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INSTRUMENTATION SPECIFICATION FOR
CLIMATIC LABORATORY TESTS

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Army Aviation Systems Test Activity
Edwards Air Force Base, California

August 1973

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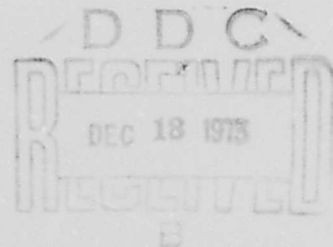
BY

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**INSTRUMENTATION SPECIFICATION
FOR CLIMATIC LABORATORY TESTS**

1. SCOPE. This specification defines the test instrumentation requirements for Climatic Laboratory tests conducted by the United States Army Aviation Systems Test Activity (USAASTA). This document is intended to provide guidance to contractors and activities that are required to instrument and support Climatic Laboratory tests conducted at Eglin Air Force Base, Florida.

2. REFERENCED DOCUMENTS.

<u>MIL-I-5289</u>	Instrumentation Installation for Climatic Test of Aircraft; General Specification For
<u>MIL-STD-882</u>	System Safety Program for Systems and Associated Subsystems and Equipment; Requirement For
<u>TM 55-1500-323-25</u>	Department of the Army Technical Manual, Installation Practice for Aircraft Electric and Electronic Wiring
<u>AMCP 706-203</u>	Engineering Design Handbook, Helicopter Engineering, Part Three, Qualification Assurance
<u>Pamphlet, 1970</u>	Climatic Laboratory Facility, Armament Development and Test Center, Eglin AFB, Florida

3. GENERAL REQUIREMENTS.

3.1 Instrumentation for the climatic tests shall be installed in the aircraft in accordance with the requirements of MIL-I-5289.

3.2 System wiring practices shall conform to the preferred methods of TM 55-1500-323-25.

3.3 All instrumentation design and installation shall comply with the system safety program requirements of MIL-STD-882, and safety statements resulting from system safety reviews.

3.4 The data acquisition format for all recording media (oscillograph, magnetic tape, etc.) shall be compatible with equipment in service at the data processing

facility, or facilities, designated by the procuring agency. The format for data processed at Eglin Air Force Base shall be coordinated with the Climatic Laboratory early in the planning phase. The data processing and environmental test facilities available at the Climatic Laboratory are described in their pamphlet entitled *The Climatic Laboratory*. This document may be obtained directly from the Climatic Laboratory at Eglin Air Force Base, Florida.

3.5 A test plan for conducting the Climatic Laboratory Survey in accordance with Sections 8-9.7 and 8-8.3 of AMCP 706-203 will be prepared by the activity or contractor designated by the procuring agency. The following information shall be included in the test plan.

- a. Test environmental conditions.
- b. The type, range, and number of measurements required.
- c. Specific transducer types.
- d. Accuracy required for each measurement.
- e. Calibration and data verification (system self-check).
- f. Data acquisition system compatibility considerations.
- g. Support requirements.
- h. Data package and documentation requirements.

3.6 Early in the planning phase of the Climatic Laboratory tests, the activity or contractor required to instrument the test aircraft shall coordinate the proposed instrumentation installation with USAASTA. The following items shall be submitted to USAASTA for coordination.

- a. Sufficient mechanical and electrical drawings to indicate general location and type of measuring instrumentation.
- b. The type and total number of transducers, electronics equipment, and recording instruments.
- c. Calibration procedures.
- d. Data reduction and output procedures, methods, and format.
- e. Support (logistic, resources, spare parts, etc.).
- f. Other system documentation.

3.7 Following coordination of the proposed instrumentation installation with USAASTA, the following items shall be submitted to the procuring agency and USAASTA for approval.

- a. Detailed drawings to indicate exact location of the instrumentation.
- b. Identification by make, nomenclature, and source of all measurement equipment to be installed in the aircraft.
- c. Calibration procedures, equipment, and standards.
- d. Sign, polarity, and data format conventions.
- e. Data reduction and presentation procedures, methods, and format.
- f. Detailed support provisions.
- g. Other system documentation.

4. DETAIL REQUIREMENTS.

Data parameters to be recorded will vary according to the particular helicopter being tested and the extent of testing required by the procuring agency. In general, data parameters to be recorded will include as a minimum the following parameters as appropriate to the particular aircraft configuration.

- a. Propulsion:
 - (1) Ambient temperature of starter.
 - (2) Cooling air temperature to starter.
 - (3) Case temperature of starter.
 - (4) Measured gas temperature.
 - (5) Engine oil temperature (inlet/outlet).
 - (6) Gas generator speed (N_g).
 - (7) Power turbine speed (N_p).
 - (8) Engine torque.
 - (9) Starter torque.
 - (10) Engine oil pressure.

- (11) Fuel flow rate.
 - (12) Compressor inlet temperature.
 - (13) Engine surface temperature (as specified).
 - (14) Engine oil cooler inlet and exit air temperature.
- b. Fuel system temperature and pressure:
- (1) Fuel temperature in tank.
 - (2) Boost pump inlet and outlet pressure, if applicable.
 - (3) Engine fuel inlet temperature.
 - (4) Fuel filter inlet pressure.
 - (5) Fuel filter outlet pressure.
 - (6) Fuel tank pressure at vent lines.
 - (7) Engine fuel inlet pressure.
- c. Hydraulic system temperatures and pressures:
- (1) Hydraulic pump inlet temperature.
 - (2) Hydraulic pump outlet temperature.
 - (3) Lateral cyclic actuator inlet temperature.
 - (4) Lateral cyclic actuator outlet temperature.
 - (5) Longitudinal cyclic actuator inlet temperature.
 - (6) Longitudinal cyclic actuator outlet temperature.
 - (7) Collective pitch actuator inlet temperature.
 - (8) Collective pitch actuator outlet temperature.
 - (9) Hydraulic pump inlet pressure.
 - (10) Hydraulic pump outlet pressure.

- d. Transmission temperatures and pressures:
 - (1) Transmission oil pump outlet temperatures.
 - (2) Oil cooler inlet temperature.
 - (3) Oil cooler outlet temperature.
 - (4) Oil filter inlet temperature.
 - (5) Oil pump outlet pressure.
 - (6) Oil cooler outlet pressure.
 - (7) Oil cooler inlet pressure.
 - (8) Oil filter inlet pressure.

- e. Intermediate and tail rotor temperatures and pressures:
 - (1) Tail rotor gearbox oil temperature (tapped in magnetic drain plug).
 - (2) Tail rotor drive bearing hanger temperature (hottest bearing - 3 parallel sensors).
 - (3) Intermediate gearbox oil temperature.
 - (4) Intermediate gearbox oil pressure.
 - (5) Tail rotor gearbox oil pressure

- f. Passenger/flight crew compartment:
 - (1) Temperature at crew and passenger head level.
 - (2) Temperature at crew and passenger waist level.
 - (3) Temperature at crew and passenger ankle level.
 - (4) Temperature at pilot/copilot/observer windshields at 0.5-inch multiple locations.
 - (5) Temperature at passenger windows at 0.5-inch offset.
 - (6) Humidity.
 - (7) Air flow.

- (8) Air supply toxicity and contamination.
- (9) Area of crew station windshield and windows that become fogged/iced.
- (10) Time required to defog/deice crew station windshields and windows.

NOTE: Data shall be in a format such that the wet bulb globe temperature (WBGT) index can be determined. This is the heat stress index preferred by the Army.

g. Stress:

- (1) Main rotor:
 - (a) Pitch link tension and compression.
 - (b) Mast bending at zero degrees and 90 degrees.
 - (c) Blade T.E. tension and compression, 3 stations.
 - (d) Blade flapwise bending, 3 stations.
 - (e) Shaft torque(s).
 - (f) Lag damper load.
 - (g) Pivoting actuator.
 - (h) Swiveling actuator
 - (i) Fixed link.
 - (j) Drive arm.
- (2) Tail rotor:
 - (a) Pitch link tension and compression.
 - (b) Shaft torque.
 - (c) Shaft bending.

h. Motion:

- (1) Main rotor blade flapping.
- (2) Main rotor blade pitch.
- (3) Tail rotor blade pitch.
- (4) Control positions.

i. Other:

- (1) Main rotor(s) thrust.
- (2) Tail rotor thrust.
- (3) Main rotor speed (N_R).
- (4) Battery voltage.
- (5) Battery current.
- (6) Voltage at starter terminals.
- (7) Current at starter terminals.
- (8) Lab main chamber ambient temperature.
- (9) Lab main chamber ambient pressure.
- (10) Battery cell temperature.