

- I. INTRODUCTION: These specifications are to be considered as being currently applicable and necessarily subject to revision from time to time, due to rapid development of the aircraft industry. The following recommendations are based on practical engineering requirements for such temperature controls as are now used on aircraft and for such as may be developed to meet the demands imposed in the field of service.

The SAE does not recommend, approve, or endorse any specific type of automatic controls and does not intend to limit the manufacturer's right to choose any design and type of construction so long as the equipment conforms to the general requirements herein set forth.

- II. SCOPE: These specifications are written to cover automatic temperature controls under three classifications, namely:

- A. AUTOMATIC TEMPERATURE CONTROLS - GENERAL - Dealing with features applicable to all types and uses.
- B. AUTOMATIC TEMPERATURE CONTROLS - MILITARY AND COMMERCIAL - Covering features applicable to military aircraft and commercial aircraft.
- C. DESIRABLE DESIGN FEATURES - General information for use of those concerned in meeting the requirements contained herein.

- III. AUTOMATIC TEMPERATURE CONTROLS - GENERAL:

A. DEFINITION

- 1. A system of automatically controlling temperatures in an airplane during the process of heating the interior or occupied spaces comprising a unit or units having the following component parts or any combination thereof:
  - a. Temperature Sensitive Elements
  - b. Regulators
  - c. Lag devices
  - d. Anticipators
  - e. Regulating Motors
  - f. Indicating Instruments

B. GENERAL REQUIREMENTS

- 1. Component parts of temperature controls shall comply with such existing government specifications or other as may apply. All units shall be constructed of materials which are considered acceptable for the particular use, and shall be furnished with the degree, uniformity, and grade of workmanship generally acceptable in the aircraft industry and satisfactory to the user.

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## 2. Dependability:

- a. Temperature regulating and indicating units and assemblies shall be manufactured and assembled with the necessary rigidity to withstand normal vibration, shock, and long usage. Prolonged vibration shall not cause equipment to short cycle.

## 3. Operation:

- a. Units may be designed for operation by the electrical, hydraulic, air, or vacuum system of the airplane.

## 4. Sensitivity:

- a. Control units shall be designed to combine maximum sensitivity and minimum time lag.
- b. Sensitivity as applied to temperature sensitive elements shall be understood to mean the ability of these units to respond to changes in air temperature.

## 5. Markings:

- a. Temperature control units shall carry the following markings:
  - (1) Manufacturer's name and/or trade mark.
  - (2) Identifying number (catalog or equivalent).
  - (3) Rating.
- b. Markings should preferably be in the form of a permanent tag or plate.
- c. Installation connections shall be suitably marked on the unit and a diagram thereof shall accompany the part.

## 6. Tests:

- a. Units shall meet satisfactory tests as determined between supplier and user for accuracy of calibration, accuracy of response, and accuracy of movement.

## 7. Samples for Tests:

- a. Samples submitted for test shall be representative of the device as regularly manufactured and marketed. The selection of test samples shall be in accordance with U. S. Army Spec. No. 94-277884.

IV. AUTOMATIC TEMPERATURE CONTROLS - MILITARY AND COMMERCIAL REQUIREMENTS:

## A. GENERAL

1. The use of automatic controls for regulation of temperature is recommended for all aircraft where such equipment can be advantageously incorporated.

## B. TEMPERATURE SENSITIVE ELEMENTS

## 1. Types:

The following types of sensitive elements are currently being incorporated in the design of automatic units for temperature control:

- a. Mercury Column
- b. Bi-Metal
- c. Resistance
- d. Expansible Liquid
- e. Thermocouple

## 2. Performance:

Representative commercial samples of temperature indicating and regulating units shall be subjected to the following tests for determination of performance.

## a. Endurance Tests:

Temperature sensitive elements shall be subjected to 50,000 cycles of operation. Upon completion of this test there shall be no evidence of mechanical or electrical failure or undue burning or pitting of electric contacts when employed.

## b. Accuracy of Scale Test:

Calibration shall be made at the mid-point of the scale, and the temperature sensitive element shall have an accuracy of  $\pm 5\%$  of the scale length at either end of the scale.

## c. Accuracy of Calibration Test

- (1) Calibration of temperature sensitive unit shall be within  $\pm 2^{\circ}$  F at the mid-point of the scale range.
- (2) The indicator of the temperature sensitive element shall first be set at the mid-point of its scale range. The actuating element shall then be placed in a well-stirred water bath at a temperature of approximately  $10^{\circ}$  F lower or higher than the scale setting. The temperature of the water shall then be raised or lowered slowly (not over  $\frac{1}{2}^{\circ}$  F per minute change) until the unit reacts. The temperature (measured by a thermometer in the water) at which the reaction is noted shall agree with the setting on the scale within the above limits.

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## C. AUTOMATIC DEVICES

No recommendations are being offered at this time because of current research and development. These devices include regulators, lag devices, and anticipators.

## D. CONTROL MOTORS

1. These include the following:

- a. Electric
- b. Air
- c. Hydraulic

2. Electric motors shall conform to all requirements as set forth in applicable SAE Specifications governing electrical motors.

3. Hydraulic motors shall conform to all requirements as set forth in applicable SAE specifications governing hydraulic equipment.

4. No recommendations are proposed under item D-1-b or D-1-c because of current research and development.

## E. INSTRUMENTS

1. All instruments used in connection with automatic temperature control in aircraft shall meet requirements as set forth in applicable SAE Specifications governing instruments.

## F. SHIELDING

1. Electrical shielding used in the installation of automatic temperature control units shall conform to requirements as set forth in applicable SAE Specifications governing radio shielding.

V. DESIRABLE DESIGN FEATURES

## A. GENERAL

1. These units shall be capable of normal handling when being shipped, and shall stand temperatures from  $-65^{\circ}$  F to  $+125^{\circ}$  F and conditions of high humidity.

2. The desired temperature control may be obtained by employing single or multiple control points depending on the nature of the requirements.

## B. ENCLOSURES

1. Enclosures for temperature sensitive elements where no dimension exceeds 6 inches may be constructed of die-cast metal of not less than 1/32 inch in thickness or of sheet metal of not less than .0188 gauge.