MIL-F-23447 (Wep)
14 September 1962

MILITARY SPECIFICATION

FIRE WARNING SYSTEMS, AIRCRAFT, RADIATION SENSING TYPE; TEST AND INSTALLATION OF

This specification has been approved by the Bureau of Naval Weapons, Department of the Navy.

1. SCOPE

1.1 Scope. This specification describes the requirements for the design, manufacture, testing and installation of radiation sensing (surveillance type) fire warning systems for use in aircraft.

2. APPLICABLE DOCUMENTS

2.1 The following documents, of the issue in effect on date of invitation to bid, form a part of this specification to the extent specified herein:

SPECIFICATIONS

Military

MIL-P-116	Preservation, Methods of
MIL-W-5088	Wiring, Aircraft, Installation of
MIL-E-5272	Environmental Testing, Aeronautical and Associated Equipment, General Specification for
MIL-E-5400	Electronic Equipment, Aircraft, General Specification for
MIL-G-5572	Gasoline, Aviation: Grades 80/87, 91/96, 100/130, 115/145
MIL-J-5624	Jet Fuel, Grades JP-3, JP-4 and JP-5
MIL-D-6055	Drums; Metal with Removable Head, Reusable Interior, Shipping
MIL-R-6106	Relays, Electrical, Aircraft, General Specification for
MIL-I-6181	Interference, Controlled Requirements, Aircraft Equipment
MIL-E-7080	Electric Equipment, Piloted Aircraft, Installation and Selection of, General Specification for
MIL-P-7936	Parts and Equipment, Aeronautical, Preparation for Delivery
MIL-I-8700	Installation and Test of Electronic Equipment in Aircraft, General Specification for
MIL-C-26482	Connectors, Electric, Circular, Miniature, Quick Disconnect
MIL-D-70327	Drawings, Engineering and Associated Lists

STANDARDS

Military

MIL-STD-130	Identification Marking of U.S. Military Property
MIL-STD-411	Aircrew Station Visual Signals
MIL-STD-704	Electric Power, Aircraft, Characteristics and Utilization of
MS 25231	Lamp, Incandescent, Single Contact, Miniature Bayonet Base, T-3-¼ Bulb
MS 33586	Metals - Definition of Dissimilar

PUBLICATION

Air Force-Navy Aeronautical Bulletin

No. 143	Specifications and Standards; Use of

(When requesting any of the applicable documents, refer to both title and number. All requests should be made via the cognizant Government inspector. Copies of this specification and other unclassified specifications and drawings required by contractors in connection with specific procurement functions should be obtained upon application to the Commanding Officer, Naval Supply Depot (Code CDS), 5801 Tabor Avenue, Philadelphia 20, Pennsylvania. All other documents should be obtained from the procuring activity or as directed by the contracting officer.)

3. REQUIREMENTS

3.1 Preproduction testing. Prior to beginning production installation of fire warning systems, preproduction tests shall be performed. (See 4.3)

3.2 Components. The fire warning system shall consist of optic sensors, a control amplifier, warning signals, a test circuit and necessary wiring. The term "system" as used in this specification shall refer to the fire warning system.

3.3 Materials and parts.

3.3.1 Metals. Metals shall be corrosion-resistant or shall be suitably protected to resist corrosion and electrolytic action for the life of the equipment. Dissimilar metals, as defined in Standard MS 33586, shall not be used in direct contact with each other.

3.3.1.1 Magnesium. The use of magnesium and its alloys shall be avoided if practicable, and its use where necessary shall be subject to approval by the Bureau of Naval Weapons.

3.3.2 Nonmetals. All nonmetals shall be moisture resistant, shall not support fungus growth and shall not be adversely affected by weathering, aircraft fluids and temperature extremes.

3.3.3 Selection of materials and parts. Specifications and standards for necessary materials and processes not specifically designated herein shall be selected in accordance with the order of precedence set forth in ANA Bulletin No. 143. AN or MIL standard parts shall be used wherever they are suitable for the purpose.

3.3.3.1 Materials. Materials shall conform to the applicable specifications in conformance with Specification MIL-E-5400.

3.3.4 Interchangeability. All parts having the same manufacturer's part number shall be directly and completely interchangeable with each other with respect to installation and performance. Changes in manufacturers' part numbers shall be governed by the drawing number requirements of Specification MIL-D-70327.

3.3.5 Weight. Weight shall be kept to a minimum consistent with other requirements of this specification.

3.4 Design requirements.

3.4.1 Function. The system shall produce an alarm signal when exposed to radiant energy (non-thermal) emitted by a flame.

3.4.2 Flame detection characteristics. The system shall indicate fire within 5 seconds after exposure to the standard test flame described herein. No alarm shall occur as a result of exposure to steady or intermittent sources of extraneous radiation such as steady or chopped sunlight, hot engine parts or artificial lighting, or any other ambient light that may exist within an engine space.

3.4.3 Detection capability. The system shall signal an alarm when operating with the maximum design number of sensors, and only one sensor is subjected to the flame. The detection capability shall not be adversely affected by accumulation of contaminants that may be encountered in normal aircraft operation.

3.4.4 Automatic repeatability. Within 5 seconds after signal clearance, the system shall be capable of signalling a re-ignition of the flame, without requiring manual resetting.

3.4.5 Abnormal flight conditions. The system shall be capable of continuing operation during abnormal flight attitudes, rapidly changing altitudes from sea level to 80,000 feet, 95% relative humidity, temperatures varying between -65°F and 180°F, contaminating atmospheres, 15g accelerations and other conditions which may be encountered during take-off, flight, landing or servicing the aircraft.

3.4.6 Prevention of false warnings. The design and installation of the system shall be such as to prevent the occurrence of false fire warnings resulting from flight operations, environmental conditions, damage to components of the system, or loose connections.

3.4.6.1 Flight conditions. A false warning shall not occur as a result of abnormal flight conditions, as described in 3.4.5.

3.4.6.2 Fault in system. A false warning shall not occur as a result of any conductor of the system accidentally becoming broken, grounded or disconnected, or contacting another conductor of the system.

3.4.6.3 Voltage variations. A false warning shall not result from transient voltage conditions, as specified in Standard MIL-STD-704, or from any intermittent voltage between 0 and 124 volts for AC powered systems, or between 0 and 29 volts for DC powered systems.

3.4.7 Fire warning signal. The system, when actuating, shall illuminate a legend-type warning signal showing the word "FIRE" in bold red lettering at least one-half inch in height. The signal shall conform to Standard MIL-STD-411 and shall be located in the direct view of the pilot and copilot.

3.4.7.1 Additional warning signal. In those aircraft where a crew member other than the pilot or copilot is responsible for the fire emergency procedure, the fire warning signal shall be located in the direct view of that crew member, and a master warning signal shall be provided for the pilot and copilot.

3.4.7.2 Lamps. Where light signals are used for fire warning, each signal shall include two MS 25231-313 lamps, or two other MS or AN lamps of equivalent wattage, in a parallel circuit. During the fire indication, the lamps shall be operated at rated current.

3.4.7.3 Zone indication. Where more than one fire warning signal is provided, each signal shall indicate the specific engine or compartment in which the fire occurs, and shall be marked in accordance with Table 1 of Standard MIL-STD-411. The fire warning signals shall differentiate between fires in different zones of the same power plant when the crew's emergency procedure differs depending upon the zone involved.

3.4.7.4 Alarm verification. Crew members shall not be required to operate a test switch to verify an alarm.

3.4.7.5 Fire extinguishing installation. In those aircraft where a fixed fire extinguishing system is installed, the fire warning light shall be incorporated in the fire emergency control handle serving the zone or area associated with the particular fire warning light. The fire warning light shall conform to the requirements of 3.4.7 through 3.4.7.4.

3.4.8 Dimming. Warning light dimming shall not be used.

3.4.9 Test provisions. A test switch shall be provided in the immediate vicinity of each fire warning signal to permit inflight and ground check of the continuity of the electrical circuits. Operational readiness shall be shown by actuation of the warning signal when the test switch is operated.

3.4.10 Supply power. The system shall comply with applicable requirements of Standard MIL-STD-704 and shall give specified performance as stated in 4.6.9. Nominal input power shall be 28 volts DC or 115 volts, 400 cycles per second, single phase.

3.4.11 Abnormal voltage protection. The system shall be capable of accepting input voltages below 102 volts AC or 17 volts DC, as applicable, without being damaged, and shall automatically resume operation when the input voltage returns within operating limits. If transistors are used in the system, protection shall be incorporated to prevent damage by 200 volts rms voltage transients of 50 milliseconds duration or by 56 volts DC voltage transients of 50 milliseconds duration, as applicable.

3.4.12 Electromagnetic interference. The system shall comply with the electromagnetic interference requirements of Specification MIL-I-6181.

3.4.13 Explosion proof. The system shall be designed to operate in an explosive atmosphere without creating an ignition hazard.

3.4.14 Sensor viewing field. The viewing field of each sensor shall include a conical volume whose envelope extends at least 45° from the center line of the cone axis.

3.4.15 Sensor temperature. The sensor shall function satisfactorily when subjected to temperatures between -65°F and 300°F over extended periods.

3.4.16 Sensitivity setting. For systems having sensitivity adjustment, the sensitivity of the installed system shall not be less than that used in the Phase I preproduction test under this specification. Sensitivity adjustments shall be secured with a locking device and sealed with tamper-proof seals.

3.4.17 Internal wiring. Internal wiring of the control amplifier and sensors shall be in accordance with Specification MIL-E-5400.

3.4.18 Hermetic sealing. The control amplifier and the sensors shall be hermetically sealed or shall be made environment-proof by other suitable means.

3.4.19 Connectors. Connectors shall conform to the applicable performance requirements of Specification MIL-C-26482.

3.4.20 Relays. Relays not enclosed in the control unit shall be in accordance with Specification MIL-R-6106.

3.4.21 Design operating life and reliability. The system shall have an operating life of at least 1000 hours without requiring removal for bench servicing. As a reliability objective, less than two inflight failures per 100 service installations should occur per year.

3.4.22 Total operating life. The system shall be designed for a minimum total operating life of 10,000 hours with reasonable servicing and replacement of parts.

3.5 Identification of product. The system components shall be marked for identification in accordance with Standard MIL-STD-130.

3.6 Installation requirements.

3.6.1 Monitored zones. The following potential fire zones, and such other zones as may be determined by the aircraft contractor, shall be monitored by the sensors:

(a) Power sections and accessory sections of reciprocating engine compartments.
(b) Compressor, burner, tailpipe (if necessary) and afterburner compartments of turbine engine installations.
(c) Accessory sections of turbine engines, if flammable fluid system components and sources of ignition are both present.
(d) Engine compartments of rocket engine installations.
(e) Auxiliary power plant compartments if not normally occupied.
(f) Compartments containing electrical or electronic equipment in the vicinity of combustibles where such compartments are not normally occupied.

3.6.2 Location of sensors. Sensors shall be located and aimed to provide complete optical coverage of sources of combustibles such as fuel and hydraulic fluid components, and sources of ignition such as electrical equipment, where the proximity of these and other sources of combustion and ignition may be potential sources of fire. The selected locations shall also comply with the following requirements.

(a) Sensors shall be located to view the paths of most probable flame travel, including air exits from potential fire zones.
(b) Sensors shall be located out of the paths of normal exhaust gases and shall not be located in positions where ambient temperatures may exceed the allowable operating temperature of the sensors.
(c) Sensors shall not be mounted on hot engine parts nor in any manner that will interfere with the ready repair or replacement of the engine, and shall be positioned to avoid facing into direct sunlight.

(d) Sensors shall be located to minimize the probability of damage during engine removal and other aircraft maintenance.

3.6.3 Accessibility. Components shall be located to facilitate repair, replacement and test, preferably without the use of special tools or the movement of other parts of the airplane.

3.6.4 Fire-resistance. Connectors, clamps and wiring located within potential fire zones shall be capable of withstanding a temperature of 2000°F for at least 5 minutes.

3.6.5 Safety wiring. All connectors shall be secured by safety wire or by a suitable locking means.

3.6.6 Electric and electronic components. Except as modified herein, installation of electric and electronic components of the system shall be in accordance with the applicable requirements of Specifications MIL-E-7080 and MIL-I-8700, respectively.

3.6.7 Wiring. The installation of all wiring of the system shall be in accordance with Specification MIL-W-5088. Wiring to the sensors shall be clamped at intervals not exceeding 8 inches, and shall be so installed as to minimize the possibility of chafing and the effects of vibration resonance of the sensors. Wiring in potential fire zones shall be protected to withstand a 2000°F fire for a period of 5 minutes without impairing the fire detection capabilities. Leads shall be isolated as required to preclude false signals if damage occurs to the leads.

3.6.8 Circuit breaker. A separate circuit breaker shall be provided for the exclusive use of each fire warning system. The electrical power shall be supplied from the essential bus. Testing circuits need not comply with the foregoing requirements provided that failure of the testing circuit will not impair the ability of the system to detect and signal a fire.

3.7 Submittal of data. Prior to the initial installation of the fire warning system, and after any changes to the engine or nacelle that may affect the operation of the system, the contractor shall submit to the Bureau of Naval Weapons, for review and concurrence, the design data listed below. The contractor shall also specifically indicate any proposed deviations from this specification.

(a) Location of control units, warning signals and test switches.
(b) A sketch of the sensor locations in relation to engines, firewalls and shrouding, and showing the field of optical coverage of each sensor.
(c) Estimated maximum temperature to which each sensor will be subjected during aircraft operations.
(d) Estimated weight of the system and major components therof.

3.8 Workmanship. All details of workmanship shall be in accordance with high grade aircraft practice.

4. QUALITY ASSURANCE PROVISIONS

4.1 Inspection responsibility. The supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified, the supplier may utilize his own or any other inspection facilities and services acceptable to the Government. Inspection records of the examination and tests shall be kept complete and available to the Government as specified in the contract or order. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure that supplies and services conform to prescribed requirements.

4.2 Classification of tests. The inspection and testing of fire warning system installations shall be classified as follows:

(a) Preproduction tests (4.3)
(b) Acceptance tests (4.4)

4.3 Preproduction tests. The preproduction tests shall consist of Phase I and Phase II preproduction testing.

4.3.1 Phase I. For purposes of this specification, Phase I preproduction tests are those test accomplished on samples submitted by the fire warning system manufacturer to demonstrate the suitability of the system with respect to design and environmental requirements of this specification.

4.3.1.1 Test reports. Unless otherwise specified, the Phase I preproduction tests shall be conducted at the supplier's plant under supervision of the Government inspector. The supplier shall furnish a test report, in duplicate, showing results of Phase I tests performed and shall indicate the test results associated with each applicable paragraph of 4.6.1 through 4.6.5 and 4.6.9 through 4.6.31. The report shall include a listing of all components successfully tested, showing nomenclature and part numbers. The test report shall be delivered to the Government Inspector for endorsement and transmittal to the Chief of the Bureau of Naval Weapons, Department of the Navy, Washington 25, D.C.

4.3.1.2 Phase I tests. Phase I preproduction tests shall consist of all tests specified in 4.6.1 through 4.6.5 and 4.6.9 through 4.6.31 under "Test methods." The tests shall be conducted consecutively in the order listed, and after the tests have been initiated, further adjustments to the system shall not be permitted.

4.3.1.3 Failure of test sample. If damage to any component occurs during the Phase I preproduction test to render the component inoperative, that component shall be replaced and all prior testing which involved satisfactory operation of the failed component shall be repeated. A false alarm signal occuring

during any of the tests shall disqualify the components from further testing. Repeat tests following a false alarm signal will be authorized only if the supplier presents satisfactory evidence that the cause of failure has been suitably remedied.

4.3.1.4 Waiver of Phase I preproduction tests. Phase I preproduction tests will not be required on subsequent orders from previous suppliers of fire warning systems, provided the product or processes have not been changed, and a certified statement to that effect is furnished to the procuring activity. The certified statement shall list the name and part number of each component for which Phase I preproduction approval was previously given, and shall reference the letter or letters of previous approval. In conducting Phase I preproduction tests, it is not intended that any test be performed if compliance with the requirements of this specification can be shown by a test previously conducted under terms of this specification. However, the procuring activity reserves the right to require performance of any of the tests at any time it is considered necessary to determine conformance of the product to this specification. Preproduction tests or certificates of previous compliance are not required for procurement of components as spares or supply items.

4.3.2 Phase II. For purposes of this specification, Phase II preproduction tests are those tests conducted to demonstrate the suitability of the system for a particular aircraft installation. Phase II tests shall be conducted on the first aircraft having a new design of the warning system installation, and shall include tests of 4.6.6, 4.6.7, 4.6.8 and 4.6.32 under "Test methods."

4.3.2.1 Approval of prior testing. In the procurement of fire warning system installations, the Government reserves the right to reject any installation submitted for Phase II preproduction testing when the components thereof have not been tested and approved under the requirements of Phase I preproduction tests.

4.4 Acceptance tests. Acceptance tests shall consist of component individual tests and installation individual tests.

4.4.1 Component individual tests. Each component of the system submitted for acceptance under contract shall be subjected to the tests of 4.6.1 through 4.6.5.

4.4.2 Installation individual tests. Each installation of a fire warning system in an airplane shall be subjected to the tests of 4.6.6, 4.6.7 and 4.6.8.

4.5 Test conditions.

4.5.1 Ambient conditions. Unless otherwise specified, all tests shall be conducted at an atmospheric pressure of approximately 29.92 inches of mercury and at an ambient temperature of approximately 75°F. Allowance shall be made in the test reports for any substantial deviation from these values.

4.5.2 Operation during tests. Unless otherwise specified, the system shall be operated under standby conditions during the tests, with rated input power applied. An alarm signal in the tests shall be indicated by illumination of two MS 25231-313 lamps. The lamps shall be connected in parallel direct to the control unit, without the use of an external relay.

4.5.3 Standard test flame. Flame tests shall be conducted with a standard flame produced by burning JP-4 fuel conforming to Specification MIL-J-5624, or 100 octane gasoline conforming to Specification MIL-G-5572, in a flat pan having an inside diameter of 5 inches and a depth of at least 3 inches. Unless otherwise specified, the air flow over the pan shall not exceed 10 feet per second. Unless otherwise specified, the sensor shall be aimed at the base of the flame and shall be 48 inches from the flame. The temperature of the sensor during exposure to the flame shall correspond to the maximum ambient temperature for which approval is requested.

4.5.4 Environmental test procedure. In performing the environmental tests of 4.6.19 through 4.6.26, the system shall be operated at standby in accordance with 4.5.2. The system used for the test of 4.6.19 shall be used in the following tests through 4.6.26.

4.6 Test methods.

4.6.1 Examination of product. Each component of the system shall be examined to determine conformance with this specification with respect to materials, workmanship and marking.

4.6.2 Response time. Each sensor shall be exposed to the test flame as described in 4.5.3 and an alarm shall occur in not more than 5 seconds. The flame shall then be blocked off and the alarm shall clear in not more than 5 seconds. For acceptance testing, a suitable colored light may be used in lieu of the standard flame test.

4.6.3 Control unit adjustment. Each control unit shall be tested to determine that its respond and reset points are within the manufacturer's design limits.

4.6.4 Insulation resistance. Each sensor and control unit shall be subjected to an insulation resistance test applied at 200 volts DC for 5 seconds between all electrical circuits connected together and the metal case. The insulation resistance shall be not less than 5 megohms. This measurement shall not be made to circuits where the test potential will appear across windings, resistors, capacitors and similar elements.

4.6.5 Dielectric test. Each sensor and control unit shall be subjected to a test potential between electrical circuits and between electrical circuits and the metal case. Except as specified in 4.6.5.1, the test potential shall be a sinusoidal voltage at a commercial frequency with an rms value of five times the maximum circuit voltage. The potential shall start from zero and

shall be increased at a uniform rate to the test value. It shall be maintained at this value for 5 seconds, and then reduced at a uniform zero. These tests are intended to insure proper electrical isolation of the circuit components, and should not be applied to circuits where the potential will appear across windings, resistors, capacitors or similar components.

4.6.5.1 Alternate dielectric test. Hermetically sealed components shall be tested at 200 volts rms. Circuits that operate at potentials below 15 volts shall not be subjected to dielectric tests.

4.6.6 Examination of installation. Each fire warning system installation shall be examined to determine compliance with the installation and functional requirements specified herein.

4.6.7 Resistance. The resistance of each installed circuit shall be checked to verify that it complies with the specified value.

4.6.8 Continuity. Each installed fire warning system shall be checked for continuity and operational readiness, as evidenced by actuation of the fire warning signals when the system integrity test is made.

4.6.9 Power variation tests. Flame tests in accordance with 4.5.3 shall be conducted under the input power conditions specified in 4.6.9.1 or 4.6.9.2. In each case, an alarm shall occur in not more than 5 seconds after exposure to flame, and shall clear in not more than 5 seconds after removal of the flame.

4.6.9.1 DC input systems. For systems operating on DC power, the flame application and removal tests shall be conducted with input voltages of 22, 28 and 29 volts.

4.6.9.2 AC input systems. For systems operating on AC power, the flame application and removal tests shall be conducted with each of the following combinations of input voltage and frequency:

a. 115 volts at 400 cps.
b. 124 volts at 380 cps.
c. 102 volts at 420 cps.

4.6.10 Saturation test. The sensor shall be mounted approximately 3 inches above the center of a flat pan, 2 feet in diameter, containing JP-4 fuel or 100 octane gasoline to a level 1/8 inch from the bottom. The fuel shall be ignited by a source that cannot be detected by the sensor. An alarm shall occur in 5 seconds or less, and shall not clear while the sensor is exposed to this test for a period of one minute.

4.6.11 Repeat response test. The sensor shall be exposed to the flame test of 4.5.3 for a period of one minute. The flame shall then be blocked off. Within 5 seconds after the alarm has cleared, the sensor shall again be exposed to the flame and an alarm shall be signalled in 5 seconds or less.

4.6.12 Partial extinguishment test. The flame test of 4.5.3 shall be applied for a period of 30 seconds. The test flame shall then be masked so as to reduce its effective area by approximately 50 percent. The alarm signal shall not clear. After an additional 30 seconds, the flame shall be removed entirely, and the alarm signal shall clear in 10 seconds or less.

4.6.13 Field of view tests. The system shall be operated with the maximum number of sensors for which it is designed. One sensor shall be subjected to the flame tests outlined below, while all other sensors are kept completely shielded from light. The standard flame test of 4.5.3 shall be performed, except that the viewing distance shall be 36 inches. The test shall be conducted with the exposed sensor aimed at each of the following viewing angles, measured from a reference line between the sensor and the flame center. The sensor shall not be rotated about its viewing axis in the tests. In each test, an alarm signal shall occur in 5 seconds or less after exposure to flame.

	Horizontal (degrees)	Vertical (degrees)
a.	0	+45
b.	0	-45
c.	+45	0
d.	-45	0

4.6.14 Sensor heat resistance. With the system operating at standby, one sensor shall be subjected to a temperature of 2000°F for two periods of one minute each. In the last 10 seconds of each period, the flame test of 4.5.3 shall be applied and an alarm shall occur in 5 seconds or less. After each period, the flame shall be masked and the alarm shall clear in 45 seconds or less. The test flame of 4.5.3 shall again be applied after the clearing following the second period, and an alarm shall occur in 5 seconds or less. Artificial means of cooling the sensor shall not be used. A false alarm occurring during this test shall constitute failure of the system.

4.6.15 Sunlight rejection. With the system operating at standby, one sensor shall be exposed to the direct rays of sunlight for a period of 30 seconds. The sunlight shall not pass through a window or filter, and shall be within 45 degrees of the zenith. The illumination shall be 5,000 foot-candles or greater, measured with a light meter facing into the sun. No alarm shall occur.

4.6.16 Subdued sunlight rejection. The test of 4.6.15 shall be repeated, except that light intensities of 10 and 20 foot-candles shall be used.

4.6.17 Fault in conductor. With the system operating at standby, the integrity test switch shall be actuated and the warning lights shall illuminate. The test switch shall be released. Each external connection shall be grounded in turn to the control unit case and to the external ground lead, and a warning signal shall not occur. Each external wire of the system shall be individually disconnected and a warning signal shall not occur.

4.6.18 Radio interference test. The system shall be tested to determine conformance with the requirements of Specification MIL-I-6181.

4.6.19 High temperature test. The system shall be subjected to the high temperature test of Specification MIL-E-5272, Procedure II. The flame test of 4.5.3 shall be performed near the completion of the high temperature test while the system is kept at the high temperature.

4.6.20 Low temperature test. The system shall be subjected to the low temperature test of Specification MIL-E-5272, Procedure I. The flame test of 4.5.3 shall be performed near the completion of the low temperature test while the system is kept at the low temperature.

4.6.21 High altitude and rate of climb test. The system, while operating at standby, shall be subjected to a pressure that is varied from normal atmospheric pressure to an altitude pressure equivalent to 80,000 feet, at a rate of not less than 20,000 feet per minute. The system shall be maintained at the 80,000 foot altitude pressure for a period of 48 hours. The pressure shall then be increased to sea level conditions. Sealed components of the system shall not leak as a result of exposure to this pressure. The resistance to leakage shall be demonstrated by subjecting the sealed portions of the system to the immersion test of Specification MIL-E-5272, Procedure I.

4.6.22 Low altitude test. The system shall be subjected to the same test as outlined in 4.6.21, except that the rate of pressure variation need not be as specified therein and the pressure shall be maintained at an altitude pressure equivalent to minus 1000 feet.

4.6.23 Rain test. The system shall be subjected to the rain test of Specification MIL-E-5272, Procedure II. The rain test shall not be required for components that have been subjected to the immersion test of 4.6.21.

4.6.24 Vibration test. The system shall be subjected to the vibration test of Specification MIL-E-5272, Procedure XII, except that a value of plus or minus 15g shall be substituted for the plus or minus 10g acceleration.

4.6.25 Salt spray test. Components of the system which are to be installed in exposed portions of the aircraft shall be subjected to the salt spray test of Specification MIL-E-5272, Procedure I, for a period of 50 hours.

4.6.26 Humidity test. The system shall be subjected to the humidity test of Specification MIL-E-5272, Procedure I, except that 5 cycles shall be performed.

4.6.27 Fungus resistance. The system shall be subjected to the fungus resistance test of Specification MIL-E-5272, Procedure I. The fungus test may be waived providing the manufacturer certifies that all components of the fire detector system are made of non-nutrient base materials.

4.6.28 Fuel and oil immersion test. The sensor shall be thoroughly immersed in 100 octane gasoline conforming to Specification MIL-G-5572 at room temperature, and then allowed to drain for one minute. The sensor shall then be thoroughly immersed in oil conforming to Specification MIL-L-7808, and

removed and allowed to drain for one minute. No cleaning other than the drainage specified above shall be permitted. The flame test of 4.5.3 shall then be performed and an alarm shall be signalled in 5 seconds or less.

4.6.29 Explosion tests. The sensor shall be subjected to the explosion test of Specification MIL-E-5272, Procedure IV. This test may be waived providing the manufacturer furnishes the Bureau of Naval Weapons with a certified statement to the effect that the components have been made explosion proof by suitable sealing and that exposed surface areas will not reach a temperature over 390°F under any combination of tests required by this specification.

4.6.30 Life test. The system shall be operated for 1000 hours, either in one continuous period or in 20 periods each consisting of 50 hours operation and 3 hours cooling. At the completion of the 1000 hours, the system shall be subjected to the flame test of 4.5.3. An alarm shall occur in 5 seconds or less after exposure to the flame, and shall clear in 5 seconds or less after removal of the flame. During the periods of operation, the sensor shall be kept in an ambient temperature of at least 300°F.

4.6.31 Disassembly and inspection. At the conclusion of the tests of 4.6.19 through 4.6.30, each component of the system shall be disassembled to the extent practicable and shall be inspected. Any evidence of major deterioration, corrosion or excessive wear shall be cause for rejection.

4.6.32 Flight demonstration. The following tests shall be performed during the flight demonstration of the airplane to verify that the fire warning system will not indicate a false warning under various flight operating conditions, with any combination of atmospheric conditions that may be encountered:

(a) Engine start.
(b) Quick warm-up to maximum allowable temperature.
(c) Ground run-up to full power.
(d) Take-off.
(e) Military power climb from take-off (and maximum thrust).
(f) Level flight at full military power (and maximum thrust) at service ceiling and below 20,000 feet.
(g) Propellor feathering, if applicable.
(h) Engine restart during flight, at minimum allowable airspeed (if permissible).
(i) Landing roll with maximum allowable reversed-thrust operation.
(j) Dive from service ceiling under conditions simultaneously resulting in both maximum increase in ambient air and airplane speed. The change shall be accomplished in minimum practicable time, starting from low speed conditions.
(k) Missed approach or go-around after long low-power approach.
(l) Flight with airplane tail facing into the sun at sunset.

4.7 Engineering inspection. The fire warning system installation of one of the first complete experimental or production aircraft will be subject to inspection by an engineering representative of the Bureau of Naval Weapons

for conformance with the requirements of this specification. It is expected that this inspection will be conducted at the aircraft contractor's plant concurrently with similar engineering inspections of other systems of the aircraft.

4.8 Satisfactory performance. Failure of any component being tested to meet the requirements of any specified test, or occurrence of a false alarm during any test, shall constitute failure of the component.

5. PREPARATION FOR DELIVERY

5.1 Application. The requirements of Section 5 apply only to system components that are purchased directly by or shipped directly to the Government.

5.2 Preservation and packaging.

5.2.1 Level A. When this level is specified, components of the fire warning system shall be preserved and packaged in accordance with Specification MIL-P-7936. Unit packaging of control units and sensors shall be in accordance with Method IId under Specification MIL-P-116, using a container conforming to Specification MIL-D-6055. All other components shall be packaged in accordance with Method III under Specification MIL-P-116, using a MIL-D-6055 container.

5.2.1.1 Non-mixing of components. Unless otherwise specified, interior packages shall contain items of only one part number.

5.2.2 Level C. When this level is specified, the above components shall be preserved and packaged in accordance with standard commercial practice.

5.3 Packing.

5.3.1 Level A and B. When level A or level B is specified, packaged items shall be packed for overseas or domestic shipment, respectively, in accordance with Specification MIL-P-7936.

5.3.2 Level C. When this level is specified, fire warning system components shall be prepared for shipment to comply with standard commercial regulations.

5.4 Marking. Marking of interior and exterior containers shall be in accordance with Specification MIL-P-7936.

6. NOTES

6.1 Intended use. Fire warning systems covered by this specification are intended for use in engine spaces or other normally unoccupied compartments in aircraft where the presence of combustible fluids presents a potential fire hazard.

6.2 Ordering data. Requisitions, contracts and orders should refer to the title, number and date of this specification and should state the levels of packaging and packing desired.

6.3 Preproduction tests.

6.3.1 Authorization for Phase I preproduction tests. Manufacturers planning to conduct Phase I preproduction tests should notify the cognizant Government inspection office sufficiently in advance to permit arranging the required inspection supervision.

6.3.2 Phase I preproduction tests. In the case of Phase I preproduction tests, written notice of approval or disapproval will be given to the fire warning system manufacturer by the Bureau of Naval Weapons.

6.3.2.1 Alteration after approval. If any alteration in material or construction of a component is made after approval of the test, the manufacturer should immediately notify the Bureau of Naval Weapons, outlining points of similarity and differences between the approved and the altered component. Supplementary tests will be required at the option of the Bureau of Naval Weapons.

6.3.3 Phase II preproduction tests. In the case of Phase II preproduction tests, written notice of approval will be given to the aircraft prime contractor by the Bureau of Naval Weapons.

6.3.4 Information on tests. Requests for information pertaining to the Phase I or Phase II preproduction tests should be addressed to the Chief of the Bureau of Naval Weapons, Department of the Navy, Washington 25, D.C.

6.3.5 Waiver of Phase I preproduction tests. Under the conditions specified in 4.3.1.4, Phase I preproduction tests may be waived.

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

OMB Approval
No. 22-R255

INSTRUCTIONS: The purpose of this form is to solicit beneficial comments which will help achieve procurement of suitable products at reasonable cost and minimum delay, or will otherwise enhance use of the document. DoD contractors, government activities, or manufacturers/ vendors who are prospective suppliers of the product are invited to submit comments to the government. Fold on lines on reverse side, staple in corner, and send to preparing activity. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements. Attach any pertinent data which may be of use in improving this document. If there are additional papers, attach to form and place both in an envelope addressed to preparing activity.

DOCUMENT IDENTIFIER AND TITLE

NAME OF ORGANIZATION AND ADDRESS

CONTRACT NUMBER

MATERIAL PROCURED UNDER A

☐ DIRECT GOVERNMENT CONTRACT ☐ SUBCONTRACT

1. HAS ANY PART OF THE DOCUMENT CREATED PROBLEMS OR REQUIRED INTERPRETATION IN PROCUREMENT USE?
   A. GIVE PARAGRAPH NUMBER AND WORDING.

   B. RECOMMENDATIONS FOR CORRECTING THE DEFICIENCIES

2. COMMENTS ON ANY DOCUMENT REQUIREMENT CONSIDERED TOO RIGID

3. IS THE DOCUMENT RESTRICTIVE?

   ☐ YES ☐ NO *(If "Yes", in what way?)*

4. REMARKS

SUBMITTED BY *(Printed or typed name and address - Optional)*

TELEPHONE NO.

DATE

DD FORM 1 JAN 72 1426 REPLACES EDITION OF 1 JAN 66 WHICH MAY BE USED S/N 0102-014-1802