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SPECIFICATION NUMBER 117

APRIL 18, 1962

X376 PITCH FAN ACCEPTANCE TEST SPECIFICATION

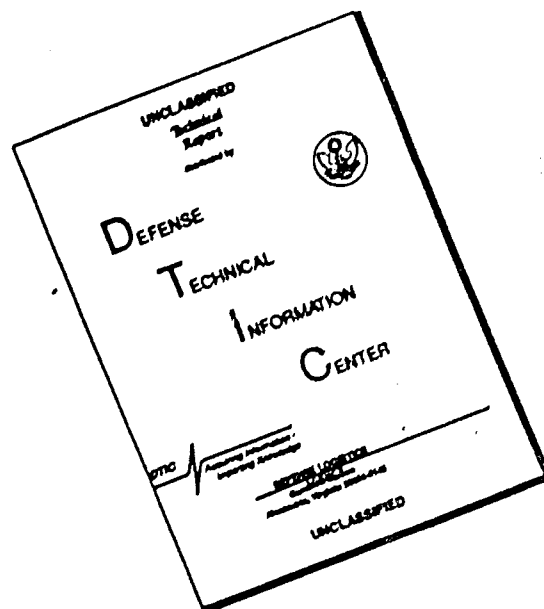
W211

LIFT FAN FLIGHT RESEARCH AIRCRAFT PROGRAM

CONTRACT NUMBER DA44 177-TC-715

GENERAL  ELECTRIC

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X376 PITCH FAN

ACCEPTANCE TEST

Specification No. 117

April 18, 1962

May 28, 1962 (Revision)

APPROVAL STATUS: This specification was approved by U.S. Army TRECOM for use on this program with modifications incorporated on pages marked 1 as of May 28, 1962.

GENERAL ELECTRIC COMPANY

FLIGHT PROPULSION LABORATORY DEPARTMENT

CINCINNATI, OHIO

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Modification  applies to the following pages:

1, 1, 4, 5, 6, 8, 11, 12, 13, 14, and 19.

Spec. No. 117

Date April 18, 1962

Revised May 28, 1962

X376 PITCH FAN

ACCEPTANCE TEST SPECIFICATION

1. SCOPE

1.1 General. - This specification defines the acceptance test requirements for the X376, ducted, pitch trim control fan conforming to Specification No. 113.

2. APPLICABLE DOCUMENTS

2.1 The X376 pitch fan Specification No. 113, and applicable publications from ANA Bulletin 343n form part of this specification in so far as specifically referenced in other paragraphs of this specification.

3. REQUIREMENTS

3.1 This section is not applicable to this specification.

4. QUALITY ASSURANCE PROVISIONS

4.1 General. - All tests defined by this specification shall be conducted at the convenience of the contractor. Systems, components and test apparatus shall be subject to inspection by authorized contracting agency representative(s) who shall be given all reasonable facilities to determine conformance with this specification. All instructions for testing of the pitch fan shall be available to the contracting agency representative(s) prior to the tests.

4.1.1 Accuracy of Data. - For all system and component cali-

brations, evaluated data shall have a steady state accuracy within the tolerances shown below. The instrumentation systems and calibration methods used by the contractor shall be subject to the approval of an authorized contracting agency representative. Calibrations shall be performed as often as necessary in the judgement of the contractor to insure the required degree of accuracy is maintained.

ITEM OF DATA

Fan speed	± 0.5 per cent of maximum rated speed
Fan thrust	± 5.0 per cent of maximum rated thrust
Weight	± 2.0 pounds
Other	Appropriate to the test in the judgement of the contractor

4.1.2 Weight. - The weight shall be measured and the center of gravity determined at the time the pitch fan is being prepared for test. If the weight is measured with research instrumentation installed, the component weight may be calculated by subtracting the weight of sensors, leads, brackets and other such equipment designated by the contractor as research instrumentation. The subtracted weight shall be substantiated in the test notes.

4.2 Test Conditions. - The test shall be conducted at the ambient conditions of the contractor's plant at Evendale, Ohio in an outdoor facility. Performance calibrations shall be obtained for wind conditions not to exceed 5 mph and with the pitch fan mounted such that, in the judgement of the contractor, there are no appreciable effects of ground proximity influencing the ratings.

4.2.1 Lubrication. - The fan bearings shall each be packed with 50 grams of contractor specified grease during initial assembly.

4.2.2 Test Apparatus. -

4.2.2.1 Gas Generator. - The gas generator(s) shall be either a YJ85-GE-5 or J85-GE-5 turbojet engine, less afterburner, used as a "slave" to the system and may be changed and/or maintained to the extent necessary to complete the test. Fuel in accordance with MIL-J-5624D shall be used. Test ducting shall be selected such that, in the judgment of the contractor, system conditions essentially as described in the X376 Pitch Fan Specification No. 113 shall be maintained as appropriate for test of the pitch fan. The performance of the gas generator(s), diverter valve(s), ducting, nozzle(s) and other equipment used to provide the conditions of the test shall not affect the acceptance of the X376 pitch fan.

4.2.2.2 Test Arrangement. - The test arrangement may include one gas generator and one diverter valve providing gas for each of the pitch fan scrolls, or two gas generators and two diverter valves and in either case excess flow from the gas generator(s) shall be discharged as bleed. The diverter valve(s) used shall be X353-5B hardware or equivalent to obtain appropriate transient test conditions.

4.2.2.3 Test Stand Dynamic Characteristics. - Vibratory amplitudes shall be measured with the propulsion system operating in a test stand which has the following dynamic characteristics: the natural frequencies of the installed propulsion system shall be no higher than 50 per cent of the rated fan speed in all modes of motion which can be excited by residual rotor unbalance.

4.2.3 Starter. - All starts shall be performed with the standard engine air impingement system using the contractor's shop air supply system.

4.2.4 Vibration Measuring Equipment. - The vibration equipment used for the measurement of component vibration shall have frequency response characteristics in accordance with the curves in Figure 1. The actual response of the vibration measuring equipment where cali-

brated by applying known sinusoidal motion to the pickup shall not deviate from the curves shown in Figure 1 by more than 5 per cent at frequencies up to 1000 cps.

4.2.5 Operating Test Conditions. -

4.2.5.1 Miscellaneous Data. - The date, operating schedule, test system model designation and serial number(s) shall be recorded on each log sheet. Test configuration details shall be included in the general log.

4.2.5.2 Test Notes. - Notes shall be placed on the log sheets of all incidents of the run such as leaks, vibrations, and other irregular functioning of the propulsion system components or the equipment, and corrective measures taken.

4.3 Preliminary Runs. - The nature and extent of the running-in prior to the acceptance tests shall be determined by the contractor.

4.3.1 Control Adjustments. -

Prior to initiation of the final run, the gas generator control(s) shall be adjusted while installed on the gas generator, using only routine field service adjustments, to produce under sea level static conditions rated lift or higher within the limits of the measured gas temperatures and rotor speeds associated with the ratings. Test data shall be extrapolated to the corrected rating point by application of the ideal fan laws if ambient conditions or the gas generator(s) used in the test preclude actual test demonstration.

4.3.1.1 Gas Requirement. - The gas flow provided to each scroll shall be discharge bleed from the gas generator(s) and shall be a nominal value at rated fan speed as determined below:

$$W_{15.3} = (0.106) (0.992) (W_g + W_f) \text{ per scroll}$$

where: 0.106 represents 10.6% X353-5B diverter valve discharge flow bleed and 0.992 represents nominal 0.8% diverter valve leakage per gas generator - diverter valve system.

4.3.1.2 Scroll Area Requirement. - The scroll areas of the pitch fan shall be trimmed for the flow in 4.3.1.1 and the total area (scroll plus excess flow bleed ducts) shall be trimmed for producing rated gas generator discharge temperature as defined in Specification No. 113 at ambient conditions corresponding to 2500 feet altitude on an ANA 421 standard hot day.

4.3.1.3 Fan Discharge Conditions. - The test equipment may include provision for simulating fan discharge conditions corresponding to maximum, nominal, and maximum reverse thrust, steady state at the contractor's option. Performance of equipment used to provide such test conditions shall not affect the acceptance of the pitch fan.

4.3.1.4 Diverter Valve Adjustment. - The diverter valve doors shall be adjusted for normal closure at either terminal position. The actuation rate shall be adjusted so that the time for full valve travel in either direction at maximum gas generator power setting shall not exceed one second.

4.3.1.5 Overspeed Signal. - The pitch fan speed signal output shall fall within limits shown on Figure 5, "X376 Fan RPM Indicating and Limiting System for VZ-11 Flight Research Vehicle".

4.4 Acceptance Test. - The acceptance test shall be conducted on each pitch fan to be delivered to the contracting agency and shall consist of the test periods specified under paragraph 4.4.1. No fan inlet distortion shall be simulated during the test. Recorded time at each test condition shall start upon com-

pletion of the reverser, power lever, and/or diverter valve movement(s) necessary to obtain the specified condition. The sequence of running the periods listed in 4.4.1.1 may be selected by the contractor.

4.4.1 Acceptance Test Schedule. - The acceptance test schedule shall consist of the following described runs.

4.4.1.1 Initial Run. - The X376 pitch fan shall be subjected to an initial run in accordance with the following schedule. The fan discharge conditions shall be maintained for maximum thrust except as noted. The power lever shall be advanced or retarded, as applicable, in not more than one second:

- a. The gas generator shall be started in the turbojet mode accelerated to idle speed and then the diverter valve shall be positioned for the lift mode.
- b. Ten minutes with the power lever in the maximum power position (lift mode). (γ = nominal, optional)
- c. Four minutes with the power lever in the maximum power position (turbojet mode) - (c.o.)^a.
- d. Ten minutes at maximum power setting (lift mode) consisting of two minutes at each of the following discharge conditions, γ :

γ = nominal	}	γ = maximum, optional
γ = maximum reverse		
γ = nominal		
γ = maximum reverse		
γ = maximum		

^aRuns marked (c.o.) are not a requirement but may be inserted at the contractor's option in order to permit performance of this test schedule in conjunction with Specification No. 116.

- e. Ten minutes at 3000 rpm (or peak vibration speed if measured to be other than this specified speed). In the event of simultaneous testing with the X353-5B propulsion system, power settings consistent with Specification No. 116 shall be used for this run. (γ = nominal, optional)
- f. Six minutes with the power lever at the normal continuous power setting (turbojet mode) - (c.o.).
- g. Ten minutes consisting of six minutes with the power lever in the maximum power position (lift mode) and four minutes with the power lever in the idle position (lift mode).
- h. The gas generator shall be shut down while in the lift mode for a period of at least five minutes. A start in the turbojet mode, conversion to lift mode at idle and acceleration to maximum power setting (lift mode) shall be made followed by eight minutes of operation with the power lever in the maximum power position. In the event of simultaneous testing with the X353-5B propulsion system any remaining time of the eight minute period after completion of Specification No. 116 transients shall be run at the idle power setting (lift mode).
- i. Two minutes consisting of the following transients:
 - (1) Turbojet acceleration, lift mode: idle to maximum power setting.
 - (2) Turbojet deceleration, lift mode: maximum to idle power setting.
 - (3) Conversion lift to turbojet mode: idle power setting.

- (4) Turbojet acceleration, turbojet mode: idle to maximum power setting (c.o.).
- (5) Conversion turbojet to lift mode: maximum power setting.
- (6) Conversion lift to turbojet mode: maximum power setting.
- (7) Turbojet deceleration, turbojet mode: maximum to idle power setting (c.o.).

Any remaining time of the two minute period shall be run at the idle power setting (turbojet mode) - (c.o.).

4.4.1.1.1 Initial Run Allowances. - The initial run may be interrupted at any point to make adjustments, inspections or perform normal line maintenance and minor part replacement not requiring component disassembly, and which is not, in the contractor's judgement, required because of a functional operating fault without penalty to the accumulated test time except if the interruption occurs to transient runs 4.4.1.1 "h" or "i" in which case a repetition of the transient run during which interruption occurs shall be required.

4.4.1.2 Inspection after Initial Run. - Upon completion of the initial run the component(s) shall be inspected without requiring disassembly unless appropriate in the judgement of the contractor. The visual inspection shall include, as applicable, at least the following items:

ITEM OF INSPECTION

Front Frame	Bulletnose	excessive grease seal leakage
	Air Seal	abnormal rubs loose or shifted seal segments
	Mounts	alignment missing or loose hardware discoloration
	General	cracks, instrumentation and fastener security
Scroll	Insulation	discoloration loose or damaged blankets
	Air Seals	evidence of dislodged segments or exceeding overlap limits
	Mounts	lock nut security alignment discoloration scoring
	General	rear frame hanger alignment nozzle condition from discharge side
Rotor	Buckets	trailing edge F.O.D., hot spots shroud damage, wear - indication of rubbing stator or insulation accumulations
	Torque Band	cracks, scratches distortion evidence of rubbing

ITEM OF INSPECTION

	Blades	nicks, scratches, cracks accumulations instrumentation security
	General	rotor runout unusual noises with rotation
Rear Frame	Stators	nicks, dents braze integrity hot spots
	Insulation	discoloration loose or damaged blankets
	General	expansion joint integrity cracks, tears distortions fastener security
Operating		
Instrumentation	T/C Resistance	electrical check
	T/C Continuity	electrical check
	Vibratory Pickups ^a	respond to displacement
	Speed Pickups	operating at end of test

If any part is found to be defective, an approved part shall be supplied to replace it. Rework or repair subject to the limitations specified in the X376 Pitch Fan Installation, Operating and Maintenance Instructions may be accomplished at the contractor's option provided the parts are not worn or defective to an extent which will prevent their being reconditioned sufficiently to enable them to pass the detailed inspection required for

^aOptional

similar unused parts; allowance for normal operation as defined by the standard on acceptability of conditions after operation, included in the X376 Maintenance Instructions, shall be applied.

4.4.1.3 Penalty Run. - The maximum penalty run shall be a complete repetition of the initial run. Any part(s) replaced or repaired because of a fault which occurs as a result of operation and is directly attributable to the part(s) quality or design shall be subject to a maximum penalty run. Expendable items such as nuts, bolts, brackets, etc., replaced because of non-functional operating faults do not require penalty testing. A penalty schedule for parts replacement or repair because of non-functional operating faults requiring less than a maximum penalty shall be approved by the contracting agency.

4.4.1.4 Inspection after Penalty Run. - Upon completion of any penalty run, the replaced or repaired part(s) shall be inspected according to 4.4.1.2 as applicable. Additional penalty runs in the event of additional parts replacement or repair in order to satisfactorily complete the initial run shall be allowed subject to 4.6.3.

4.4.1.5 Running-in Prior to Final Run. - The nature and extent of running-in, if any, prior to the final run shall be determined by the contractor. A cleaning procedure recommended for field use by the contractor and approved by the contracting agency may be applied.

4.4.1.6 Final Run. - The final run shall consist of the initial run of 4.4.1.1 except that the time duration required for each steady state power setting shall be half that required in the initial run. If facility utilization would be improved, the final run may, at the contractor's option, require the same time durations as the initial run to enable the simultaneous initial run of one component with the final run of another, subject to 4.6.3.

4.4.2 Not Applicable



4.4.3 Data. - During the tests specified in 4.4.1.1 and 4.4.1.6 the data defined in 4.4.3.1, 4.4.3.2 and 4.4.3.3 shall be recorded.

4.4.3.1 Steady-State Data. - Except for the transient runs, the following data shall be recorded where applicable once during each test period:

Time of day

Total accumulated time, hours:minutes (a separate log for accumulated time on replacement parts shall also be maintained)

Ambient dry bulb temperature, °F

Ambient wet bulb temperature, °F

Wind velocity, mph

Wind direction

Power lever position, degrees

Fan discharge setting (γ)

Diverter valve position, degrees

Scroll area, sq. in.

Cruise nozzle γ_{CF} , sq. in. } if readjusted

Data for determining trim bleed flow

Gas generator(s) rotor speed, rpm

Fan rotor speed, rpm

Vertical lift, lb.

Fuel consumption lb/hr.

Data for determining gas generator(s) air flow

Gas generator inlet total temperature, °F

Fan inlet total temperature, °F

Gas generator turbine discharge total pressure, psig

Gas generator turbine discharge total temperature, EGT, °F

Gas generator and fan vibrations, mils peak to peak
Fan bearing temperature, °F

Optional:

J85 lube oil temperature, °F
J85 lube oil pressure, psig
J85 compressor discharge pressure, psig
Fuel manifold pressure, psig

All stops shall be indicated and at least once during each test fuel specific gravity shall be recorded.

4.4.3.1.1 Ambient Conditions. - Approval of the contracting agency shall be obtained for location of the barometer pressure and ambient temperature measuring devices. A minimum stabilization time of two hours shall precede any readings for performance checks. Ambient conditions shall be read and recorded at intervals not exceeding one hour.

4.4.3.2 Transients Data. - For each transient performed in 4.4.1.1 "i", the maximum values of measured gas generator T_g harness temperature, fuel flow, gas generator speed, fan speed and power lever or diverter valve position attained during the transient shall be read and recorded. Periodic checks of fuel boost pressure and diverter valve actuator pressure shall be read and recorded throughout the test.

4.4.4 Stoppages. - Stoppage from any cause, other than required by test schedule, during the final run shall require a complete repetition of the final run. If on close inspection at the completion of the last test run any discrepancy is found which would normally result in a stoppage if known, a complete rerun after the discrepancy is corrected shall be required.

4.5 Performance. - During the final run, at least one set of observed data shall be corrected to determine comparative X376 pitch fan performance and the corrected

data shall demonstrate compliance with the following portions of Specification No. 113:

- a. Performance ratings (Table I)
- b. 3.12 Dry weight of complete pitch fan

All data concerned with the evaluation and determination of performance characteristics shall be corrected for instrument calibrations . Previously accepted components shall not be subject to retest upon recalibration of the test stand.

4.6 Rejection and Retest. - Whenever there is evidence that a pitch fan subject to the acceptance test is malfunctioning or is not meeting Specification No. 113 requirements, the difficulty shall be investigated and its cause corrected to the satisfaction of the contracting agency before the test will be considered complete. If such investigation requires disassembly involving any part of the pitch fan, as applicable, the portion of the test in which the difficulty was encountered shall be repeated. After the final run, inspection according to 4.4.1.2 plus the following items shall be required to establish conformance with the standard on acceptability of conditions after operation included in the X376 Pitch Fan Installation, Operating and Maintenance Instructions:

ITEM OF INSPECTION

Scroll	Nozzles	leading edge condition hot spots
	Struts	buckling, nicks, dents
	Skin	buckling, cracks, tears hot spots

4.6.1 Speed Signal Check. - The speed signal system shall be adjusted or replaced until conformance with 4.3.1.5 is attained.

4.6.2 Component Vibration. - When the pitch fan exceeds the maximum permissible displacements as specified in 3.17 of Specification No. 113, it shall be considered that a malfunction has occurred.

4.6.3 Maximum Hours of Running. - If any pitch fan requires more than 15 hours of running with EGT above 1000^oF to complete the quality assurance provisions defined in this specification, including preliminary runs or running-in when performed, it shall stand rejected. Parts from these rejected components may be used in reassemblies or other assemblies, provided these parts are not worn or defective to an extent which will prevent their being reconditioned sufficiently to enable them to pass the detailed inspection required for similar unused parts with allowance for normal operation condition. Parts shall not be resubmitted for testing without full particulars being given the contracting agency concerning previous rejection of the component.

4.6.4 Over Temperature. - If at any time the temperature exceeds the maximum allowable transient temperatures specified in 3.4.15 of Specification No. 113, this shall be considered a malfunction. Before the test is considered to be completed a "hot section" inspection without disassembly and excluding the gas generator shall be conducted to determine if all parts are satisfactory.

4.7 Acceptance Test Log Sheets. - The contractor shall retain copies of the acceptance test log sheets for each component for a period of two years. Copies of test sheets shall be furnished to the contracting agency upon request.

4.8 Not Applicable

4.9 Data Correction. - Readings of thrust, rpm, airflow rate, fuel flow rate, gas pressures, and gas temperatures shall be corrected to ARDC standard sea level atmospheric conditions: Correction for humidity effect will be applied when appropriate in the judgement of the contractor. In order to determine conformance with system performance ratings, the data shall be adjusted for any difference between the test gas conditions and Specifications No. 113 estimated gas conditions. Corrected values shall be obtained as follows:

$$\text{Corrected temperature, } T_c = T \left(\frac{518.688}{T_{\text{inlet}}} \right) = \frac{T}{\theta}$$

$$\text{Corrected pressure, } P_c = P \left(\frac{14.696}{P_{\text{inlet}}} \right) = \frac{P}{\delta}$$

$$\text{Corrected fan speed, } N_{fc} = N_f \sqrt{\frac{518.688}{T_{t_{20.0}}}} = \frac{N_f}{\sqrt{\theta_{20.0}}} \times C_{1h}$$

where: C_{1h} is the humidity correction, Figure 2a.

$$\text{Corrected g.g. speed, } N_{gc} = N_g \sqrt{\frac{518.688}{T_{t_{20.0}}}} \times C_{1h} = \frac{N_g}{\sqrt{\theta_{20.0}}} \times C_{1h}$$

$$\text{Corrected g.g. thrust, } F_{gc} = F_g \frac{14.696}{P_{t_{20.0}}} \times C_{2h} = \left(\frac{F_g}{\delta_{20.0}} \right) \times C_{2h}$$

where: C_{2h} is the humidity correction, Figure 3a.

$$\text{Corrected fan thrust, } L_c = L \left(\frac{14.696}{P_{t_{20.0}}} \right) C_{3h} = \frac{L}{\delta_{20.0}} \times C_{3h}$$

where: C_{3h} is the humidity correction, Figure 2b.

$$\text{Corrected g.g. airflow, } W_{ac} = W_a \left(\frac{14.696}{P_{t_{20.0}}} \right) \sqrt{\frac{T_{t_{20.0}}}{518.688}} \times C_{4h} =$$

$$\frac{W_a \sqrt{\theta_{a.0}}}{\delta_{20.0}} \times C_{4h}$$

where: C_{4h} is the humidity correction, Figure 3b.

$$\text{Exhaust gas temperature, } T_{t_{5.1c}} = T_{t_{5.1}} \left(\frac{518.688}{T_{t_{20.0}}} \right) C_{5h} = \frac{T_{t_{5.1}}}{\theta_{20.0}} \times C_{5h}$$

where: C_{5h} is the humidity correction, Figure 4a.

$$\text{Corrected fuel flow, } W_{fc} = W_f \left(\frac{14.696}{P_{t_{20.0}}} \right) \sqrt{\frac{518.688}{T_{t_{20.0}}}} \times C_{6h} =$$

$$\frac{W_f}{\delta_{20.0} \sqrt{\theta_{20.0}}} \times C_{6h}$$

where: C_{6h} is the correction for humidity, Figure 4b.

$$\text{Corrected horsepower, } HP_{15.3c} = HP_{15.3} \left(\frac{14.696}{P_{t_{20.0}}} \right) \sqrt{\frac{518.688}{T_{t_{20.0}}}} \times C_{7h} =$$

$$\frac{HP_{15.3}}{\sqrt{\theta_{20.0}} \delta_{20.0}} \times C_{7h}$$

where: C_{7h} is the correction for humidity, Figure 2c.

For Comparison of Pitch Fan Performance with that Based on Specification No. 113 Estimated Gas Conditions:

- a. determine ideal $HP_{15.3} = \frac{778}{550} T_{ts.1} C_{P6.1} \left[1 - \left(\frac{P_{in}}{P} \right)^{\frac{\gamma-1}{\gamma}} \right] W_{815.3}$
- b. correct $HP_{15.3}$ to pitch fan inlet conditions
- c. enter Figure 12, Specification No. 113 to obtain estimated lift for the value of horsepower calculated in (b) and compare the test result with this.

4.9.1 Barometer Correction. - Barometer readings shall be corrected for the difference between mercury temperature and 32°F.

4.9.2 Temperature Sensing System Calibration. - The gas generator gas temperature sensing system for the purpose of adjusting tail pipe temperature and nozzle area shall be a standard YJ85-GE-5 or J85-GE-5 engine T_5 harness, whichever is applicable, located in the diverter valve inlet in the same relative position to the gas generator and engine seal leakage recovery tubes as in the standard engine configuration. For the purpose of fan performance calculations, the indicated temperature shall be compared with a test array of thermocouples located downstream of the diverter valve. Harness calibration shall be in accordance with 4.5.

4.9.3 Bleed Thrust. - The method of accounting for any extraneous thrust from the bleed system(s) shall be provided to the contracting agency upon request.

5. PREPARATION FOR DELIVERY

5.1 Record cards in suitable jackets shall be provided with each component to be delivered providing at least the following information, where applicable:

serial numbers:

assembly

rotor parts

accumulated running time including previous history

weight

center of gravity

assembly completion date

acceptance test completion date

part deviations from Specification No. 113

balance data

performance rating at 100% speed

scroll area setting at delivery

maximum vibration level

preservation, if any

6. NOTES

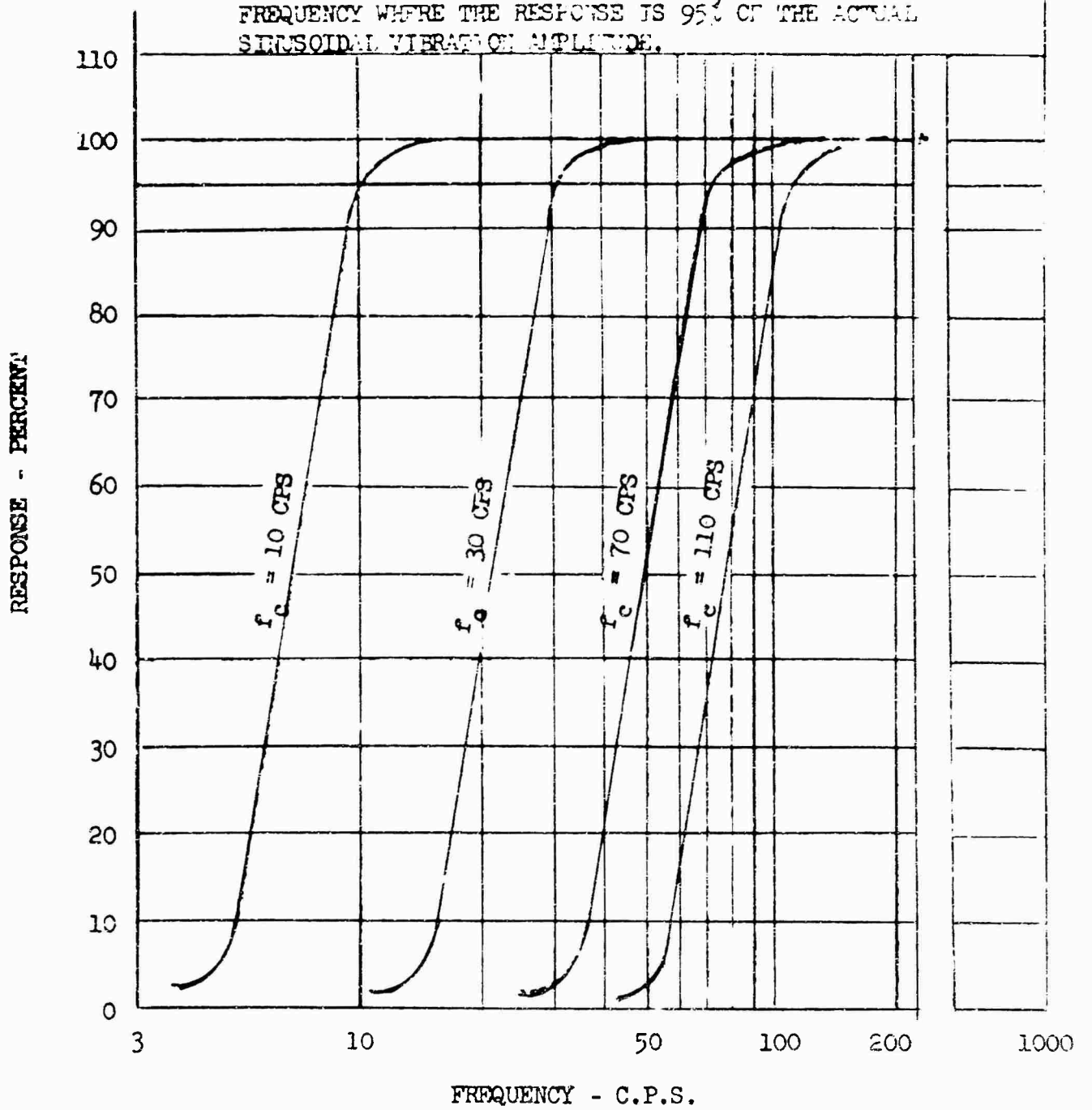
6.1 Intended Use. - This specification defines the test requirements for a ducted, pitch trim control fan intended to demonstrate the quality of each delivered X376 fan to be suitable for use by the contracting agency subject to the limitations of Specification No. 115.

6.2 Definitions and Symbols. - The definitions and symbols used in this specification are as specified in the X376 Pitch Fan Specification No. 113 and, where this is not inclusive, in MIL-E-5007B, plus the following: τ equals thrust reverser door position.

Custodian:
U.S. Army (TRECOT)

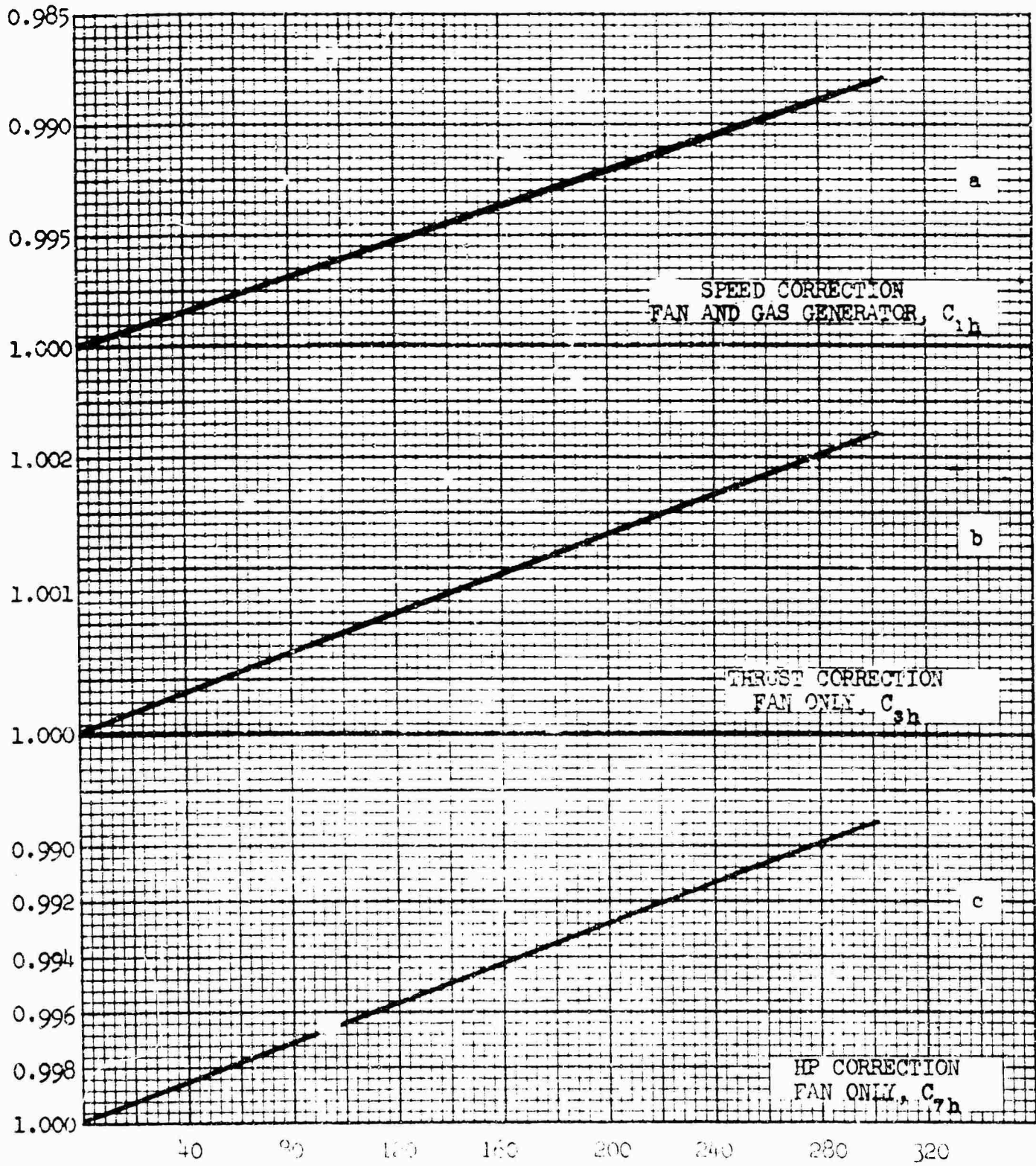
Preparing Organization:
The General Electric Company

NOTE: THE CUT-OFF FREQUENCY f_c OF THE FILTERS IN THE VIBRATION METER IS ARBITRARILY DEFINED AS THAT FREQUENCY WHERE THE RESPONSE IS 95% OF THE ACTUAL SINUSOIDAL VIBRATION AMPLITUDE.



Frequency response characteristics

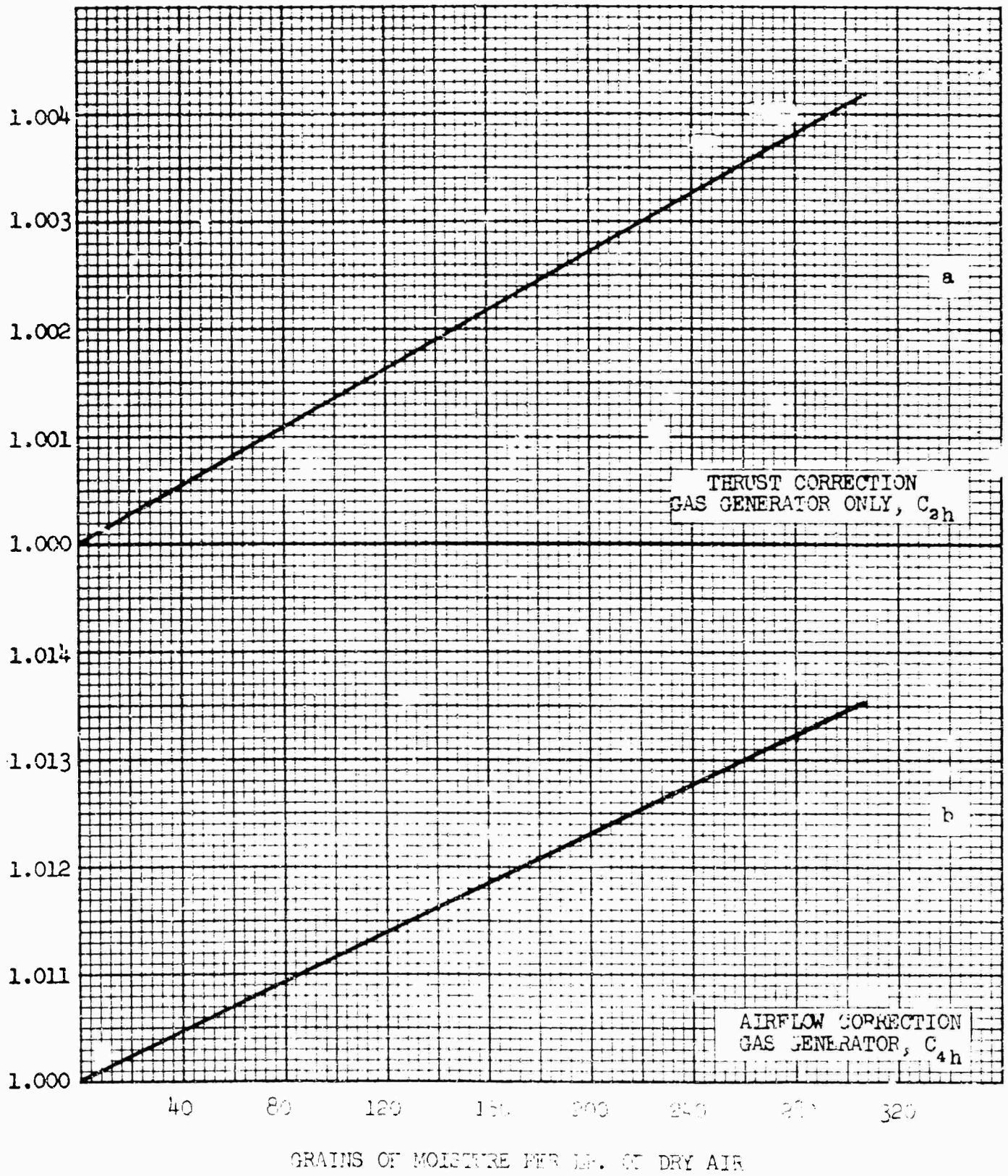
Figure 1



GRAINS OF MOISTURE PER LB. OF DRY AIR

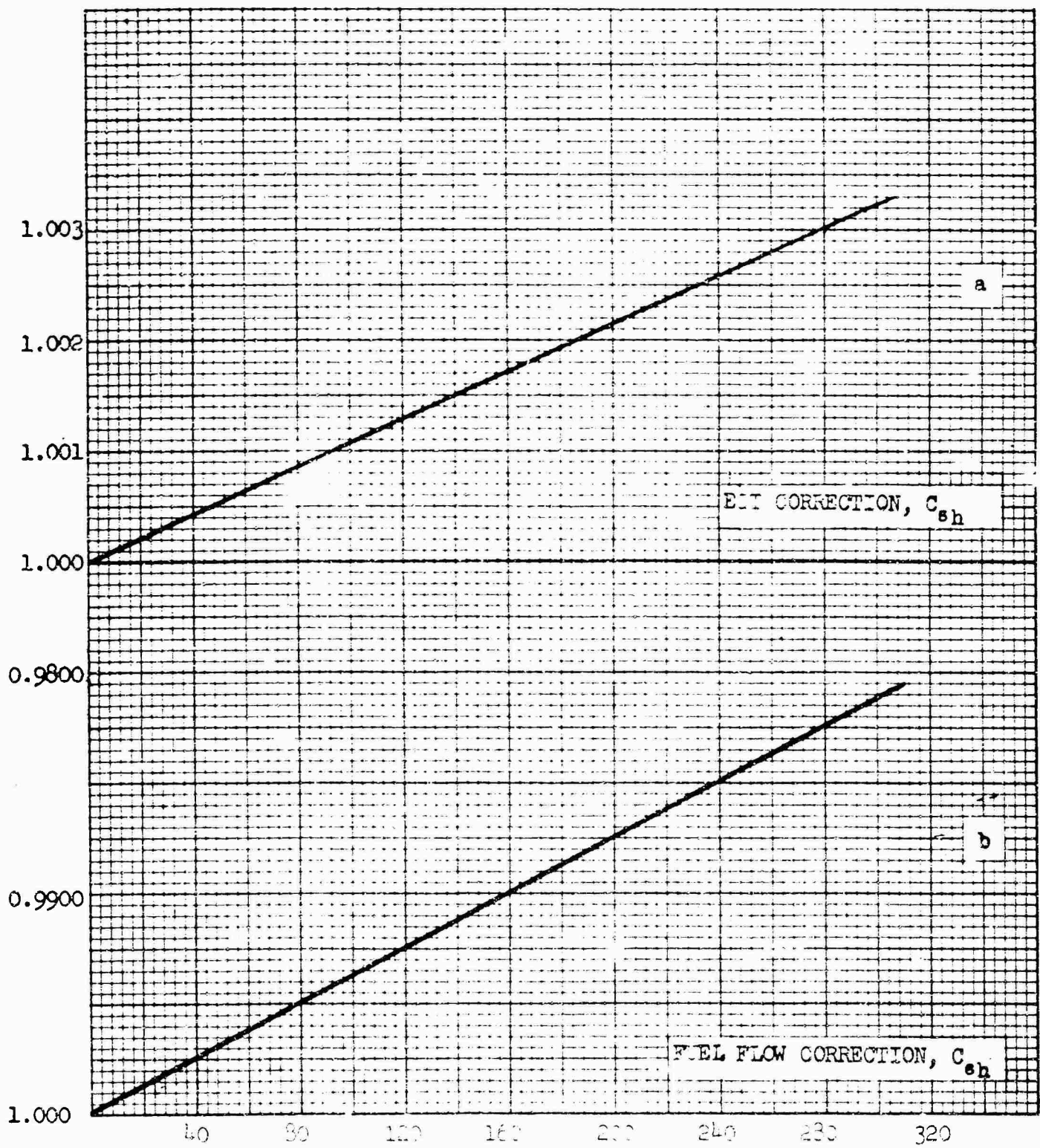
PERCENTAGE CORRECTION FACTORS

FIGURE 3-25 (b), c



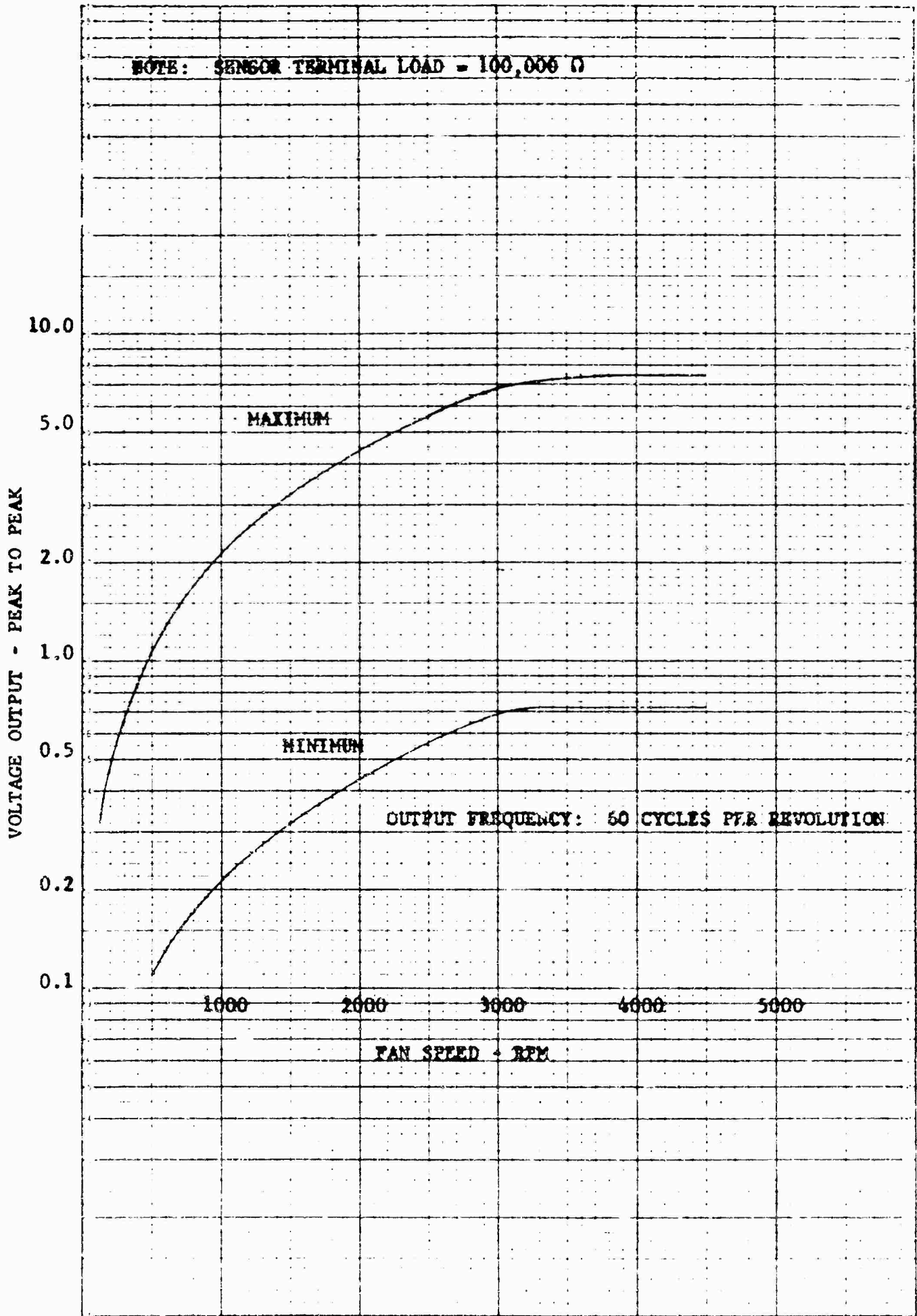
HUMIDITY CORRECTION FACTORS

FIGURE A-1



RATIO OF DENSITIES PER LB. OF FUEL PER LB. OF AIR

FUEL FLOW CORRECTION, C_{sh}



X376 RPM INDICATING AND LIMITING SYSTEM FOR VZ-11 FLIGHT RESEARCH VEHICLE

Figure 5