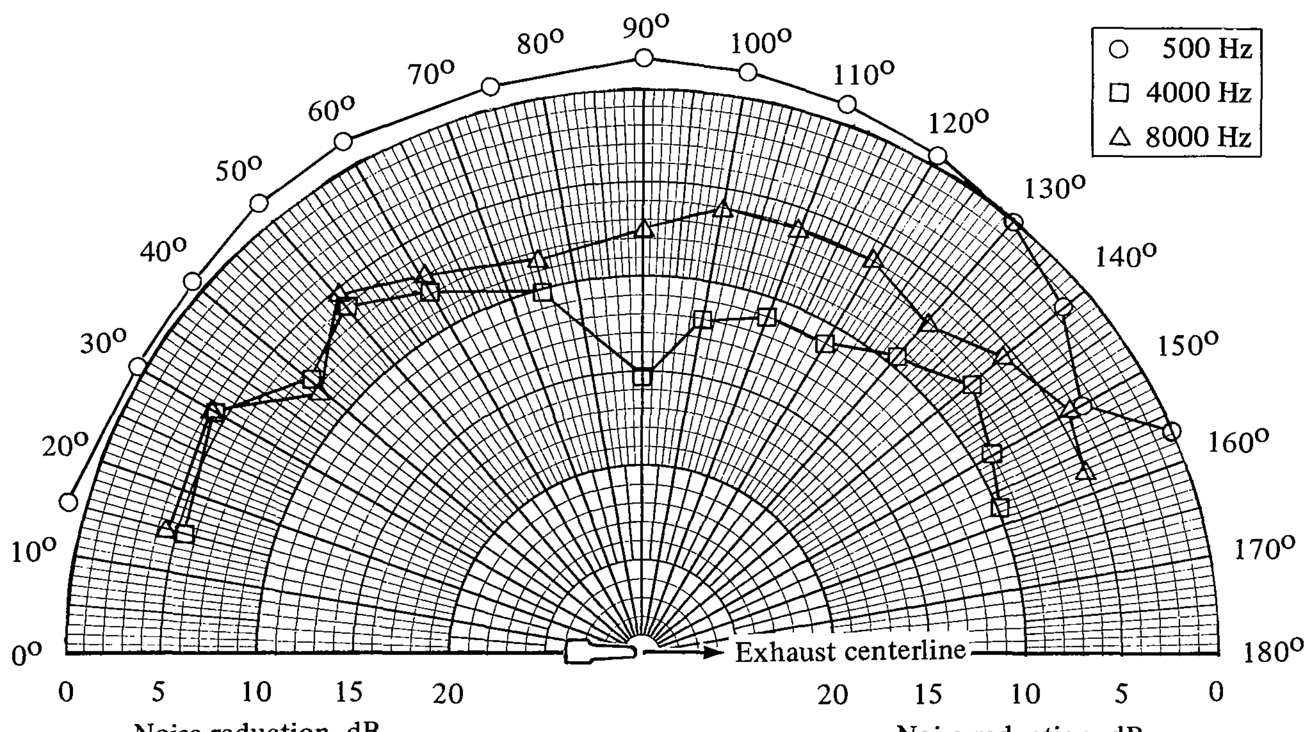


Figure 36. – Spectra of noise-reduction obtained at 110 degrees and 150 ft by the combination of the one-ring treated inlet and the 48-in.-long treated fan-exhaust ducts; no noise-suppressor enclosures around the engine.

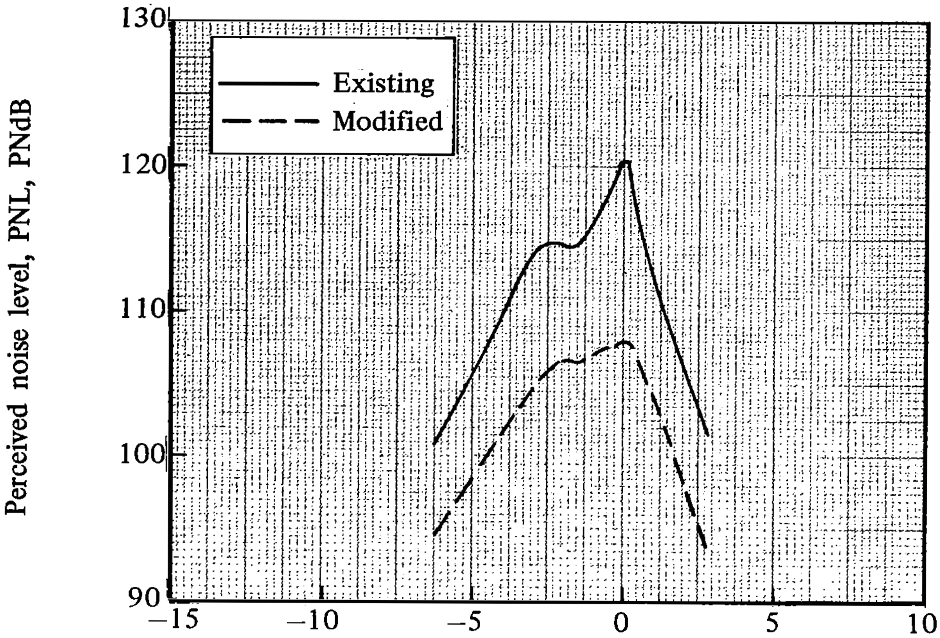


(a) 4600-rpm referred rotor speed.

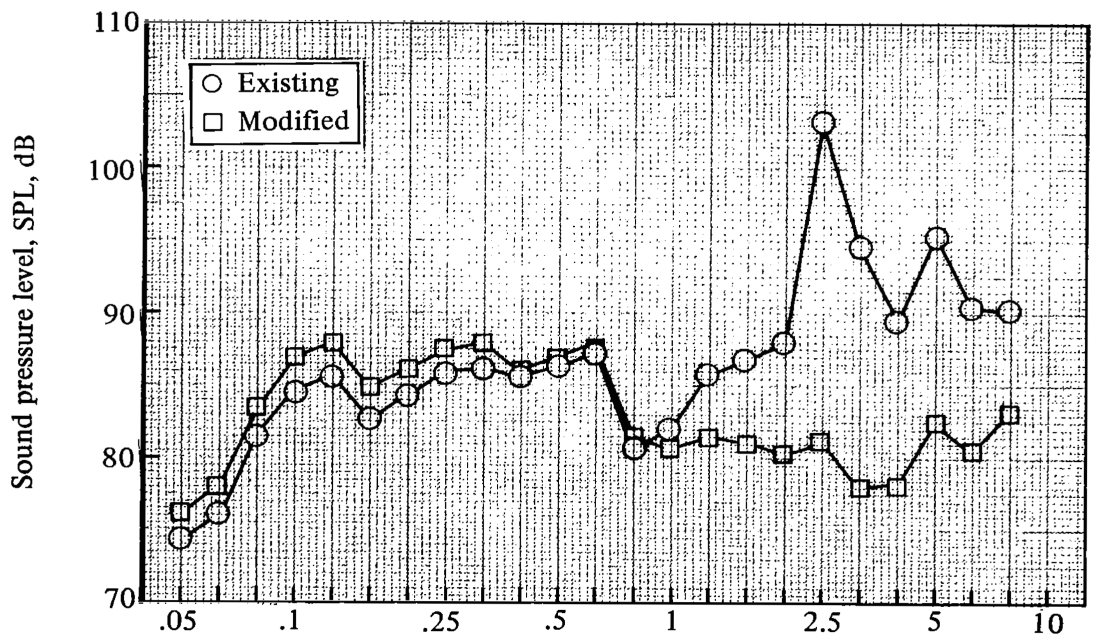


(b) 6300-rpm referred rotor speed.

Figure 37. – Polar distribution of noise-reduction achieved at a distance of 150 ft by the combination of the one-ring treated inlet and the 48-in.-long treated fan-exhaust ducts; no noise-suppressor enclosures around engine.



(a) Perceived noise levels.



(b) SPL spectra at time of PNLM.

Figure 38. – Predicted PNLs and SPL spectra at a distance of 1 n. mi. from threshold for a DC-8 airplane, with a landing gross weight of 240 000 lb, flying a 3-deg landing approach flight path. Air temperature 59°F; relative humidity 70 percent.

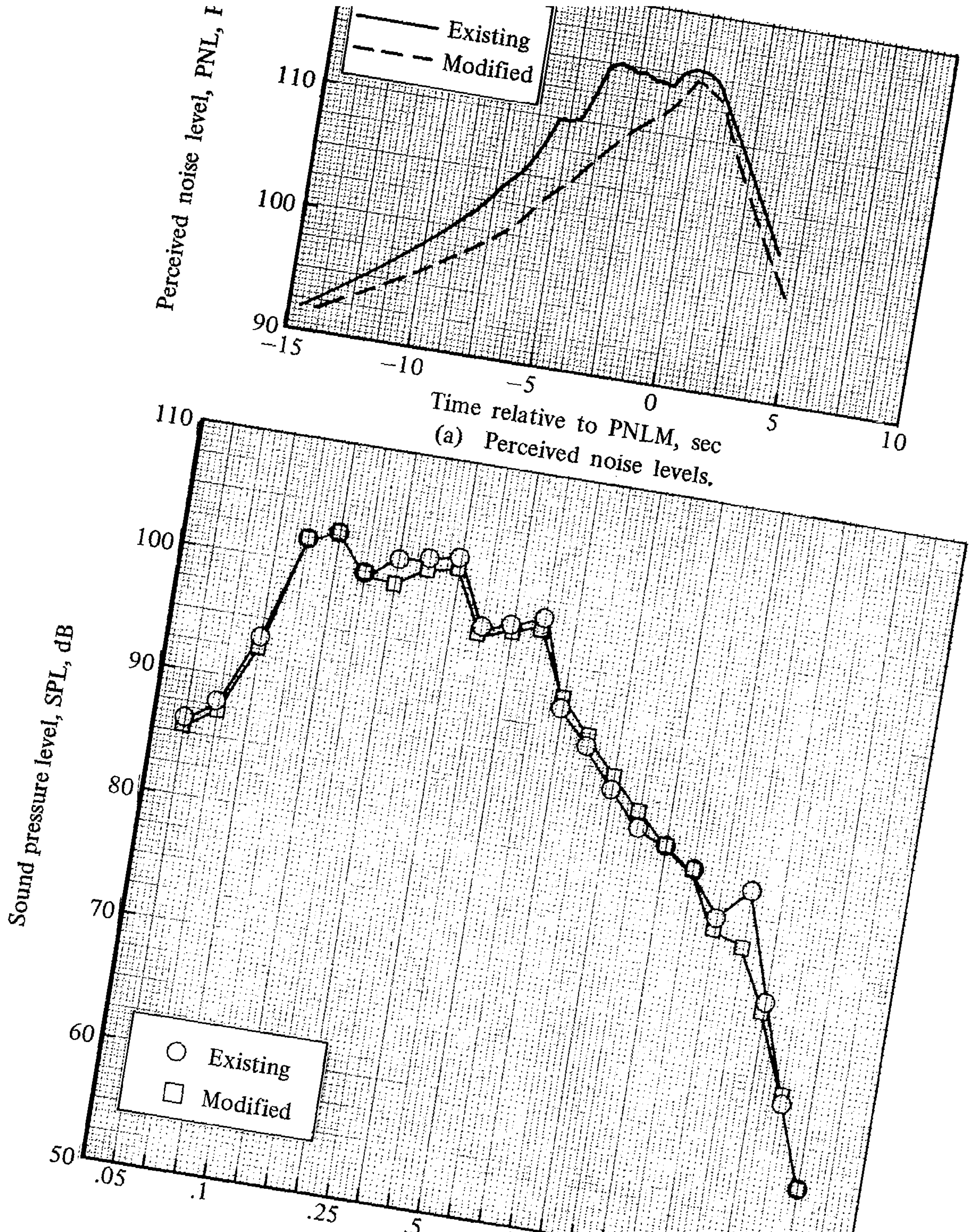
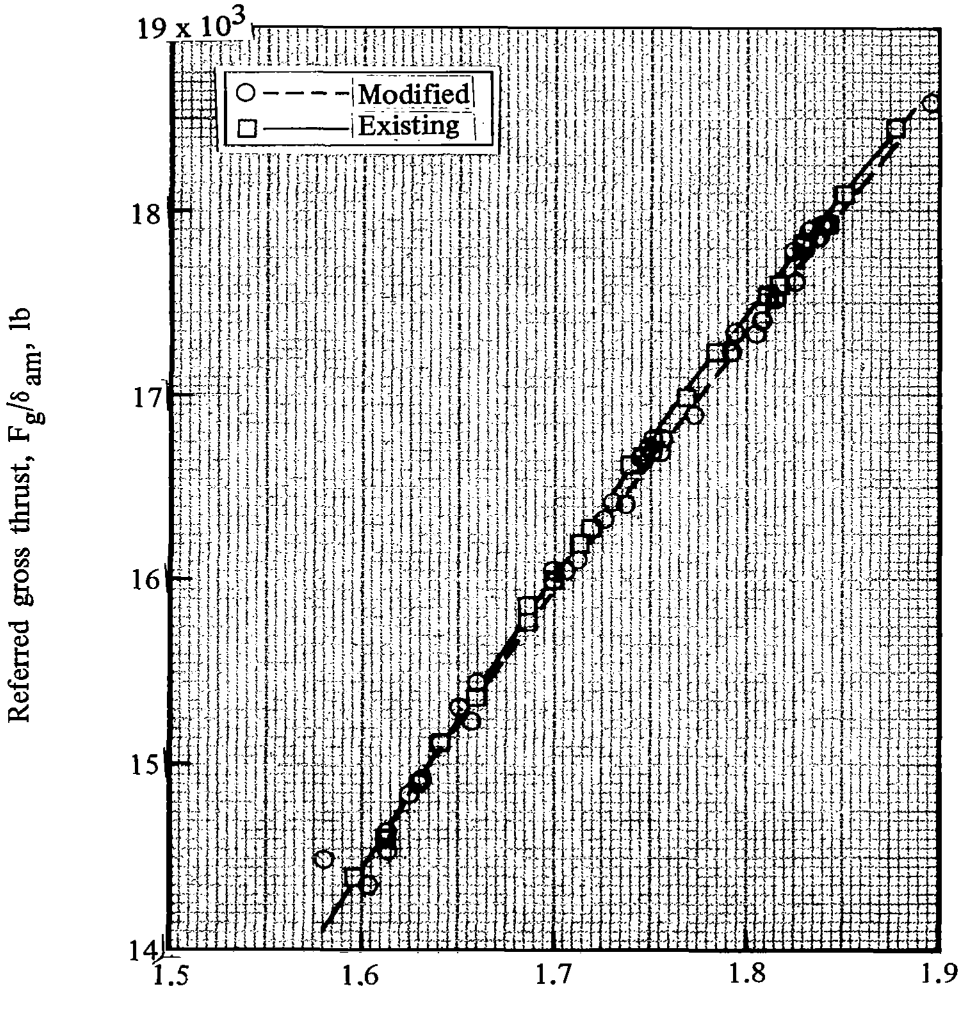
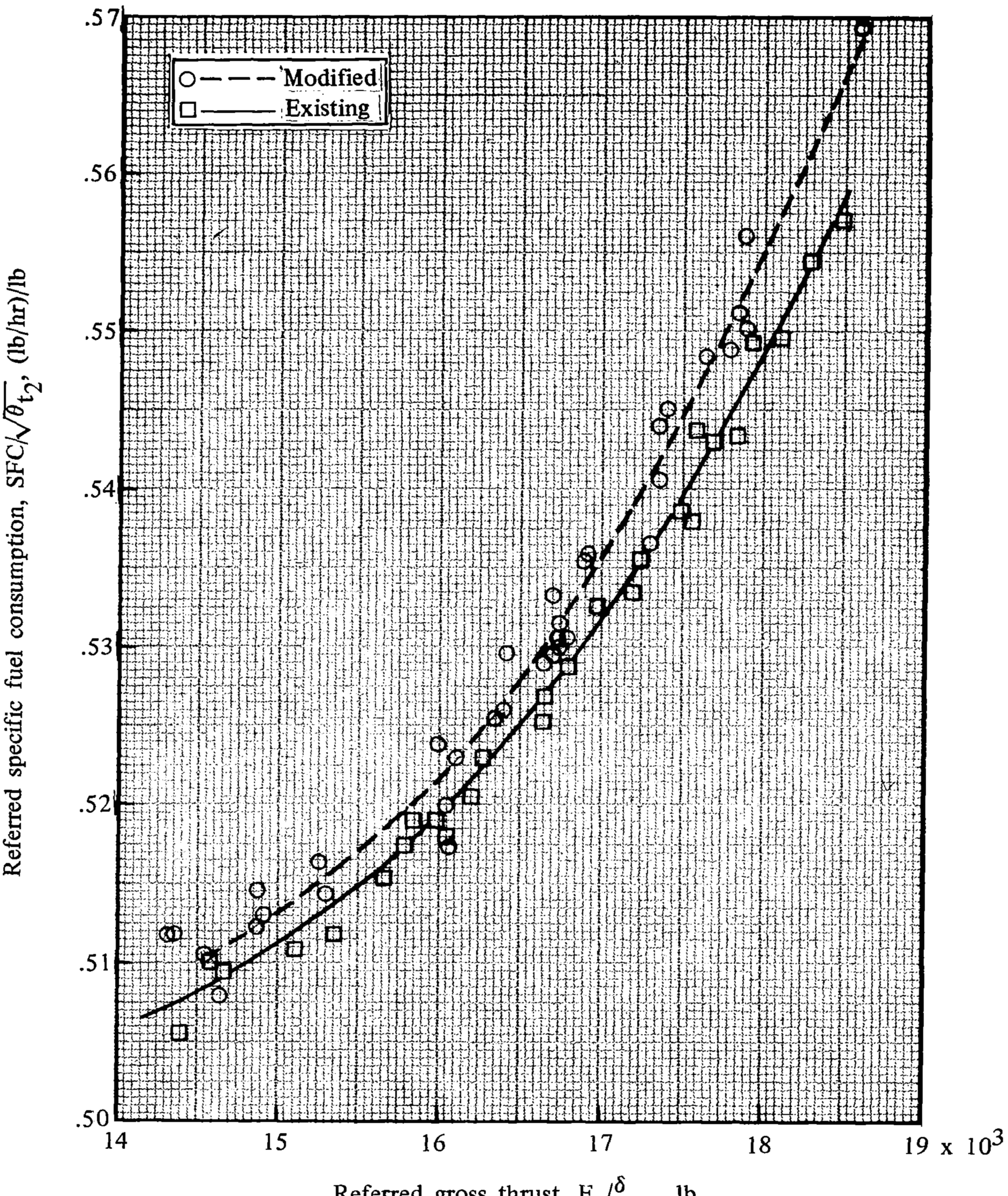


Figure 39. – Predicted PNLs and SPL spectra at a distance of 3.5 n. mi. from brake release for DC-8 airplanes, with takeoff gross weights of 325 000 lb, climbing out with an airspeed of V_2 + 10 knots and maintaining takeoff-rated thrust. Air temperature 59°F; relative humidity 70 percent.



(a) Gross thrust.

Figure 40. – Performance of JT3D engine with combination of one-ring treated inlet and 48-in.-long treated fan-exhaust ducts installed; existing production primary nozzle. No noise-suppressor enclosures around engine.



(b) Specific fuel consumption.

Figure 40. – Concluded.

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