

NOT MEASUREMENT SENSITIVE

MIL-STD-27733

18 May 1998

**DEPARTMENT OF DEFENSE
STANDARD PRACTICE**

**MODIFICATION AND MARKING REQUIREMENTS
FOR TEST EQUIPMENT
IN AEROSPACE VEHICLES
AND RELATED SUPPORT EQUIPMENT**



AMSC F7307

FSC 15GP

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

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FOREWORD

1. This standard is approved for use by all Departments and Agencies of the Department of Defense (DoD).

2. This standard identifies marking, safety, and configuration control practices for temporary non-standard modifications on Department of Defense owned aerospace vehicles, and related support equipment in support of research, development, test and evaluation.

3. The standard marking requirements provide the operational and maintenance community the ability to easily identify test and associated equipment installed in aerospace vehicles. These standard marking requirements also provide a common interface between all departments and agencies operating and maintaining aerospace vehicles modified with test equipment. The marking requirements are not defined in any other handbooks, non-government standards, or military specifications.

4. This document addresses unique safety concerns that are encountered with temporary non-standard modifications. Airworthiness certificates, operational ground checks, aerodynamic evaluation flights, and examination of products are specified in this standard to help ensure the safety of aircrew and ground-crew members associated with aerospace vehicles that have temporary non-standard modifications accomplished.

5. Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to 412 TW/TSIDM, 25 N Wolfe Ave, Edwards AFB, CA 93524, or to the Preparing Activity; using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document.

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1. SCOPE

1.1 Scope. This standard identifies marking, safety, and configuration control practices for temporary non-standard modifications on Department of Defense owned aerospace vehicles, and related support equipment in support of research, development, test and evaluation.

2. APPLICABLE DOCUMENTS. Not applicable.

3. DEFINITIONS

3.1 Modification engineering authority. Modification engineering authority is the government engineering activity responsible for the safe integration of the temporary non-standard modification into the aerospace vehicle and related ground support equipment.

3.2 Modification number. A modification number is a unique number issued by the configuration management office responsible for the temporary non-standard modification project. The modification number is to be used to track the modification and will appear on the modification paperwork generated.

3.3 Temporary non-standard modification. Temporary non-standard modifications are temporary hardware or software changes or alterations to aerospace vehicles (aircraft, guided weapons, drones, remotely piloted vehicles (RPV), and missiles other than strategic), airborne support equipment, external and internal stores, subsystems, components, or support equipment that interface with an aerospace vehicle. They are installations or changes that support research development, design changes to existing modifications, and development and operational test and evaluation programs or in-service testing of systems or equipment.

4. GENERAL REQUIREMENTS

4.1 General. This section covers the general aspects of Aerospace Vehicle modification requirements.

4.2 Modification data. The following general data requirements shall apply for all temporary non-standard modifications.

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4.2.1 Temporary non-standard modification documentation. Temporary non-standard modification documentation shall be prepared and submitted to the contracting activity in accordance with the Contract Data Requirements List (DD Form 1423) (see 6.2) for contractor generated modifications.

4.2.2 Component certificate of airworthiness. A component certificate of airworthiness shall be provided for all installed equipment that is part of the temporary modification. The certificate shall indicate that the equipment is airworthy and safe to operate in the intended environment at design conditions. The certificate shall also identify any associated hazards and limitations.

4.2.3 Aerospace vehicle certificate of airworthiness. An aerospace vehicle certificate of airworthiness shall be provided prior to flight of a modified aerospace vehicle. The certificate shall identify any flight restrictions imposed as a result of the modification(s).

4.2.4 Modification number. Modification numbers for each modification or demodification accomplished shall be recorded by a modification number for the lifetime of, and transferred with, the aerospace vehicles permanent flight records.

4.3 Checks and evaluations. Checks and evaluations shall be accomplished for all manned aerospace vehicles.

4.3.1 Operational ground checks. Operational ground checks shall be accomplished to assure an aerospace vehicle is safe for flight. All systems and components affected by a temporary modification, including systems affected by software changes, shall be operationally ground checked to determine safe operation and condition prior to release for flight. These checks shall include electromagnetic compatibility, electromagnetic interference, and related system functional checks. If an adequate ground check cannot be accomplished, a power-on check shall be accomplished prior to the first test flight.

4.3.2 Aerodynamic evaluation flight. Aerodynamic evaluation flight(s) are required whenever the modification changes aerodynamic configuration of the aerospace vehicle, changes flight controls, or affects structural strength. An aerodynamic evaluation flight shall be performed by experimental flight test pilots to evaluate aerospace vehicle structure or aerodynamic characteristics and to determine the effects of the modification on the aerospace vehicle.

4.3.3 Inspection prior to first flight. Each modification shall be thoroughly examined to determine compliance with the requirements herein. A physical configuration inspection and inventory of equipment shall be accomplished to determine the accuracy of identification and documentation and the adequacy of maintenance and operation instructions.

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4.3.4 Mass properties. Mass properties for the modified aerospace vehicle, inclusive of any previous modifications, shall be evaluated and documented to indicate the actual weight, moment, and center of gravity change resulting from the current additional modification. Records will be maintained indicating the weight and location of all installed and removed equipment. The modification engineering authority will provide and certify the mass properties data for previously installed modifications. The new center of gravity must fall within maximum allowable center of gravity limits for the baseline aerospace vehicle.

4.3.5 Electrical loads. Electrical load requirements of any new installed or activated equipment shall be identified and evaluated against available aerospace vehicle power as impacted by the electrical loads of previous modifications. Records including power source connectivity and power consumed or restored will be maintained for all modification-related equipment. The modification engineering authority will provide and certify the electrical loads data for previously installed modifications.

5. DETAILED REQUIREMENTS

5.1 General. The detailed requirements for installation, identification, and marking of mechanical and electrical components installed for temporary non-standard modifications, are given in this section.

5.2 Modification requirements. The following items shall be installed on every temporary non-standard modification.

5.2.1 Master power switch. A master power switch readily accessible to the aircrew shall be installed to de-energize, at one time, all test equipment and instrumentation installed in conjunction with a temporary non-standard modification, except for that required for safe operation of the aerospace vehicle or related support equipment. The switch shall be installed on a black plate with an orange border. The plate shall be identified with solid contrasting lettering as follows: **"TEMPORARY MODIFICATION EQUIPMENT MASTER POWER SWITCH."**

5.2.2 Polyvinyl chloride (PVC) wiring. PVC wiring, electrical cable, or wire with PVC insulation shall not be used in manned aerospace application for interconnection of components.

5.2.3 Advisory plate. An advisory plate shall be installed in a conspicuous location in the cockpit of manned aerospace vehicles. This plate shall be black with an orange border. The plate shall be marked with solid contrasting lettering as follows: **"TEMPORARY MODIFICATION EQUIPMENT INSTALLED – SEE OPERATING OR MAINTENANCE INSTRUCTIONS."**

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5.3 Identification and marking. All items installed as part of a temporary non-standard modification shall be marked as indicated in this section. Marking will be applied so that it does not interfere with equipment functionality.

5.3.1 General markings. Modified equipment and components shall be marked with orange marking to facilitate ready identification. Whenever possible, an identification label shall be positioned so that it is readily visible when the item is installed. When it is not feasible to mark installed equipment in orange directly (i.e. engine parts), an identification label shall be placed as close to the equipment as possible.

5.3.2 Control components. All control components of installed equipment including but not limited to switches, release handles and actuating devices, shall be clearly marked as to their function (see figures 1 and 2).

5.3.3 Modification components. All modification components such as cameras, inverters, junction boxes, amplifiers, control boxes, recorders and test equipment, shall be identified by a modification label (see figures 3 and 4).

5.3.4 Specially calibrated instruments or modified components. Specially calibrated instruments or modified components such as altimeters, temperature measuring devices, or pressure gauges installed as part of the crew station or in photo or observer's panels, shall be identified in orange (i.e., an orange dot for analog gauges). The markings shall be located so they do not interfere with the operation or readability of the instrument.

5.3.5 External components. External components such as pylons, fuel tanks, pitot tubes, antennas, or instrumentation pods, shall be marked with the modification number in readily visible lettering and orange markings (see 5.3.1).

5.3.5.1 Fuel tanks. When fuel tanks are used as carriers for test equipment, they shall be identified by an encircling four-inch band of orange located approximately one-quarter of the tank length from the leading edge. The inscription "**TEMPORARY MODIFICATION EQUIPMENT INSTALLED – DO NOT FUEL**" shall be marked in orange adjacent to the filler cap(s). The modification number shall be stenciled in orange.

5.3.5.2 Non-standard tanks and stores. Non-standard tanks and stores used as carriers for test equipment shall be marked with a four-inch orange band around the tank or store, located approximately one-quarter of the tank or store length, from the leading edge. Tanks and stores shall have the modification number stenciled with readily visible lettering and numbers.

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5.3.6 Electrical wire marking. Electrical wire marking shall contain, as a minimum, the following information:

- 1) A code established by the modification engineering authority.
- 2) A unique wire number.
- 3) A letter designating the wire segment.
- 4) A number indicating wire size.

The order of the numerals/letters is left to the discretion of the responsible organization. A record of the assigned numbers shall be maintained by the modification engineering authority for the project to prevent duplication.

5.3.6.1 Electrical wire identification. Electrical wire identification for temporary non-standard modified aerospace vehicles and related support equipment shall be identified with orange bands at both ends or shall consist of wiring having an outer covering colored completely in orange. Marking shall be black alphanumeric lettering marked directly on the wire (see 5.3.6).

5.3.6.2 Specialty wiring. Specialty wiring like coaxial, thermocouple, twisted shielded, pre-fabricated cable and similar types of cable that cannot be marked directly on the wire or cable, shall be identified by orange bands installed at each end of the cable. Black alphanumeric marking shall be applied directly on sections of white or orange tubing or tape installed over the cable at each end (see 5.3.6). Wire either too small or, because of adverse dielectric properties (e.g. some Teflons), shall be identified by this method.

5.3.7 Tubing. Tubing shall be marked with one band of orange adjacent to and following any standard tubing color code markings.

6. NOTES

(This section contains information of a general or explanatory nature which may be helpful, but is not mandatory.)

6.1 Intended use. The practices covered by this standard are intended for use in accomplishing temporary non-standard modifications. They are intended to require important desirable characteristics and to prohibit serious installation design discrepancies. This standard cannot properly account for special problems encountered in the installation of new equipment. Modification activities are encouraged to continually review the requirements of this standard, with the intent of developing proposals when such proposals will yield improved operations while providing adequate margins of safety.

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6.2 Associated Data Item Description (DID). This standard is cited in DoD 5010.12-L, Acquisition Management Systems and Data Requirements Control List (AMSDL), as the source document for the following DID. When it is necessary to obtain the data, the applicable DID must be listed on the Contract Data Requirements List (DD Form 1423), except where the DoD Federal Acquisition Regulation Supplement exempts the requirement for a DD Form 1423.

<u>DID Number</u>	<u>DID Title</u>
DI-MISC-81562	Temporary Non-Standard Modification Documentation and Marking Requirements for Test Equipment in Aerospace Vehicles and Related Ground Support Equipment

The above DID was current as of the date of this standard. The current issue of the AMSDL must be researched to ensure that only current and approved DIDs are cited on the DD Form 1423.

6.3 Reference information.

6.3.1 Wire marking and installation. Wire marking and installation guidelines of MIL-W-5088, Wiring, Aerospace Vehicles, may be used as a reference.

6.3.2 General engineering manuals. Each service's general engineering manuals particular to aerospace vehicles and related support equipment may be pertinent and should be used for information purposes.

6.3.3 Other manuals. Other manuals, including but not limited to maintenance instructions, structural repair, functional check flights, maintenance operator checks and related support equipment manuals for each service, should also be used and referenced when required.

6.3.3.1 Copies of manuals. Copies of manuals, when required in connection with specific acquisition functions, should be obtained from the contracting activity, or as directed by the contracting officer.

6.3.4 Quality assurance. The following provision is suggested to be included in the contract.

6.3.4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or purchase order, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

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6.4 Subject term (keyword) listing.

Certificate of airworthiness, aerospace vehicle
Certificate of airworthiness, component
Documentation, temporary non-standard
Evaluation flight, aerodynamic
Marking, orange
Modification authority
Modification requirements, aerospace vehicles
Modifications, temporary non-standard
Operational ground check
Safety of flight, modified aerospace vehicles
Wire marking, modified aerospace vehicles

6.5 Changes from previous issue. Marginal notations are not used in this standard to identify changes with respect to the superseded specification due to the extent of the changes.

CONCLUDING MATERIAL

Custodians:
Army – AV
Navy – AS
Air Force – 11

Preparing activity:
Air Force - 11

Project Nr. 15GP-0037

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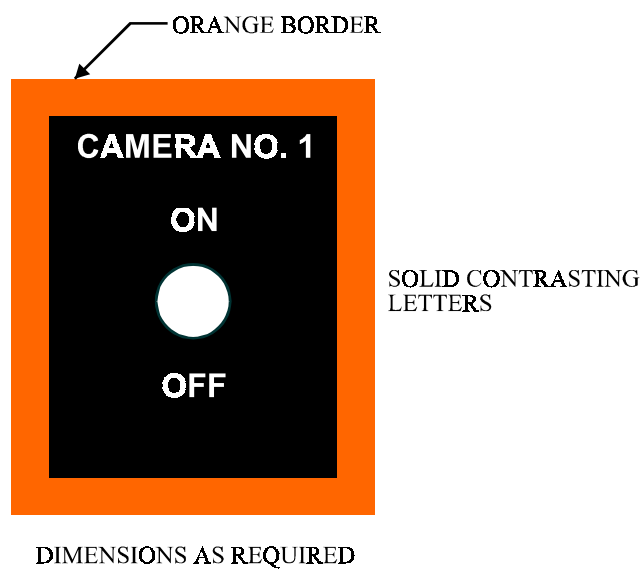


FIGURE 1. Example of typical specific control identification plate.

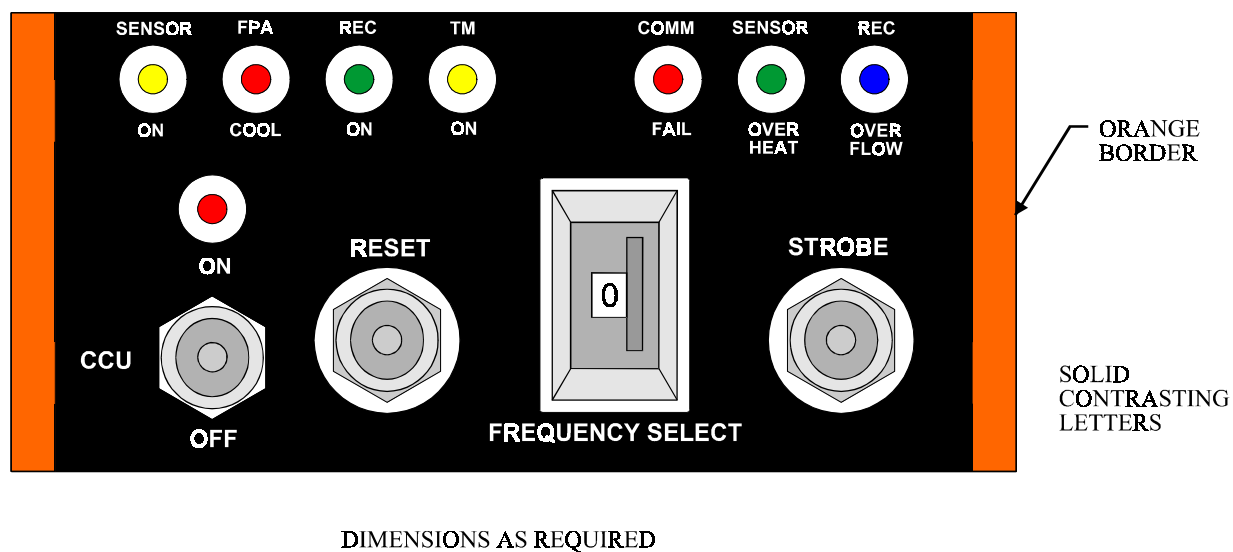


FIGURE 2. Example of typical general control identification plate.

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ITEM: _____
 MOD: _____
 CHART: _____
 WT: _____ ARM: _____

ITEM: Nomenclature of the component, abbreviated as necessary to fit the limited space available.
 MOD: Modification number or the project title.
 CHART: Number of the form used to identify the component in the aerospace vehicle weight and balance paper work.
 WT: Item weight.
 ARM: Fuselage station in inches.

FIGURE 3. Component identification label.

Inverter
 M6A776A
 DD Form 365A
 15#, 992"

FIGURE 4. Component identification, limited space.

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STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS

1. The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the document number and revision letter should be given.
 2. The submitter of this form must complete blocks 4, 5, 6, and 7.
 3. The preparing activity must provide a reply within 30 days from receipt of the form.
- NOTE: This form may not be used to request copies of documents, nor to request waivers, or clarification of requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waiver any portion of the referenced document(s) or to amend contractual requirements.

I RECOMMEND A CHANGE:

1. DOCUMENT NUMBER
MIL-STD-27733

2. DOCUMENT DATE (YYMMDD)
18 MAY 1998

3. DOCUMENT TITLE

MODIFICATION AND MARKING REQUIREMENTS FOR TEST EQUIPMENT IN AEROSPACE VEHICLES AND RELATED SUPPORT EQUIPMENT

4. NATURE OF CHANGE *(Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)*

5. REASON FOR RECOMMENDATION

6. SUBMITTER

a. NAME *(Last, First, Middle Initial)*

b. ORGANIZATION

c. ADDRESS *(Include Zip Code)*

d. TELEPHONE *(Include Area Code)*

e. DATE SUBMITTED
(YYMMDD)

(1) Commercial

(2) AUTOVON
(If applicable)

8. PREPARING ACTIVITY

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