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MILITARY SPECIFICATION

CHARTS; STANDARD AIRCRAFT CHARACTERISTICS AND PERFORMANCE, PILOTED AIRCRAFT

This specification was approved by the Departments of the Army, the Navy, and the Air Force for use of procurement services of the respective Departments.

1. SCOPE

1.1 Scope.- This specification governs the definition of requirements for, and methods of, presenting characteristics and performance data for U. S. military piloted aircraft.

1.2 Application.- For all piloted aircraft proposed or contracted for subsequent to the effective date of this specification, characteristics and performance data shall be prepared and presented in accordance with the provisions of this specification and submitted to the procuring agency for acceptance, unless specifically exempted or otherwise authorized by the procuring agency. Deviations from the provisions of this specification to portray more adequately the capability of certain aircraft are permissible, but shall in all cases be approved by the procuring agency. Authorized deviations shall be fully explained through proper annotations on the data charts.

1.3 Classification.- Characteristics and performance data shall be presented on the following types of charts as required by the procuring agency and utilizing formats as provided. Unauthorized reproduction of such charts is prohibited.

1.3.1 Standard Aircraft Characteristics Chart.- The Standard Aircraft Characteristics chart for the presentation of detailed data is essentially self-explanatory, and is composed basically of six pages. The page sizes, when reproduced, shall be as specified by the procuring agency. The pages shall be arranged as follows:

(a) First page - cover sheet which shall include a photograph, or perspective drawing of the aircraft model.

(b) Second page - a drawing showing a descriptive arrangement of the aircraft, and a drawing showing the tankage installations, armament installations, cargo space, or interior arrangements, as required by the procuring agency.

(c) Third page - mission, description, and principal characteristics of the aircraft.

(d) Fourth page - performance data for the aircraft in tabulated form and applicable notes.

(e) Fifth page - performance graphs.

(f) Sixth page - description of mission problems; also continuation of notes and diagrams.

1.3.2 Supplemental Charts.- Aircraft characteristics and performance data not coming within the scope of the Standard Aircraft Characteristics charts shall be presented on Supplemental charts. Reasons for preparing Supplemental charts may be as follows:

(a) Possible special loadings 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 (see paragraphs 3.2.1.5 and 3.4.1.1.3)

(3) show the maximum potential use of certain aircraft in special missions.

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

(c) Theater operations involving nonstandard atmospheric conditions.

(d) To show inboard profiles, additional drawings, illustrations, and graphs.

(e) To show carrier suitability characteristics of carrier-based aircraft.

The Supplemental chart format may be the same as the Standard Aircraft Characteristics, or may consist of a single sheet of special design suitable for binding along with the corresponding basic Standard Aircraft Characteristics chart.

1.3.3 Characteristics Summary Chart.- The Characteristics Summary chart is intended to present a summary of performance capabilities on the basic 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 Standard Aircraft Characteristics charts. The standard format for the Characteristics Summary for each aircraft model, shall consist basically of a two-page, single sheet, and shall be 8 by 10-1/2 inches in size after reproduction.

1.4 Categories.- The above charts shall be identified by categories to show the development status of the aircraft or data involved. All chart formats shall be completed in full detail.

1.4.1 Proposal.- Proposal data charts are intended to provide information during the evaluation of new aircraft designs, design studies, and proposed modifications of existing aircraft and are suitable primarily for limited distribution within the procuring agency.

1.4.2 Pre-Mock-Up.- Pre-mock-up data charts are intended to provide information on new aircraft designs during the interim period from initial procurement to completion of mock-up. The initial pre-mock-up data charts need not include the effect of all design changes recommended by the procuring agency, but a list of major design changes shall be given under the notes on the chart.

1.4.3 Experimental.- Experimental data charts are intended to provide information on experimental aircraft models. The initial issue of a chart on an experimental aircraft model shall normally be prepared when the configuration and weight for an experimental aircraft design have stabilized following the mock-up inspection.

1.4.4 Service Test.- Service Test data charts are intended to provide information on production aircraft models assigned on limited quantities for service evaluation. Charts shall be prepared as soon as practicable after such assignment.

1.4.5 Service.- Service data charts are intended to provide information on service aircraft models. Preparation of the initial issue of a chart on a service aircraft model shall normally be initiated not later than when the configuration and weight have stabilized following the mock-up inspection.

1.5 Identification and Security Classification.- Each page of the foregoing chart types shall be marked as follows:

(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 shall be shown on the lower-inner corner.

(d) The security classification shall be as specified by the procuring agency and shall be shown on center at top and bottom.

(e) The upper-inner corner is reserved for use by the procuring agency.

2. APPLICABLE SPECIFICATIONS AND OTHER PUBLICATIONS

2.1 The following publications, of the issue in effect on date of invitation for bids, shall form a part of this specification to the extent specified herein:

2.1.1 Specifications.-

Military

MIL-D-7822	Drawings; For Standard Aircraft Characteristics and Performance Charts, Piloted Aircraft
MIL-F-5572	Fuel; Aircraft Reciprocating Engine
MIL-F-5616	Fuel; Aircraft Engine, Grade JP-1
MIL-F-5624	Fuel, Aircraft Turbine and Jet Engine, Grades JP-3 and JP-4

Air Force-Navy-Civil Aeronautical

ANC-2a	ANC Bulletin Ground Loads

2.1.2 Other Publications.-

Air Force-Navy Technical Order

AN 01-1B-40	Handbook of Weight and Balance Data

(Copies of specifications, standards, and drawings required by contractors in connection with specific procurement functions should be obtained from the procuring agency or as directed by the contracting officer.)

3. REQUIREMENTS

3.1 General Requirements.- Unless otherwise specified by the procuring agencies, preparation by contractors of charts (and revisions thereto) for each aircraft model shall include the preparation of photographically reproducible copy in the required types and categories, and, in addition, satisfactory reports containing supporting characteristics and performance data.

3.1.1 Substantiating Data Report.- All data presented on the charts shall be substantiated by reports which shall be submitted with the charts. The report may be in legible, rough-draft form utilizing contractor's work sheet copy, but they shall be complete and shall contain a list of adequate references, authority, and justification for all data used. Contractors are free to use calculation methods of their own selection, but such methods shall be fully explained, and sample calculations shall be given. Calculations shall be presented in sufficient detail to permit ready review and check of conclusions, and to enable additional calculations to be made by the procuring agency as required.

3.1.1.1 Text.- The arrangement of the substantiating data reports shall be as follows:

Section 1 - Introduction

Include pertinent background information regarding data upon which performance calculations are based, approved aircraft configuration changes, similarity of the aircraft model to other aircraft, and any further special considerations.

Section 2 - Tabulated Data

Tabulate all data essential to the computation of performance, such as:

(a) Aircraft dimensional data

(b) Derivation of weights, with reference to latest weight reports available to the procuring agency, operational weight limitations, etc.

(c) Power plant characteristics as installed, including source of power plant ratings and fuel consumption data.

Section 3 - Aerodynamic Data

Present an analysis leading to the establishment of lift and drag values used in the calculations, including airplane efficiency and compressibility correction factors, and adequate references to applicable wind tunnel or flight test data.

Section 4 - Power Required

State the method of computing power or thrust required throughout the speed range.

Section 5 - Power Available

State the method of establishing power available, including discussion of duct losses, propeller efficiencies, etc.

Section 6 - Performance

Indicate derivation of performance items required for completion of charts. Include graphs of power (thrust) required and available, or equivalent, and fuel flows. Fuel quantities required, time and distances covered in each of the operational sequences involved in the combat range, and combat radius problems shall be shown. Graphs of maximum speed, rate of climb, ceilings, and miles per pound at long range airspeed versus weight shall be submitted. The weight range shall cover all anticipated operating weights of the aircraft.

Section 7 - Structure (Air Force Only)

Substantiate the structural requirements of paragraphs 3.2.1.5 and 3.2.1.6. This section shall comprise sufficient calculations for complete substantiation together with supporting data consisting of excerpts from applicable basic loads, stress analysis reports, and load factor charts which are required by the procuring agency. Weight breakdown, fuel distribution, and balance calculations for the maximum take-off and landing gross weights, together with confirmations that resulting c.g. positions are within and will remain within permissible limits, shall be included.

Section 8 - Weight Envelope (Air Force Only)

When applicable, including a graph of payload vs fuel load (plus disposable tanks used) showing incremental gross weight lines convenient for interpolation and plots of each of the maximum weight criteria referred to under paragraphs 3.2.1.5 and 3.2.1.6. The weight envelope shall be a heavy line formed by load limiting criteria lines. Criteria which obviously do not limit load or weight may be tabulated on the graph rather than plotted. All lines shall be clearly identified and the weight less fuel, payload, and external droppable tanks noted.

Section 9 - Carrier Suitability

For carrier based aircraft, a detailed analysis of airplane launching characteristics during carrier catapult take off shall be included. These characteristics shall be in agreement with the minimum wind requirements of paragraph 3.4.2.1(a). Time history plots of airplane attitude in pitch, angle of attack, velocity, elevator and/or stabilizer position during the time required to rotate the airplane from angle of placement on the catapult to the attitude corresponding to the

angle of attack for level or climbing flight immediately following carrier catapult launch are required. This detailed analysis may be submitted in a separate report, if necessary, so as not to delay submittal of the substantiating data report for the charts.

Section 10 - 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 shall be included as an appendix to this report.

3.1.2 Revisions.- Revisions to charts in the Pre-Mock-Up, Experimental, Service Test, and Service categories, and the corresponding substantiating data reports, shall be prepared and submitted by the contractor throughout the life of the contract whenever significant changes in aircraft configuration or data occur, such as:

(a) Air Force -

(1) A change in aircraft dimensions.

(2) An accumulation of weight changes resulting in significant performance changes.

(3) A change in power plant designation, augmentation, or power plant rating.

(4) The availability of new reliable test data.

(5) A change in official model designation.

(b) Navy - When specifically requested.

3.1.2.1 Number of Charts To Be Prepared.- Each chart shall cover only one aircraft model. For the information of the contractor, the following guide is given regarding the probable number of charts and revisions thereto which are required throughout the life of an aircraft model. The exact number of revisions required will depend upon aircraft changes experienced.

Category of Chart	Reason	Basis for Data
Proposal	New design	Estimated *
Pre-Mock-Up	Contract for new aircraft or major modification	Estimated *
Experimental	Contract for Experimental Aircraft	Estimated *
Experimental (Revision)	Design or weight changes	Estimated *
Experimental (Revision)	Flight tests	Flight tests
Service Test	Contract for service test aircraft	Estimated * or X-aircraft flight test
Service	Contract for production aircraft	Estimated * or X-aircraft flight test

* May also be flight data on a similar aircraft model.

Category of Chart	Reason	Basis for Data
Service (Revision)	Design or weight changes	Estimated * or I-aircraft flight test
Service (revision)	Flight tests	Flight test of service model

* May also be flight data on a similar aircraft model.

3.1.3 Standards.- Characteristics and performance data shall be based on practical engineering standards which produce results consistent with flight test results of aircraft 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, 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 guaranties

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

3.1.3.3 Basis for Data.- For new experimental aircraft, the performance data shall be based on the best available power plant and aerodynamic data with proper allowances for practicable aircraft construction and operation. For all chart categories, latest approved flight test data shall be used as a basis for performance data when available. The results of flight tests conducted at official Navy and/or Air Force testing facilities shall be used in preference to flight test data obtained by contractors.

3.1.3.4 Aircraft Condition.- Performance data shall be presented in such a manner as to show clearly the applicable aerodynamic configuration, power plant, and loading information. Aircraft configurations shall include the installation of complete service equipment applicable to that particular aircraft 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. Flight performance items shall be presented with external radio, guns, rotatable enclosures, bomb-bay doors, etc., in position of least drag, retractable enclosures and wheels in retracted or closed position, and external bombs or other armament in position for each condition of loading unless otherwise stated under notes. Fuel loadings shall comprise only those for which service approval has been obtained.

3.1.3.5 Standard Atmosphere.- Performance data on Standard Aircraft Characteristics charts shall be based on the NACA standard atmospheric conditions. Performance data for other atmospheric conditions may be added in the form of notes or given on Supplemental Data sheets.

3.2 Definitions.- The following definitions are used for the various data on the charts and shall be strictly adhered to.

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

3.2.1.1 Empty.- Configuration for design purposes, as defined in current detail model specification (does not include crew, fuel, oil, armament, cargo, bombs, disposable, or special equipment).

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

3.2.1.3 Basic.- Configuration for operating purposes, as defined in Handbook of Weight and Balance Data, AN 01-1B-40, (weight empty plus trapped fuel and oil and all fixed armament and equipment for normal operation)..

3.2.1.4 Combat.- Weight over the target for the mission involved, with full oil, and ammunition, but without bombs, rockets, (except those carried in lieu of ammunition), torpedoes, cargo, or droppable tanks, unless otherwise noted.

(a) Navy - Fuel load equals either full internal fuel capacity of those aircraft carrying external droppable tanks, or 60 percent of the take-off fuel loading of those aircraft with no external droppable tanks or with external droppable tanks whose capacity is small in comparison to the total fuel at take-off.

(b) Air Force - Fuel load that is determined as follows:

Bomber and Reconnaissance - Immediately after dropping the bomb load, but prior to combat.

Fighter - Immediately prior to combat.

Tanker - After completion of fuel transfer.

Other - Prior to start of return flight for resupply (radius) missions and prior to landing for range missions.

Ferry Mission (All Aircraft Types) - Reserve fuel only.

3.2.1.5 Maximum Take-Off.- Maximum take-off weight is the greatest weight for take-off established by Technical Orders, design requirements, or other specific recommendations of the procuring agency. For Air Force, maximum take-off weight shall not exceed the least weight determined by the following criteria:

3.2.1.5.1 Overload.- The maximum (overload) take-off weight shall not exceed the least weight determined by the following:

(a) The weight of the aircraft fully loaded with fuel, bombs, and cargo to capacity for which space and/or tankage is normally provided. Bearing capacity for a floor and supporting structure shall not be exceeded. Each bomb-bay shall be limited to one size bomb. The expendable weight of JATO may be added to the quoted maximum take-off weight provided the criteria of paragraph 3.2.1.5.1(b) is satisfied and a qualifying note appears on the chart.

(b) The aircraft and its components (wing, landing gear, supporting structure for ordnance, cargo, etc.) shall make good at least a minimum load factor specified by the procuring agency for each phase of operation, and shall meet the minimum criteria of applicable specifications for taxi and ground handling.

(c) The take-off ground run (with assist if normally provided) at sea level and with standard atmospheric conditions shall not exceed 8,000 feet.

(d) The maximum rate-of-climb at sea level and standard atmospheric conditions with normal power shall not be less than 500 ft/min.

(e) The service ceiling at maximum power with one engine inoperative shall not be less than sea level.

(f) Throughout the flight the center of gravity will remain within the limits for satisfactory flight and ground handling.

(g) Such other criteria specified by the procuring agency for the aircraft type or model concerned.

3.2.1.5.2 Normal.- The maximum (normal) take-off weight shall not exceed the least weight determined by criteria of paragraph 3.2.1.5.1 and the following additional criteria:

(a) The maximum power service ceiling shall not be less than sea level on a hot day with one engine inoperative, propeller (if any) feathered, gear up, flaps set for take-off.

(b) The distance over a 50-foot height at sea level on a hot day shall not exceed 10,000 feet. The speed at the 50-foot height shall allow the climb rate as expressed by criteria of paragraph 3.2.1.5.2(a) above.

(c) The airplane must be capable of cruising at airspeeds for long range at 5,000 feet pressure altitude on a hot day with power not exceeding 70 percent of normal power for reciprocating and 85 percent of normal power for gas turbine engines.

3.2.1.6 Maximum Landing.- Maximum landing weight is greatest weight established for landing by Technical Orders, design requirements, or specific recommendations of the procuring agency. The maximum landing weight shall not exceed the weight at which the aircraft makes good a sinking speed of 8 ft/sec with one "G" wing lift acting for the landing conditions of ANC-2a, and shall not exceed the take-off gross weight, unless means are provided for increasing weight in flight, as, for example, in-flight refueling.

3.2.1.7 Payload.- The load which justifies the mission. Payload includes cargo, personnel other than crew, bombs, rockets, reconnaissance cameras and flares, etc; includes ammunition for fighters and gunnery trainers only; excludes all fuel except that portion carried by a tanker to be transferred. Special equipment required for the mission such as winterization, rescue equipment, cargo handling, etc., shall not be included in payload.

3.2.1.8 Standard Fuel Weight.- Standard weight of fuel in pounds per U. S. gallon shall be as follows: MIL-F-5572 (gasoline in all grades) 6.0, MIL-F-5616 (JP-1) 6.8, MIL-F-5624 (JP-3 or JP-4) 6.5.

3.2.2 Speed.- All speeds shall be level-flight true airspeeds, in knots unless otherwise noted and explained.

3.2.2.1 Maximum.- Highest speed obtainable in level flight. State the weight, altitude, and engine-power rating. Such maximum speed shall be within all operating restrictions. For the Characteristics Summary, maximum speed shall be at combat weight, maximum power, and the altitude for best speed.

3.2.2.2 Combat.- Highest speed obtainable in level flight at combat weight with maximum power at combat altitude.

3.2.2.3 Stall, Power-Off.- The stall speed power-off, in the landing configuration at standard weight, shall be computed on the basis of the maximum trimmed lift coefficient, without power, considered or proven to be practicable for the given configuration of wing and high-lift device.

3.2.2.4 Stall, with Approach Power.- Same as paragraph 3.2.2.3 except with approach power. Approach power is that power which is required for level flight at 1.2 times the power-off stall speed in the applicable landing configuration.

3.2.2.5 Average Cruise Speed.- Total cruise distance divided by time for cruise. (Distance and time in climb and combat are not included.)

3.2.2.6 Speed at Specified Altitude.- This speed (defined as Basic Speed for the Air Force) is used only for direct speed comparison between aircraft of similar types and does not necessarily reflect the altitude specified for combat in the applicable radius and endurance problem. The speed at specified altitude is the highest speed obtainable within all operating restrictions in level flight at combat weight and stated power. Except for interceptors, the altitude at which this speed is quoted shall not exceed either combat or cruise ceilings. For interceptors the altitude shall not exceed combat ceiling. Except when governed by the above, the altitude shall conform to the following:

Interceptor (gas turbine engines)	* 50,000 ft
Attack, Bomber, Fighter, Reconnaissance (gas turbine engines)	35,000 ft
Cargo and Tanker (gas turbine engines)	25,000 ft
Attack, Bomber, and Cargo with pressurized cabin (reciprocating engine)	25,000 ft
Fighter (reciprocating engines)	15,000 ft
Attack, Bomber, and Cargo without pressurized cabin and Search/Rescue aircraft	5,000 ft
Tanker (reciprocating engines)	5,000 ft
Liaison, Trainer, Utility, Helicopter (except ASW)	5,000 ft
Patrol, ASW airplanes	1,500 ft
Attack, Bomber, and Fighter aircraft designed for ground support, ASW helicopter, low altitude reconnaissance, mine layer	S.L.

* 40,000 feet for aircraft not capable of a practical mission at 50,000 feet.

3.2.2.7 Airspeed for Long-Range Operation.- The airspeed for long-range operation shall be the greater of the two speeds at which 99 percent of the maximum miles per pound of fuel are attainable at the momentary weight and altitude.

3.2.2.8 Airspeed for Maximum Endurance Operation.- The airspeed for maximum endurance shall correspond to the speed for minimum fuel flow attainable at momentary weight and altitude except as limited by acceptable handling characteristics of the aircraft.

3.2.3 Ceiling.-

3.2.3.1 Service.- Service ceiling is that altitude at which the rate-of-climb is 100 ft/min at stated weight and engine power.

3.2.3.2 Combat.- Combat ceiling is that altitude at which rate-of-climb is 500 ft/min at stated weight and engine power.

3.2.3.3 Cruising.- Cruising ceiling is that altitude at which rate-of-climb is 300 ft/min at normal power at momentary weight.

3.2.4 Combat Altitude.- Combat altitude is the altitude at the target for the specific mission shown.

3.2.5 Take-Off Distance.- Take-off distance shall be that normally obtainable in service operation at sea level with NACA standard atmospheric conditions and on hard surfaced runways. For estimated data, the following criteria shall be used:

(a) Air Force Airplane - The take-off lift coefficient utilizing ground effect shall be based on the maximum angle of attack attainable with the main landing gear oleo struts positioned for the static condition, provided take-off lift coefficient shall not exceed that for 110 percent of power-off stall speed (take-off configuration), and no credit shall be taken for the vertical component of thrust. Distances to clear a 50-foot height shall be based on speeds that are at least 120 percent of the power-off stall speeds for the take-off configuration. Normally, distances shall be for hard surface runway having a rolling coefficient of friction of 0.025.

(b) Navy Airplane - The take-off lift coefficient shall be not greater than the maximum attainable as limited by ground angle or 90 percent of maximum lift coefficient, not utilizing ground effect. Distances to clear a 50-foot height shall be based on speeds that are at least 120 percent of the power on stall speeds for the take-off configuration. Normally distances shall be for hard surface runway having a rolling coefficient of friction of 0.025.

(c) Helicopters - Estimated minimum distances shall be increased at least 15 percent until verified by flight tests. Normally, distances shall be for firm dry sod having a rolling coefficient of friction of 0.05.

3.2.6 Landing distances shall be for operation at standard sea level on hard surface runways with no wind. Distances based on flight tests shall not be less than those required in normal service operation. For estimated data the following criteria shall be used:

(a) Airplane - The landing lift coefficient utilizing ground effect shall be based on the maximum angle of attack attainable with the main landing gear oleo strut positioned for the static condition, provided landing lift coefficient shall not exceed that for 110 percent of power-off stall speed for the landing configuration. Distances to clear a 50-foot height shall be based on speeds that are at least 120 percent of the power-off stall speed for the landing configuration. Normally, distances shall be for hard-surface runways having a braking coefficient of friction of 0.30.

(b) Helicopter - Estimated minimum distance shall be increased at least 15 percent until verified by flight test. Normally distances shall be for firm dry sod having a braking coefficient of friction of 0.25.

3.2.7 Take-Off Time.- Take-off time shall be that normally obtainable in service operation at sea level with NACA Standard atmosphere with no wind.

3.2.8 Power.- The term "power" shall be used to mean brake horse-power and/or thrust as applicable with due consideration for installation effects and limitations. (Engine and JATO "Ratings," as defined in paragraphs 3.4.1.1.2.1 and 3.4.3.1.4, shall be those which appear in the approved engine model specification without regard to installation effects or limitations.)

3.2.8.1 Take-Off Power.- Maximum power available for take-off.

3.2.8.2 Maximum Power.- Maximum power (war emergency, combat, military, or normal) available for combat or emergency operation other than take-off, with afterburning and/or fluid injection or other augmentation if available after take-off. The continuous use of maximum power for a specified time shall be subject to established time limits. Therefore a sequence of power settings may be involved such as in determining time to climb from sea level.

3.2.8.3 Normal Power.- Normal power is the maximum allowable for continuous operation.

3.2.9 Fuel Consumption Data.- Fuel consumption data, regardless of source, shall be increased by 5 percent for all engine power conditions as a service tolerance to allow for practicable operation. In addition, corrections or allowances shall be made for power plant installation losses such as accessory drives, ducts, fans, cabin pressure bleeds, tail-pipes, afterburners, ram-pressure recovery, etc. Unless otherwise specified, or prohibited by design, fuel for all Navy aircraft and for Air Force aircraft with reciprocating engines shall be gasoline (6.0 pounds per gallon); for Air Force aircraft with gas turbine engines, fuel shall be JP-3 (6.5 pounds per gallon).

3.2.10 Combat Radius.- Combat radius is the distance attainable on a practicable flight to the target and return a distance equal to that flown out, carrying a specific load (bombs, cargo, personnel, etc.) to or from the target according to a sequence of operations specified under "Missions" (paragraph 3.3). Droppable fuel tanks are dropped when empty or prior to combat unless such tanks are designed to be carried during combat.

3.2.11 Combat Range.- Combat range is the distance (including distance covered in climb) attainable on a practicable one-way flight carrying load (bombs, cargo, personnel) the entire distance. Droppable fuel tanks are dropped when empty. The flight plan shall conform to the following:

(a) Warm-Up, Taxi, and Take-Off - Fuel is reduced according to the allowances shown on table I.

(b) Climb - Fuel is further reduced by that required for climb on course to the outgoing cruise altitudes specified in table I herein for the combat radius problems using power as specified.

(c) Cruise - Cruise at the airspeed for long range operation, at either a constant or varying altitude as specified in table I, utilizing available fuel remaining after deducting the fuel of (a), (b), and (d).

(d) Reserve - Fuel remaining at the end of flight shall conform to the allowances shown on table I.

TABLE I
Combat Radius and Endurance Problems

Flight Plan	High Altitude Attack, Bomber, and Reconnaissance		General Purpose and Escort Fighter	
	Reciprocating Engine	Gas Turbine	Reciprocating Engine	Gas Turbine
1. Fuel allowance for starting engines, take-off, and accelerate-to-climb speed is the sum of following items:				
(a) Pounds of fuel used in ___ minutes with normal power at sea level.	10	5	10	5
(b) Pounds of fuel used in ___ minutes with maximum power at sea level (if afterburner is used for take-off):	--	1	--	1
(c) Pounds of fuel (if any) taken from airplane tanks by assist devices.				
2. Climb on course to an altitude of not less than _____ feet with _____ power.	5,000 normal	5,000 up to max	5,000 normal	5,000 up to max
3. Cruise at airspeeds for long range at altitude for best range but not less than _____ feet.	5,000	5,000	5,000	5,000
4. If necessary, climb on course so as to reach cruising ceiling _____ before bomb drop.	500 nautical miles	15 minutes	-- --	-- --
5. Cruise in level flight to target including a bomb run of _____ minutes with _____ power.	15 normal	15 normal	-- --	-- --
6. Drop bombs, chaff and/or flares.			--	--
7. No credit is taken for distance covered during a _____ minute period of _____ action with fuel consumption based on _____ power, at _____ altitude.	2 evasive normal combat	2 evasive normal combat 1/	20 combat 10 max - 10 mil 15,000 feet 1/	20 combat 5 max - 15 mil 35,000 feet 1/
8. Credit for distance is taken for a period of ____ minutes for escape with normal power.	8	8 1/	--	--

1/ Climb to altitude for best range is accomplished in items 7 and 8.

TABLE I (continued)
Combat Radius and Endurance Problems

Flight Plan	High Altitude Attack, Bomber, and Reconnaissance		General Purpose and Escort Fighter	
	Reciprocating Engine	Gas Turbine	Reciprocating Engine	Gas Turbine
9. Cruise at airspeeds for long range at altitude not less than combat altitude a distance of _____ nautical miles.	500	- -	- -	- -
10. Cruise at airspeeds for long range to home base at an altitude for best range but not less than _____ feet.	5,000	5,000	5,000	5,000
11. Fuel allowance for reserve and landing is the sum of the following items:				
(a) _____ percent of initial fuel	5	5	5	5
(b) _____ minutes at speed for _____ at sea level. All engines used in the landing approach shall be operating.	30 Long Range	30 Max Endurance	20 Long Range	20 Max Endurance

Flight Plan	Interceptor Fighters	
	Area Intercept	Point Intercept
	Gas Turbine	Gas Turbine
1. Fuel allowance for starting engines, take-off, and accelerate-to-climb speed at sea level is the sum of the following items:		
(a) Pounds of fuel used in _____ minutes with normal power at sea level.	2	2
(b) Pounds of fuel used in _____ minutes with maximum power at sea level (if afterburner is used for take-off).	1	1
(c) Pounds of fuel (if any) taken from airplane tanks by assist devices.		
2. Climb on course to _____ ceiling with _____ power.	Cruising up to max	Combat maximum
3. Cruise at long range speeds at _____ ceiling.	Cruising	- - -
4. Climb on course with maximum power to _____ ceiling.	Combat	- - -

TABLE I (continued)
Combat Radius and Endurance Problems

Flight Plan	Interceptor Fighters	
	Area Intercept	Point Intercept
	Gas Turbine	Gas Turbine
5. No credit is taken for distance covered during combat for a period of _____ minutes with fuel consumption based on _____ power at _____ altitude.	5 maximum 50,000 2/	5 maximum 50,000 2/
6. Cruise to home base at speeds for long range at altitudes for best range, but not less than _____ feet.	5,000	- - -
7. Loiter at 35,000 feet at airspeed for maximum endurance for _____ minutes.	- - -	maximum
8. Fuel allowance for reserve and landing is the sum of the following items: (a) _____ percent of initial fuel (b) _____ minutes at speeds for maximum _____ at sea level. All engines used in the landing approach shall be operating.	5 20 Endurance	0 20 Endurance

2/ Combat ceiling with maximum power if less than 50,000 feet.

Flight Plan	Low Altitude Attack and Ground Support Bomber		Ground Support Fighters	
	Reciprocating Engine	Gas Turbine	Reciprocating Engine	Gas Turbine
1. Fuel allowance for starting engines, take-off, and accelerate-to-climb speed is the sum of the following items:				
(a) Pounds of fuel used in _____ minutes with normal power at sea level.	10	5	10	5
(b) Pounds of fuel used in _____ minutes with maximum power at sea level (if afterburner is used for the take-off).	- -	1	- -	1
(c) Pounds of fuel (if any) taken from airplane tanks by assist devices.				
2. Climb on course to an altitude of: not less than _____ feet with _____ power.	5,000 normal	5,000 up to max	5,000 normal	5,000 up to max

TABLE I (continued)
Combat Radius and Endurance Problems

Flight Plan	Low Altitude Attack and Ground Support Bomber		Ground Support Fighters	
	Reciprocating Engine	Gas Turbine	Reciprocating Engine	Gas Turbine
3. Cruise at long range speeds at altitudes for best range but not less than _____ feet.	5,000	5,000	5,000	5,000
4. Descend to sea level (no fuel consumed, no distance credit). Loiter for _____ minutes at airspeeds for maximum endurance.	0	0	30	10
5. Drop bombs and fire external rockets.				
6. No credit is taken for distance covered during combat for a period of _____ minutes with _____ power at sea level.	15 5 max +10 normal	5 military	10 maximum	10 military
7. Climb on course to an altitude of not less than _____ feet with _____ power.	5,000 normal	5,000 up to max	5,000 normal	5,000 up to max
8. Cruise at speeds for long range at altitude for best range, but not less than _____ feet.	5,000	5,000	5,000	5,000
9. Fuel allowance for reserve and landing is the sum of the following items:				
(a) _____ percent of initial fuel.	5	5	5	5
(b) _____ minutes at speeds for _____ at sea level. All engines used in the landing approach shall be operating.	20 Long Range	20 Maximum Endurance	20 Long Range	20 Maximum Endurance

Flight Plan	Mine Layer and Low Altitude Reconnaissance		ASW Fixed Wing Aircraft	
	Reciprocating Engine	Gas Turbine	Reciprocating Engine	Gas Turbine
1. Fuel allowance for starting engines, take-off, and accelerate-to-climb speed is the sum of the following items:				
(a) Pounds of fuel used in _____ minutes with normal power at sea level.	10	5	10	5

TABLE I (continued)
Combat Radius and Endurance Problems

Flight Plan	Mine Layer and Low Altitude Reconnaissance		ASW Fixed Wing Aircraft	
	Reciprocating Engine	Gas Turbine	Reciprocating Engine	Gas Turbine
(b) Pounds of fuel used in ____ minutes with maximum power (if afterburner is used for take-off).	- -	1	- -	1
(c) Pounds of fuel (if any) taken from airplane tanks by assist devices.				
2. Climb on course to an altitude of not less than _____ feet with _____ power.	5,000 3/ normal	5,000 3/ up to max	1,500 normal	1,500 up to max
3. Cruise at airspeeds for long range at altitudes for best range, not less than _____ feet.	5,000 3/	5,000 3/	Combat Radius is 40 percent of combat range at 1,500 feet altitude	
4. Let down so as to reach sea level altitude ____ nautical miles from target (no fuel consumed, no distance credit).	50	50		
5. At military power, fly in ____ nautical miles, drop mines or flares and fly out ____ nautical miles.	50 50	50 50		
6. Climb on course to an altitude of not less than _____ feet with _____ power.	5,000 3/ normal	5,000 3/ up to max		
7. Cruise at airspeeds for long range at altitudes for best range, not less than _____ feet.	5,000 3/	5,000 3/		
8. Fuel allowance for reserve and landing is the sum of the following items:				
(a) ____ percent of initial fuel	5	5	5	5
(b) ____ minutes at speeds for ____ at sea level. All engines used in landing approach shall be operating.	20 Long Range	20 Maximum Endurance	20 Long Range	20 Maximum Endurance

3/ 1,500 feet for overwater operation

TABLE I (continued)
Combat Radius and Endurance Problems

Flight Plan	Cargo and Transport (For Tanker See Footnote 4/)		Search/Rescue	
	Reciprocating Engine	Gas Turbine	Reciprocating Engine	Gas Turbine
1. Fuel allowance for starting engines, take-off, and accelerate-to-climb speed is the sum of the following items:				
(a) Pounds of fuel used in _____ minutes with normal power at sea level.	10	5	10	5
(b) Pounds of fuel used in _____ minutes with maximum power at sea level (if afterburner is used for take-off).	--	1	--	1
(c) Pounds of fuel (if any) taken from airplane tanks by assist devices.				
2. Climb on course to an altitude of not less than _____ feet with _____ power.	5,000 normal	5,000 up to max	5,000 normal	5,000 up to max
3. Cruise to remote base at speeds for long range at altitudes for best range, but not less than ____ feet.	5,000	5,000	5,000	5,000
4. Land at remote sea level base and _____ (no fuel consumed, no distance credit)	Unload Entire Cargo	Unload Entire Cargo	Load Design Passenger Complement	Load Design Passenger Complement
5. Fuel allowance for restarting engines, take-off from remote base and accelerate-to-climb speed is the sum of the following items:				
(a) Pounds of fuel used in _____ minutes with normal power at sea level.	10	5	10	5
(b) Pounds of fuel used in _____ minutes with maximum power at sea level (if afterburner is used for take-off).	--	1	--	1
(c) Pounds of fuel (if any) taken from airplane tanks by assist devices.				

4/ For tankers, items 1, 2, 3, 7, and 8 apply, but substitute for items 4 through 6 the following: Climb on course to cruising ceiling. Rendezvous in level flight for 1 hour at airspeeds for long range (no distance credited for rendezvous). Cruise in level flight on outboard course with normal power during transfer period using maximum fuel transfer rate. State weight off-loaded.

TABLE I (continued)
Combat Radius and Endurance Problems

Flight Plan	Cargo and Transport (For Tanker See Footnote 4/)		Search/Rescue	
	Reciprocating Engine	Gas Turbine	Reciprocating Engine	Gas Turbine
6. Climb on course to an altitude of not less than _____ feet with _____ power.	5,000 normal	5,000 up to max	5,000 normal	5,000 up to max
7. Cruise to home base at speeds for long range at the altitude for best range, but not less than _____ feet.	5,000	5,000	5,000	5,000
8. Fuel allowance for reserve and landing is the sum of the following items:				
(a) _____ percent of initial fuel	5	5	5	5
(b) _____ minutes at speed for _____ at sea level. All engines used in the landing approach shall be operating.	30 Long Range	30 Max Endurance	30 Long Range	30 Max Endurance

4/ For tankers, items 1, 2, 3, 7, and 8 apply, but substitute for items 4 through 6 the following: Climb on course to cruising ceiling. Rendezvous in level flight for 1 hour at airspeeds for long range (no distance credited for rendezvous). Cruise in level flight on outboard course with normal power during transfer period using maximum fuel transfer rate. State weight off-loaded.

Flight Plan	Liaison and Trainer 5/		Helicopter (Transport)		Helicopter (Observation)	
	Reciprocating Engine	Gas Turbine	Reciprocating Engine	Jet Driven	Reciprocating Engine	Jet Driven
1. Fuel allowance for starting engines, take-off and accelerate-to-climb speed is sum of following items:						
(a) Pounds of fuel used in: _____ minutes with normal power at sea level.	5	5	5	2	5	2

5/ The trainer basic mission as defined by this table is applicable to basic and advanced trainer airplanes. Combat and tactical trainer airplanes fly the basic mission for the appropriate parent-type airplane; for example, the TB-50 flies basic mission for bombers with reciprocating engines. Basic mission for the Navigator and Bombardier trainers is same as for bombers.

TABLE I (continued)
Combat Radius and Endurance Problems

Flight Plan	Liaison and Trainer 5/		Helicopter (Transport)		Helicopter (Observation)	
	Reciprocating Engine	Gas Turbine	Reciprocating Engine	Jet Driven	Reciprocating Engine	Jet Driven
(b) Pounds of fuel used in ___ minutes with maximum power at sea level (if afterburner is used for take-off)	—	1	—	1	--	1
(c) Pounds of fuel (if any) taken from aircraft tanks by assist devices.						
2. Climb on course to an altitude of not less than _____ feet with _____ power.	5,000 normal	5,000 up to max	5,000 6/ normal	5,000 6/ up to max	1,500 normal	1,500 up to max
3. Cruise to remote base at long range speeds at altitudes for best range, but not less than _____ feet.	5,000	5,000	5,000 6/	5,000 6/	1,500	1,500
4. Land at remote sea level base. (No fuel consumed, no distance credit.)	No change in payload	No change in payload	Unload entire cargo	Unload entire cargo	- - -	- - -
5. Observe for ___ minutes at maximum endurance speeds at sea level (no distance credit.)	--	--	--	--	maximum	maximum

5/ The trainer basic mission as defined by this table is applicable to basic and advanced trainer airplanes. Combat and tactical trainer airplanes fly the basic mission for the appropriate parent-type airplane; for example, the TB-50 flies basic mission for bombers with reciprocating engines. Basic mission for the Navigator and Bombardier trainers is same as for bombers.

6/ 1,500 feet for overwater operation.

TABLE I (continued)
Combat Radius and Endurance Problems

Flight Plan	Liaison and Trainer 5/		Helicopter (Transport)		Helicopter (Observation)	
	Reciprocating Engine	Gas Turbine	Reciprocating Engine	Jet Driven	Reciprocating Engine	Jet Driven
6. Fuel allowance for restarting engines, take-off and accelerate-to-climb speed from remote base is the sum of the following items:						
(a) Pounds of fuel used in ____ minutes with normal power at sea level.	5	5	5	2	- -	- -
(b) Pounds of fuel used in ____ minutes with maximum power (if afterburner is used).	- -	1	- -	1	- -	- -
(c) Pounds of fuel (if any) taken from the aircraft tanks by assist devices.						
7. Climb on course to an altitude of not less than ____ feet with ____ power.	5,000 normal	5,000 up to max	5,000 6/ normal	5,000 6/ up to max	1,500 normal	1,500 up to max
8. Cruise at speeds for long range to home base at an altitude of not less than ____ feet.	5,000	5,000	5,000 6/	5,000 6/	1,500	1,500

5/ The trainer basic mission as defined by this table is applicable to basic and advanced trainer airplanes. Combat and tactical trainer airplanes fly the basic mission for the appropriate parent-type airplane; for example, the TB-50 flies basic mission for bombers with reciprocating engines. Basic mission for the Navigator and Bombardier trainers is same as for bombers.

6/ 1,500 feet for overwater operation.

TABLE I (continued)
Combat Radius and Endurance Problems

Flight Plan	Liaison and Trainer 5/		Helicopter (Transport)		Helicopter (Observation)	
	Reciprocating Engine	Gas Turbine	Reciprocating Engine	Jet Driven	Reciprocating Engine	Jet Driven
9. Fuel allowance for reserve and landing is the sum of the following items:						
(a) ___ percent of initial fuel.	5	5	10	10	10	10
(b) ___ minutes at speeds for ___ at sea level. All engines used in landing approach shall be operating:	20 Long Range	20 Maximum Endurance	0 - -	0 - -	0 - -	0 - -

5/ The trainer basic mission as defined by this table is applicable to basic and advanced trainer airplanes. Combat and tactical trainer airplanes fly the basic mission for the appropriate parent-type airplane; for example, the TB-50 flies basic mission for bombers with reciprocating engines. Basic mission for the Navigator and Bombardier trainers is same as for bombers.

6/ 1,500 feet for overwater operation.

Flight Plan	Assault Helicopter		ASW Attack Helicopter	ASW Search Helicopter
	Reciprocating Engine	Jet Driven	Reciprocating Engine	Reciprocating Engine
1. Fuel allowance for starting engines, take-off and accelerate-to-climb speed is the sum of the following items: (a) Pounds of fuel used in ___ minutes with normal power at sea level.	5	2	5	5

TABLE I (continued)
Combat Radius and Endurance Problems

Flight Plan	Assault Helicopter		ASW Attack Helicopter	ASW Search Helicopter
	Reciprocating Engine	Jet Driven	Reciprocating Engine	Reciprocating Engine
(b) Pounds of fuel used in ___ minutes with maximum power at sea level (if afterburner is used for take-off)	- -	1	- -	- -
(c) Pounds of fuel (if any) taken from aircraft tanks by assist devices.				
2. Cruise at air speeds for ____ at an altitude of sea level. 7/	80 percent normal power	90 percent normal power	80 percent normal power	
3. Land at remote sea level base. (No fuel consumed, no distance credit.)	No change in payload	No change in payload		
4. Combat	- -	- -	Drop weapon (no fuel consumed, no distance credit)	
5. Fuel allowance for restarting engines, take-off and accelerate-to-climb speed from remote base is the sum of the following items:				
(a) Pounds of fuel used in ___ minutes with normal power at sea level.	5	2	- -	
(b) Pounds of fuel used in ___ minutes with maximum power (if afterburner is used for take-off)	- -	1	- -	

7/ For overland operation of assault helicopters climb to and cruise at minimum altitude of 5,000 feet.

TABLE I (continued)
Combat Radius and Endurance Problems

Flight Plan	Assault Helicopter		ASW Attack Helicopter	ASW Search Helicopter
	Reciprocating Engine	Jet Driven	Reciprocating Engine	Reciprocating Engine
(c) Pounds of fuel (if any) taken from aircraft tanks by assist devices.				At sea level, cruise and hover alternately. Total cruise at airspeed for long to be 40 percent of time; total hover to be 60 percent of time. Combat endurance equals cruise time plus hover time.
6. Cruise at air speeds for ___ to home base at an altitude of sea level. 7/	80 percent normal power	90 percent normal power	Long Range Operation	
7. Fuel allowance for reserve and landing is the sum of the following items:				
(a) ___ percent of initial fuel.	10	10	10	10
(b) ___ minutes at speed for max ___ at sea level. All engines used in the landing approach shall be operating.	0 - -	0 - -	0 - -	0 - -

7/ For overland operation of assault helicopters climb to and cruise at minimum altitude of 5,000 feet.

3.2.12 Ferry Mission.- Ferry range is greatest distance attainable on a practicable one-way mission with maximum fuel and no pay load according to a specified sequence of operations, allowances, and reserves. Droppable external tanks are dropped when empty. Unless otherwise specified, reserve shall conform to the allowances shown on table I.

3.2.13 Total Mission Time.- Time in air (excludes time before start of initial climb and reserve unless otherwise specified and noted). For interceptors only, include actual time required for take-off and acceleration to climb speed.

3.3 Missions.- Missions, chosen to portray the typical capabilities of aircraft as military weapons, are defined in terms of combat radius problems and combat range problems. In computing combat radius and combat range, specific fuel consumption data shall be increased in accordance with paragraph 3.2.9. No credit in distance will be taken for any descent, consumption or off-loading of oil, or expenditure of ammunition or internal rockets if carried in lieu of ammunition. Except for interceptors, the cruising ceiling shall not be exceeded. When applicable, a minimum number of engines may be used to increase combat range or combat radius, but such engine operation shall be fully noted.

3.3.1 Basic Mission.- For comparative purposes, each aircraft type shall be considered capable of accomplishing a basic mission in accordance with table I, unless otherwise specified.

3.3.1.1 Basic Mission Loadings.-

(a) Navy - In the absence of specific instructions, the loading shall be selected from the list of important loading conditions given in the detail specification for the aircraft.

(b) Air Force - The Basic Mission take-off weight shall be the maximum (overload) as defined in paragraph 3.2.1.5.1. Except as limited by the above criteria, the loadings shall be in accordance with table II.

TABLE II
Loadings for USAF Basic Mission Take-off for Bomber, Fighter, and Reconnaissance Aircraft

Loadings	Bomber	Bomber or Fighter (Ground Support)	Fighter (Escort)	Fighter (Interceptor)	Reconnaissance
1. Bomb load	10,000 lb or max bomb load whichever is less; not necessarily a single bomb.	4 x 5 inches HVAR plus 2 x 1,000 lb Bombs	No external or internal bombs	No external or internal bombs. Full complement of rockets if carried in lieu of ammunition.	Design load of flare bombs
2. Ammunition	Full ammunition	Full ammunition	Full ammunition	Full ammunition	Full ammunition
3. Fuel	Fuel is added until all tanks are full or until max take-off weight (as limited by strength or performance) is reached. Bomb bay and/or external tanks suitable for use with above loading are used.	Maximum fuel consistent with payload.	Max which can be used advantageously for the radius type escort mission.	Full built in fuel. (External tanks may be carried if required for practical mission; however, such tanks shall be full at start of mission.)	Same as for bomber.
4. Other load	Items of design useful load other than the above.	Same as bomber.	Same as bomber.	Same as bomber.	Same as bomber.

TABLE II (continued)
Loadings for USAF Basic Mission Take-Off for
Cargo, Liaison, and Trainer Aircraft, and Helicopter

Loadings	Assault Transport	Liaison Trainer and Helicopter	Search/ Rescue	Tanker	Cargo
1. Payload	Design	Design load if any.	Design load or flare bombs.	Maximum fuel that can be transferred at a distance 1,000 nautical miles out and permit tanker to return to base.	Max cargo or personnel which can be carried to a base 1,000 nautical miles distance from home base and return without refuel. (750, 500, or 250 nautical miles for airplanes not able to achieve 1,000 miles with significant payload.)
2. Ammunition	Design	Full Ammunition	Full Ammunition	Full Ammunition	
3. Fuel	Protected fuel only	Full built-in fuel	Max fuel which can be used advantageously for the Search or Rescue Type mission	As required for mission	Fuel as required.
4. Other load	Items of design useful load other than the above.	Same as Assault Transport	Same as Assault Transport. (Include full complement of attendants.)	Same as Assault Transport	Same as Assault Transport

3.3.2 Typical Missions.- In addition to its basic mission, an aircraft shall be considered to be capable of accomplishing other missions typical to the aircraft. These involve varying conditions of loading and flight paths.

(a) Navy - Loading shall be selected from the list of important loading conditions given in the detail specification for aircraft.

(b) Air Force - Suggested typical missions for aircraft are listed in table III. For each aircraft the ferry mission shall be included as well as at least one mission at the maximum (normal) take-off weight (conforming otherwise to the Basic Mission) and one mission with design useful load. Other typical missions may be added.

TABLE III
Typical Missions for Bomber Aircraft

Mission	Principal Load Items	Flight Plan
1. Bomber (0 to max bomb loads)	Weight limited by max take-off or capacities. Bomb load variable in reasonable increments.	Same as basic mission.
2. High speed bomber	Same as basic mission.	Same as basic mission except all cruise shall be at normal power.
3. High altitude bomber (reciprocating engine aircraft)	Same as basic mission.	Same as table I (High altitude bomber) mission except minimum cruise altitude is 25,000 feet.
4. Reconnaissance	Max fuel with appropriate reconnaissance equipment.	See table I (high and low latitude reconnaissance).
5. Ground attack (surface support)	See table II, (Ground Support).	See table I (Ground Support Bombers).
6. Ferry (range)	Max fuel for ferry.	Items 1, 2, 3, and 11 of table I (high altitude bomber) mission apply.

Typical Missions for Fighter Aircraft

1. Ground attack (surface support)	See table II (Ground Support).	See table I (Ground support fighter).
2. Strafing	Maximum fuel and ammunition.	Same as above.
3. Interception	See table II (Interceptor).	See table I (Interceptor).
4. Ferry (range)	Maximum fuel for ferry.	Items 1, 2, 3, and 11 of table I (Escort fighter) mission apply.

Typical Missions for Cargo Aircraft

1. Resupply (radius)	Maximum and design cargo at max take-off, design and design alternate take-off weights.	Same as basic mission.
2. Supply (range)	Same as above.	Items 1, 2, 3, and 8 of basic mission apply.
3. High altitude supply (range)	Same as above.	Same as 2 above except minimum cruising altitude is 20,000 feet.
4. Ferry (range)	Maximum fuel for ferry.	Same as 2 above.

TABLE III (continued)
Typical Missions for Liaison and Trainer Aircraft
and Transport Helicopters

Mission	Principal Load Items	Flight Plan
1. Reconnaissance (radius)	Same as basic mission.	Same as basic mission disregarding items 4 through 7.
2. Transport (range)	Max cargo and/or personnel at max take-off weight and at design and design alternate take-off weights.	Items 1, 2, 3, and 9 of basic mission apply.
3. Maximum Endurance (radius)	Maximum fuel	Items 1, 2, 3, 8, and 9 of helicopter (observation) basic mission apply except that all cruising is accomplished at the airspeeds for maximum endurance.
4. Ferry (range)	Maximum fuel for ferry.	Same as 2 above.

3.4 Detail Requirements.-

3.4.1 Standard Aircraft Characteristics Charts.-

3.4.1.1 Required Characteristic Data (Including Descriptive Data).- The following data concerning the principal characteristics of the aircraft shall be given as applicable in the appropriate blocks provided on the chart formats.

3.4.1.1.1 Mission and Description.- The first paragraph in this block shall be a concise statement of the principal mission of the aircraft. This statement shall be followed by a brief descriptive narrative concerning pertinent background information and status of the aircraft together with general design features and principal aircraft components such as configuration, structure, control surface configuration, dive brakes, alternate configurations, operational limitations, type and amount of injection fluid carried, etc. A statement shall be included describing the type of high-lift device employed on the aircraft. 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 or plans, as applicable.

3.4.1.1.2 Power Plant.- Data to be listed shall include, as applicable:

Number and model of engines
Manufacturer
Engine Specification No.
Supercharger (type)
Reduction gear (ratio)
Augmentation (type)
Turbo supercharger mfr. and model and number per engine if more than one.
Tail pipe nozzle (type)
Propeller manufacturer
No. blades/propeller diameter
Propeller blade design No.
Type (gas turbine compressor)
Length (gas turbine)
Diameter (gas turbine)
Tail pipe control (type)
Number and type of assist devices such as ATO
Helicopter Rotor Gear Ratio(s)

3.4.1.1.2.1 Ratings.- Engine ratings shall include power or thrust, rpm, altitude(s), and time limits or duration, as applicable. For ram jet engines, design Mach number, altitude, and corresponding thrust shall be given. Engine ratings and ATO ratings shall conform to those established in the officially approved engine specification except that in the case of turbo supercharger installations, the word "Turbo" shall be used in lieu of numerical values of critical altitude. Ratings with augmentation shall be identified by note. If performance items are based on powers which differ appreciably from the listed specification ratings, due to flight or engine laboratory test results or restrictions, such powers with explanations will be listed under notes. Reference to source of such power shall be clearly stated in the performance data report.

3.4.1.1.3 Weight and Load Factors.- The gross weight and the corresponding allowable load factors shall not exceed the limits established by latest applicable technical orders, design requirements, or other specific recommendations of the procuring agency. Maximum weights for which a mission is shown on the Standard Aircraft Characteristics charts to illustrate maximum combat capabilities, but which may involve nonstandard operating procedure and/or special operating technique associated with such weights may be given, provided such weights are clearly identified with a note defining the limitations on usage. Overload conditions which exceed the limits established in accordance with the above shall only be given on Supplemental Charts in accordance with paragraph 1.3.2, with adequate explanation of all limitations involved. The following weights with corresponding load factors as applicable shall be shown:

Loading	Pounds	Load Factor	Reference
Empty			3.2.1.1
Basic			3.2.1.3
Design			3.2.1.2
Combat (basic mission)			3.2.1.4
Maximum take-off (overload)			3.2.1.5
Maximum take-off (normal)			3.2.1.5
* Maximum in flight			3.2.1.5
Maximum landing			3.2.1.6

* By refueling (or equivalent)

3.4.1.1.3.1 Basis of Weight Data.- Empty weight shall be identified by the symbols "E," "C," or "A" to show whether the basis for weights shown is estimated, calculated, or actual, respectively. As applicable, notation shall be made immediately below the take-off weight of the principal factor(s) limiting take-off weight (see paragraph 3.2.1.5).

3.4.1.1.4 Fuel and Oil.- The number of fuel and oil tanks, their usable capacities and locations, extent of self-sealing provisions, together with grade and specification of fuel and oil used, shall be listed. Fuel tanks shall be grouped by fuel systems.

3.4.1.1.5 Electronics.- Data concerning the principal types of electronic gear in the aircraft shall be listed.

3.4.1.2 Additional Characteristics Data.- Additional information important to the analysis of the capabilities of the aircraft, such as the following, shall be given as necessary under appropriate headings. The blocks for additional characteristics data provided on the format for Standard Aircraft Characteristics may be used alternately as necessary for the best presentation of such data.

3.4.1.2.1 Ordnance.- Data concerning the standard size and number of each type of droppable ordnance items such as bombs, torpedoes, mines, rockets, and the maximum bomb load which may be accommodated by the aircraft. Ordnance carried externally shall be identified. The number and caliber of guns, the number of turrets, rounds of ammunition per gun, and the gun stations shall be listed.

3.4.1.2.2 Cargo.- Maximum cargo load, clear space dimensions, limit floor loads, door size, etc. Additional cargo information may be entered on a supplemental page. Maximum cargo shall not exceed that for which the aircraft has a combat range of at least 100 nautical miles.

3.4.1.2.3 Personnel.- Seating capacity, litter capacity, paratroop capacity, etc.

3.4.1.2.4 Dimensions.- Over-all dimensions, in agreement with the general arrangement drawings, of the basic aircraft in three-point static position such as span, length, height, maximum tread, beam, draft, etc., and propeller ground clearance in level attitude. Height is with propellers operating (if any) and wings in flight position. For seaplanes, height is for aircraft on beaching gear. For helicopters include projected disc area(s), blade area(s), blade diameter(s), and height with blades stowed or not operating, as applicable.

3.4.1.3 Tabulated Performance Data.- Tabulated performance for the basic mission (paragraph 3.3.1) and for other typical missions (paragraph 3.3.2) shall include applicable loading and performance items in accordance with table IV (Navy) or table V (Air Force). (References and notes appearing on these tables are for clarification of requirements and need not appear on charts.)

TABLE IV
Performance Data - Naval Aircraft

Airplanes - Navy

Item	Units	Reference	Notes
TAKE-OFF LOADING CONDITION		3.3.1.1	1
TAKE-OFF WEIGHT	lb	3.3.1.1, 3.2.1.5, 3.4.1.3	
Fuel	lb		
Payload	lb	3.2.1.7	
Wing loading	psf		
Stall speed - power-off	knots	3.2.2.3	
Take-off run at SL - calm	ft	3.2.5	2
Take-off run at SL kn. wind	ft	3.2.5	2
Take-off to clear 50 ft - calm	ft	3.2.5	2
Max speed/altitude	knots/ft	3.2.2.1	4
Rate of climb at SL	fpm		3
Time: SL to ft	min		3
Time: SL to ft	min		3
Service ceiling (100 fpm)	ft	3.2.3.1	3
Combat range	nautical mi	3.2.11	
Average cruising speed	knots	3.2.2.5	
Cruising altitude(s)	ft	3.2.11(c)	
Combat radius	nautical mi	3.2.10	8
Average cruising speed	knots	3.2.2.5	8
COMBAT LOADING CONDITION		3.2.1.4	5, 8
COMBAT WEIGHT	lb	3.2.1.4	8
Engine power		3.2.8.2	6, 8
Fuel	lb	3.2.1.4	8
Combat speed/combat altitude	knots/ft	3.2.2.2, 3.2.4	8
Rate of climb/combat altitude	fpm/ft	3.2.4	8

TABLE IV (continued)
Performance Data - Naval Aircraft

Item	Units	Reference	Notes
Airplanes - Navy			
Combat ceiling (500 fpm)	ft	3.2.3.2	8
Rate of climb at SL	fpm		8
Max speed at SL	knots	3.2.2.1	8
Max speed/altitude	knots/ft	3.2.2.1	8
LANDING WEIGHT	lb		7
Fuel	lb		7
Stall speed - power-off	knots	3.2.2.3	
Stall speed - with approach power	knots	3.2.2.4	
Helicopters - Navy			
TAKE-OFF LOADING CONDITION			1
TAKE-OFF WEIGHT	lb	3.2.1.5, 3.3.1.1, 3.4.1.3	
Fuel	lb		
Payload	lb	3.2.1.7	
Disc loading	psf		
Vertical rate of climb at SL	ft/min		9
Absolute hovering ceiling	ft		9
Max rate of climb at SL	ft/min		10
Service ceiling (100 ft/min)	ft	3.2.3.1	10
Speed at SL	knots	3.2.2.1	10
Max speed/altitude	knots/ft	3.2.2.1	10
Combat range	nautical mi	3.2.11	
Average cruising speed	knots	3.2.2.5	
Cruising altitude	ft	3.2.11(c)	
Combat radius	nautical mi	3.2.10	8
Average cruising speed	knots	3.2.2.5	8

Notes (Applicable to table IV)

1. Identify mission and type of payload carried.
2. For carrier-based aircraft, minimum take-off distance in calm and 25-knot wind unless otherwise required.

   For seaplane, substitute take-off time in calm.

   For amphibians give seaplane take-off time in addition to deck take-off for carrier-based, or ground-roll and distance over 50 ft for land-based types.

   For land-based aircraft give take-off distance for ground run and to clear 50-ft obstacle with zero wind.

   For aircraft having a combination of reciprocating and jet engines, two sets of take-off distance data shall be given; one set for take-off with reciprocating engines alone, the other with combined engines. For aircraft with take-off assist devices such as JATO, take-off data shall be given with and without such devices in operation. In either of the aforementioned cases, contemplated standard practice shall be identified by appropriate notes.

Notes (Applicable to table IV) (continued)

3. Climb power as specified in combat radius or range problem. Except for interceptors, rates of climb and ceilings shall be based on take-off weight with no allowance for weight reduction during ground operation and climb. Time is to 40,000 ft and 50,000 ft for interceptors; and 20,000 ft and 30,000 ft for other aircraft with turbine engines; 10,000 ft and 20,000 ft for airplanes with reciprocating engines; 5,000 ft and 10,000 ft for helicopters. Time to service ceiling shall be shown if less than the above. The time to climb shall consider the effects of weight reduction during ground operation and climb. For interceptors only, include in Time the period required for take-off and acceleration-to-climb speed.
4. Normal power.
5. Give combat configuration.
6. State applicable engine power. Performance shall be shown at war emergency, combat, and military power, as applicable.
7. Land with fuel reserve as shown in table I.
8. Execute for combat type aircraft only.
9. Normal rated and take-off power. No ground effect.
10. Normal rated power. No ground effect.

TABLE V
Performance Data - Air Force Aircraft

Airplanes except cargo, search/rescue, liaison, and trainer types (Air Force)

Item	Units	Reference	Notes
TAKE-OFF WEIGHT	lb	3.4.1.3, 3.3.1.1, and 3.2.1.5	
Fuel at ____ lb/gal (grade ____)	lb	3.2.1.8 and 3.2.9	
Payload ( )	lb	3.2.1.7	
Payload ( )	lb	3.2.1.7	
Wing loading	psf		
Stall speed (power-off)	knots	3.2.2.3	
Take-off ground run at SL	ft	3.2.5	
Take-off ground run with JATO	ft	3.2.5	
Take-off to clear 50 ft	ft	3.2.5	
Take-off to clear 50 ft with JATO	ft	3.2.5	
Rate of Climb at SL	fpm		1
Rate of Climb at SL (one engine out)	fpm		11
Time - SL to ____ ft	min		1
Time - SL to ____ ft	min		1
Service ceiling (100 fpm)	ft	3.2.3.1	1
Service ceiling (one engine out)	ft	3.2.3.1	11
COMBAT RANGE	nautical mi	3.2.11	2
Average speed	knots	3.2.2.5	
Initial cruising altitude	ft		
Final cruising altitude	ft		
Total mission time	hr	3.2.13	

TABLE V (continued)
Performance Data - Air Force Aircraft

Airplanes except cargo, search/rescue, liaison, and trainer types (Air Force) (continued)

Item	Units	Reference	Notes
COMBAT RADIUS	nautical mi	3.2.10	2
Average speed	knots	3.2.2.5	
Initial cruising altitude	ft		
Target speed	knots		13
Target altitude	ft		13
Final cruising altitude	ft		
Total mission time	hr	3.2.13	
TOTAL MISSION TIME	hr	3.2.13	14
Interception altitude	ft		14, 15
COMBAT WEIGHT	lb	3.2.1.4(b)	3
Combat altitude	ft		4
Combat speed	knots	3.2.2.2	5
Combat climb	fpm		5
Combat ceiling (500 fpm)	ft	3.2.3.2	12
Service ceiling (100 fpm)	ft	3.2.3.1	1
Service ceiling (one engine out)	ft	3.2.3.1	1
Max rate of climb at SL	fpm		6
Max speed at _____ ft	knots	3.2.2.1	7
Basic speed at _____ ft	knots	3.2.2.6	12
LANDING WEIGHT	lb		8
Ground roll at SL	ft	3.2.6	
Ground roll (auxiliary brake)	ft	3.2.6	
Total from 50 ft	ft	3.2.6	
Total from 50 ft (auxiliary brake)	ft	3.2.6	

Airplanes, cargo, search/rescue, liaison, and trainer types (Air Force)

TAKE-OFF WEIGHT	lb	3.4.1.3, 3.3.1.1, and 3.2.1.5	
Fuel at _____ lb/gal (grade ___)	lb	3.2.1.8 and 3.2.9	
Payload (_____)	lb	3.2.1.7	
Payload (_____)	lb	3.2.1.7	
Wing loading	psf		
Stall speed (power off)	knots	3.2.2.3	
Take-off ground run at SL	ft	3.2.5	
Take-off ground run at SL with JATO	ft	3.2.5	
Take-off to clear 50 ft.	ft	3.2.5	
Take-off to clear 50 ft with JATO	ft	3.2.5	
Rate of climb at SL	fpm		1
Rate of climb at SL (one engine out)	fpm		11
Time - SL to ____ ft	min		1
Time - SL to ____ ft	min		1
Service ceiling (100 fpm)	ft	3.2.3.1	1
Service ceiling (one engine out)	ft	3.2.3.1	11

TABLE V (continued)
Performance Data - Air Force Aircraft

Item	Units	Reference	Notes
Airplanes, cargo, search/rescue, liaison, and trainer types (Air Force) (continued)			
COMBAT RANGE	nautical mi	3.2.11	2
Average speed	knots	3.2.2.5	
Initial cruising altitude	ft		
Final cruising altitude	ft		
Total mission time	hr	3.2.13	
COMBAT RADIUS	nautical mi	3.2.10	2
Average speed	knots	3.2.2.5	
Initial cruising altitude	ft		
Final cruising altitude	ft		
Total mission time	hr	3.2.13	
FIRST LANDING WEIGHT	lb		8
Ground roll at SL	ft	3.2.6	
Ground roll at SL (auxiliary brake)	ft	3.2.6	
Total from 50 ft	ft	3.2.6	
Total from 50 ft (auxiliary brake)	ft	3.2.6	
COMBAT WEIGHT	lb	3.2.1.4(b)	3
Combat altitude	ft		4
Combat speed	knots	3.2.2.2	5
Combat climb	fpm		5
Combat ceiling (500 fpm)	ft	3.2.3.2	12
Service ceiling (100 fpm)	ft	3.2.3.1	1
Service ceiling (one engine out)	ft	3.2.3.1	1
Take-off ground run at SL	ft	3.2.5	9
Take-off ground run at SL with JATO	ft	3.2.5	9
Take-off to clear 50 ft	ft	3.2.5	9
Take-off to clear 50 ft with JATO	ft	3.2.5	9
Rate of climb at SL	fpm		6
Max speed at ____ ft	knots	3.2.2.1	7
Basic speed at ____ ft	knots	3.2.2.6	12
LANDING WEIGHT	lb		8
Ground roll at SL	ft	3.2.6	
Ground roll at SL (auxiliary brake)	ft	3.2.6	
Total from 50 ft	ft	3.2.6	
Total from 50 ft (auxiliary brake)	ft	3.2.6	
Helicopters (Air Force)			
TAKE-OFF WEIGHT	lb	3.4.1.3, 3.3.1.1, and 3.2.1.5	
Fuel at ____lb/gal (grade ____)	lb	3.2.1.8	
Payload (____)	lb	3.2.1.7	

TABLE V (continued)
Performance Data - Air Force Aircraft

Helicopters (Air Force) (continued)

Item	Units	Reference	Notes
Payload ( )	lb	3.2.1.7	
Take-off power loading	lb/bhp		
Disc loading	psf		
Auto rotation speed (minimum R/D)	knots		
Vertical rate of climb at SL	fpm		1
Max rate of climb at SL	fpm		1, 10
Speed for max rate of climb	knots		1, 10
Time - SL to _____ ft	min		1, 10
Time - SL to _____ ft	min		1, 10
Service ceiling (100 fpm)	ft	3.2.3.1	1, 10
Absolute hovering ceiling	ft		1, 10
COMBAT RANGE	nautical mi	3.2.11	2
Average speed	knots	3.2.2.5	
Cruising altitude	ft		
Total mission time	hr	3.2.13	
COMBAT RADIUS	nautical mi	3.2.10	2
Average speed	knots	3.2.2.5	
Cruising altitude	ft		
Total mission time	hr	3.2.13	
COMBAT WEIGHT	lb	3.2.1.4(b)	3
Combat altitude	ft		4
Combat speed	knots	3.2.2.2	5
Combat climb	fpm		5, 10
Service ceiling (100 fpm)	ft	3.2.3.1	1, 10
Absolute hovering ceiling	ft		1, 10
Max rate of climb at SL	fpm		6, 10
Speed for max rate of climb	knots		6, 10
Max speed at _____ ft	knots	3.2.2.1	7
Basic speed at _____ ft	knots	3.2.2.6	12

Notes (Applicable to table V)

1. Max power for point interceptor missions, climb power in accordance with approved operating procedures for climb for all other missions, unless otherwise specified. Except for interceptors, rates of climb and ceilings shall be based on take-off weight with no allowance for weight reduction during ground operation and climb. Time is to 40,000 feet and 50,000 feet for interceptors, and 20,000 feet and 30,000 feet for other aircraft with turbine engines; 10,000 feet and 20,000 feet for airplanes with reciprocating engines; 5,000 feet and 10,000 feet for helicopters. Time to service ceiling shall be shown if less than the above. The time to climb shall consider the effects of weight reduction during ground operation and climb. For interceptors only, include in Time the period required for take-off and acceleration-to-climb speed.

Notes (Applicable to table V) (continued)

2. Except for point interceptor mission, enter combat range or combat radius as applicable to mission.
3. At radius if listed, otherwise at range.
4. Initial altitude over the target for the mission concerned.
5. With maximum power at combat altitude.
6. With maximum power at sea level.
7. At altitude for highest speed with maximum power.
8. Landing for the radius mission if applicable.
9. Take-off from remote base - applies to radius missions only.
10. For helicopters, climb rates, service ceilings, and combat ceiling shall be outside ground effect in forward flight. Absolute hovering ceiling shall be outside ground effect.
11. With maximum power, gear up, critical engine out, prop feathered, if applicable.
12. With maximum power.
13. Applied for bombers and reconnaissance aircraft only. Speed is for normal power at weight preceding bomb drop.
14. Required for point intercept missions only.
15. Altitude at end of climb.

3.4.1.4 Graphic Performance Data.- Performance data shall also be shown graphically on the appropriate four grids as provided in the formats. Grid lines may be broadened at significant intervals to improve readability. Curves shall not extend beyond any applicable limits.

3.4.1.4.1 Speed.- As a function of altitude, plot maximum speeds at basic mission combat weight with maximum, military, and normal power, as applicable, and additional loads including basic mission take-off weight with military or normal power to show the effects of drag of significant external stores and/or important weight changes.

3.4.1.4.2 Climb.- As a function of altitude, plot rate-of-climb at basic mission combat weight with maximum, military, and normal power, as applicable; and for additional loads including basic mission take-off weight with military or normal power, to show the effects of drag of significant external stores and/or important weight changes. The effects on rate-of-climb of weight reduction during climb shall not be considered except for interceptors. The effects of acceleration on rate-of-climb shall be considered. A time-to-climb curve conforming to the definitions of tables IV and V may be added.

3.4.1.4.3 Combat Range, Radius.-

(a) Navy - The following data shall be shown graphically for the basic mission loading condition as applicable:

Type of Aircraft	Type of Engine	Show Graphically
Combat	Reciprocating	Combat radius vs average cruise airspeed from the minimum acceptable flight speed to maximum speed with normal power. Cruising altitude shall be as specified in the applicable combat radius problem.
Combat	Gas Turbine	Combat radius at long range air speed vs altitude from 25,000 feet to initial cruising ceiling with normal power. Combat radius vs average cruise airspeed from the minimum acceptable flight speed to maximum speed with normal power at a representative high cruising altitude.

Type of Aircraft	Type of Engine	Show Graphically
Non-combat	Reciprocating	Combat range vs average cruise airspeed from minimum acceptable flight speed to maximum speed with normal power at a representative cruising altitude.
Non-combat	Gas Turbine	Combat range at long range airspeed vs altitude from sea level to initial cruising ceiling with normal power. Combat range vs average cruise airspeed from minimum acceptable flight speed to maximum speed with normal power at a representative high cruising altitude. In addition, when combat range or radius is flown at varying altitudes present combat range or radius as a point on the range versus average speed grid.

(b) Air Force - The combat radius curve shall be a diagram of average velocity versus combat radius having parameters of bomb load or payload from zero to maximum and covering a range of operation from maximum range to normal power. The flight plan for each point on the curve shall meet the requirements of the basic missions other than speed as set forth in table I in paragraph 3.3.1. The flight profile may be so selected as to maximize the radius within these limitations for each speed point. In the case of fighter aircraft, variation of configuration shall be substituted for bomb load or payload parameters. For cargo aircraft the block heading should be changed to PAYLOAD-DISTANCE. Plot combat radius and combat range versus payload at stated cruising altitude using applicable portions of the basic mission flight plan and loadings in accordance with paragraph 3.2.1.5. Payload shall not increase at distances less than 100 nautical miles. For tankers, plot altitude (during transfer operation) versus tanker radius at end of refuel with parameters of fuel transfer quantity ranging from zero to the maximum practical amount of fuel.

3.4.1.4.4 Take-off.-

(a) Navy - See paragraph 3.4.1.4.5(a) below.

(b) Air Force - Plot ground run and total distance required to clear 50-foot obstacle vs gross weight (not exceeding maximum take-off weight). Distances shall conform to paragraph 3.2.5. For helicopters, block heading should be changed to CEILING. Plot absolute hovering ceiling outside of ground effect with maximum power and the service ceiling in forward flight with normal climb power vs gross weight.

3.4.1.4.5 Unassigned.- The remaining block on the page of graphs shall be employed in accordance with the following, unless otherwise specified.

(a) Navy -

(1) Carrier-Based Aircraft - Block heading shall be TAKE-OFF. As a function of gross weight, plot deck take-off distance in calm and a wind, without and with assist in accordance with paragraph 3.2.5.

(2) Land-Based Aircraft - Block heading shall be TAKE-OFF. As a function of gross weight, plot take-off ground run and total distance to clear 50 feet in calm. Also show effects of assist when applicable.

(3) Transport Aircraft - Block heading shall be COMBAT RANGE. For take-off gross weight plot payload versus combat range at stated altitude. Payload shall not increase at combat ranges less than 100 nautical miles.

(4) Helicopters - Block heading shall be CLIMB. Plot vertical rate-of-climb at sea level without ground effect, versus weight.

(5) Seaplanes - Block heading shall be TAKE-OFF. As a function of gross weight plot take-off time in calm. Also show effects of assist when applicable.

(b) Air Force - Not applicable.

3.4.1.5 Drawings.- Shall be as specified in Specification MIL-D-7822.

3.4.1.6 Notes.- Adequate description of the conditions and qualifications affecting the aircraft performance data shall be given on the charts in the space provided under "Notes."

3.4.1.6.1 Required.-

(a) Performance Basis:

(1) Estimated data.
(2) Calculated data based on preliminary flight test of _____ aircraft.
(3) Calculated data based on flight test of _____ aircraft.
(4) Combat range and/or radius is based on _____ (Insert engine specification, laboratory, or flight test, or other applicable data) fuel consumption data.

(b) Brief description (or diagram) of the flight plan (or profile).

(c) Basis of or reason for revision, if applicable.

3.4.1.6.2 Additional.- Additional applicable information will also be given, such as:

(a) The effect on combat radius and combat range of use of alternate fuel on jet engines.
(b) The effect on important performance items resulting from dropping or installing principal armament or tankage items, or deicing equipment, engine operating limits, one (or two) engine inoperative, etc.
(c) Power on which performance is based if significantly different from standard engine ratings, as required in paragraph 3.4.1.1.2.1, under the same conditions.
(d) Spotting data; for carrier-based aircraft, information concerning the spotting on appropriate aircraft carriers.
(e) For helicopter data - do not include ground effect.

3.4.2 Supplemental Charts.- Supplemental charts shall present in a concise manner data for special considerations as described in paragraph 1.3.2. As applicable, the presentation of characteristics data, tabulated performance data, graphic performance data, drawings and/or notes shall conform to practices or definitions set forth for Standard Aircraft Characteristics Charts unless deviations are necessary and the reasons therefor are fully explained. For cargo aircraft, performance curves showing altitude versus rate of climb for one engine out using maximum and normal power on operating engines may be included for various gross weights up to maximum. Also curves showing payload versus distance (radius and range) for various take-off weights including design and design alternates may be included. Characteristics data normally comprise packaging and cargo tie-down diagrams. For fighter aircraft, performance curves showing altitude versus radius for various level flight cruising altitudes may be included for the different configurations. The flight plans for the various curves shall meet the requirements of the basic missions other than cruise altitudes. Also, curves showing radius of turn and rate of turn versus Mach number at combat weight and various altitudes are desirable for fighter aircraft.

3.4.2.1 Carrier Suitability Page.- For carrier-based aircraft, a Carrier Suitability page shall be presented. Two plots shall be presented on this page as follows:

(a) Minimum Wind Over Deck Required for Catapulting versus Gross Weight - Curves shall be presented on this plot for all applicable catapults. Curves shall be based on minimum safe take-off speeds and on maximum catapult end speeds. Weight range shall extend from empty weight to maximum take-off weight.

(b) Minimum Wind Over Deck Required for Landing versus Gross Weight - Curves shall be presented on this plot for all applicable arresting gear. Curves shall be based on design approach speed. Weight range shall extend from empty weight to maximum landing weight.

3.4.3 Characteristics Summary Chart.- Required unless otherwise specified by the procuring agency.

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:

3.4.3.1.1 Dimensions.- Enter wing area, span, length, and height of the basic aircraft in accordance with paragraph 3.4.1.2.4.

3.4.3.1.2 Procurement and Availability.- Information regarding aircraft procurement and availability shall not be given. This block on Characteristics Summary shall be left blank.

3.4.3.1.3 Status.- On Characteristics Summary, shall be given pertinent notes regarding dates of contract, mock-up, first flight, first service use, etc.

3.4.3.1.4 Power Plant.- Enter the number, model(s), manufacturer(s), and rating of engines and assist devices such as JATO, as applicable. Only engine ratings for take-off, normal, and maximum powers are required.

3.4.3.1.5 Features.- List in brief form, such items as crew, special electronics installations, unusual aerodynamic or equipment features, etc. Maximum fuel capacity and maximum cargo capacity, if applicable, shall be shown.

3.4.3.1.6 Armament.- List the number and caliber of guns and/or rockets, number of turrets, rounds of ammunition, maximum bomb size, maximum bomb load, and other features or ordnance. For cargo, transport aircraft, and helicopters, substitute data in accordance with paragraph 3.4.1.2.2 and/or paragraph 3.4.1.2.3 with appropriate heading.

3.4.3.2 Tabulated Performance Data.- Performance items given in the appropriate blocks on the Characteristics Summary shall be in agreement with similar items given for the basic mission in the first column of the Tabulated Performance Data of the Standard Aircraft Characteristics chart.

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 aircraft model as specified in Specification MIL-D-7822. Include aircraft type and model designation within the narrow block, and the name of the manufacturer together with the popular name of the aircraft model within the main block.

3.4.3.3.2 Flight Profile.- Show simple line sketch of the principal portions of the applicable combat radius problem to outline the flight profile key altitudes and give title of combat radius problem in accordance with table I.

3.4.3.4 Notes.- Notes entered on Characteristics Summary shall conform to paragraphs 3.4.1.6.1(a), 3.4.1.6.1(c) and 3.4.1.6.2.

3.4.4 Workmanship and Material.- Workmanship and material shall be subject to approval of the procuring agency.

3.4.4.1 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.

(a) Navy - Identification and markings required under paragraph 1.5 shall be lettered in black ink using vertical Leroy 140 guide and No. 1 pen, or equivalent. Identification markings shall be so located as to start or end flush with the vertical border lines as applicable. Pages shall not be numbered. Omit reference to security classification on pages which are unclassified. The aircraft model designation and the approved popular name shall be given on the first page of the Standard Aircraft Characteristics chart. Such information shall be given below and centered on the title leaving a 3/8-inch space and utilizing a vertical Leroy 350C guide and No. 4 pen, or equivalent. One-fourth inch below the aircraft designation, centered on the page, enter the contractor's name in vertical Leroy 140C guide and No. 1 pen, or equivalent. Graphs shall be drawn with sufficiently broad pen so that they stand out clearly from the grid, but do not unduly compromise accuracy of reading. Grid lines shall be properly increased in weight to emphasize the scale readings. Tables and narratives shall be entered with typewriter using standard elite type, vari-type No. 260-7, or equivalent.

(b) Air Force - Principal text entered into the format shall be equivalent to 12-point Bookman or similar book-fact type. Typeset, IBM Electromatic 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 agency. 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.

3.4.4.2 Copy.- Unless otherwise specified, charts shall be submitted as reproducible copy using the formats supplied by the procuring agency and be suitable for production of first-class negatives for photo-lithographic reproduction. Unless otherwise specified, color shall be restricted to black throughout the chart with the exception of halftones used for illustration of Air Force charts. All halftone illustrations and all line illustrations not assembled into the text shall be mounted on a suitable mounting board and protected by an inner tissue and an outer heavy paper cover affixed to the mount along the top edge. Art work shall be clean. All oil, wax, grease, etc., shall be carefully removed. Care shall be taken to avoid damage in handling. Sample charts shall be submitted by the procuring agency for use as a guide for composition in the preparation of reproducible copy.

(a) Air Force - Copy shall be of high quality comparable as to text, compilation, arrangement, and accuracy, to high-grade commercial handbooks. Copy which has filled letters or is blurred will not be accepted. All material shall be submitted with all mechanical indications for accurate photo-lithographic reproduction. The exact location and final size of all square-finish halftones shall be indicated on the reproduction proof. The indication shall consist of hairline typeset li es or fine lines in black ink locating top and bottom limits of the halftone. Art work shall be indicated for cropping by the use of crop marks placed in the marginal area of the illustration of its mounting to indicate the proportion of the figure to be included in the final production. The proportion shall agree with the proportion indicated on the reproduction proofs.

4. SAMPLING, INSPECTION, AND TEST PROCEDURES

4.1 Inspection and Acceptance.- Charts shall be subject to final inspection and approval of the procuring agency. All data contained in the charts shall be subject to review and analysis and shall be closely coordinated with the project officer concerned.

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, as applicable, to:

(a) Navy - Bureau of Aeronautics
Department of the Navy
Washington 25, D. C.
ATTN: DE-33

(b) Air Force - Commanding General,
Wright Air Development Center
Wright-Patterson Air Force Base
Dayton, Ohio
ATTN: WCSP

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

"Reproduction Copy"
"Government Order No. (or Contract No.)"

6. NOTES

6.1 Formats.- Formats and interpretations of the technical requirements of this specification may be obtained by addressing the applicable offices listed in paragraph 5.2.

NOTICE: When Government drawings, 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.

Custodians:
Navy - Bureau of Aeronautics
Air Force

SPECIFICATION ANALYSIS SHEET

Form Approved
Budget Bureau No. 119-R004

INSTRUCTIONS

This sheet is to be filled out by personnel either Government or contractor, involved in the use of the specification in procurement of products for ultimate use by the Department of Defense. This sheet is provided for obtaining information on the use of this specification which will insure that suitable products can be procured with a minimum amount of delay and at the least cost. Comments and the return of this form will be appreciated. Fold on lines on reverse side, staple in corner, and send to preparing activity *(as indicated on reverse hereof)*.

SPECIFICATION

ORGANIZATION *(Of submitter)*

CITY AND STATE

CONTRACT NO.

QUANTITY OF ITEMS PROCURED

DOLLAR AMOUNT
$

MATERIAL PROCURED UNDER A

☐ DIRECT GOVERNMENT CONTRACT ☐ SUBCONTRACT

1. HAS ANY PART OF THE SPECIFICATION CREATED PROBLEMS OR REQUIRED INTERPRETATION IN PROCUREMENT USE?

A. GIVE PARAGRAPH NUMBER AND WORDING.

B. RECOMMENDATIONS FOR CORRECTING THE DEFICIENCIES.

2. COMMENTS ON ANY SPECIFICATION REQUIREMENT CONSIDERED TOO RIGID

3. IS THE SPECIFICATION RESTRICTIVE?

☐ YES ☐ NO IF "YES", IN WHAT WAY?

4. REMARKS *(Attach any pertinent data which may be of use in improving this specification. If there are additional papers, attach to form and place both in an envelope addressed to preparing activity)*

SUBMITTED BY *(Printed or typed name and activity)*

DATE

DD, FORM, APR 63 1426 REPLACES NAVSHIPS FORM 4863, WHICH IS OBSOLETE C-8278