

MIL-C-27171(USAF)

15 May 1959

MILITARY SPECIFICATION
CHARTS; STANDARD MISSILE CHARACTERISTICS,
PREPARATION OF

1. SCOPE

1.1 SCOPE.- This specification governs the definition of requirements for, and methods of, presenting characteristics and performance data for guided missiles. The term Guided Missile as here-in-after referred to is any unmanned vehicle capable of a controlled flight path. For guided missiles the data requirements include the submittal of information delineating the characteristics and performance of the vehicle by the contractor. This complete submittal comprises a Standard Missile Characteristics chart, Characteristics Summary, drawings, and substantiating performance data report with revisions thereto. This specification concerns these characteristics and performance data.

1.2 EFFECTIVE DEFINITIONS.- Definitions and requirements are written in this specification with the intent of coverage for all classes of guided missiles. Definitions or requirements that may arise and are not covered herein will be discussed and agreed to between the contractor and the procuring activity. (See 6.3)

1.2.1 MISSILE SYSTEM.- Data contained in the SMC chart shall reflect the performance of the Guided Missile System as well as that of the Guided Missile. Additional data (Supplemental Pages) on primary operational equipment (i.e., Ground Support and Control) shall be included in a brief but clear manner.

1.3 CLASSIFICATION.- Characteristics and performance data are to be presented on the following types of charts utilizing formats available from the procuring activity. (See 6.4)

1.3.1 STANDARD MISSILE CHARACTERISTICS.- The Standard Missile Characteristics, (SMC) chart for the presentation of detailed data is composed basically of six pages. The pages are to be arranged as follows.

a. First page - cover sheet showing a photograph, or perspective drawing of the guided missile. Include model designation, popular name, and manufacturer as well as the designation of the propulsion system and manufacturer.

b. Second page - a drawing showing a descriptive arrangement of the missile, a drawing showing the method of launching, and an inboard profile drawing showing principal equipment such as warhead, re-entry vehicle, guidance and control equipment, power plant, fuel, oxidizer and coolant tanks, with capacities labelled, etc.

c. Third page - mission, description, and principal characteristics of the missile in narrative and tabular forms.

d. Fourth page - performance data for the guided missile in tabulated or graphic form and applicable notes, or illustration of the missile weapon system as applicable.

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e. Fifth page - guided missile performance graphs to supplement the performance data shown on page four.

f. Sixth page - description of mission problems; also continuation of notes and diagrams or any other items of importance.

1.3.2 SUPPLEMENTAL CHARTS.- Data not coming within the scope of the SMC charts are to be presented on Supplemental charts. Supplemental charts shall present the following types of data:

a. Ground Support Equipment - Drawings and tabulated data reflecting operational shelter(s) and handling, servicing, check out, and launching equipment.

b. Control Equipment - Outline of the control equipment required, i.e., ground radars, fire control center, tracking stations, data link receivers, etc.

c. Shipment Information - Drawings and tabulated data reflecting the following:

(1) Drawing showing points of separation of the missile with dimensions of each section shown thereon.

(2) Special provisions required for shipment. Include drawings when necessary

(3) Compatibility with various means of transportation both from a dimension and load encountered standpoint.

d. Possible special loading or extreme overloading conditions which may:

(1) Be used in restricted tactical operations.

(2) Involve nonstandard procedure and special operating techniques, except as provided herein.

(3) Show the maximum potential use in special missions.

e. Such loadings that may involve equipment which for security reasons are only suitable for limited distribution.

f. Theater operations involving nonstandard atmospheric conditions.

g. To show additional drawings, illustrations, and graphs.

The Supplemental chart format may be same as the SMC chart format, or may consist

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of one or more sheets of special design suitable for binding along with the corresponding basic SMC charts.

1.3.3 CHARACTERISTICS SUMMARY CHART.- The Characteristics Summary chart shall present a summary of performance capabilities on the basic (design) mission and principal features in an abbreviated form. Data shown on the Characteristics Summary chart shall be in agreement with similar data shown on the SMC charts. The standard format for the Characteristics Summary consists basically of a two-page, single sheet.

1.4 CATEGORIES.- The above charts are to be identified by categories to show the development status of the missile or data involved. All charts shall be completed in full detail.

1.4.1 PROPOSAL.- Proposal data charts shall provide information during the evaluation of new guided missile designs, design studies, and proposed modifications of existing missiles. Performance data contained will normally be contractors best estimates.

1.4.2 PRE-FLIGHT.- Pre-flight data charts are intended to provide information for controlled distribution on new guided missile designs during the interim period between initial procurement and early flight tests.

1.4.3 SERVICE.- Service data charts shall provide information on production and service guided missiles. Preparation of these charts shall normally be initiated not later than when the configuration and weight have stabilized following mock-up inspection and will continue during service life.

1.5 IDENTIFICATION AND SECURITY CLASSIFICATION.- Each page of the foregoing chart types shall be marked as follows except that the upper-inner corner shall be left blank:

a. The military model designation or the contractor's model designation (in the case of charts in the proposal category) shall be shown on the lower outer corner.

b. The chart category as defined in paragraph 1.4 shall be shown on the upper outer corner.

c. The date of issue shall be shown on the lower-inner corner.

d. The security classification shall be as specified by USAF and shall be shown on center at top and bottom.

2. APPLICABLE DOCUMENTS

2.1 The following documents, of the issue in effect on date of invitation for bids, form a part of this specification: _____.

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SPECIFICATIONS

Military

MIL-C-5011	Charts; Standard Aircraft Characteristics and Performance, Piloted Aircraft
MIL-D-7822	Drawings; For Standard Aircraft Characteristics and Performance Charts, Piloted Aircraft
MIL-D-25869	Data Requirements for Submission of Guided Missile Airframe Subsystems

(Copies of documents required by contractors in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

2.2 OTHER PUBLICATIONS.- The following document forms a part of this specification. Unless otherwise indicated, the issue in effect on date of invitation for bids shall apply.

ASTIA

Nr. 110233 ARDC Model Atmosphere, 1956

(Application for copies should be addressed to Armed Services Technical Information Agency, Arlington Hall Station, Arlington 12, Virginia.)

3. REQUIREMENTS

3.1 GENERAL REQUIREMENTS.- The complete requirement for characteristics and performance data involves submittal of a Performance Data Report, the Standard Missile Characteristics chart plus any required Supplemental Charts, the Characteristics Summary chart and supporting drawings.

3.1.1 PERFORMANCE DATA REPORT.- All data presented on the charts are to be substantiated by reports to be submitted with the charts. The report may be in legible, rough-draft form utilizing contractor's work sheet copy, but is to be complete and contain adequate list of references, and justification for all data used. Contractors are free to use calculation methods of their own selection, but such methods are to be fully explained, and sample calculations are to be given. Calculations are to be presented in sufficient detail to permit ready review and check of conclusion, and to enable additional calculations to be made by reviewing personnel as required. The performance report required by MIL-D-25869 may be substituted in lieu of this report provided the coverage outlined below is contained therein.

a. Pertinent linear, angular and area dimensions, wetted areas and area progressions necessary to the estimates of lift and drag characteristics.

b. Drag build-up, total aerodynamic drag at gross lift, drag due to lift, variation of drag with Mach number, etc., necessary to the computation of performance.

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- c. Aerodynamic lift, lift curve slope, etc.
- d. Net thrust characteristics of the power plant as installed and operating in the missile.
- e. Calculations of detailed mission performance.

3.1.1.1 **TEXT.**- The arrangement of the substantiating data report is to be as follows:

a. **Section 1 - Introduction.** Include pertinent background information regarding data upon which performance calculations are based, approved missile configuration changes, similarity of the missile model to other missiles, and any further special considerations.

b. **Section 2 - Tabulated Data.** Tabulate all data essential to the computation of performance, such as:

- (1) Missile dimensional data.
- (2) Derivation of weights, with reference to latest weight reports as specified by the procuring activity. (See 6.3)
- (3) Power plant characteristics as installed, including source of power plant ratings and fuel or propellant consumption data.

c. **Section 3 - Aerodynamic Data.** Present an analysis leading to the establishment of lift and drag values used in the calculations, including corrections for trim lift and drag, and adequate reference to applicable wind tunnel or flight test data.

d. **Section 4 - Thrust Required.** State the method of computing thrust or power required throughout the speed range.

e. **Section 5 - Thrust Available.** State the method of establishing thrust available, including discussion of losses and efficiencies associated with the computation of the thrust available.

f. **Section 6 - Performance.** Give, insofar as practicable, all equations used in solution of flight problems, discussion of solution methods used, and sample calculations. As applicable, include graphs of thrust required and available, or equivalent, and fuel or propellant flows, fuel or propellant quantities required, time and distances covered in each of the operational sequences involved in the mission and alternate mission problems, variations of speed, altitude, normal acceleration, etc., with missile flight range from launch to termination. The weight range shall cover all anticipated weights of the missile.

g. **Section 7 - Drawings.** Present a three view drawing showing detailed dimensional data and an inboard profile with stations and points of separation indicated thereon.

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h. Section 8 - References. Tabulate all reference material used in connection with the preparation of this report. Specific reference material prepared by the contractor but not previously furnished to the procuring agency is to be included as an appendix to this report.

3.1.2 REVISIONS.- Revisions to charts and the corresponding Performance Data reports, to be prepared and submitted by the contractor are required throughout the life of the contract whenever significant changes in missile configuration or data occur, such as:

- a. A change in guided missile dimensions or internal equipment.
- b. An accumulation of weight changes resulting in significant performance changes.
- c. A change in power plant designation, augmentation, or power plant rating.
- d. The availability of new reliable test data.
- e. A change in official model designation.

3.1.2.1 ANNUAL REVISION.- An annual revision or a written report to the procuring activity shall be submitted accounting for minor development changes accumulated during the reporting period.

3.1.3 STANDARDS.- Characteristics and performance data shall be based on practical engineering standards which produce results consistent with flight test results of guided missile of like types using standard operating procedures.

3.1.3.1 DATA.- All characteristics and performance data shall be based on the latest reliable aerodynamic, power plant, ballistic, and weight information available. The information given shall include the effect on weight and performance of all authorized contract and service changes, together with important changes assured of authorization but pending at the date of chart issue. Data quoted need not necessarily reflect contractor's guarantees (except for design mission).

3.1.3.2 LIMITATIONS.- Performance data shall fall within all established limitations on the guided missile and its components except as specifically provided herein.

3.1.3.3 BASIS FOR DATA.- For experimental missiles, the performance data shall be based on the best available power plant and aerodynamic data with proper allowances for practicable construction and operation. Flight test data shall be used as a basis for performance data when available. The results of flight tests conducted at official Air Force testing facilities shall be used in preference to flight test data obtained by contractors. Copies of USAF Flight Test Reports will be furnished by the procuring activity. (See 6.6)

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3.1.3.4 GUIDED MISSILE CONDITION.- Performance data shall be presented in such a manner as to show clearly the applicable aerodynamic configuration, power plant, and loading information. Guided missile configurations shall include the installation of complete service equipment applicable to that particular model for the mission concerned. No special sealing of doors or cracks, filling of seams, waxing, or polishing shall be allowed unless this is standard practice, and is so stated on the charts.

3.1.3.5 STANDARD ATMOSPHERE.- Performance data on SFC charts shall be based on the Geopotential altitude, ARDC Model Atmosphere, 1956 (ASTIA Document 110233). Performance data for other atmospheric conditions may be added in the form of notes or given on Supplemental Data sheets. Deviations from this standard shall be made only upon-prior approval of the procuring activity. (See 6.6)

3.2 DEFINITIONS.- The following definitions are used for the various data on the charts and shall be adhered to when applicable.

3.2.1 WEIGHTS.- Weights given on the charts shall comply with the following definitions:

a. Empty - Configuration for design purpose, as defined in detail model specification and excludes weight of booster where such is a separate component. (Does not include fuel, trapped or usable, oxidizer, inert gases, coolant or special instrumentation).

b. Design - Weight at which specified flight, structural design requirements are met or are required to be met.

c. Basic - Configuration for operating purposes (weight empty plus trapped fuel, oil, etc., and all fixed equipment for normal operations). (See 6.5)

d. Pre-Launch - The weight of the guided missile immediately after fueling for launch (Surface/Surface, Drones, Recoverable Test Vehicles) or the instantaneous weight of the vehicle immediately prior to launch (air/surface, air/air). No allowance shall be made for overloading, propellant boil-off or for the purposes of run-ups, system checks, etc.

e. Launch - Weight of the guided missile when released for flight; allowing for fuel boil-off, run-ups, system check, etc. The initial weight for performance calculations.

f. Terminal - The weight of the payload carrying portion of the guided missile, following expenditure of fuel and separation of any staging components.

g. Burn-out or cut-off weight - The weight of the vehicle at burn-out or pre-determined fuel cut-off point.

h. Payload - The load which justifies the mission. Payload includes war-head, reconnaissance equipment, special test instrumentation, etc.

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1. Standard Fuel, Oxidizer or Propellant Weight - Weight of fuel oxidizer and liquid or solid propellant etc., shall be in conformance with the applicable military and/or contractors specification.

3.2.2 **SPEED.**- For vehicles operating entirely within the atmosphere of the earth, speed shall be in knots and true Mach number. For all other vehicles, speed shall be in feet per second.

3.2.2.1 **MAXIMUM VELOCITY.**- Highest velocity obtainable. State the weight, altitude, and operating conditions.

3.2.3 **MAXIMUM ALTITUDE.**- Highest altitude obtainable. State weight, speed and operating conditions.

3.2.4 **RANGE.**- Maximum distance in nautical miles between point of launch and impact with target.

3.3 **MISSION.**- Shall be delineated to the maximum extent possible. The performance of the guided missile system over the areas in which the system is an effective weapon. For practical reasons, and for yardstick comparison purposes, this performance is normally illustrated by selected missions. The basic mission is related to the operational requirements forming the basic for original procurement of the missile system. Calculation and presentation of alternate missions showing additional capability of the system may also be required.

3.3.1 **GUIDED MISSILE SYSTEM.**- Missions for the guided missile system will involve considerations of items such as ground or air launch, radar identification and guidance limitation, etc.

3.3.2 **GUIDED MISSILE.**- Missions for the guided missile will involve primarily the effectiveness of the missile against representative targets.

3.4 **DETAIL REQUIREMENTS.**-

3.4.1 **STANDARD MISSILE CHARACTERISTICS CHARTS.**-

3.4.1.1 **REQUIRED CHARACTERISTICS DATA (INCLUDING DESCRIPTIVE DATA).**- The following data concerning the principal characteristics of the guided missile shall be given as applicable in the appropriate blocks provided on the chart formats.

3.4.1.1.1 **MISSION AND DESCRIPTION.**- The Navy equivalent and the Manufacturer's model designation shall be entered in the upper left hand and right hand corners respectively. The first paragraph in this block shall be a concise statement of the principal mission of the guided missile system. This statement shall be followed by a brief descriptive narrative concerning pertinent background information and status of the guided missile together with general design features and principal components such as configuration, structural design features, control surface configuration, dive brakes, alternate configurations, operational limitations, guidance system, Stand by limits, readiness time, etc. Other designations by which the particular model has been identified shall be listed. Under a subheading **DEVELOPMENT** include such information as prototype designation, dates of contract approval, first flight and first acceptance, and current production status, as applicable.

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3.4.1.1.2 POWER PLANT.- Data to be listed shall include, as applicable:

Number, model and type	Length
Manufacturer	Diameter
Engine Specification Nr.	Tail pipe control (type) if any
Augmentation (type)	Number and type of assist devices
Exhaust nozzle (type)	Extremes of altitude and temperature of operation

Characteristics for booster devices shall be included in the lower portion of the block under an appropriate heading.

3.4.1.1.2.1 RATING.- Rating shall conform to those established in the officially approved engine specification.. If performance items are based on values which differ appreciably from the listed specification ratings, due to flight of engine laboratory test results, installation effects, or restrictions, such thrust values with explanations shall be listed under notes. Reference to source of such thrust values shall be clearly stated in the performance data report. Similar data for booster shall be included under a separate sub-heading.

3.4.1.1.3 BASIS OF WEIGHT DATA.- The weights shall not exceed the limits established by latest applicable technical orders, design requirements or other specific recommendations of the procuring activity. Entries to be included and the sequence are Empty, Basic, Design and Launching. The Empty and Basic weights shall be identified by the symbols (E) for Estimated, (A) Actual, and (C) for Calculated and shall be appropriately footnoted.

3.4.1.1.4 FUEL, OIL AND PROPELLANT.- The number of fuel, oil, and propellant tanks, their usable capacities, type, locations, grade and applicable specification, shall be listed as applicable.

3.4.1.1.5 GUIDANCE AND CONTROL SYSTEMS.- Types of guidance and control systems in the missile shall be listed. Include brief functional description of guidance and control equipment. If available, include type designation of principal electronic components.

3.4.1.2 ADDITIONAL CHARACTERISTICS DATA.- Additional information important to the analysis of the capabilities of the missile, such as the following, shall be given as necessary under appropriate headings. The blocks for additional characteristics data provided on the format for SMC charts may be used alternately as necessary for the best presentation of such data.

3.4.1.2.1 WARHEAD.- Data concerning the warhead type and weight shall be listed. Any alternate warhead types that may be installed shall be carried under a sub-heading. Type of fuzing device normally employed shall be listed.

3.4.1.2.2 DIMENSIONS.- List over-all dimensions, in agreement with the general arrangement drawings, of the basic missile in static position such as wing area, span, length, height, body diameter, etc.

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3.4.1.2.3 RE-ENTRY VEHICLE.- Data concerning the re-entry vehicle shall include the type, manufacturer, weight, heat protection system, etc. Performance data of the re-entry vehicle shall be shown in the graphical and tabulated performance data. Parameters of accuracy (CEP), probability of kill, etc. shall be tabulated.

3.4.1.3 TABULATED AND GRAPHIC PERFORMANCE DATA.- Tabulated or graphical performance data shall be presented or a combination thereof. The choice of method shall be made on the basis of which will most effectively illustrate the mission of the guided missile.

3.4.1.4 DRAWING.- As specified in MIL-D-7822

3.4.1.5 NOTES.- Adequate description of the conditions affecting missile performance data shall be given on the charts in the space provided under "NOTES". Information to be given, as applicable, will be such as follows:

- a. Performance basis; estimated, calculation based on wind tunnel, flight test of (designation) guided missile, etc.
- b. Basis for revision
- c. Thrust rating values for performance calculation if different from specification.
- d. Description and diagram of the mission profile.

3.4.2 SUPPLEMENTAL CHARTS.- The purpose of Supplemental Charts is to present additional data pertinent to the weapon system which does not fall within the scope of the SMC charts. Data presented on the Supplemental Charts shall be shown in a clear, concise manner. Data for which Supplemental Charts shall be prepared are described in paragraph 1.3.2. As applicable, the information presented shall conform to practices or definitions set forth for SMC charts. The requirements for and methods of presentation for the Supplemental Charts shall be discussed and agreed upon between the contractor and the procuring activity (See 6.3).

3.4.3 CHARACTERISTICS SUMMARY CHART.-

3.4.3.1 CHARACTERISTICS DATA.- Characteristics data shall be entered in the appropriate blocks of the standard format in accordance with the following requirements:

- a. Dimensions - Enter lifting surface area, span, length, and height of the basic missile in accordance with paragraph 3.4.1.2.2.
- b. Procurement and Availability - Information regarding missile procurement and availability shall not be given. This block on Characteristics Summary shall be left blank.
- c. Status - Give pertinent notes regarding dates of contract, mock-up, first flight, first service use, etc. The Navy equivalent and the Manufacturer's

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model designation shall be shown in the lower left hand and right hand corners of the block.

d. Power Plant - Enter the number, model(s) manufacturer(s), and rating of engines and assist devices such as ATO, as applicable.

e. Features - List in brief form such items as guidance equipment, flight control equipment, unusual aerodynamic or equipment features, etc. Maximum fuel or propellant capacity shall be shown.

f. Warhead - List warhead type and weight and other features of ordnance such as fuzes, etc.

3.4.3.2 PERFORMANCE DATA.- Tabulated or graphical performance data shall be in agreement with similar items given in the SMC charts. Data to be shown will be as specified by the procuring activity.

3.4.3.3 DRAWINGS.-

3.4.3.3.1 OUTLINE.- Show on the first page within the space provided an undimensioned three-view drawing of the missile model in accordance with MIL-D-7822. Include missile class and model designation within the narrow block, and the name of the manufacturer together with the popular name of the guided missile model within the main block.

3.4.3.3.2 MISSION PROFILE.- Show on the second page within the space provided a simple line sketch of the principal portions of the applicable mission problem to outline the flight profile key altitudes.

3.4.3.4 NOTES.- Notes entered on Characteristics Summary shall conform to paragraph 3.4.1.5.

3.4.4 PREPARATION.- In the preparation of charts, tables, graphs, and illustrations, all lines, letters, and numbers shall be made with the aid of a mechanical device or shall be typeset characters. Principal text entered into the format shall be equivalent to 12-point Bookman or similar book-face type. Typeset, IBM Electronic Proportional Spacing Machine, or Varitype copy may be used. Other letters, numbers, or characters shall be similar to those in the formats provided by the procuring activity. Text and, insofar as practicable, tabular data shall have right-hand margins justified (lines flush at the right). All graphical data shall be presented in the spaces provided in the format on a scale which will provide ease and accuracy of reading. Figures and words shall not obliterate a curve on a chart, and when appearing on a chart shall be set in a white background block.

3.4.4.1 COPY.- Unless otherwise specified, charts shall be submitted as unmounted reproducible copy (14 1/4 by 11 inches for the SMC and 14 by 10 1/2 inches for the Characteristics Summary) using the formats supplied by the procuring activity. Photographic prints of the charts of a high quality are acceptable. The charts and summary shall be of high quality comparable as to text, compilation, arrangement, and accuracy, to high grade commercial handbooks. The

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copy shall be suitable for the production of first class negatives for photolithographic reproduction. Unless otherwise specified, color shall be restricted to black throughout the charts with the exception of halftones. All halftone illustrations and line illustrations shall be protected by an inner tissue and outer heavy paper cover affixed to the top edge. Material submitted shall have all mechanical indicators for accurate photo-lithographic reproduction. Art work shall be indicated for cropping by the use of crop marks placed in the marginal area of the illustration to indicate the proportion of the figure to be included in the final production. Art work shall be clean and free of oil, wax, grease, etc. Care shall be taken to avoid damage in handling.

4. QUALITY ASSURANCE PROVISIONS

4.1 INSPECTION AND ACCEPTANCE.- Charts will be subject to final inspection and approval by the procuring activity. All data contained in the charts are subject to review and analysis and shall be closely coordinated with the procuring activity. (See 6.3)

5. PREPARATION FOR DELIVERY

5.1 PACKING.- Reproduction copy shall be packed separately and in such manner that contents will not be damaged during shipment. Reproduction copy shall not be folded. All shipping containers containing reproduction copy shall also contain a copy of the applicable letter of transmittal.

5.2 MARKING AND LABELING.- All shipping containers shall be addressed to:

Commander
Wright Air Development Center
ATTN: WCLSD
Wright-Patterson Air Force Base, Ohio

5.2.1 The following information shall appear on all shipping containers for reproduction copy:

"Reproduction Copy"
"Government Order Nr. (or Contract Nr.)"

6. NOTES

6.1 INTENDED USE - The charts covered by this specification are intended for publication and dissemination in the documents Air Force Guide Nrs. 1 and 2 and as such are used in connection with staff reference and planning.

6.2 ORDERING DATA - Procurement documents should specify the following:

a. Title, number, and data of this specification.

6.3 INTERPRETATIONS - Interpretations, review and analysis of the technical requirements of this specification may be obtained from Wright Air Development Center, WCLSD.

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6.4 FORMATS - The oversize formats to be utilized in preparation of the charts required by this specification may be obtained from the Wright Air Development Center, WCLSD.

6.5 WEIGHT AND BALANCE INFORMATION - Information on weight and balance is contained in Technical Order 1B-40 entitled, "Weight and Balance Data Handbook". Copies of this technical order may be obtained from the respective contracting officer.

6.6 FLIGHT TEST REPORTS - Copies of AF Flight Test Reports may be obtained from Wright Air Development Center, WCLSD.

NOTICE: When Government drawing, specifications, or other data are used for any purpose other than in connection with a definitely related Government procurement operation, the United States Government thereby incurs no responsibility nor any obligation whatsoever; and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use, or sell any patented invention that may in any way be related thereto.

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