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MILITARY SPECIFICATION

CHARTS: STANDARD AIRCRAFT CHARACTERISTICS AND PERFORMANCE, PILOTED AIRCRAFT (FIXED WING)

This limited coordination Military Specification has been prepared by the Air Force based upon currently available technical information, but it has not been approved for promulgation as a coordinated revision of Military Specification MIL-C-5011A. It is subject to modification. However, pending its promulgation as a coordinated Military Specification, it may be used in procurement.

1. SCOPE

1.1 Scope. This specification governs the definitions of requirements for, and methods of presenting characteristics and performances for military piloted airplanes. This specification while primarily oriented to conventional take-off and landing (CTOL) aircraft may be applied to STOL and VTOL airplanes if the design criteria established by requirements for specific designs are substituted for the CTOL criteria established herein.

1.2 Application. This specification is applicable to the preparation and presentation of characteristics and performance data. It is also applicable, when appropriate, as an outline of design requirements and mission rules for use in contractual documents and specifications.

1.3 Classification. Characteristics and performance data shall be presented on the following types of charts as required by the procuring agency, and utilizing format as provided. Unauthorized reproduction of such charts bearing the (by authority of the Secretary of the Air Force) statement is prohibited; however no restriction is placed upon use of the format.

1.3.1 Standard aircraft characteristics charts. The standard aircraft characteristics charts are intended to provide a concise, accurate compilation of physical characteristics and performance capabilities of a weapon system.

1.3.1.1 Arrangement. The standard aircraft characteristics chart is basically composed of 10 pages with provisions for supplemental pages as required by the procuring agency. Pages 1, 2, 3, 4, 6 and 9 are mandatory. Pages 5, 7 and 8 are optional as determined by the procuring agency. If certain pages are not required for a specific weapon system, and are omitted, the remaining pages shall be numbered consecutively.

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1.3.1.1.1 Basic. The arrangement of the standard aircraft characteristics chart shall be as follows:

a. Page 1 -- Cover sheet which shall include a photograph or perspective drawing of the aircraft model in flight.

b. Page 2 -- Drawings showing descriptive details of the aircraft, such as: Three-view, fuel and oil tankage, armament, inboard profile, etc.

c. Page 3 -- Mission, description, and principal characteristics of the aircraft.

d. Page 4 -- Performance data for the aircraft in tabulated form.

e. Page 5 -- Supplemental tabulated performance data.

f. Page 6 -- Performance graphs.

g. Page 7 -- Supplemental performance graphs.

h. Page 8 -- External store loadings.

i. Page 9 -- Notes. Mission profiles, applicable allowances, and explanatory notes.

Specific requirements are detailed in 3.6.2.

1.3.1.1.2 Supplemental pages. Aircraft characteristics and performance data not coming within the scope of the standard aircraft characteristics charts shall be presented on supplemental pages. Reasons for preparing supplemental pages may be as follows:

a. Possible special loadings or conditions which may:

(1) Be used in restricted tactical operations

(2) Involve non-standard procedures and special operating techniques

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

b. Special loadings that may involve equipment, which, for security reasons are only suitable for limited distribution.

c. Theater operations involving non-standard atmospheric conditions.

d. To show additional drawings, illustrations, and graphs. The supplemental page format should be the same as the standard aircraft characteristics chart but may consist of a special design suitable for binding along with the corresponding pages.

1.3.2 Characteristics summary. The characteristics summary is intended to present a summary of performance capabilities on the design mission and principal features in an abbreviated format. Data shown on the characteristics summary shall be in agreement with similar data shown on the standard aircraft characteristics chart. The standard format for the characteristics summary of each 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 foregoing charts shall be identified by categories to show the development status of the aircraft or data involved.

1.4.1 Development. Charts in this category provide information on new designs during the detail design development after the design becomes stabilized and only minor configuration changes are anticipated.

1.4.2 Service. Charts in this category provide information of aircraft during production and operational use.

1.5 Markings. Each of the foregoing chart types shall be marked as follows:

1.5.1 Designation. The military model designation shall be shown on the lower outer corner.

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

1.5.3 Date. The date of publication will be inserted by the procuring agency on the lower inner corner.

1.5.4 Security. The security classification shall be marked as specified by the current DOD Security Regulations. For security purposes each block or graph shall be considered as a paragraph.

1.5.5 Reserved. The upper inner corner is reserved for the use of the procuring agency.

1.6 Submittal. Initial submittal of charts in the development category shall be accomplished after the design has stabilized as determined by the procuring agency. Charts in the service category shall be submitted after the system has been approved for production.

2. APPLICABLE DOCUMENTS

2.1 Issues of documents. The following documents, (effective on the date of invitation for request for proposal) form a part of this specification to the extend specified herein:

SPECIFICATIONS

MILITARY

MIL-G-5572	Gasoline, Aviation, Grades 80/87, 100/130, 115/145
MIL-T-5624	Turbine Fuel, Aviation, Grades JP-4 and JP-5
MIL-M-7700	Manuals, Flight
MIL-F-8785	Flying Qualities of Piloted Airplanes
MIL-A-008860	Airplane Strength and Rigidity, General Specification for
MIL-W-25140	Weight and Balance Control System (For Airplanes and Rotorcraft)
MIL-T-83133	Turbine Fuel, Aviation, Kerosene Type, Grade JP-8

STANDARDS

MILITARY

MIL-STD-210	Climatic Extremes for Military Equipment
MIL-STD-1374	Weight and Balance Data Reporting Forms for Aircraft (Including Rotorcraft)

MANUAL

AFM 60-16	General Flight Rules

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

3. REQUIREMENTS

3.1 General. Unless otherwise specified by the procuring agency, preparation by contractors of charts (and revision thereto) for each model shall include the preparation of photographically reproducible copy in the required types and categories. Substantiating reports containing supporting characteristics and performance data are required.

3.1.1 Revisions. Revisions to the charts, shall be prepared and submitted by the contractor. Unless otherwise specified by the procuring agency, revisions are required whenever significant changes in vehicle configuration or data occur, as for:

a. A change in vehicle dimensions
b. An accumulation of changes resulting in a significant performance change. (See 3.1.1.1).

c. A change in propulsion system designation, augmentation, or rating.
d. The addition of external stores.
e. The availability of test data showing significant performance change. (See 3.1.1.1).
f. When specifically directed by the procuring agency.

3.1.1.1 Criteria. The following criteria will be used in forming a judgment as to whether a significant change in performance exists:

a. A change of 5 percent or more in drag.
b. A change of 5 percent or more in installed thrust.
c. A change of 5 percent or more in specific fuel consumption.
d. A change in weight which in itself results in a 5 percent or greater change in mission radius or range.
e. Any combination of two or more of the above resulting in a change of 5 percent or more in any performance parameter.

3.1.1.2 Number. Each chart shall cover only one aircraft model. The probable number of charts and revisions which are required throughout the life of the aircraft model will depend on the number of aircraft changes experienced.

3.2 Substantiating report. All data presented on the charts shall be substantiated by reports submitted with the charts. The reports may be legible rough draft copies of the contractor's work sheets. They shall be complete and shall present in detail the contractor's build up of aerodynamic and propulsive data and shall contain a listing 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 explained in detail so as to permit a ready understanding of aerodynamic, propulsive and weights bookkeeping methods. Calculations shall be presented in sufficient detail as to permit ready review and check of conclusions.

3.2.1 Basic aerodynamic data. Prior to proceeding with the initial performance calculations for the Standard Aircraft Characteristics charts mutual agreement shall be established between the contractor and the procuring agency relative to the aerodynamic and propulsive and weight data to be used for performance data. This agreement shall be accomplished through normal review and reporting procedures.

3.2.2 Report. The basic aerodynamic propulsive and weight data (see 3.2.1) shall, after review and acceptance by the procuring agency, form the basis for the detailed preparation of the substantiating data report. These data shall be expanded as necessary and used to prepare the detailed performance data required to substantiate the Standard Aircraft Characteristics.

3.2.3 Revisions. The substantiating data report shall be revised under the same criteria as the charts (see 3.1.1).

3.2.4 Text. The required data and the arrangement of the substantiating data report is contained in Appendix 1A.

3.3 Standards. Characteristics and performance data shall be based on engineering analysis which produce results consistent with flight test results.

3.3.1 Basis for data. All characteristics and performance data shall be based on the latest reliable aerodynamic, propulsion system, and weight information. The information given shall include the effects 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.

3.3.1.1 Changes in characteristics. Changes in aircraft characteristics which do not result in a significant performance change (see 3.1.1.1) do not require a revision by the contractor. However, the procuring agency shall be notified by correspondence so that proper notat on may be appended to the published chart.

3.3.1.2 Flight test. The latest flight test data approved by the procuring agency shall be used as a basis for performance.

3.3.2 Limitations. Performance data shall fall within all established limitations on the vehicle and its components.

3.3.3 Aircraft condition. Performance shall be presented in such a manner as to show clearly the applicable aerodynamic configuration, propulsion system, and loading information. Aircraft configurations shall include the installation of complete service equipment applicable to that particular aircraft model for the mission concerned. Flight performance shall be presented with guns, rotable enclosures, bomb bay doors, etc., in position of least drag, and external bombs or other armament in position for each loading condition, as noted.

3.3.4 Atmosphere. Performance shall be based on the latest approved standard atmospheric tables as specified by the procuring agency.

3.3.4.1 Standard day. Unless otherwise specified, performance shall be based on the standard atmosphere as tabulated and described in Appendix 1C.

3.3.4.2 Non-standard day. Tropical and Hot day properties must conform to Appendix 1C.

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

3.4.1 Weights. Weights given on the charts shall comply with the following definitions derived from, and consistent with, MIL-STD-1374, MIL-W-25140 and T.O.AN 01-1B-50 (see 6.2).

3.4.1.1 Empty weight. The weight of the structure, propulsion system, equipment, etc., in the configuration defined in current system specification.

3.4.1.2 Basic weight. The empty weight adjusted for non-expendable operational items. (Weight empty plus unusable fuel and oil and all fixed armament and equipment for normal operation.)

3.4.1.3 Operating weight. Mission take-off weight less payload and usable fuel. (Basic weight plus usable oil, crew, crew baggage, steward equipment, emergency equipment, special mission fixed equipment, pylon and racks not in basic weight, and other nonexpendable items not in basic weight.)

3.4.1.4 Design weight. Weight at which specified structural design requirements are met or are required to be met.

3.4.1.5 Take-off weight. Take-off weight is the total weight of the aircraft with the fuel and payload (see 3.4.1.10) for the mission presented. The take-off weight normally shall be determined prior to start of engines except in specially approved cases when weight expended during taxi and take-off are excluded (see 3.4.1.5.1.b).

3.4.1.5.1 Maximum. 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 and is the least weight determined by the following criteria:

a. The weight of the vehicle fully loaded with fuel, oil, armament or cargo to the capacity for which space or tankage is normally provided. The bearing load for the floor and supporting structure shall not be exceeded.
b. The aircraft and its components (wings, landing gear, supporting structures for ordnance, cargo, etc.) shall be capable of sustaining the authorized load factor and shall not violate the minimum criteria of applicable specifications for taxi and ground handling. When ground handling criteria permits a higher weight than does the flight limit, those items expended during take-off, (water, ATO, etc.) may be added to the quoted maximum take-off weight for mission computations, and proper notation thereof will be carried in qualifying note on the performance charts.
c. Throughout the mission profile the center of gravity shall remain within design limits.
d. The maximum tow force, shall not be exceeded.

3.4.1.5.2 Typical design criteria. For design purposes consideration may be made of alternate definitions of maximum take-off weight such as: Specifying the critical field length and ground run associated with the operational concept of the design, including the effects of such items as runway surface (hard, sod, etc.), ambient runway temperature and pressure altitudes.

3.4.1.6 Maximum inflight weight. The maximum weight at which the aircraft is authorized to be airborne. This weight may be greater than maximum take-off weight if in-flight refueling is utilized.

3.4.1.7 Maximum ramp weight. Maximum in-flight weight unrefueled plus fuel, water, etc., used during engine start, taxi, and take-off, shall not exceed other limits such as those for taxiing, ground handling, wheel jacking, etc., as specified in MIL-A-008860.

3.4.1.8 Combat weight. Weight over the target for the mission presented with fuel and oil but without bombs, missiles, mines, cargo or droppable tanks unless otherwise noted.

3.4.1.8.1 Fuel load is determined as follows:

a. Bomber, Fighter Bomber, Missile Carrier (for ground attack) - Immediately after dropping the offensive ordnance, but prior to escape.

b. Fighter (interceptor, air superiority) - Immediately prior to combat.

c. Tanker - Immediately after completion of fuel transfer.

d. Reconnaissance - Immediately after arrival at target (after drop of photo flash bombs if carried).

e. Others (cargo-trainers) - Prior to start of return flight for resupply (radius mission) and prior to landing for range missions.

f. Ferry Mission (all vehicle types) - Reserve fuel only.

3.4.1.8.1.1 Typical design criteria. For design purposes, consideration of alternate definitions of combat fuel load such as: with 50 percent of combat fuel allowance consumed, with 100 percent of combat fuel allowance consumed, or any other criteria selected to optimize the aircraft design.

3.4.1.9 Landing weight

3.4.1.9.1 Maximum. Maximum landing weight is the greatest weight established for landing by structural criteria.

3.4.1.9.2 Mission. The weight at the end of the mission as determined by the mission ground rules. It shall include the fuel reserve as specified by the mission.

3.4.1.10 Payload. The load which justifies the mission. Payload includes cargo, personnel other than crew, bombs, chaff, missiles, reconnaissance cameras, electronic countermeasures pods, photo flash flares, fuel carried for transfer by tankers, and ammunition.

Special equipment required for the mission such as winterization, rescue equipment, except that carried for drop by (H) type vehicles (search-rescue), cargo handling, etc., shall not be included in payload.

3.4.1.11 Fuel. Standard fuel weight of fuel in pounds per U. S. gallon shall be as follows:

a. MIL-F-5572 (Gasoline in all grades) — 6.0 lbs/gal.
b. MIL-F-5624 (JP-4) Jet fuel — 6.5 lbs/gal.
c. MIL-F-5624C (JP-5) Jet fuel — 6.8 lbs/gal.
d. MIL-T-83133 (JP-8) Jet fuel — 6.7 lbs/gal.
e. If design requires special fuels of specified densities or BTU content, such shall be used and specified in the chart notes.

3.4.2 Speeds. All speeds shall be level flight true airspeeds in knots and mach number as applicable.

3.4.2.1 Maximum speed. The highest speed obtainable for configuration and weight in level flight. The altitude at which this speed occurs shall be stated. It shall be the lesser of the speeds determined by the intersection of the thrust (power) available and required curves or the speed limit imposed through structural or heating consideration.

3.4.2.2 Penetration speed. A specified speed ( ) at which the aircraft shall conduct the final run in to the target at a specified altitude. This speed shall be specified by design requirements.

3.4.2.2.1 Combat speed. Maximum speed at combat weight and combat altitude with maximum power.

3.4.2.3 Stall speed. The stall speed shall be computed on the basis of 1.0g flight with the maximum trimmed lift coefficient established by computation or wind tunnel testing. Upon availability of flight test results, stall speed shall be changed to the highest of the speeds for steady straight 1.0g flight at C_L max., the speed at which abrupt loss of control occurs about any of the pitch, roll or yaw axes, the speed at which intollerable buffet or structural vibration in encountered, or other minimum permissible speed as defined in MIL-F-8785.

3.4.2.3.1 Power-off. The stall speed without power.

3.4.2.4 Take-off speed

3.4.2.4.1 Take-off speed shall be the highest of the speeds specified below:

a. A speed corresponding to 110 percent of power off stall speed in the take-off configuration.

b. A speed determined by the lift coefficient, in ground effect, for the maximum angle of attack attainable with the main landing gear oleo in the static position with aircraft on ground.
c. Minimum speed at which the aircraft has a climb gradient potential of 1/2 percent (0.005), with maximum power, in the take-off configuration, out of ground effect. For multi-engine aircraft this potential shall be obtainable with the most critical engine inoperative. Where;

$$\text{gradient} = \frac{[\text{Vertical Height in climb (ft)}]}{[\text{Horizontal distance in climb (ft)}]} \qquad (1)$$

d. Air minimum control speed as specified in 3.4.2.8.2.
e. The speed which permits attaining obstacle climb-out speed, as defined in 3.4.2.5, at or before reaching 50 ft. height above the runway.

3.4.2.4.1.1 Typical design criteria. For design purposes, consideration may be made of alternate definitions of take-off speed such as: a higher or lower percentage of stall speed, a higher climb gradient potential or other criteria which optimizes the design.

3.4.2.5 Obstacle climb-out speed. The climb speed at the 50-foot obstacle shall not be less than the highest of the speeds specified below.

a. One hundred fifteen percent of power off, 1.0g, stall speed.
b. Air minimum control speed.
c. Speed at which the aircraft has a climb gradient of 2.5 percent (0.025) with gear up, flaps in take-off position, with maximum power, out-of-ground effect. For multi-engine aircraft this potential shall be obtainable with the most critical engine inoperative.
d. If gear retraction results in a transient drag increase over that for gear down, the speed at which the aircraft has a 1/2 percent (0.005) climb gradient potential with flaps in take-off setting, gear in transit, with maximum thrust out-of-ground effect. For multi-engine aircraft, the most critical engine shall be inoperative.

3.4.2.5.1 Typical design criteria. For design purposes, consideration may be made of alternative limitations to the obstacle climb-out speed such as: a higher or lower percentage of the stall speed, an increase in climb gradient potential or any criteria which is in keeping with the operational concept of the design.

3.4.2.6 Climb speed. The climb speed shall be the airspeed at which the maximum rate-of-climb is attained for the given configuration, weight, altitude, and power. Consideration shall be made for kinetic energy corrections in optimizing the climb speed schedule. When authorized in the applicable flight manual, a simplified, non-optimum speed schedule may be used.

3.4.2.7 Critical engine failure speed. The critical engine failure speed shall be the speed at which the most critical engine can fail and the same distance be required to either continue the take-off or abort. See 3.4.5.4.

3.4.2.8 Minimum engine-out control speed

3.4.2.8.1 Ground. The minimum control speed, ground, shall be the minimum speed during the take-off run where the engine, most critical to directional control, can fail and directional control can be maintained as defined in MIL-F-8785.

3.4.2.8.2 Air. The minimum control speed, air, shall be the minimum airborne speed with maximum thrust where the engine, most critical to control, can fail and directional control can be maintained.

3.4.2.9 Cruise speed

3.4.2.9.1 Maximum range cruise speed. The speed for maximum range operation shall be the speed at which maximum nautical miles per pound of fuel are attainable at the momentary weight and altitude.

3.4.2.9.2 Long range cruise speed. The higher of the two airspeeds which give nautical miles per pound of fuel equal to 99 percent of the maximum nautical miles per pound of fuel for momentary weight and altitude. This speed may be used to decrease mission time without severe penalty to range.

3.4.2.9.3 Maximum cruise speed. The highest speed that can be maintained with maximum continuous power at stated altitude, weight and configuration.

3.4.2.9.4 Average cruise speed. Total distance covered in cruise divided by the time for cruise (distance and time for climb, acceleration to combat speed, combat time, loiter time etc. are not included).

3.4.2.10 Maximum endurance (loiter) speed. 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 flying qualities.

3.4.2.10.1 Combat loiter speed. The airspeed for maximum endurance shall correspond to the speed for minimum fuel flow attained at momentary weight and attitude except that the airspeed must be adequate to allow an instantaneous load factor of a specified value.

3.4.2.11 Approach speed. The approach speed down to the 50-foot obstacle shall be the higher of:

a. Air minimum control speed, gear down, flaps in approach configuration and lift augmentation operable.
b. A speed of 120 percent of 1.0g power-off stall speed, out-of-ground effect, gear down, flaps in approach configuration.

c. A speed at which the aircraft has a climb gradient potential of 2.5 percent (0.025) with gear retracted, flaps in approach configuration, and with maximum dry take-off power. For multi-engine aircraft the most critical engine shall be inoperative.

Note: If other than landing flap is selected for approach, it's characteristics shall be specified i.e., approach flap develops a stall -- percent higher than does landing flap.

3.4.2.11.1 Typical design criteria. For design purposes, consideration may be made of alternate definitions of approach speed such as: higher or lower percentage of stall speed, a higher climb gradient potential, alternate go-around power settings or any other criteria which might optimize the design.

3.4.2.12 Landing speed. The landing speed shall be the greater of:

a. A speed determined by the lift coefficient, in ground effect, for the maximum angle attainable with the main landing gear oleo in the static compressed position with aircraft on ground.
b. One hundred fifteen percent (115 percent) of 1.0g power-off stall speed in the landing configuration.

3.4.2.12.1 Typical design criteria. For design purposes, consideration may be given to alternate definitions of landing speed such as: geometry-limited with oleos in full or partial extended position, changes in percentage of stall speed and climb gradient potential or any other criteria which would optimize the design.

3.4.3 Ceiling

3.4.3.1 Service ceiling. The altitude at which the maximum rate of climb at subsonic speed is 100 ft/min at stated weight and engine power.

3.4.3.2 Combat ceiling

3.4.3.2.1 Subsonic. The altitude at which the max subsonic rate of climb is 500 ft/min at stated weight and power.

3.4.3.2.2 Supersonic. The highest altitude at which the vehicle can fly supersonically and have a climb potential of 1000 fpm at stated power and weight.

3.4.3.3 Cruise ceiling

3.4.3.3.1 Subsonic. The altitude at which the maximum rate of climb potential is 300 ft/min at maximum continuous engine rating at momentary weight.

3.4.3.3.2 Supersonic. The highest altitude at which the vehicle can fly supersonic at maximum continuous power with a climb potential of 1000 fpm at momentary weight.

3.4.4 Altitude

3.4.4.1 Cruise altitude. The altitude at which the cruise portion of the missions is computed. Depending on the mission ground rules, the cruise altitude may be assigned or it may be otherwise governed by limitations such as terrain clearance, mission length, ceilings, oxygen or other crew/aircraft restrictions. In no case shall cruise altitude exceed cruise ceiling.

3.4.4.2 Optimum cruise altitude. The altitude at which the aircraft attains the maximum nautical miles per pound of fuel for the momentary weight and configuration. If this altitude exceeds cruise ceiling the latter shall be used for cruise.

3.4.4.3 Combat altitude. The altitude at the target for the specific mission shown.

3.4.5 Take-off. Criteria for conventional take-off aircraft shall comply with the following: (for STOL aircraft the criteria shall be determined by design criteria.) (Vertical components of thrust may be used in take-off computation.)

3.4.5.1 Ground run distance (i.e. take-off distance). Take-off ground run distance shall be that normally obtainable in service operation at Sea Level with standard atmospheric conditions, zero wind, no runway slope on hard (concrete or asphalt) surfaced runways. The take-off speed criteria of 3.4.2.4 shall be used.

3.4.5.1.1 Typical design criteria. For design purposes, consideration may be made of alternate definitions of take-off ground run such as: non-standard atmospheric conditions, higher pressure altitudes, alternate runway surfaces (hard, sod etc.), head or tail-wind or other criteria in keeping with the operational concept of the design.

3.4.5.2 Distance to 50 ft. The distance to clear a 50-foot obstacle shall be the sum of take-off ground run distance of 3.4.5.1 plus the airborne distance needed to accelerate and climb to arrive at the 50-foot height at the speed specified in 3.4.2.5.

3.4.5.3 Take-off time. The take-off time shall be that normally obtainable in service operation at sea level under standard day atmospheric conditions with no wind. The time is measured from start of take-off (brake release) to start of enroute climb (attainment of climb speed).

3.4.5.4 Critical field length. Critical field length is the sum of the distance required to accelerate with all engines operative to critical engine failure speed (3.4.2.7) plus the distance to accelerate with the critical engine inoperative to take-off or to decelerate to a stop from critical engine failure speed in the same distance.

3.4.5.4.1 Data basis. The data basis for the computation of the stopping distance for the chart for critical field length shall be as follows:

a. At engine failure speed the aircraft continues to accelerate for 3 seconds pilot reaction time with remaining engines at maximum power and zero thrust on the inoperative engine.
b. At the end of the 3-second acceleration time, power on all engines is instantaneously reduced to idle, brakes applied, and deceleration devices deployed.
c. Sufficient time, after, b, above, shall be allowed for deployment of the deceleration device(s) or for reverse thrust to reach maximum before including its effect on deceleration.

3.4.5.5 Coefficient of friction. The coefficient, μ, as used in this document is defined as the ratio of the total retardation force attributable to the braking system to the momentary gross weight of the aircraft. The following values will be used unless ground or flight test data are available.

3.4.5.5.1 Rolling μ. The rolling (unbraked) coefficient of friction for a dry, hard surface runway shall be assumed equal to 0.025.

3.4.5.5.2 Braking μ. The total braking coefficient of friction for a dry hard surface runway shall be assumed equal to 0.30.

3.4.5.5.3 Test data. Test μ values may be either the results of tests conducted on the specific aircraft or similar types, i.e. commercial aircraft.

3.4.5.5.4 Typical design criteria. For design purposes, consideration may be given to the effects of new and improved methods of increasing the total retardation force such as by anti-skid devices.

3.4.6 Climb. Climb after take-off may be divided into two segments as specified by the procuring agency: Initial climb-out and enroute climb.

3.4.6.1 Initial climb-out. Climb-out shall be at a speed which shall not be less than that limited by the criteria of 3.4.2.5. Gear retraction shall be initiated as soon as an adequate positive climb gradient (3.4.2.5c and d), using applicable power, has been established and maintained while accelerating to climb-out speed. Flaps shall be in the take-off position.

3.4.6.1.1 All engines operating. Initial climb-out with all engines operating shall be based on all engines operating from brake release to take-off. Acceleration to climb-out speed and climb-out shall be based on the thrust (power) available with all available engines.

3.4.6.1.2 One engine inoperative. Initial climb-out with one engine inoperative shall be based on all engines operating from brake release to critical engine failure speed and with the critical engine inoperative from critical engine failure speed to take-off. Acceleration to climb-out speed and climb-out shall be based upon the thrust (power) available with the remaining engines at take-off thrust and the drag of the inoperative engine. If means of reducing drag of the inoperative engine are a design feature, such drag reduction shall be utilized with a time allowance for activation.

3.4.6.2 Climb path angle. The climb flight path angle shall be expressed in terms of a gradient (vertical feet per 100 horizontal feet). This path shall be determined from the 50-foot height point and at the 50-foot height climb-out speed as determined in 3.4.2.5. Conditions shall be with gear up, flaps in take-off position, out of ground effect and with appropriate configuration, power and weight. For multi-engine aircraft the climb flight path with the critical engine inoperative shall be included.

3.4.6.3 Enroute climb. Enroute climb data shall be based on the appropriate configuration, power and weight. The aircraft shall have the landing gear and flaps retracted and have attained the airspeed for best climb for the applicable condition.

3.4.6.4 Time to climb. The time to climb to specified altitude(s) shall be expressed in minutes from start of enroute climb. Weight reduction as a result of fuel consumption shall be applied to the calculations.

3.4.6.5 Combat climb. Combat climb is the instantaneous maximum vertical speed capability in feet per minute at combat conditions, such as, weight, configuration, altitude, and power.

3.4.7 Landing distance. The following criteria are for conventional aircraft. (For STOL aircraft the criteria shall be as established by design requirements.) Landing distance includes: (a) landing ground roll and (b) distance over a 50 foot height. Distances shall be for the landing configuration and weight and shall be based on the landing speeds defined in 3.4.2.12. Unless otherwise specified, ground roll deceleration shall be based on operation at Sea Level, standard day, zero wind, no runway slope, idle power and a braking coefficient as defined in 3.4.5.5.2.

3.4.7.1 Typical design criteria. For design purposes, consideration may be given to alternate definitions of landing distance such as: reverse thrust, atmospheric conditions, runway slopes and winds of a non-standard nature, a rigid computer analysis of the air distance and other similar criteria selected to optimize the design of the airplane.

3.4.8 Power. The term (power) is used to mean brake horsepower or thrust as applicable with due consideration for installation effects and limitations. Engine and assisted takeoff ratings as defined in 3.6.2.1.3 c and 3.6.3.1.4 shall be those which appear in the approved engine model specification without regard to installation effects or limitations.

3.4.8.1 Maximum power. Maximum engine power output. This condition of operation may have an incremental duration time limit. This term is used for both augmented and non-augmented engines.

3.4.8.2 Intermediate power. Maximum engine power output without augmentation. This condition may be time limited. This term is used only for augmented engines.

3.4.8.3 Maximum continuous power. Maximum engine power output which may be used continuously, no time limit is imposed.

3.4.8.4 Cruise power. The power required to fly the aircraft at cruise speed for the configuration, altitude and weight designated.

3.4.8.5 Minimum augmented. Lowest power at which the engine will operate with augmentation at any point specified within the augmented operating envelope.

3.4.9 Fuel. Unless otherwise specified, fuel for gas turbine engines shall be JP-4. Weights shall be obtained from 3.4.1.11.

3.4.9.1 Fuel consumption corrections. Corrections or allowances to engine fuel flow shall be made for all propulsion system installation losses such as accessory drives, BLC bleed, environmental system bleed, nozzle losses, pressure recovery, etc.

3.4.10 Mission types. Representative operational missions for various types of aircraft are specified in table I. Typical maximum effort missions are shown in Appendix IB to this specification. These maximum effort missions specify the exact fuel allowances for take-off and climb, combat, and landing reserves and are included since they are often used to compare USAF aircraft and foreign aircraft performance capabilities on a common basis.

3.4.10.1 Design mission. The design mission is defined as the primary mission for which the aircraft was specifically procured. This mission will normally be defined in procurement documents such as the statement of work and will include the flight profile, allowances, fuel (clean or external tanks) and payload. Ground rules and allowances for the design mission are dictated by the specific operational requirements and will be used in describing the mission capabilities in the Standard Aircraft Characteristics charts. Some useful alternate design criteria are discussed in 3.5.3 and in other applicable parts of this specification.

3.4.10.2 Ferry mission (ferry range). The greatest distance attainable on a practical one-way mission with maximum authorized fuel and no payload.

3.4.10.3 Typical missions. Any missions, preferably from table I, which would present the additional capabilit es of the aircraft. Normally these will include at least one mission at the maximum take-off weight (3.4.1.5.1) with the ground rules corresponding to the design mission.

3.4.10.4 Inflight refueled mission. For aircraft capable of inflight refueling, a refueled mission is the distance (radius or range) attainable through receipt of replacement fuel during flight. A single refueling operation is required although multiple refueling operations may be added if considered to be feasible. Basic profiles from table I shall apply with special allowance from table II considered.

3.4.10.5 Combat range. Combat range is the distance (including distance covered in climb) attainable on a one-way flight carrying payload (bombs, cargo, personnel) the entire distance. Droppable fuel tanks are dropped when empty. Allowances for take-off, climb, cruise are taken from the design mission. Combat range for bomber, fighter, and attack aircraft should be computed without landing reserves. Landing reserves should be included for aircraft.

3.4.10.6 Combat radius. Combat radius is the distance [including distance covered in climb(s)] to the mid-point of a equal legged mission from base to target and return. Specific mission profile actions, allowances and reserves shall be as set forth in table I and in the mission being considered.

3.4.10.6.1 Typical design criteria. For design purposes, consideration may be given to the requirement for missions containing unequal legs (offset). Significant design impact could result from a mission where the aircraft is recovered at a remote base without the requirement of returning to home base.

3.5 Mission detailed requirements

3.5.1 General mission requirements. Unless otherwise specified, the following general ground rules shall apply:

3.5.1.1 Standard atmosphere. Data shall be presented for standard day atmosphere.

3.5.1.2 Wind. Data shall be for a no-wind condition.

3.5.1.3 Formation flight. Data shall be for a single aircraft only.

3.5.1.4 Ordnance expenditure. All ordnance shall be expended at the start of combat unless otherwise specified.

3.5.1.5 Off-Loading fuel. Fuel may be off-loaded to avoid exceeding the maximum allowable take-off weight.

3.5.1.6 External fuel tanks. External fuel tanks on combat aircraft, shall be dropped when empty or prior to combat unless such tanks are designed to be carried during combat. Unless otherwise restricted (Center of Gravity etc.), dropping of external tanks shall be sequenced to provide maximum range. Cargo and tanker aircraft shall not drop empty external tanks.

3.5.1.7 Pylons/Racks. In the computation of range/radius performance, pylons and racks shall be retained unless required to be dropped by design requirements.

3.5.1.8 Reduced engine operation. When applicable, a minimum number of engines may be used to increase range if such operation would represent normal service usage. However, such action shall conform to 3.5.1.9.

3.5.1.9 Authorized operation. No operational technique, see 3.5.1.8, shall be utilized that is not included, or is not intended to be included as recommended procedure in the applicable flight manual.

3.5.1.10 Trainer aircraft. Thr trainer mission as defined by table I is applicable to basic and advanced trainer airplanes. Combat and tactical trainer airplanes fly the design mission for the appropriate parent-type airplane.

3.5.1.11 Variable geometry wing (VGW) aircraft. Normally VGW aircraft will have wings in unswept position for take-off and subsonic flight and swept for supersonic dash and chase profile segment unless footnoted otherwise.

3.5.2 Mission loading requirements. In order to facilitate and expedite the submittal of the charts, the contractor should contact the procuring agency to discuss the various mission loadings prior to submittal. In the absence of special instructions, the following shall apply.

3.5.2.1 Design mission loading. The fuel and payload loading for the design mission shall be the primary loading condition as defined in the system specification for the aircraft.

3.5.2.2 Typical missions loading. Loadings shall be selected from those included in the system specification or other approved loadings which depict a particular capability of the aircraft. At least one mission shall conform to the maximum gross weight specified in 3.4.1.5.1.

3.5.2.3 Ferry mission loading. Loading shall consist of the maximum authorized fuel and no payload.

3.5.2.4 Inflight refueled mission loading. One mission shall be for the same loading as the design mission. Other loadings may be selected from the typical missions.

3.5.2.5 Combat range mission loading. Identical to the loading of the associated combat radius mission.

3.5.3 Mission segments. Rationale for mission segments is presented below.

3.5.3.1 Take-off. Fuel allowances for ground operation including starting engines, warm-up, taxi, take-off and acceleration to climb speed, are as defined in the requirements for the design mission.

3.5.3.1.1 Typical design criteria. For design purposes, consideration may be given to defining the take-off allowance to fully utilize the state-of-the-art. Some typical examples are:

a. Specify engine operation for specific time periods at specified powers. Such as, fuel used during 5 minutes of maximum continuous power operation at Sea Level on a standard day plus 1 minute of maximum power operation if afterburner is used during take-off.
b. Estimate fuel required to start the engine(s), run-up, taxi a specified distance at a specified power setting and to accelerate from brake release to climb speed at a specified power.
c. Estimate fuel for a specified time at a specified thrust/weight ratio to account for starting and taxi plus fuel for take-off and acceleration to climb speed computed from the following:

$$W_{f_{TO}} = \frac{V_c W_{TO}}{2g} \cdot \frac{(\dot{W}_o + \dot{W}_c)}{T-D}$$

When: $W_{f_{TO}}$ = Take-off and acceleration fuel, lbs

V_c = initial climb speed, ft/sec

W_{TO} = take-off weight, lbs

$\dot{W}_o$ = static fuel flow at take-off power, lbs/sec

$\dot{W}_c$ = fuel flow at initial climb speed at take-off power, lbs/sec

T-D = thrust minus drag at V_c, lbs

g = acceleration of gravity, S.L., ft/sec^2 (2)

Note: If power is to be varied between lift-off and climb speed this equation can be so modified.
d. Other specific criteria may be selected to more accurately portray the operational characteristics of the specific design.

3.5.3.2 Climb. Except for point intercept missions, all climbs shall be enroute with power and speed schedules optimized to maximize mission range. Point intercept missions shall be optimized to obtain minimum time to combat altitude.

3.5.3.2.1 Typical design criteria. For design purposes, consideration may be given to alternate climb schedules to more adequately portray the desired operational capability of the design. For example the following schedules could apply: minimum time, minimum fuel, maximum range, specified power or speed, accelerate during climb, etc.

3.5.3.3 Cruise. Unless specifically assigned, aircraft shall cruise at the speed and altitude for maximum or long range for the applicable configuration, power and weight. Except where the altitude is specified, the aircraft may utilize a cruise climb to optimize cruise distance. This altitude shall not exceed cruise ceiling.

3.5.3.3.1 Typical design criteria. For design purposes, consideration may be given to specifying a cruise technique selected to optimize the desired characteristics of the design. Techniques to be considered include: constant altitude cruise, constant speed cruise, cruise climb profile, step climb, cruise at specified power, cruise with reduced number of engines, cruise altitude in excess of cruise ceiling, fixed distance segment, headwinds or tail winds, non-standard temperatures, etc.

3.5.3.4 Combat. Combat shall be considered by setting aside a quantity of fuel based upon a specified measure of combat performance. For task-oriented fuel allowances, computation shall be based upon weight at start of combat period with benefit due to weight reduction cridited; change in speed due to weight reduction shall be ignored.

3.5.3.4.1 Escape and evasion. Escape and evasion shall be considered by setting aside a quantity of fuel based upon a specified measure of performance.

3.5.3.4.2 Typical design criteria. For design purposes, consideration may be given to various methods of accounting for the fuel to be used during combat or escape and evasion action. Some examples of methods are:

a. Fuel required for a specified time with a specified power at a specified speed and a specified altitude.
b. Fuel consumed in expending a specified quantity of energy. For example:

$$\text{Combat fuel} = \frac{E_s \dot{W}_f}{P_s}$$

When: E_s = Specific energy, ft

$\dot{W}_f$ = fuel flow at combat speed, power, and altitude, lbs/sec

P_s = excess energy or $\frac{(T-D)V_c}{W_{T_c}}$, ft/sec

V_c = combat true airspeed, ft/sec

W_{T_c} = combat weight, lbs

(T-D) = thrust minus drag, lbs (3)

c. The quantity of fuel determined as the sum of the fuel required to accelerate from cruise speed to a specified speed, plus fuel required to make a specified number of sustainable turns at a specified speed or speeds. These operations shall be performed at a selected power(s) and altitude(s).
d. All or a portion of the armament may be expended.
e. Other specific criteria selected to more accurately portray the operational characteristics of the specific design.

3.5.3.4 Descent. For vehicles whose best cruise is subsonic, no time, fuel or distance shall be credited for descent. For supersonic cruise vehicles, credit shall be taken for descent and deceleration to a specified altitude and speed. Vehicles which conduct a supersonic run out from the target may, if the cruise altitude and speed are lower than the run out altitude and speed, account for distance in descent and deceleration to cruise.

3.5.3.5 Typical design criteria. For design purposes, consideration may be given to alternate definitions of descent. For example: Time, fuel and distance could be credited, descent could be a long range (airline) approach, use of power could vary from none to full, speeds could vary from near stall to redline, altitudes could be reduced in step increments, etc.

3.5.3.6 Landing reserve. Since the mission profiles of table I are generalized, no compliance with the alternate landing destination of AFM 60-16 is possible. Instead, a landing reserve is required which would be typical of operational use.

3.5.3.6.1 Typical design criteria. For design purposes, consideration may be given to defining the landing reserves to fully utilize the state-of-the-art. Some examples are:

a. The fuel required for a ground controlled approach; a wave-off, go-around and a second, successful landing. This could be approximated by using the equivalent of fuel consumed during a specified time at maximum endurance at Sea Level with all engines operating.
b. A specified percentage of initial fuel load.
c. Fuel consumed during a specified time of operation at a specified power at a specified altitude.
d. The greater of the fuel required for 10 percent of mission time or 20 minutes at maximum endurance speed at 10,000 feet (AFM 60-16).
e. Fuel required to fly to an alternate field (specify distance) plus a specified time at a specified speed at a specified altitude to account for landing.
f. Combinations of the above or other criteria selected to optimize the design.

3.5.4 Mission time. Time in air excluding the time before the start of initial climb and reserve unless otherwise specified and noted. For interceptors only: includes actual time required for take-off and acceleration to climb speed.

3.5.5 Cycle time. The time of flight from the start of initial climb (omitting take-off time) to the time when the engines are stopped after landing.

3.5.6 Block time. The total time of flight from engine start to engine stop after landing.

3.5.7 Intercept time. The time from engine start until initiation of combat at the intercept altitude. This time includes the period required for take-off and acceleration to climb speed.

3.6 Detail requirements

3.6.1 General information

3.6.1.1 Source. The oversize format (14-1/2 inches by 11 inches) may be obtained from the procuring agency. Page size when finally reproduced by the procuring agency shall be 8-1/2 inches by 11 inches.

3.6.1.2 Size. All pages submitted must be a photographic black and white matte print of the same size as the oversize format. All line weights used throughout must be suitable for 1/3 photographic reduction.

3.6.1.3 Graphic presentation. All graphic data shall be presented in the spaces provided on the format and must be mounted and positioned so as to constitute one complete piece of art for each page. (An exception to this rule applies only to the cover page.)

3.6.1.4 Text. Principal text entered into the format shall be equivalent to 10-point Bookman or similar book-face type. Typeset, typewriter with proportionally spaced letters or Varitype copy may be used. In all cases, typewriter copy must be clean and sharp to be suitable for reproduction by camera and offset printing.

3.6.1.5 Identification. Identification and markings required under 1.5 shall be so located as to start or end flush with the vertical border lines as applicable.

3.6.1.6 Graphs. Curves shall be drawn with a sufficiently broad pen so that they stand out clearly from the grid, but do not compromise the accuracy of reading. Select 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.

3.6.2 Standard Aircraft Characteristics charts

3.6.2.1 Required characteristic data (including descriptive detail)

3.6.2.1.1 Cover photograph (page 1). Cover sheet shall include a picture of the aircraft. In order of preference: A photograph of the aircraft in flight, a

photograph of the aircraft on the ground, a photograph of a model, or an artist conception drawing of the aircraft in flight. The drawing or photograph shall be of good contrast or permit satisfactory reproduction and should portray the distinguishing features of the aircraft. Drawing or photo shall not be smaller than 7-1/4 inches by 13 inches, nor larger than 11 inches by 13 inches. The aircraft model designation and the approved popular name shall be typeset using 24 point Futura Demibold or equivalent, centered below the title leaving a 1/2 inch space. One-half inch below the aircraft designation, center the contractor's name using 18-point Futura Demibold or equivalent.

3.6.2.1.2 Descriptive arrangement (page 2). The drawings shall be in ink on suitable drawing material and may be made oversize at whatever scale the manufacturer deems suitable. This oversize ink drawing shall then be photographically reduced so that it can be inserted on the appropriate block within the format sheet. Full advantage shall be taken of the space alloted so as to provide the largest arrangement attainable within the block. The line weights used on the drawings must be suitable to provide reproduction of the format page when reduced. All dimensions and text entered on this format page shall be typeset using 10-point Futura Medium or equivalent.

3.6.2.1.2.1 General arrangement. Material pertinent to each view shall be as follows:

a. Plan view — The plan view (center line of fuselage vertical, with nose pointed toward bottom of page) shall contain external tankage as indicated in b. Span of the horizontal tail shall be given. Drawing shall contain no other dimensions unless the peculiarities of the aircraft warrant the usage for identification not elsewhere described.

b. Front view — The front view shall be a front elevation in flight attitude with gear extended. External tanks (fixed) shall be shown in solid line. External tanks (droppable) shall be shown in dotted line. If external tanks of alternate capacities can be used interchangeably or in combination, the tankage of maximum permissible capacity shall be shown. Dimensions shall include the span (without tip tanks if droppable) and maximum tread. Maximum tread shall be shown to the center line of the outer wheel for single wheel gear, and to the center line of the outer struts for dual wheel gear.

c. Side elevation — The side elevation (nose pointing either right or left to best show the cargo doors, windows, etc.) shall be placed in a level flight attitude. Maximum overall length of the basic aircraft and height above ground in a static attitude shall be shown.

d. Scale — The scale shall be placed to the right or left of the aircraft grouping. The scale is to be prepared as to best compare to the actual dimensions. A scale bar, approximately 1-1/2 inches long shall be divided into multiples of 1, 5, and 10 feet as appropriate.

e. Dimensions and markings for descriptive arrangement drawings — Drawings of the airplane with essential features clearly delineated. The dimensions and data required shall include the following:

(1) Wing span in feet and tenths

(2) Tread in feet and tenths

(3) Fuselage length in feet and tenths

(4) Height in feet and tenths

(5) Prop ground clearance in inches

(6) Wing area, MAC, Aspect Ratio, Wing Section (root, MAC and tip)

3.6.2.1.2.2 Armament, tankage, and pressurization. The sequences and material pertinent to each component shall be as follows:

a. Tankage diagram shall be a simplified perspective line drawing of the aircraft. Armor, fixed, and flexible guns, bomb, rocket stations, cargo space and interior arrangement other than tankage shall not be shown. The fuel tanks (external and internal) are to be shaded with diagonal hatching and the corresponding key is to be entered in the lower left corner. External tanks shall include that combination which shows the maximum permissible external capacity. The engine oil tanks shall be solid black and keyed in the lower right corner. Water/alcohol tanks shall be shown by a star and keyed. Usable capacities shall be shown as call outs for each tank located outside the drawing near the respective tanks. A tank shall be considered to be a cell or series of cells forming a composite unit. Directly above the drawing wing area (gross), Aspect Ratio, Wing Section (root, MAC and tip) and MAC shall be tabulated.
b. A pressurization area shall be shown in phantom perspective view approximately one-fourth the size of the tankage diagram. The pressurized area shall be portrayed in a heavy black outline.
c. An inboard profile shall show the following equipment when applicable: Guns, bombs, crew stations, oxygen tanks, flight controls, armor plate (dominant black outline) cameras, cargo space, ramps, engines, fuel tanks in fuselage, wheel wells, etc. Wing root and horizontal tail root shall be superimposed in dotted line. Call outs to the main compartments from station to station shall be clearly delineated and titled.

3.6.2.1.3 Mission and description (page 3). The mission and description page shall include the information given below:

a. 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, operational limitations, etc. A statement shall be included describing the type of high lift device employed on the aircraft. Other designations by which the model has been identified shall be listed. Under a subheading, DEVELOPMENT, milestone dates, such as, contract date, prototype first flight, first flight of the production configured aircraft, and date of service acceptance, should be noted.

b. Propulsion system — Data to be listed shall include, as applicable:

Number and model of engines	Tail pipe nozzle (type) Tail pipe control (type) Augmentation
Manufacturer	Number of blades/propeller diameter Propeller Manufacturer
Engine Specification Number	Propeller blade design number
Type compressor	
Length	
Diameter	
Weight (dry)	Number and type of ATO devices

c. Ratings — Engine ratings shall include power or thrust, specific fuel consumption, rpm, altitude(s) and time limits or deviations, as applicable. Engine ratings and ATO ratings shall consist of the guaranteed ratings established in the officially approved engine specifications. Ratings with an augmentation shall be identified by note. If performance items are based on powers which differ appreciably from the listed specificating ratings, due to flight or engine laboratory test results or restrictions, such powers with explanations will be listed on NOTES page. Reference to source of such power shall be clearly stated in the performance data report.

d. Weight and load factors — The gross weight and the corresponding allowable load factors shall not exceed the limits established by the latest applicable technical orders, design requirements, or other specific recommendations of 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 non-standard operating procedure or special operating techniques associated with such weight may be given, provided such weights are clearly identified with a note defining the limitations on usage. The following weights with corresponding load factors as applicable shall be given:

LOADING	POUNDS	LOADING	REFERENCE
Empty			3.4.1.1

Basic	3.4.1.2
Operating	3.4.1.3
Design	3.4.1.4
Maximum Take-off	3.4.1.5.1
Maximum Inflight	3.4.1.6
Combat (design mission)	3.4.1.8
Maximum Landing	3.4.1.9.1

Note: Basis of weight data – Empty weight shall be identified by the symbols E (estimated), C (calculated) or A (actual). As applicable, a footnote shall be used to indicate the limitation for maximum take-off and maximum landing weights.
e. Fuel and Oil – The number of fuel, water/alcohol, and oil tanks, their usable capacities and locations, extent of self-sealing provisions and other unique features, together with grade and specification of fuel and oil used, shall be listed. Fuel tanks shall be grouped by fuel systems.
f. Electronics – Name and model of principle electronics equipment in the aircrafts shall be listed. Mission required electronics such as the equipment carried on (E) type aircraft shall be listed under separate heading. Secondary equipment such as circuit analyzer and frequency indicator shall not be included.
g. Ordnance – Type, model and number of droppable ordnance items, such as, bombs, mines, rockets, rocket pods, ECM pods, missiles, etc and the maximum bomb load which may be carried by the aircraft shall be listed. Maximum bomb load shall be the largest load, in pounds. Ordnance carried externally shall be shown as specified in 3.6.2.1.8. The number and caliber of guns, the number of turrets, rounds of ammunition per gun, and the gun stations shall be listed.
h. Cargo – Maximum cargo load, clear space dimensions, limit floor loads, door size and location, etc. are to be given as applicable. Additional cargo information may be entered on a supplemental (NOTES) page. Maximum cargo shall not exceed that for which the aircraft has a combat range of at least 100 nautical miles. The cargo data is to be placed in the space marked for ordnance when cargo rather than ordnance applies.
i. Dimensions – Overall dimensions, in agreement with the general arrangement drawings of the basic aircraft in the three point static position, such as wing span, incidence (root and tip), dihedral, sweepback at leading edge, length, height, maximum tread, and propeller ground clearance.

3.6.2.1.4 Tabulated performance data (page 4). Tabulated performance for the design mission (3.4.10.1) and other typical missions (3.4.10.3) shall include the applicable loading and performance items in accordance with table II. The first column of page 4 is restricted to the design mission as defined in 3.4.10.2. Criteria (ground rules) for the missions shall be presented on Page 9 (NOTES) page.

The missions shall be selected so as to illustrate the overall capabilities of the aircraft. Mission weights shall not exceed the maximum take-off weights shown in (WEIGHTS) on page 3.

3.6.2.1.5 Supplemental tabulated performance (page 6). If additional space is required, use this page for alternate loadings and performance.

3.6.2.1.6 Graphic performance data (page 6). Performance data shall also be shown graphically on the appropriate grids as provided in the formats. Data appearing on the graphs shall be consistant with like data appearing on pages 3, 4 and 5. Grid lines may be broadened at significant intervals to improve readability. Curves shall not extend beyond any applicable limits.

3.6.2.1.6.1 Speed. As a function of altitude, plot maximum speed at design mission combat weight with maximum, intermediate, or maximum continuous power, as applicable; and for additional mission loadings including design mission take-off weight with intermediate or maximum continuous power, to show the effects of drag of significant external stores and important weight changes.

3.6.2.1.6.2 Climb. As a function of altitude, plot instantaneous rate-of-climb at design mission combat weight with maximum, intermediate, or maximum continuous power as applicable; and for additional mission loadings including design mission take-off weight with intermediate or maximum continuous power, to show the effects of drag changes with various external stores and important weight changes. The effects on rate-of-climb of weight reduction during climb shall not be considered except for interceptors. For time-to-climb, plot time as a function of altitude at design mission take-off weight with applicable power. The time-to-climb shall consider the effects of weight reduction during ground operation and climb.

3.6.2.1.6.3 Take-off. As a function of gross weight, plot ground run distance and total distance to clear 50-foot obstacle, and critical field length (for multi-engine airplanes), under zero-wind conditions with maximum power and for standard day (59.0°F), tropical day (89.6°F) and hot day (103.0°F). See Appendix IC.

3.6.2.1.6.4 Trade-off. This graph shall constitute the fourth presentation on page 6, Graphic Performance.

a. For interceptor and air superiority fighters – Present a plot of time available with design mission combat fuel quantity (3.5.3.4) versus altitude as a function of mach number. In computing time available the combat quantity of fuel will be reduced by fuel required to climb to altitude with combat power or to regain cruise altitude with enroute climb power. Time at various mach numbers will be based on maximum power operation. The purpose of this plot is to depict combat time available with a defined quantity of fuel at other conditions than that which defined the fuel quantity.

b. For cargo, tanker and bomber aircraft – Present a plot of payload (munitions load for bombers) in pounds versus radius. For cargo aircraft include payload versus range plot. Design mission profile will be the basis for flight profile.

c. All other types shall show a curve of the contractors choice from the list of supplemental presentations. (3.6.2.1.7)

3.6.2.1.7 Supplemental graphic performance data (page 7). This page shall contain up to four graphs showing various performance trade-offs. These may be selected from the following or be special graphs designed by the contractor to more aptly display the capabilities of the aircraft.

a. Radius as a function of penetration speed.
b. Radius as a function of penetration distance.
c. Radius as a function of time on station.
d. Radius as a function of cruise speed.
e. Turn radius versus mach number at various altitudes and weights.
f. Energy maneuverability: altitude versus speed (TAS or Mach Number) for various levels of P_s. Where:

$$P_s = \frac{(T-D)V}{W} \quad , \quad \text{ft/sec}$$

T = thrust available, lbs

D = Drag, lbs

V = True airspeed, ft/sec

W = Weight, lbs (4)

g. Radius as a function of altitude.
h. Take-off distance and critical field length with reduced levels of take-off thrust.

3.6.2.1.8 External store loadings (page 8). This page shall contain a simplified drawing of the aircraft (front view) showing external stores stations. Columns are to be numbered corresponding to wing stations, and external stores capable of being carried are to be noted under respective stations. Left hand column (#1) may be used for general store names (rockets, bombs, missiles, tanks) while the specific item is called out under the appropriate station (400 gal tanks, MK-82 Snakeye). If an aircraft has more than seven external store stations, a single column can be used for stores carried on symetrically located stations.

3.6.2.1.9 Notes (page 9). This page shall contain the description and flight profiles of the missions tabulated on page 4 (Tabulated Performance) and page 5 (Supplemental Tabulated Performance). The left hand column from the mission ground rules (table I) shall constitute the mission description when the blanks are filled in with incremental time, fuel and distance, as appropriate, for each segment. This page shall also contain any explanatory notes for which space is not otherwise provided as well as an adequate description of any conditions and qualifications affecting the aircraft performance, if appropriate.

3.6.2.1.9.1 Required data.

a. Performance basis: Select the appropriate listing.

(1) Estimated Data

(2) Calculated data based on preliminary flight test of _____ aircraft.

(3) Calculated data based on flight test of _____ aircraft.

(4) Flight test data _____ aircraft.

b. Basis of, or reason for revision, if applicable.
c. Contractor's Engineering report: Title and Number.

3.6.2.1.9.2 Additional data. Additional applicable information shall also be given such as:

a. The effect on combat range or radius when using alternate fuel for jet engines.
b. The effect on important performance items resulting from dropping or installing principal armament or tankage items, engine operating limits, one engine inoperative, etc.
c. Power on which performance is based if significantly different from standard engine ratings, as required in 3.6.2.1.3c.

3.6.3 Characteristics summary chart. Required unless otherwise specified to the procuring agency. All data shall be in agreement with that presented in the Standard Aircraft Characteristics charts.

3.6.3.1 Characteristics data. Characteristics data shall be entered in the appropriate blocks of the oversize format obtained from the procuring agency in accordance with the following requirements.

3.6.3.1.1 Dimensions. Directly under the three view block enter wing area, span, length, and height of the basic aircraft in accordance with 3.6.2.1.3i.

3.6.3.1.2 Procurement and availability. Information regarding aircraft procurement and availability shall not be given. This block on the characteristics summary shall be left blank for possible use by recipients of the document.

3.6.3.1.3 Status. On the characteristics summary pertinent notes regarding enter dates of contract, mock-up, first flight, first acceptance, first service use and any other pertinent milestone data.

3.6.3.1.4 Propulsion system. Enter the number of engines and model designation, the manufacturer and the approved guaranteed engine ratings.

3.6.3.1.5 Features. List in brief form, such items as crew, special electronics installations, unusual aerodynamic or equipment features, fire control system, bomb system, auto-pilot designation, ECM pods, etc. The last entry in the block shall always be the maximum usable fuel capacity.

3.6.3.1.6 Armament. List the number and caliber of guns, rockets, number of turrets, rounds of ammunition, number and type of ordnance, maximum bomb size and maximum bomb load, and other features of ordnance. For cargo, and transport aircraft, change heading to (GENERAL) and substitute data in accordance with 3.6.2.1.3h. For armed reconnaissance aircraft, the armament block shall be contracted in depth and another block titled (CAMERAS) inserted and listing of photographic equipment shown.

3.6.3.2 Drawings

3.6.3.2.1 Outline. An undimensioned 3-view drawing shall be inserted in the appropriate block within the oversize format. Full advantage shall be taken of the space alloted so as to provide the largest 3-view arrangement obtainable within the 4-inch by 10-7/8-inch block. In the lower left hand portion of the block, enter the approved popular name of the aircraft. In the lower right hand portion of the block enter the contractor's name.

3.6.3.2.2 Flight profile. Show a 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.

3.6.3.3 Tabulated performance data. Performance items given in the appropriate blocks on the characteristics summary shall be in agreement with similar items given for the design mission in the first column of the tabulated performance data of the standard aircraft characteristics chart.

3.6.3.4 Notes. Notes entered on characteristics summary shall conform to 3.6.2.1.9 and 3.6.2.1.9.1.

4. SAMPLING AND INSPECTION

4.1 Inspection and acceptance. All data shall be subject to final inspection and approval by the procuring agency. All data contained in the charts and substantiating data report shall be subject to review and analysis by the procuring agency.

5. PREPARATION FOR DELIVERY
Section 5 is not applicable to this specification

6. NOTES

6.1 Formats. Formats and interpretations of the technical requirements of this specification may be obtained from the procuring agency.

6.2 Reference material. The following document is listed as a source of information in connection with this specification:

AN-01-1B-50 Basic Technical Order for USAF Aircraft Weight and Balance.

Custodian:
Air Force - 11

Preparing activity:
Air Force - 11

Project No. 1500-0066

TABLE I

STANDARD MISSIONS

ATTACK
- A-1 Hi-Hi-Hi
- A-2 Hi-Lo-Hi
- A-3 Hi-Lo-Lo-Hi
- A-4 Lo-Lo-Lo-Hi
- A-5 Lo-Lo-Lo-Lo
- A-6 CAP

BOMBER
- B-1 Hi-Hi-Hi-Hi
- B-2 Hi-Lo-Lo-Hi

CARGO
- C-1 Supply
- C-2 Assault

FIGHTER
- F-1 Air Superiority
- F-2 Point Intercept
- F-3 Area Intercept
- F-4 CAP
- F-5 Hi-Hi-Hi
- F-6 Hi-Lo-Hi
- F-7 Hi-Lo-Lo-Hi
- F-8 Lo-Lo-Lo-Hi
- F-9 Lo-Lo-Lo

TANKER
- T-1 Buddy Refuel
- T-2 Rendezvous Refuel

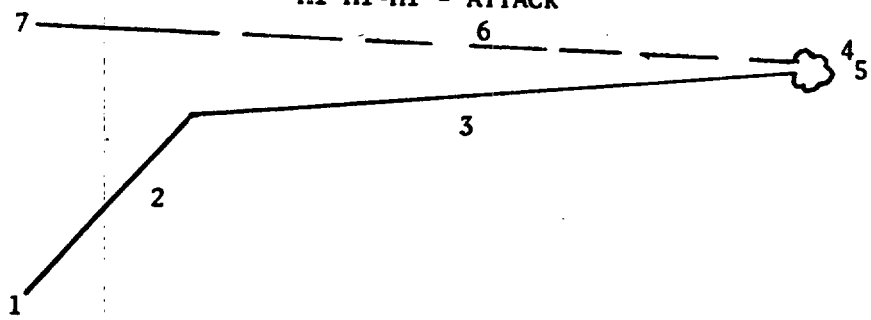
GENERAL
- G-1 Airborne Warning and Control
- G-2 Rescue
- G-3 Forward Air Controller
- G-4 Trainer
- G-5 ASW Search
- G-6 Ferry Mission

NOTES
1. For segment details and rationale - see 3.5.3
2. For each segment, enter incremental values: (Time; hours; Fuel; pounds; Distance; n. miles)
3. For tanker missions with a specified receiver - See table III

TABLE I. STANDARD MISSIONS (Continued)

MISSION A-1

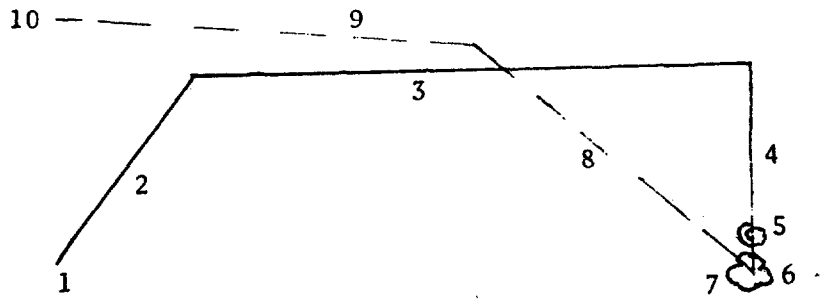
HI-HI-HI - ATTACK



SEGMENT	ALLOWANCE
1. Take-off and accelerate to climb speed ( )	1. See 3.5.3.1
2. Climb on course to cruise altitude ( )	2. Speed and power for maximum range
3. Cruise to target ( )	3. Speed and altitude for maximum range
4. Drop Stores ( )	4. Weight reduction equal to store weight
5. Escape and evasion ( )	5. See 3.5.3.4.1
6. Cruise to base ( )	6. Same as 3
7. Arrive over base with reserve fuel ( )	7. See 3.5.3.6

TABLE I. STANDARD MISSIONS (Continued) MISSION A-2

HI-LO-HI - ATTACK

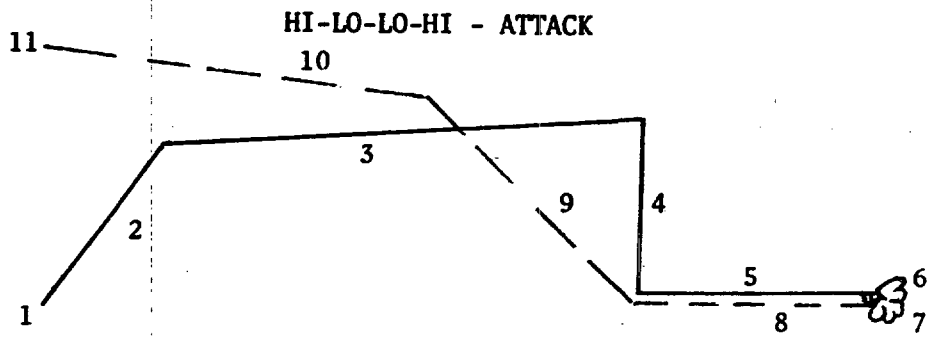


SEGMENT	ALLOWANCE
1. Take-off and accelerate to climb speed ( )	1. See 3.5.3.1
2. Climb on course to cruise altitude ( )	2. Speed and power for maximum range
3. Cruise to target ( )	3. Speed and altitude for maximum range
4. Descend to Sea Level	4. No time, fuel or distance credited except where specified
5. Acquire FAC aircraft and identify target ( )	5. Fuel for specified time at combat loiter speed at specified altitude. No distance credited
6. Drop Stores ( )	6. Weight reduction equal to store weight
7. Attack target ( )	7. See 3.5.3.4
8. Climb on course to cruise altitude ( )	8. Same as 2
9. Cruise to base ( )	9. Same as 3
10. Arrive over base with reserve fuel ( )	10. See 3.5.3.6

TABLE I. STANDARD MISSIONS (Continued)

MISSION A-3

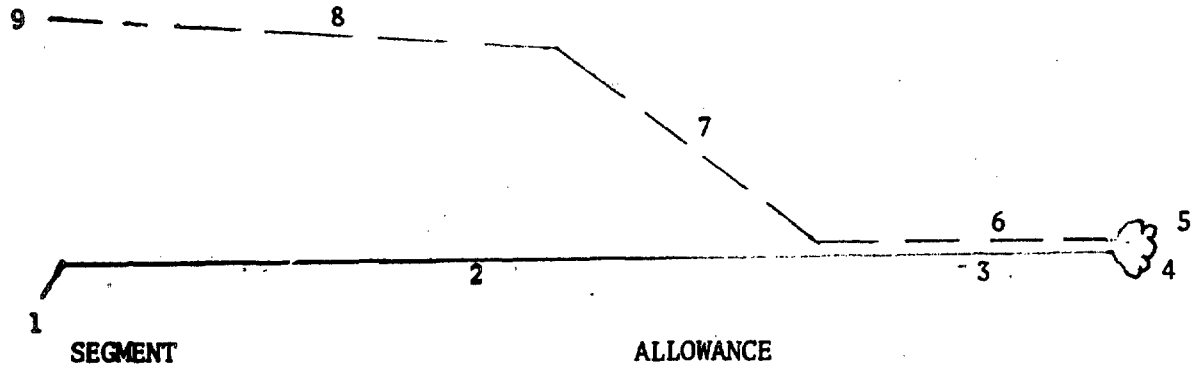
HI-LO-LO-HI - ATTACK



SEGMENT	ALLOWANCE
1. Take-off and accelerate to climb speed ( )	1. See 3.5.3.1
2. Climb on course to cruise altitude ( )	2. Speed and power for maximum range
3. Cruise to start of penetration ( )	3. Speed and altitude for maximum range
4. Descend to Sea Level	4. No time, fuel or distance credited except where specified
5. Run-in specified distance at Sea Level to target ( )	5. At penetration speed at Sea Level with power as required
6. Drop Stores ( )	6. Weight reduction equal to store weight
7. Attack target ( )	7. See 3.5.3.4
8. Run-out specified distance at Sea Level from target ( )	8. Same as 5
9. Climb on course to cruise	9. Same as 2
10. Cruise to base ( )	10. Same as 3
11. Arrive over base with reserve fuel ( )	11. See 3.5.3.6

TABLE I. STANDARD MISSIONS (Continued) MISSION A-4

LO-LO-LO-HI - ATTACK

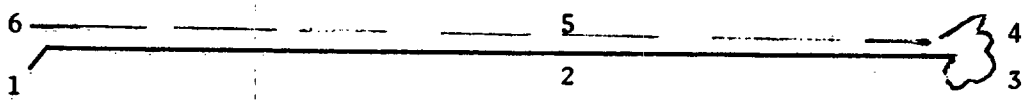


SEGMENT	ALLOWANCE
1. Take-off and accelerate to climb speed ( )	1. See 3.5.3.1
2. Cruise at Sea Level to start of penetration ( )	2. Speed and power for maximum range at Sea Level
3. Run-in specified distance at Sea Level to target ( )	3. At penetration speed at Sea Level with power as required
4. Drop Stores ( )	4. Weight reduction equal to store weight
5. Attack target ( )	5. See 3.5.3.4
6. Run-out specified distance at Sea Level from target ( )	6. Same as 3
7. Climb on course to cruise altitude ( )	7. Speed and power for maximum range
8. Cruise to base ( )	8. Speed and altitude for maximum range
9. Arrive over base with reserve fuel ( )	9. See 3.5.3.6

TABLE I. STANDARD MISSIONS (Continued)

MISSION A-5

LO-LO-LO - ATTACK

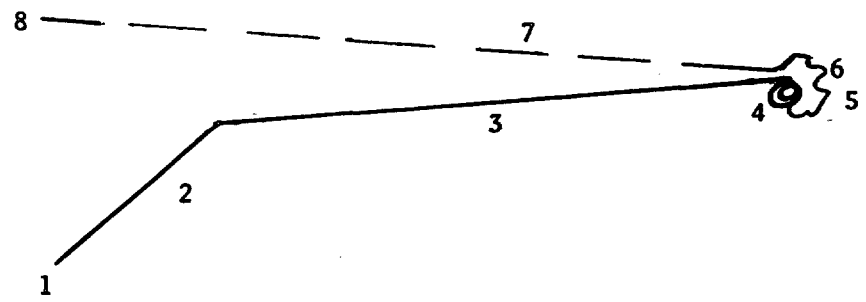


SEGMENT	ALLOWANCE
1. Take-off and accelerate to cruise speed ( )	1. See 3.5.3.1
2. Cruise at Sea Level to target ( )	2. Speed and power for maximum range
3. Drop stores ( )	3. Weight reduction equal to store weight
4. Attack target ( )	4. See 3.5.3.4
5. Cruise to base at Sea Level	5. Same as 2
6. Arrive over base with reserve fuel ( )	6. See 3.5.3.6

TABLE I. STANDARD MISSIONS (Continued)

MISSION A-6

COMBAT AIR PATROL - ATTACK

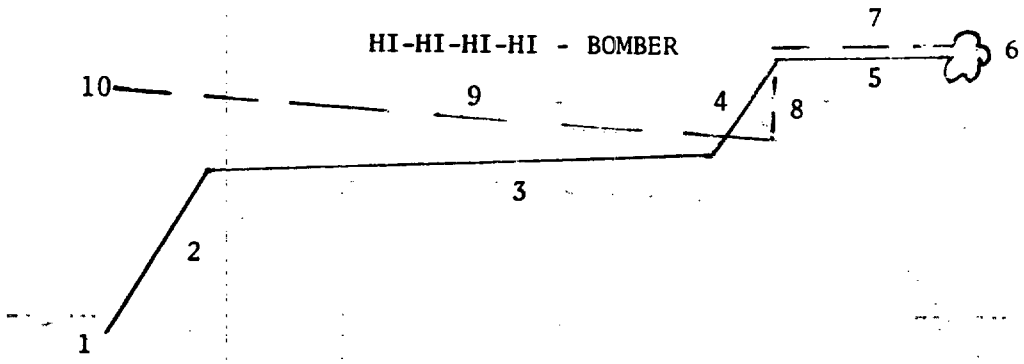


SEGMENT	ALLOWANCE
1. Take-off and accelerate to climb speed ( )	1. See 3.5.3.1
2. Climb on course to cruise altitude ( )	2. Speed and power for maximum range
3. Cruise to target area specified distance from base ( )	3. Speed and altitude for maximum range
4. Loiter at specified altitude awaiting target assignment ( )	4. Speed and power for combat loiter at specified altitude
5. Drop stores ( )	5. Weight reduction equal to store weight
6. Attack target, escape and evade ( )	6. See 3.5.3.4
7. Cruise to base ( )	7. Same as 3
8. Arrive over base with reserve fuel ( )	8. See 3.5.3.6

TABLE I. STANDARD MISSIONS (Continued)

MISSION B-1

HI-HI-HI-HI - BOMBER

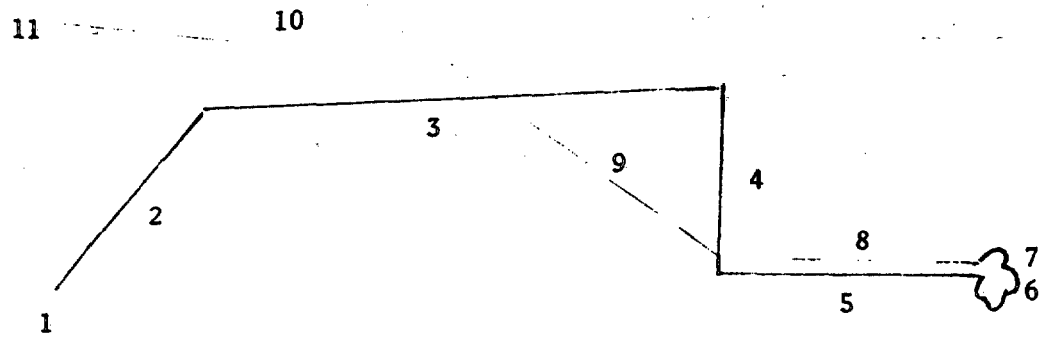


SEGMENT	ALLOWANCE
1. Take-off and accelerate to climb speed ( )	1. See 3.5.3.1
2. Climb on course to cruise altitude ( )	2. Power and speed to maximize range
3. Cruise ( )	3. Speed and altitude for max range
4. Climb to combat altitude	4. Power and speed to maximize range
5. Run-in specified distance at speed for maximum continuous power at combat ceiling ( )	5. Maximum continuous power. If this results in supersonic speeds, include time fuel and distance to accelerate as part of the penetration.
6. Drop stores and conduct evasive and turn action ( )	6. Weight reduction includes store weight plus combat fuel allowance. See 3.5.3.4.
7. Run-out specified distance at speed for maximum continuous power at combat ceiling ( )	7. Same as 5
8. Descend to cruise altitude ( )	8. No time, fuel or distance is credited for subsonic vehicles. If segment 7 is supersonic, credit may be taken for time, fuel and distance to decelerate and descent to cruise altitude
9. Cruise back to base ( )	9. Same as 3
10. Arrive over base with reserve fuel ( )	10. See 3.5.3.6

TABLE I. STANDARD MISSIONS (Continued)

MISSION B-2

HI-LO-LO-HI - BOMBER



SEGMENT	ALLOWANCE
1. Take-off and accelerate to climb speed ( )	1. See 3.5.3.1
2. Climb on course to cruise altitude ( )	2. Speed and power for maximum range
3. Cruise to start of penetration ( )	3. Speed and altitude for maximum range
4. Descend to Sea Level	4. No time, fuel or distance credited except where specified
5. Run-in specified distance at Sea Level to target ( )	5. At penetration speed at Sea Level with power as required
6. Drop stores ( )	6. Weight reduction equal to store weight
7. Identify, align and attack target ( )	7. See 3.5.3.4
8. Run-out specified distance at Sea Level from target ( )	8. Same as 5

TABLE I. STANDARD MISSIONS (Continued)

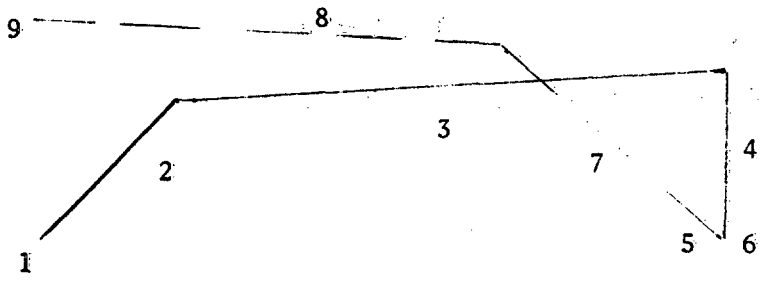
MISSION B-2 (Cont)

9. Climb on course to cruise altitude ( )	9. Same as 2
10. Cruise to base ( )	10. Same as 3
11. Arrive over base with reserve fuel ( )	11. See 3.5.3.6

TABLE I. STANDARD MISSIONS (Continued)

MISSION C-1

CARGO - SUPPLY

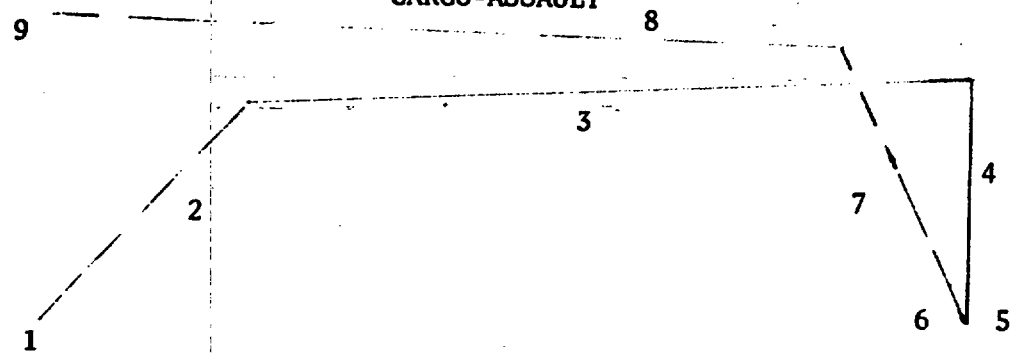


SEGMENT	ALLOWANCE
1. Take-off and accelerate to climb speed ( )	1. See 3.5.3.1
2. Climb on course to cruise altitude ( )	2. Speed and power for maximum range
3. Cruise to remote base ( )	3. Speed and altitude for maximum range
4. Descend to Sea Level	4. No time, fuel or distance credited except where specified
5. Unload Cargo ( )	5. Weight of payload removed
6. Take-off and accelerate to climb speed ( )	6. Same as 1
7. Climb on course to cruise altitude ( )	7. Same as 2
8. Cruise to base ( )	8. Same as 3
9. Arrive over base with reserve fuel ( )	9. See 3.5.3.6

TABLE I. STANDARD MISSIONS (Continued)

MISSION C-2

CARGO-ASSAULT

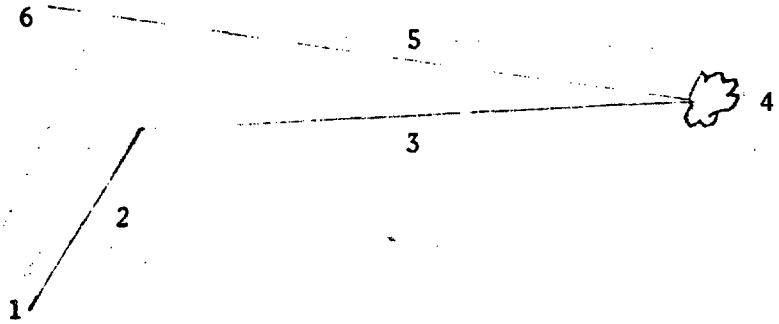


SEGMENT	ALLOWANCE
1. Take-off and accelerate to climb speed ( )	1. See 3.5.3.1
2. Climb on course to cruise altitude ( )	2. Speed and power for maximum range
3. Cruise to combat area ( )	3. Speed and altitude for maximum range
4. Descend to Sea Level	4. No time, fuel or distance credited except where specified
5. Land off-load payload and reload one half payload of casualties etc ( )	5. No time, fuel or distance credited. Payload is reduced by one-half.
6. Take-off and accelerate to climb speed ( )	6. See 3.5.3.1
7. Climb on course to cruise altitude ( )	7. Same as 2
8. Cruise to base ( )	8. Same as 3
9. Arrive over base with fuel reserve ( )	9. See 3.5.3.6

TABLE I. STANDARD MISSIONS (Continued)

MISSION F-1

AIR SUPERIORITY - FIGHTER

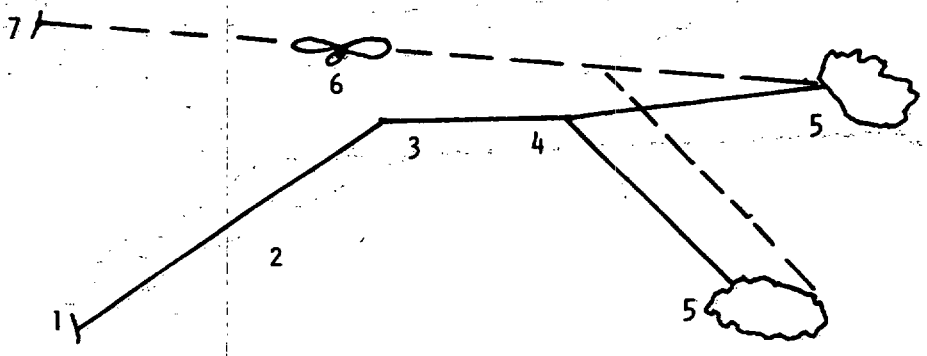


SEGMENT	ALLOWANCE
1. Take-off and accelerate to climb speed ( )	1. See 3.5.3.1
2. Climb on course to cruise altitude ( )	2. Speed and power for maximum range
3. Cruise to combat area ( )	3. Speed and altitude for maximum range
4. Engage enemy aircraft and expend ordnance at start of combat ( )	4. See 3.5.3.4
5. Cruise to base ( )	5. Same as 3. The aircraft is assumed to be at cruise altitude, speed and heading at the completion of combat
6. Arrive over base with reserve fuel ( )	6. See 3.5.3.6

TABLE I. STANDARD MISSIONS (Continued)

MISSION F-2

MINIMUM TIME INTERCEPT - FIGHTER

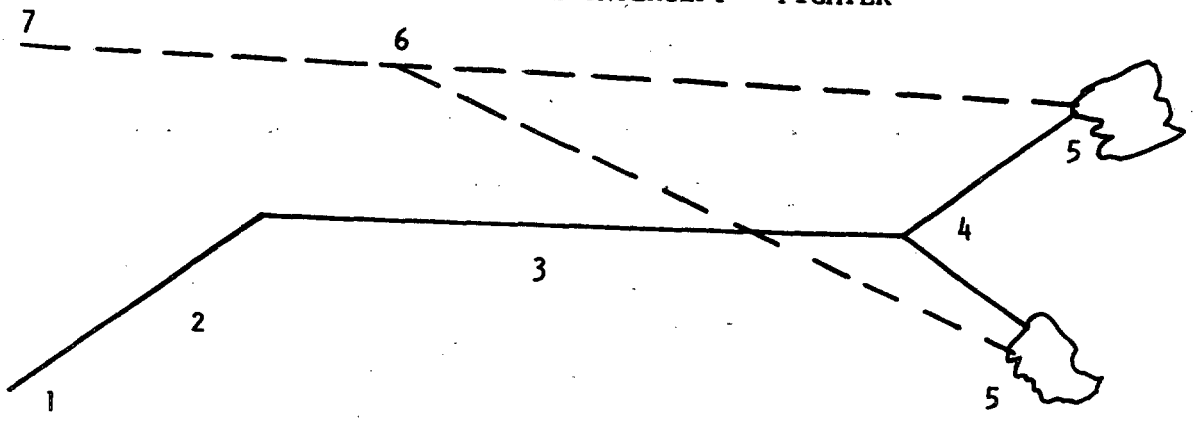


SEGMENT	ALLOWANCE
1. Take-off and accelerate to climb speed ( )	1. See 3.5.3.1
2. Climb at max power to max power cruise altitude ( )	2. Speed and power for minimum time
3. Cruise at max possible maneuverable level flight speed ( )	3. Altitude at which aircraft can most efficiently accelerate
4. Transition to combat altitude and speed ( )	4. Change power and altitude as needed to comply with combat requirements
5. Engage enemy aircraft and expend ordance at start of combat ( )	5. See 3.5.3.4
6. Loiter at specified altitude prior to recovery if the tactical situation necessitates it ( )	6. Speed and power for maximum endurance
7. Arrive over base with reserve fuel ( )	7. See 3.5.3.6

TABLE I. STANDARD MISSIONS (Continued)

MISSION F-3

MAXIMUM RANGE INTERCEPT - FIGHTER

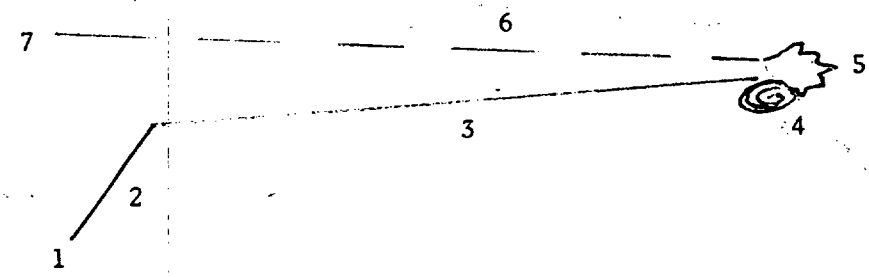


SEGMENT	ALLOWANCE
1. Take-off and accelerate to climb speed ( )	1. See 3.5.3.1
2. Climb on course to cruise altitude ( )	2. Speed and power for maximum range
3. Cruise toward target ( )	3. Speed and altitude for maximum range
4. Transition to combat speed and altitude ( )	4. Change power and altitude as needed to comply with combat requirements
5. Engage enemy aircraft ( )	5. See 3.5.3.4
6. Cruise back to base ( )	6. Same as 3
7. Arrive over base with reserve fuel ( )	7. See 3.5.3.6

TABLE I. STANDARD MISSIONS (Continued)

MISSION F-4

COMBAT AIR PATROL - FIGHTER

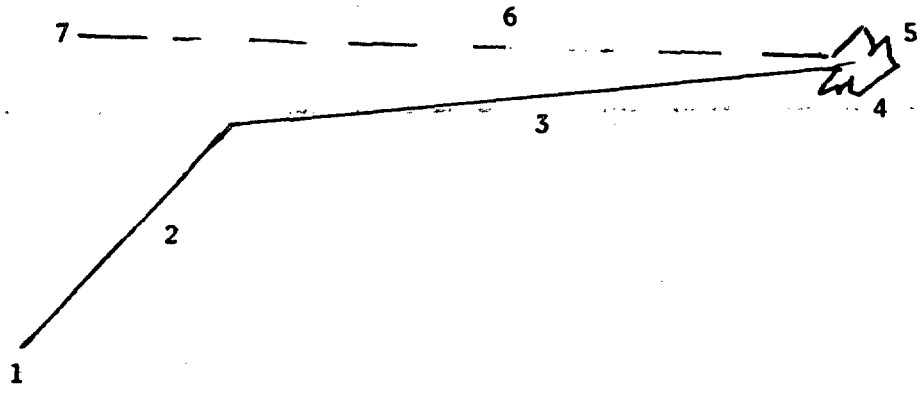


SEGMENT	ALLOWANCE
1. Take-off and accelerate to climb speed ( )	1. See 3.5.3.1
2. Climb on course to cruise altitude ( )	2. Speed and power for maximum range
3. Cruise to target area specified distance from base ( )	3. Speed and altitude for maximum range
4. Loiter on station awaiting target assignment ( )	4. Speed and altitude for combat loiter
5. Engage enemy aircraft ( )	5. See 3.5.3.4
6. Cruise back to base ( )	6. Same as 3
7. Arrive over base with reserve fuel ( )	7. See 3.5.3.6

TABLE I. STANDARD MISSIONS (Continued)

MISSION F-5

HI-HI-HI - FIGHTER

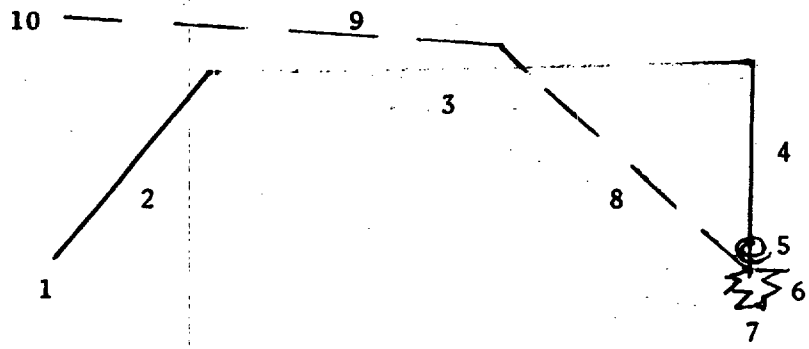


SEGMENT	ALLOWANCE
1. Take-off and accelerate to climb speed ( )	1. See 3.5.3.1
2. Climb on course to cruise altitude ( )	2. Speed and power for maximum range
3. Cruise to target ( )	3. Speed and altitude for maximum range
4. Drop stores ( )	4. Weight reduction equal to store weight
5. Escape and evasion ( )	5. See 3.5.3.4
6. Cruise to base ( )	6. Same as 3
7. Arrive over base with reserve fuel ( )	7. See 3.5.3.6

TABLE I. STANDARD MISSIONS (Continued)

MISSION F-6

HI-LO-HI - FIGHTER

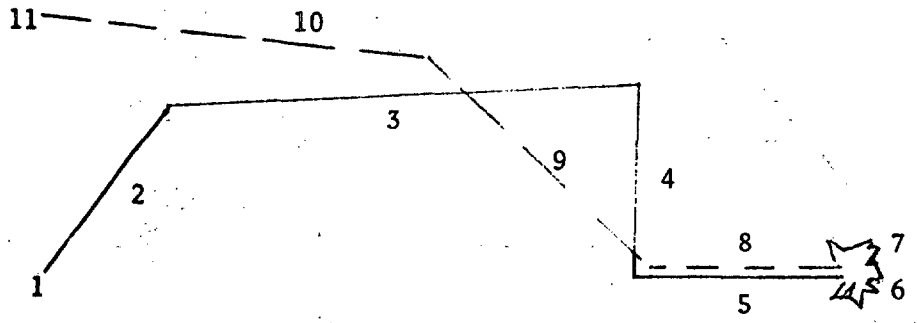


SEGMENT	ALLOWANCE
1. Take-off and accelerate to climb speed ( )	1. See 3.5.3.1
2. Climb on course to cruise altitude ( )	2. Speed and power for maximum range
3. Cruise to target ( )	3. Speed and altitude for maximum range
4. Descend to Sea Level	4. No time, fuel or distance credited except where specified
5. Acquire FAC aircraft and identify target ( )	5. Fuel for specified time at maximum endurance at Sea Level. No distance credited.
6. Drop stores ( )	6. Weight reduction equal to store weight
7. Attack target ( )	7. See 3.5.3.4
8. Climb on course to cruise altitude ( )	8. Same as 2
9. Cruise to base ( )	9. Same as 3
10. Arrive over base with reserve fuel ( )	10. See 3.5.3.6

TABLE I. STANDARD MISSIONS (Continued)

MISSION F-7

HI-LO-LO-HI - FIGHTER

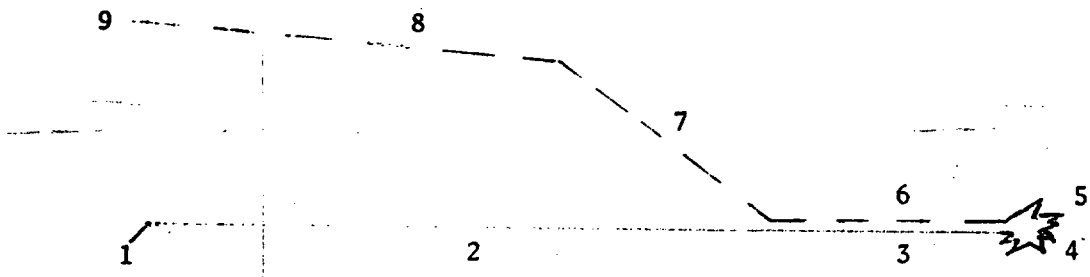


SEGMENT	ALLOWANCE
1. Take-off and accelerate to climb speed ( )	1. See 3.5.3.1
2. Climb on course to cruise altitude ( )	2. Speed and power for maximum range
3. Cruise to start of penetration ( )	3. Speed and altitude for maximum range
4. Descend to Sea Level	4. No time, fuel or distance credited except where specified
5. Run-in specified distance at Sea Level to target ( )	5. At combat speed at Sea Level with power as required
6. Drop stores ( )	6. Weight reduction equal to store weight
7. Attack target ( )	7. See 3.5.3.4
8. Run-out specified distance at Sea Level from target ( )	8. Same as 5
9. Climb on course to cruise altitude ( )	9. Same as 2
10. Cruise to base ( )	10. Same as 3
11. Arrive over base with fuel ( )	11. See 3.5.3.6

TABLE I. STANDARD MISSIONS (Continued)

MISSION F-8

LO-LO-LO-HI - FIGHTER

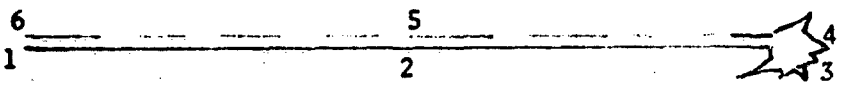


SEGMENT	ALLOWANCE
1. Take-off and accelerate to climb speed ( )	1. See 3.5.3.1
2. Cruise at Sea Level to start of penetration ( )	2. Speed and power for maximum range at Sea Level
3. Run-in specified distance at Sea Level to target ( )	3. Combat speed at Sea Level with power as required
4. Drop Stores ( )	4. Weight reduction equal to store weight
5. Attack target ( )	5. See 3.5.3.4
6. Run-out specified distance at Sea Level from target ( )	6. Same as 3
7. Climb on course to cruise altitude ( )	7. Speed and power for maximum range
8. Cruise to base ( )	8. Speed and altitude for maximum range
9. Arrive over base with reserve fuel ( )	9. See 3.5.3.6

TABLE I. STANDARD MISSIONS (Continued)

MISSION F-9

LO-LO-LO - FIGHTER

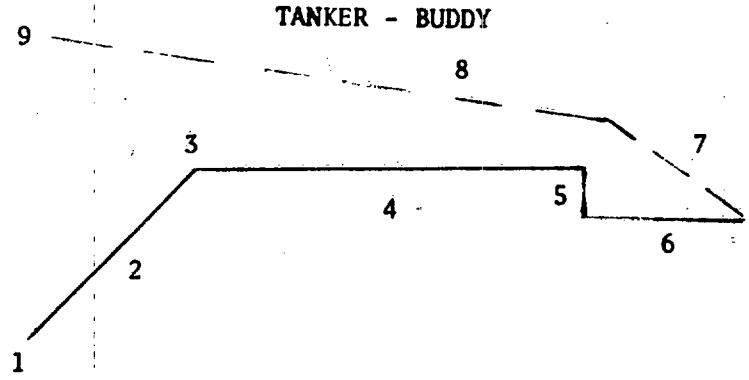


SEGMENT	ALLOWANCE
1. Take-off and accelerate to cruise speed ( )	1. See 3.5.3.1
2. Cruise at Sea Level to target ( )	2. Speed and power for maximum range
3. Drop Stores ( )	3. Weight reduction equal to store weight
4. Attack target ( )	4. See 3.5.3.4
5. Cruise at Sea Level to base ( )	5. Same as 2
6. Arrive over base with reserve fuel ( )	6. See 3.5.3.6

TABLE I. STANDARD MISSIONS (Continued)

MISSION T-1

TANKER - BUDDY



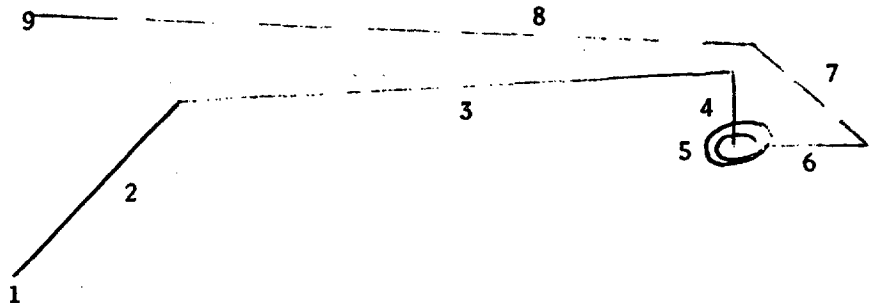
SEGMENT	ALLOWANCE
1. Take-off and accelerate to climb speed ( )	1. See 3.5.3.1
2. Climb on course to cruise altitude ( )	2. Speed and power for maximum range
3. Rendezvous with receiver ( )	3. Fuel for specified time at maximum endurance at cruise altitude. No distance credited
4. Cruise to refuel point ( )	4. Speed and altitude for maximum range
5. Descend to specified refuel altitude	5. No time, fuel or distance credited except where specified
6. Transfer fuel at receiver altitude ft ( )	6. Credit time, fuel and distance while transferring fuel at maximum transfer rate. Operation performed at maximum continuous power
7. Climb on course to cruise altitude ( )	7. Same as 2
8. Cruise to base ( )	8. Same as 4
9. Arrive over base with reserve fuel ( )	9. See 3.5.3.6

Note: This mission is to present tanker capability without consideration of a specific receiver.

TABLE I. STANDARD MISSIONS (Continued)

MISSION T-2

TANKER - RENDEZVOUS



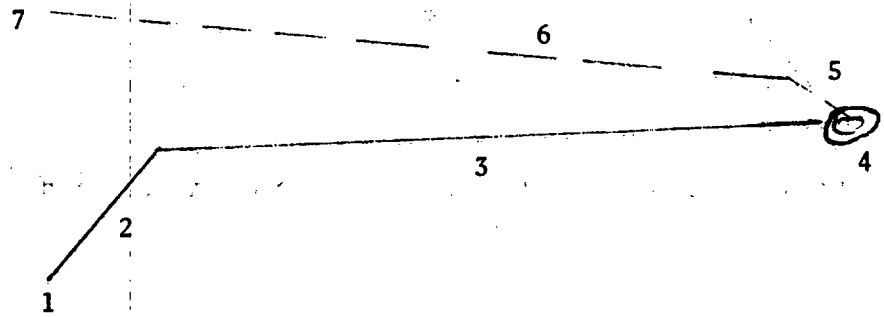
SEGMENT	ALLOWANCE
1. Take-off and accelerate to climb speed ( )	1. See 3.5.3.1
2. Climb on course to cruise altitude ( )	2. Speed and power for maximum range
3. Cruise to refuel point ( )	3. Speed and altitude for maximum range
4. Descend to specified altitude	4. No fuel, time or distance credited except where specified
5. Loiter 1 hour for rendezvous ( )	5. Fuel for 1 hour maximum endurance. No distance credited
6. Transfer fuel at speed for maximum continuous power ( )	6. Credit time, fuel and distance while transferring fuel at maximum rate. Segment performed at maximum continuous power
7. Climb on course to return cruise altitude ( )	7. Same as 2
8. Cruise to base	8. Same as 3
9. Arrive over base with reserve fuel ( )	9. See 3.5.3.6

Note: This mission is to present tanker capability without cons deration of a specific receiver.

TABLE I. STANDARD MISSIONS (Continued)

MISSION G-1

AIRBORNE WARNING AND CONTROL

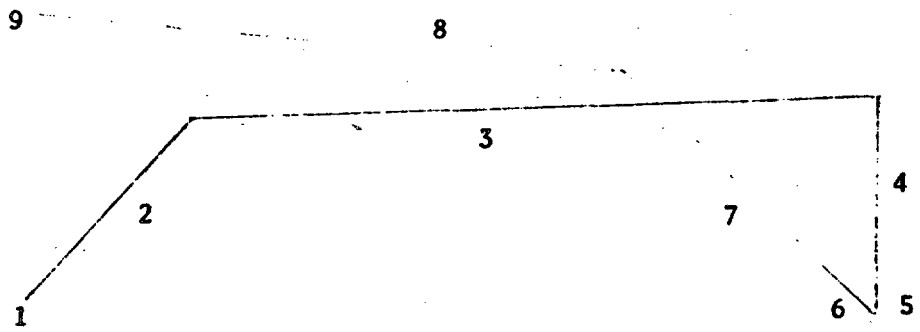


SEGMENT	ALLOWANCE
1. Take-off and accelerate to climb speed ( )	1. See 3.5.3.1
2. Climb on course to cruise altitude ( )	2. Speed and power for maximum range
3. Cruise to specified distance from base ( )	3. Speed and altitude for maximum range
4. Loiter at specified altitude or cruise altitude which ever is lower ( )	4. Maximum endurance speed at loiter altitude. No time, fuel or distance will be credited for descent from cruise altitude if applicable.
5. Climb to cruise altitude ( )	5. Same as 2
6. Cruise back to base ( )	6. Same as 3
7. Arrive over base with reserve fuel ( )	7. See 3.5.3.6

TABLE I. STANDARD MISSIONS (Continued)

MISSION G-2

RESCUE

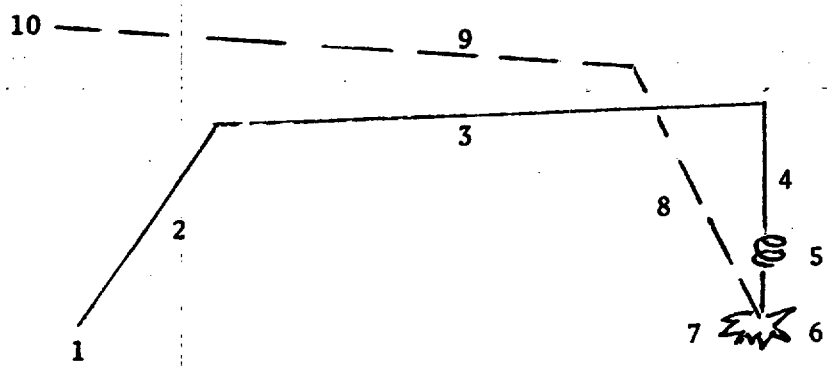


SEGMENT	ALLOWANCE
1. Take-off and accelerate to climb speed ( )	1. See 3.5.3.1
2. Climb to cruise altitude ( )	2. Speed and power for maximum range
3. Cruise to pickup point ( )	3. Speed and altitude for maximum range
4. Descend to Sea Level and land	4. No time, fuel or distance credited except where specified
5. Load design passenger complement ( )	5. Weight gain equal to passenger load
6. Restart engines, taxi, take-off and accelerate to climb speed	6. Same as 1
7. Climb to cruise altitude ( )	7. Same as 2
8. Cruise to base ( )	8. Same as 3
9. Arrive over base with reserve fuel ( )	9. See 3.5.3.6

TABLE I. STANDARD MISSIONS (Continued)

MISSION G-3

FORWARD AIR CONTROLLER

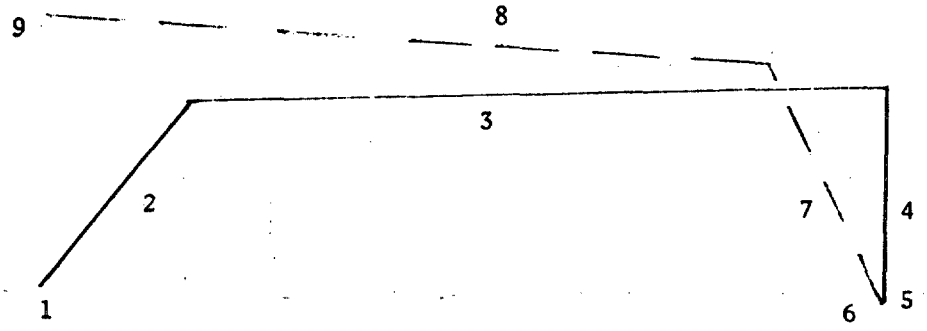


SEGMENT	ALLOWANCE
1. Take-off and accelerate to climb speed ( )	1. See 3.5.3.1
2. Climb on course to cruise altitude ( )	2. Speed and power for maximum range
3. Cruise to combat area specified distance from base ( )	3. Speed for maximum range. Altitude selected to minimize fuel used in 2 & 3
4. Descend to specified search altitude	4. No time, fuel or distance credited except where specified
5. Patrol in search area ( )	5. Speed and power for combat loiter at search altitude. No distance credited
6. Drop stores ( )	6. Weight reduction equal to store weight
7. Combat, mark targets etc ( )	7. See 3.5.3.4
8. Climb on course to cruise altitude ( )	8. Same as 2
9. Cruise to base ( )	9. Same as 3
10. Arrive over base with reserve fuel ( )	10. See 3.5.3.6

TABLE I. STANDARD MISSIONS (Continued)

MISSION G-4

TRAINER

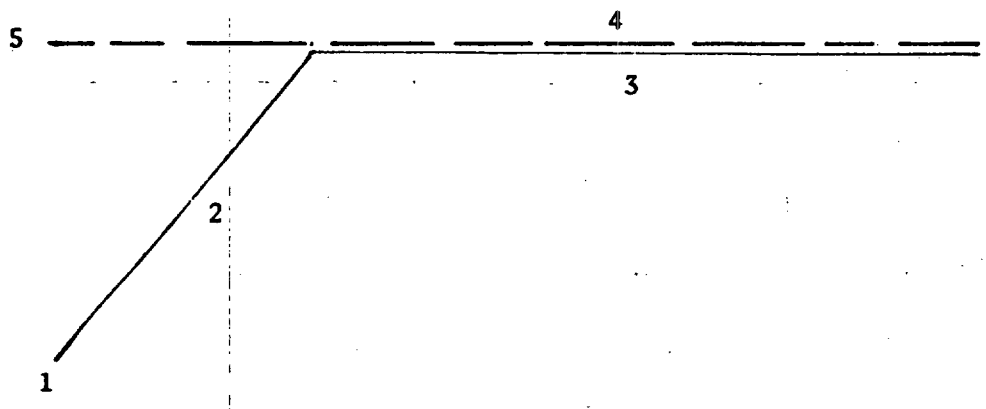


SEGMENT	ALLOWANCE
1. Take-off and accelerate to climb speed ( )	1. See 3.5.3.1
2. Climb on course to cruise altitude ( )	2. Speed and power for maximum range
3. Cruise to remote base ( )	3. Speed and altitude for maximum range
4. Descend to Sea Level	4. No time, fuel or distance credited except where specified
5. Land ( )	5. No time, fuel or distance credited. No change in payload
6. Take-off and accelerate to climb speed ( )	6. See 3.5.3.4
7. Climb on course to cruise altitude	7. Same as 2
8. Cruise to base ( )	8. Same as 3
9. Arrive over base with fuel ( )	9. See 3.5.3.6

TABLE I. STANDARD MISSIONS (Continued)

MISSION G-5

ASW SEARCH

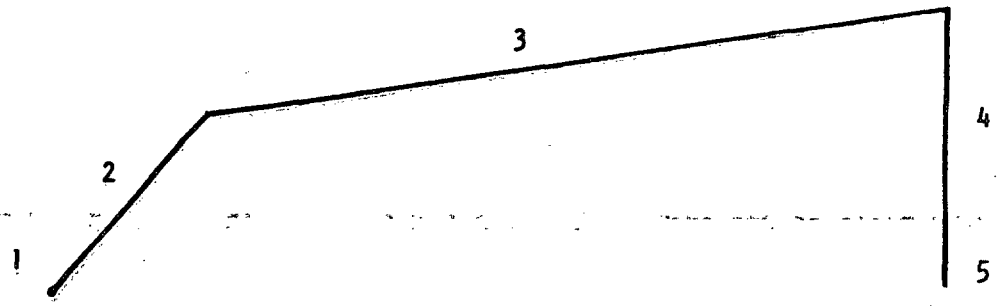


SEGMENT	ALLOWANCE
1. Take-off and accelerate to climb speed ( )	1. See 3.5.3.1
2. Climb on course to search altitude ( )	2. Speed and power for maximum range
3. Search outbound at maximum endurance at search altitude ( )	3. Speed and power for maximum endurance
4. Search inbound at maximum endurance at search altitude ( )	4. Same as 3
5. Arrive over base with reserve fuel ( )	5. See 3.5.3.6

TABLE I. STANDARD MISSIONS (Continued)

MISSION G-6

FERRY MISSION



SEGMENT	ALLOWANCE
1. Take-off and accelerate to climb speed ( )	1. See 3.5.3.1
2. Climb on course to cruise altitude ( )	2. Speed and power for maximum range
3. Cruise to remote base	3. Speed and altitude for maximum range. Normally external fuel tanks shall be retained if carried.
4. Descent to sea level	4. No time, fuel or distance credited unless otherwise specified
5. Arrive over remote base with reserve fuel ( )	5. See 3.5.3.6

TABLE II
PERFORMANCE DATA

ITEM	UNITS	REFERENCE	NOTES
TAKE-OFF LOADING CONDITION		3.5.2	1
TAKE-OFF WEIGHT	LBS	3.4.1.5	
Fuel-Internal/External	LBS	3.4.1.11	2
Payload	LBS	3.4.1.10	
Stall speed - Power off	KTS	3.4.2.3	
Take-off ground run	FT	3.4.5.1	3
Take-off to clear 50 ft	FT	3.4.5.2	3
Critical Field Length	FT	3.4.5.4	
Climb Path Angle	%	3.4.6.2	4, 5
Time - S.L. to ft	MIN	3.4.6.4	5
Service Ceiling (100 FPM)	FT	3.4.3.1	4, 5
COMBAT RANGE	NM	3.4.10.5	6, 7
Average Cruise speed	KTS	3.4.2.9.4	
Initial cruise altitude	FT	3.4.4.1	
Final cruise altitude	FT	3.4.4.1	
Total mission time	HR	3.5.4	
COMBAT RADIUS	NM	3.4.10.6	
Average cruise speed	KTS	3.4.2.9.4	
Initial cruise altitude	FT	3.4.4.1	
Final cruise altitude	FT	3.4.4.1	
Total Mission time	HR	3.5.4	
COMBAT LOADING CONDITION		3.5.2	8
COMBAT WEIGHT	LBS	3.4.1.8	11
Combat altitude	FT	3.4.4.3	
Combat speed	KTS	3.4.2.2	
Combat climb	FPM	3.4.6.5	
Combat ceiling (500 FPM)	FT	3.4.3.2	
Service ceiling (100 FPM)	FT	3.4.3.1	4
Max rate of climb @ S.L.	FPM		
Max speed at S.L.	KTS	3.4.2.1	
Max speed at ft	KTS	3.4.2.1	
LANDING WEIGHT	LBS	3.4.1.9.1	9
Stall speed - power off	KTS	3.4.2.3.1	
Ground roll	FT	3.4.7	10
Total from 50 ft	FT	3.4.7	10

TABLE II

NOTES

1. Identify mission and payload carried.

2. Usable fuel only.

3. Give take-off distance for ground run and to clear 50 ft obstacle with zero wind. For aircraft with take-off assist devices, take-off data shall be given with and without such devices in operation. For aircraft having a combination of engines, two sets of take-off distance data shall be given. For example, an aircraft with reciprocating engine and jet auxiliary engine, present data for all engines and reciprocating only.

4. For multi-engine aircraft, repeat with one-engine inoperative.

5. Climb power as specified in the combat radius or the 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 other aircraft; 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.

6. Except for point interceptor mission, enter combat range or combat radius as applicable to mission.

7. For point interceptors delete and replace with:

Total Mission Time	HR	3.5.4	5
Combat altitude	FT	3.4.4.3	5
Time to intercept	HR	3.5.7	5

For aircraft landing at radius point, e.g. cargo, trainer etc., add:

First Landing Weight	LB	3.4.1.9.2	9
Ground Roll at S.L.	FT	3.4.7	10
Total from 50 ft	FT	3.4.7	10

For aircraft capable of inflight refueling, add:

Inflight Refueled Radius	NM	3.4.10.4
Total mission time	HR	3.5.4

For attack and fighter type aircraft, add:

CAP Radius		
Loiter time at ft	HR	3.4.2.10
Total mission time	HR	3.5.4

8. Give combat configuration

9. Land with fuel reserves

10. Repeat for auxiliary brake, if applicable

11. For radius mission if radius is shown

TABLE III

Typical Ground Rules for Inflight Refueling Missions

1. Start engines, run-up and take-off; use design mission allowances.

2. Climb and cruise shall conform to that for design mission with the following exception. If tanker and receiver fly (formation), buddy system, the cruise speeds of both shall be identical. Thus, the speed of one of the aircraft may have to be compromised to perform such (formation) flight.

3. Climb or descend to refuel altitude; accounting for fuel and distance in climb but not in descent.

4. Deduct the following quantities of fuel as allowances for rendezvous, hook-up and flight contingencies with no distance credit.

4.1 For Rendezvous Missions

4.1.1 Bombers - One half hour at maximum endurance speeds at refuel altitude.

4.1.2 Fighter - Fifteen minutes at maximum endurance speed at refuel altitude. If several fighters are refueled in succession by a single tanker, add an additional 5 minutes for second, 10 minutes for third fighter, etc. After refuel the same loiter time will be added in reverse order to the aircraft after refuel to avoid separation of the fighter formation. Groups refueled simultaneously will be considered as individual units.

4.1.3 Tanker - One hour at maximum endurance speeds at refuel altitude.

4.2 Buddy Missions - For both tanker and receiver allow 10 minutes at top of initial climb - no distance credited.

5. During transfer of fuel at maximum fuel transfer rate credit distance covered and account for fuel consumed by tanker and receiver(s).

6. Following refuel, remainder of mission shall conform to design mission ground rules.

7. Refuel point shall not exceed point of no return for either aircraft. (Aircraft shall be capable of return to planned landing base if refuel is not completed.)

8. The refueling operation shall be performed at highest altitude possible. In establishing the refuel altitude, the following shall apply.

8.1 Receiver - Minimum speed of receiver shall not be less than that which provides for safe and acceptable flying qualities, e.g., should not be lower than that corresponding to 75 percent C_L maximum.

8.2 Receiver - Receiver shall have a climb potential equal to 200 fpm while operating in the downwash of the tanker.

8.3 Tanker - Tanker shall not operate at speeds or altitudes which require more than maximum continuous power.

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APPENDIX IA
PERFORMANCE SUBSTANTIATION REPORT

The performance substantiation report shall be prepared in four sections as follows:

Section I - General Data

Section II - Installed Engine Performance [May be a separate report]

Section III- Aerodynamic Data [May be a separate report]

Section IV - Performance Data

All data shall be presented with the aircraft in its baseline configuration and all configurations compatible with the design and alternate missions. The data source (calculated, wind tunnel, flight test) shall be identified. A complete set of the equations used and a sample problem shall be included for all analytically determined data.

A10. Section I, General Data, shall include at least the following:

a. A General Arrangement Drawing, to scale, and a three view drawing showing major dimensions.

b. Aircraft dimensional data including wing and tail spans, areas, aspect ratios, wetted areas, sweeps, control surface deflections, airfoil sections used, etc.

c. Weight summary to include a breakdown of the weight empty, operating weight, allowable loadings, fuel capacity and design gross weight.

d. A listing of engine, airframe, and subsystems limitations which affect mission performance, flight characteristics, etc.

A20. Section II, Installed Engine Performance. Internal aerodynamic data shall be submitted in support of the installed engine data and shall include but not be limited to:

a. Pressure recovery vs mass flow for various Mach numbers.

b. Pressure recovery vs angle of attack for various Mach numbers and mass flow.

c. Bleed flow rate vs Mach numbers and mass flow.

d. By pass flow rate vs Mach number and mass flow.

e. Spillage drag vs mass flow for various Mach numbers.

f. Spillage drag vs angle of attack for various Mach numbers and mass flow.

g. Pressure recovery of bleed and by pass systems vs Mach number.

h. Pressure distortion at engine face as a function of Mach number and angle of attack. Distortion data should be given in terms of best available distortion index supplemented by engine face total pressure maps.

i. Boundary layer removal system drag as a function of Mach numbers and angle of attack.

j. Analysis of the local flow field ahead of the inlet over the entire Mach number and angle of attack range. Effects of yaw on spillage drag, pressure recovery and engine face distortion.

k. A detailed scale drawing of the complete inlet system with dimensions.

l. Description and schematic of inlet shock pattern at design and off-design conditions.

m. Duct area distribution and contour drawings.

n. Description and schedule of variable inlet geometries and sensing techniques.

o. Description of blow in doors (or other auxiliary air inlet devices) and their effect on pressure recovery and distortion.

p. Complete pictorial, schematic and narrative description of bleed, by pass and boundary layer removal schemes.

q. Internal drag and airflow rate of all auxiliary equipment inlets versus Mach number with accompanying dimensioned drawings.

r. For convergent nozzles, velocity and mass flow coefficients shall be provided as a function of nozzle pressure ratio (or other suitable parameter). For other nozzle configurations, internal performance shall be substantiated by presenting a suitable defined thrust coefficient versus nozzle pressure ratio. Ultimate exhaust system performance shall be based on the installed configuration. To this end, data shall be provided to indicate both installed thrust and the aft end drag contribution attributable to the particular nozzle configuration. In addition, a drawing shall be furnished to indicate pertinent internal and external dimensions of the installed nozzle.

s. The effects on engine performance shall be noted for changes in inlet pressure recovery, engine bleed and power extractions as a function of flight Mach number and corrected engine RPM. The method for correcting estimated engine performance due to the above off-design conditions shall be presented with a sample calculation to show the effects of each off-design condition.

t. The effects of Mach number and engine speed on inlet drag shall be provided for each flight phase.

u. Airflow schedules for the purpose of engine inlet matching shall be submitted for both the engine and inlet subsystems. The operating envelope should depict flight Mach number versus corrected weight flow for the inlet and all constraints will be labelled as described above.

v. A description and analysis of a reverse thrust device shall be presented if applicable.

w. Engine power available (thrust, SHP, at transmission output if applicable) corrected for installation losses and installed fuel flow shall be presented for power settings from idle to maximum with Intermediate and Maximum Continuous powers shown as specific power settings. Data will encompass the complete speed/altitude envelope of the aircraft. For aircraft with service ceiling less than 15,000 feet, the altitudes shall vary from Sea Level to maximum in increments not greater than 2,000 feet. The data shall cover temperatures from +40°C to -40°C.

A30. Section III, Aerodynamic Data. Aerodynamic data shall be presented with the aircraft in its base-line configuration or configurations and in those configurations compatible with the alternate and design missions. If the aircraft can be flown in a large variety of configurations, sufficient store data shall be furnished to establish these configurations. All necessary aerodynamic data needed to describe the aerospace vehicle must be presented. This data is required as a function of Mach number, thrust coefficient, center of gravity, flap and slat deflections, variations in vehicle geometry, angle of attack, altitude, etc. If a boundary layer control system is used, data substantiating the selection of the type of system and air pumping blowing equipment shall be included, along with data from which airflow quantities and pressures can be determined. Aerodynamic data shall reflect ground effect, aeroelastic and thermoelastic effects, etc. If these effects were determined analytically, the complete set of equations and an example problem shall be presented.

1. External aerodynamic data shall include, but not be limited to:

a. Variation of vehicle lift coefficient with angle of attack for cruise, take-off and landing configurations. Cruise data shall show effects of Mach number.

b. Lift coefficient versus total drag coefficient for cruise, take-off and landing configurations where applicable. Gear drag shall be included. The buffet

boundaries will be defined and the prediction method presented. Data shall cover the operational flight Mach number range for each configuration. In the case of V/STOL aircraft, low speed data shall be presented from the point at which lift supports the vehicle weight. These data shall be presented for the trimmed and untrimmed condition whenever wind tunnel data is used as the basis. For data based on calculations or wind tunnel test, the following shall be presented:

(1) Data shall be presented for each drag coefficient increment, i.e, skin friction, pressure drag, drag-due-to-lift, trim drag, wave drag, etc.

(2) A component skin friction drag build-up showing component lengths, Reynolds Numbers, etc, shall be presented for each operational speed and altitude regime such as optimum subsonic cruise, design supersonic cruise, sea level dash, etc. Include roughness and shape factors, etc. For V/STOL vehicles during hover, drag of the components immersed in the slipstream/downwash airflow shall be presented in terms of equivalent flat plate area.

c. Variation of aircraft pitching moment with lift coefficient, angle of attack, and control surface deflection for several Mach numbers covering the operational range. Include drag due to surface deflection.

d. Describe the high lift devices or systems to be used and include type, location, weight, mechanical characteristics and aerodynamic characteristics.

e. For supersonic vehicles include plots of cross-sectional area distribution versus longitudinal distance at Mach number one (1.0) for each component and for the complete vehicle. Include inlet area in this plot and indicate same.

f. Comments shall be presented, where applicable, to describe features which may affect the system performance or flight operations. These include such arrangements as towing, parasite systems, variable geometry, unusual take-off or landing devices, etc. The design criteria, operating features, anticipated problems or limitations and expected benefits shall be discussed. If none present, explain why. A discussion of anticipated downwash/recirculation patterns and ground effects shall be provided V/STOL aircraft during low speed, low altitude flight and hovering in and out of ground effect.

g. If the vehicle is to have an aerial refueling capability, the type and location of installed refueling gear, the refueling envelope, the proximity of the tanker and receiver and the included angle for the receiver pilot to view the tanker shall be submitted along with aerodynamic effects of tanker on receiver.

h. The length, diameter, shape, class or type, mounting location, suspension arrangement, method of ejection, and number of all external stores shall be submitted with the installed aerodynamic characteristics.

2. This data shall be determined using best means available, from, flight test, wind tunnel, empirical and analytical methods.

a. Data based on flight tests shall include actual test points. These points will indicate scatter obtained during the tests and curve fairing basis. Also discuss any abnormalitites. Flight test data shall include configuration description and test conditions flown. Test data reduction procedures shall be discussed.

b. Data based on wind tunnel tests shall include a summary of force and moment data. Wind tunnel data shall include nomenclature, sign conventions and symbols, definitions of configurations and a detailed run schedule showing those parameters that were held constant and those that were varied.

(1) Discuss criteria used for curve fairing when combining data taken from different wind facilities.

(2) Discuss different effects, such as changes in vehicle geometry, Reynolds Number, etc., on the characteristics of the aerospace vehicle.

(3) Discuss special techniques used to define a particular coefficient or derivative boundary or value when this value is not evident in the wind tunnel data.

(4) Special emphasis shall be placed on methods for determining buffet boundaries and intensities.

(5) Flow tripping methods, tunnel and support interference effects, tunnel characteristics and tare information shall be presented, as shall a discussion of method of extrapolation to full scale.

c. Analytical and empirical data shall include any assumptions, justification for the assumption, applicable methods and equations and their limitations, as well as a list of references used to determine the aerodynamic coefficients.

d. Variation of vehicle lift coefficient with angle of attack for take-off, landing, maneuver and cruise configurations. Cruise data shall show Mach number effects. Take-off and landing cases shall show ground effects.

e. Maximum lift coefficient variation as a function of Mach number and C.G. location in maneuver, cruise, take-off and landing configurations. Buffet boundary and stall warning boundary must also be defined.

f. Lift coefficient versus total trimmed drag coefficient shall be included for cruise, maneuver, take-off and landing configurations. Mach number and altitude effects shall be included in polars for cruise configuration. Landing gear drag and ground effect shall be included for take-off and landing configurations. The take-off and landing configuration lift coefficient versus drag coefficient curves shall include power effects.

g. The report shall describe all high lift and deceleration devices to be used during maneuvering, take-off and landing. Type, location and aerodynamic effect on lift and drag and trim shall be included.

h. The length, diameter, shape, mounting location, suspension arrangement of all external stores shall be submitted with the installed aerodynamic drag coefficient as a function of Mach number.

i. If an off-the-shelf vehicle is used in the proposal, then the aerodynamic data will be based on flight test results, modified for any changes made to the configuration. These changes shall be presented as a delta effect as well as being included in the final configuration data plots. Substantiation of the modification and the basic vehicle data shall be as required above.

A40. Section IV, Performance Data shall include the basic equations, assumptions used and sample calculations. Data shall include the effects of external drag changes (ΔC_D), non-standard temperatures and weight. The data presented shall include at least the following:

a. A complete description of take-off performance as a function of gross weight, power, pressure altitude, and ambient temperature. Data shall include climb gradient at the 50 ft obstacle height. The effect of reducing thrust below maximum take-off thrust on distance and climb gradients shall be shown for selected weight.

b. An altitude performance summary including rates of climb, maximum level flight speeds and structural design speeds as a function of pressure altitude for the gross weight range of the aircraft.

c. Time, fuel and distance for enroute climb for all engines operating and the most critical engine inoperative at maximum, intermediate and maximum continuous power as applicable with the combat ceilings (500 ft/min subsonic, 1000 ft/min supersonic), cruise ceilings (300 ft/min subsonic, 1000 ft/min supersonic) and service ceilings (100 ft/min) identified. Include a plot of the ceilings versus weight.

d. Specific range at constant altitude as a function of Mach number (true airspeed) for the gross weight and altitude range of the aircraft for all engines operating and the most critical engine inoperative. The altitude increment shall not exceed 5,000 ft. The effect of center of gravity on range performance shall be identified.

e. Endurance speed and fuel flow as a function of altitude and gross weight for all engines operating and the most critical engine inoperative.

f. A descent summary for enroute and rapid descents which include rates of descent, time, fuel, and distance to descend and the speed and power schedule used.

g. A complete description of the landing performance as a function of gross weight and pressure altitude. The landing distance will be from touchdown and 50 feet above ground for flaps up and normal flap setting.

h. All flight limitations (gross weight, airspeed, altitude) resulting from such items as structural limits, wing stall, etc., shall be presented in this section.

i. Plots of energy maneuverability (P_s, turn rate and radius, etc.) shall be included for fighter type aircraft.

j. Time, fuel and distance summaries shall be presented for each mission considered.

APPENDIX IB

MAXIMUM EFFORT MISSIONS
(SPECIFIED ALLOWANCES)

BOMBER

M-1	OPTIMUM Hi-Hi-Hi
M-2	OPTIMUM Hi-Lo-Lo-Hi

CARGO

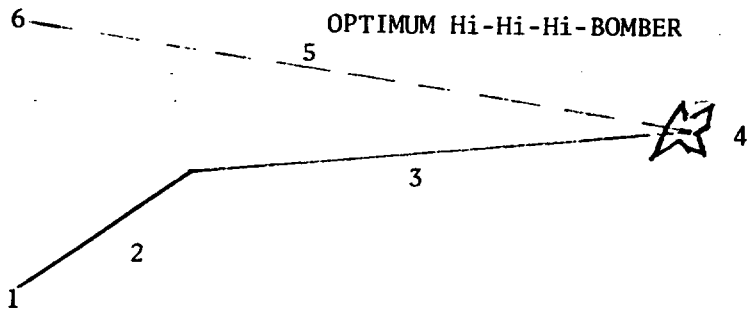
M-3	TRANSPORT SUPPLY MISSION

FIGHTER

M-4	NATO Hi-Lo-Hi
M-5	NATO Lo-Lo-Hi
M-6	NATO Lo-Lo-Lo
M-7	MAXIMUM SUPERSONIC POINT INTERCEPT
M-8	SUPERSONIC AREA INTERCEPT
M-9	SUBSONIC AREA INTERCEPT
M-10	LOW ALTITUDE INTERCEPT
M-11	RECONNAISSANCE MISSION (Hi-Lo-Lo-Hi)
M-12	RECONNAISSANCE MISSION (Hi-Hi-Hi)

NOTE:
Variable Geometry Wing conditions; unswept for takeoff and subsonic flight. Swept for supersonic dash and chase profile segments-unless noted otherwise.

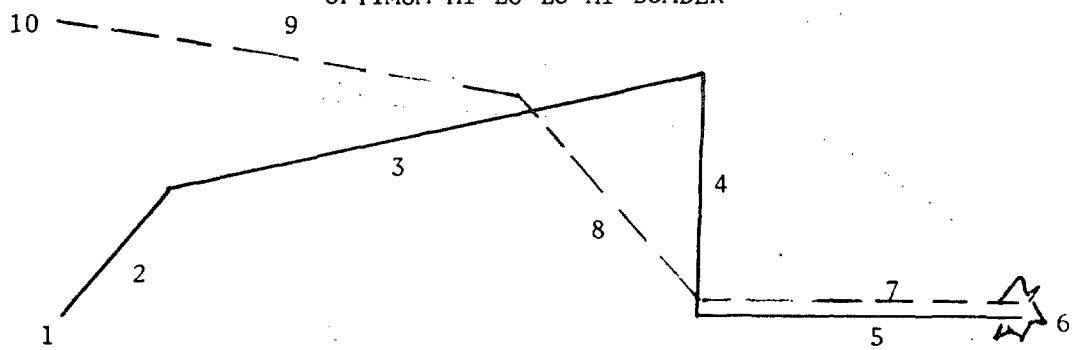
MISSION M-1



SEGMENT	ALLOWANCE
1. Take-off and Accelerate to climb speed ( )	1. Fuel for 5 minutes at maximum continuous power (S.L.S.)
2. Climb on course to cruise altitude ( )	2. Maximum or maxnon A/B power.
3. Cruise - Climb ( )	3. Speed and altitude for max range.
4. Release weapon(s) ( )	4. Weight reduction
5. Cruise - Climb ( )	5. Speed and altitude for max range.
6. Landing reserve ( )	6. Fuel for 30 minutes of maximum endurance at sea level.

MISSION M-2

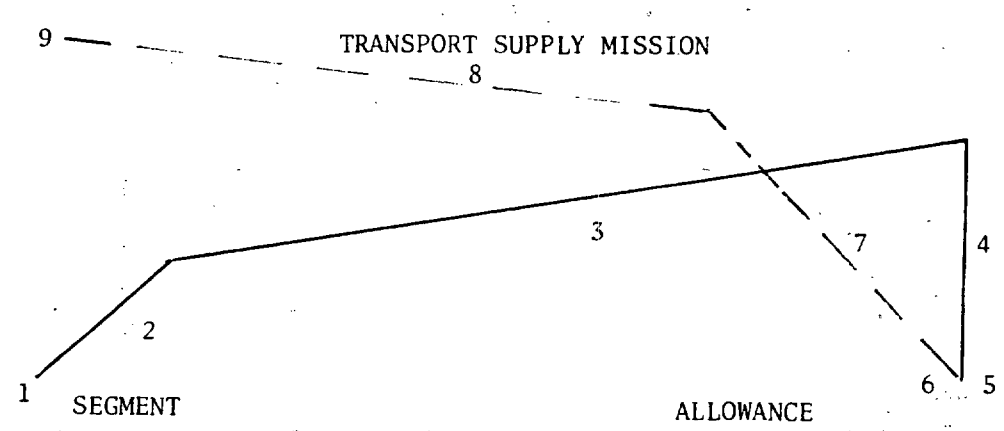
OPTIMUM Hi-Lo-Lo-Hi-BOMBER



SEGMENT	ALLOWANCE
1. Take-off and accelerate to climb speed ( )	1. Fuel for 5 minutes at maximum continuous power. (S.L.S.)
2. Climb on course to cruise altitude ( )	2. Maximum or maxnon A/B power.
3. Cruise - climb ( )	3. Speed and altitude for max range.
4. Descend to sea level	4. No time, fuel or distance credit except where specified.
5. Run-in specified distance at sea level to target ( )	5. Specified dash distance at specified mach number.
6. Release weapon(s)	6. Weight reduction
7. Run-in specified distanced at sea level from target ( )	7. Same as 5
8. Climb on course to cruise altitude ( )	8. Same as 2
9. Cruise-climb to base. ( )	9. Same as 3
10. Landing reserve ( )	10. Fuel for 30 minutes of maximum endurance at sea level.

NOTE: AN ASM CARRIER HAS THE OPTION AT 6 TO POP UP TO A SPECIFIED ALTITUDE FOR A SPECIFIED TIME FOR ASM RELEASE.

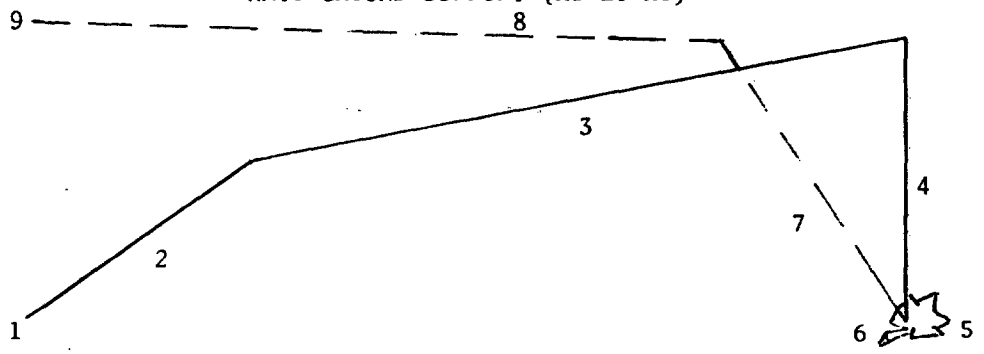
MISSION M-3



SEGMENT	ALLOWANCE
1. Take-off and accelerate to climb speed ( )	1. Fuel for 5 minutes at maximum continuous power. (S.L.S.)
2. Climb on course to cruise altitude ( )	2. Climb at normal rated power.
3. Cruise-climb ( )	3. Speed and altitude for max range
4. Descend to sea level and land	4. No time, fuel or distance credit except where specified.
5. Unload cargo	5. Weight of payload removed.
6. Take-off and accelerate to climb speed ( )	6. Same as 1
7. Climb on course to cruise altitude ( )	7. Same as 2.
8. Cruise-climb ( )	8. Same as 3.
9. Landing reserve ( )	9. Fuel for 30 minutes of maximum endurance at Sea Level plus 5 percent of initial fuel.

MISSION M-4

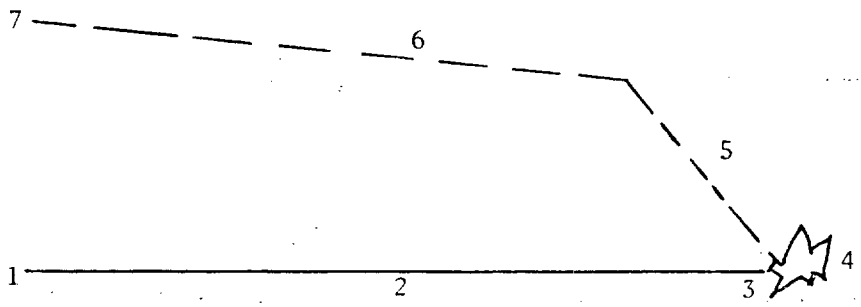
NATO GROUND SUPPORT (HI-LO-HI)



SEGMENT	ALLOWANCE
1. Take-off and accelerate to climb speed ( )	1. Fuel for 2 minutes at maximum power (S.L.S.)
2. Climb to cruise altitude ( )	2. Maximum non-afterburning power
3. Cruise ( )	3. Speed and altitude for maximum range.
4. Descend to Sea Level	4. No time, fuel or distance credited except where specified.
5. Release weapon ( )	5. Weight reduction
6. Combat ( )	6. Fuel for 5 minutes at V max at Sea Level with maximum non-afterburning power. No distance credited
7. Climb to cruise altitude ( )	7. Same as 2.
8. Cruise ( )	8. Same as 3.
9. Landing reserve ( )	9. Fuel for 10 minutes of maximum endurance at Sea Level

MISSION M-5

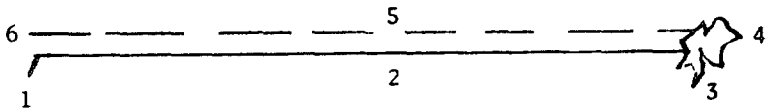
NATO GROUND SUPPORT (LO-LO-HI)



SEGMENT	ALLOWANCE
1. Take-off and accelerate to climb-speed ( )	1. Fuel for 2 minutes at maximum continuous power (S.L.S.)
2. Hi-speed cruise ( )	2. Cruise at 485 knots at Sea Level.
3. Release weapon ( )	3. Weight reduction
4. Combat ( )	4. Fuel for 5 minutes at V max with maximum non-afterburning power. No distance credited.
5. Climb to cruise altitude ( )	5. Maximum non-afterburning power
6. Cruise ( )	6. Speed and altitude for maximum range
7. Landing reserve ( )	7. Fuel for 10 minutes of maximum endurance at Sea Level

MISSION M-6

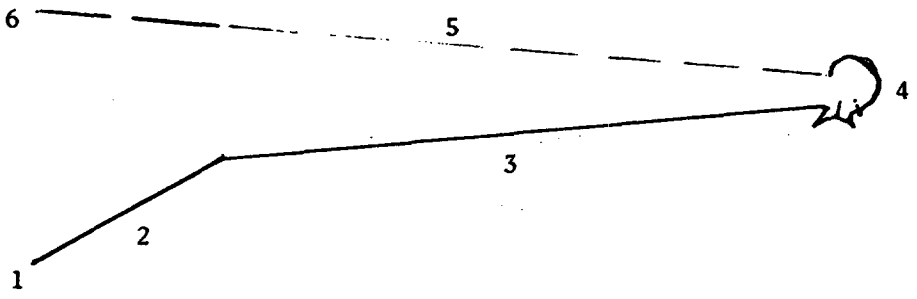
NATO GROUND SUPPORT (LO-LO-LO)



SEGMENT	ALLOWANCE
1. Take-off and accelerate to climb speed ( )	1. Fuel for 2 minutes at maximum continuous power (S.L.S.)
2. Hi-speed cruise ( )	2. Cruise at 485 knots at Sea Level.
3. Release Weapon ( )	3. Weight reduction
4. Combat ( )	4. Fuel for 5 minutes at V max with maximum non-afterburning power. No distance credited
5. Return to base ( )	5. Same as 2
6. Landing reserve ( )	6. Fuel for 10 minutes of maximum endurance at Sea Level.

MISSION M-7

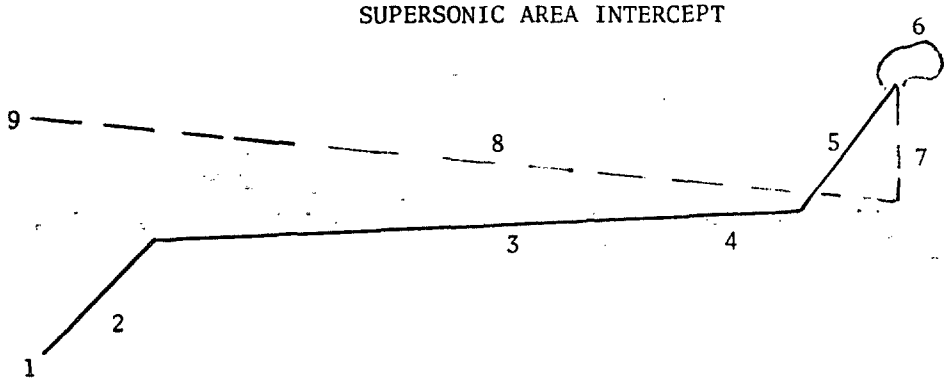
MAXIMUM SUPERSONIC POINT INTERCEPT



SEGMENT	ALLOWANCE
1. Take-off and accelerate to climb speed ( )	1. Fuel for 2 minutes maxon A/B power at Sea Level plus 1 minute at maximum A/B Sea Level static power.
2. Climb on course to max speed altitude ( )	2. Minimum time accelerating climb to highest altitude at which max speed is attainable.
3. Cruise-climb ( )	3. Cruise-climb at max speed.
4. Release weapon(s) and perform 180 deg turn ( )	4. Perform level, minimum radius, constant speed 180 deg. turn. Distance credit is taken for radius of 180 turn.
5. Cruise-climb ( )	5. Speed and altitude for max range.
6. Landing reserve ( )	6. Fuel for 10 minutes of maximum endurance at Sea Level.

MISSION M-8

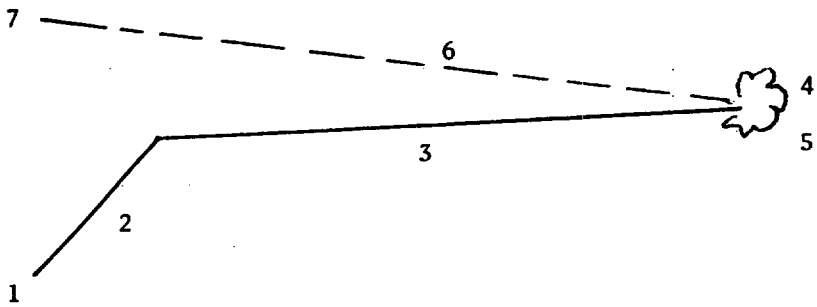
SUPERSONIC AREA INTERCEPT



SEGMENT	ALLOWANCE
1. Take-off and accelerate to climb speed ( )	1. Fuel for 2 minutes at maximum continuous power (S.L.S.)
2. Climb to cruise altitude ( )	2. Maximum non-afterburning power.
3. Cruise ( )	3. Speed and altitude for maximum range.
4. Accelerate from cruise speed to specified supersonic speed ( )	4. Maximum power
5. Climb to 50,000 feet ( )	5. At supersonic speed from 4 using maximum power.
6. Conduct 180° turn ( )	6. At 50,000 ft. at supersonic speed of segment 4 with maximum power. No distance credited.
7. Release weapon(s) and descend to cruise altitude ( )	7. Weight reduction equal to weapon. No time, distance or fuel credited for descent except where specified.
8. Cruise to base ( )	8. Same as 3
9. Landing reserve ( )	9. Fuel for 10 minutes of maximum endurance at Sea Level.

MISSION M-9

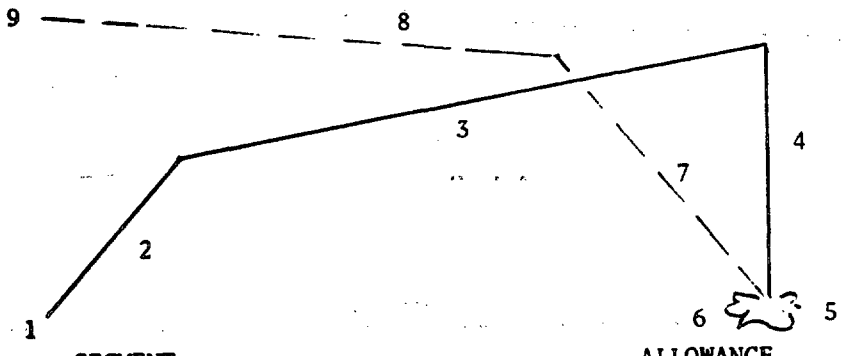
OPTIMUM SUBSONIC INTERCEPT



SEGMENT	ALLOWANCE
1. Take-off and accelerate to climb speed ( )	1. Fuel for 2 minutes at maximum continuous power (S.L.S.)
2. Climb to cruise altitude ( )	2. Use maximum non-augmented power
3. Cruise ( )	3. Speed and altitude for maximum range.
4. Combat at best cruise altitude ( )	4. Fuel for 5 minutes at maximum power at Mach = 1.0 at 50,000 ft. No distance credited
5. Release weapon(s) ( )	5. Weight reduction
6. Cruise to base ( )	6. Same as 3
7. Landing reserve ( )	7. Fuel for 10 minutes of maximum endurance at Sea Level

MISSION M-10

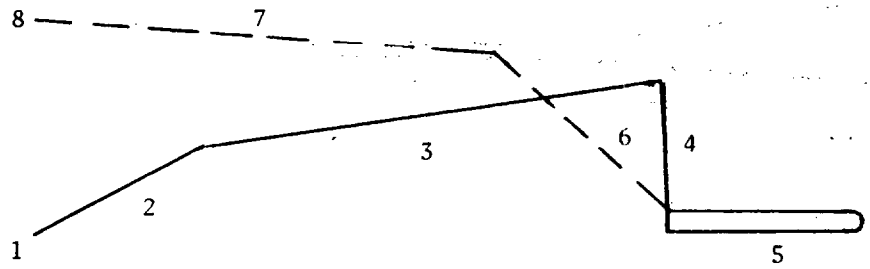
OPTIMUM LOW ALTITUDE INTERCEPT



SEGMENT	ALLOWANCE
1. Take-off and accelerate to climb speed ( )	1. Fuel for 2 minutes at maximum continuous power (S.L.S.)
2. Climb to cruise altitude ( )	2. Maximum non-afterburning power.
3. Cruise ( )	3. Speed and altitude for maximum range.
4. Descend to Sea Level	4. No time, fuel or distance credited except where specified.
5. Combat ( )	5. Fuel for 5 minutes at V_{max} at maximum non-afterburning power at Sea Level
6. Release weapon(s) ( )	6. Weight reduction
7. Climb to cruise altitude ( )	7. Same as 2
8. Cruise ( )	8. Same as 3
9. Landing reserve ( )	9. Fuel for 10 minutes of maximum endurance at Sea Level

MISSION M-11

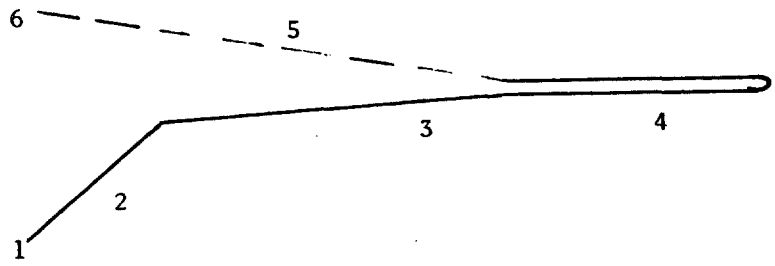
RECONNAISSANCE MISSION
(Hi-Lo-Lo-Hi)



SEGMENT	ALLOWANCE
1. Take-off and accelerate to climb speed ( )	1. Fuel for 2 minutes at maximum continuous power (S.L.S.)
2. Climb to cruise altitude ( )	2. Maximum non-afterburning power
3. Cruise - climb ( )	3. Speed and altitude for maximum range
4. Descend to Sea Level	4. No time, fuel or distance credited except where specified.
5. Reconnaissance activity ( )	5. Fuel for 50 NM dash in and out (total 100NM) or 5 minutes non-afterburning power at Sea Level whichever is less, recon speed is 485 knots.
6. Climb to cruise altitude ( )	6. Same as 2
7. Cruise climb ( )	7. Same as 3
8. Landing reserve ( )	8. Fuel for 10 minutes of maximum endurance at Sea Level

MISSION M-12

RECONNAISSANCE MISSION
(Hi-Hi-Hi)



SEGMENT	ALLOWANCE
1. Take-off and accelerate to climb speed ( )	1. Fuel for 2 minutes as maximum continuous power (S.L.S.)
2. Climb to cruise altitude ( )	2. Maximum non-afterburning power
3. Cruise climb ( )	3. Speed and altitude for maximum range
4. Reconnaissance activity	4. Five minutes at maximum afterburning power at an altitude of 50,000 feet or above (specified) and at a specified Mach number.
5. Cruise - climb ( )	5. Same as 3
6. Landing reserve ( )	6. Fuel for 10 minutes of maximum endurance at Sea Level.

APPENDIX IC
ATMOSPHERIC TABLES

Table IV. Standard day
Table V. Tropical day
Table VI. Hot day

1. STANDARD DAY - U.S. Standard Atmosphere, 1962, properties are presented as a function of geopotential altitude to 100,000 ft in 500 ft increments. For a standard day, pressure altitude and geopotential altitude are identical.

2. TROPICAL DAY - The tropical atmosphere is typical of that which might exist in the Northern Hemisphere and its properties are shown for geopotential altitudes up to 100,000 ft in increments of 500 ft. This atmosphere is hydrodynamically balanced and can be used for problem solutions involving engine performance, aerodynamic characteristics and calculations of true vertical velocity.

Note that these parameters are presented as a function geopotential altitude rather than as a function of pressure altitude on a tropical day in order to allow calculation of true climb performance. A given pressure altitude, which is directly defined by the atmospheric pressure, occurs at a greater geopotential altitude on a tropical day than on a standard day because of atmospheric expansion and therefore pressure altitude can not be used for climb calculations directly.

All ratios presented are based upon standard day, sea level values.

3. HOT DAY - Properties of a typical hot day are presented as a function of the associated pressure altitude up to 15,000 ft. These are statistically sampled properties and are not hydrodynamically balanced and can not be used to calculate true rate of climb. Rather, this table is included to show extreme properties to be expected and to permit criteria to be specified for approximately constant altitude conditions, primarily for take-off performance. In light of this, the altitudes were selected as a mere convenience. All ratios presented are based upon standard day, sea level values.

4. CONSTANTS AND RELATIONSHIPS -

a. Acceleration of gravity, sea level; $g_o = 32.17404$ ft/sec^2

b. Temperature, sea level, std day; $T_o = 518.67^{\circ}R$ $(288.2^{\circ}K)$

c. Pressure, sea level, std day; $P_o = 2116.22$ lb/ft^2 (29.92 in. Hg)

d. Universal Gas Constant; $R = 1545.31 \frac{\text{ft-lb}}{(\text{lb-mole})(^\circ\text{R})}$

e. Relationship between geopotential, H, and geometric, Z, altitude:

$$H = \frac{1}{g_o} \int_o^Z g dZ$$

where g is the local acceleration of gravity.

TABLE IV. Standard day atmosphere.

Altitude h ft'	Temperature			Temp Ratio θ	Press Ratio δ	Pressure		Density ρ × 10^2 slugs/ft^3 ρ	Density Ratio σ	Sq Root of Density Ratio $(\sigma)^{\frac{1}{2}}$	Specific Weight w × 10 lb/ft^3	Speed of Sound		Abs μ × 10^6 lb-sec/ft^2	Kin ν × 10^4 ft^2/sec	Altitude h ft'
	°F	°R	°C			in Hg	lb/ft^2					ft/sec	knots			
0	59.0	518.7	15.0	1.0000	1.0000	29.92	2116.22	.2377	1.0000	1.0000	.7647	1116.5	661.1	.3737	1.5723	0
500	57.2	516.9	14.0	.9966	.9821	29.38	2078.26	.2342	.9855	.9927	.7536	1114.5	659.9	.3727	1.5913	500
1,000	55.4	515.1	13.0	.9931	.9644	28.86	2040.85	.2308	.9711	.9854	.7426	1112.6	658.8	.3717	1.6105	1,000
1,500	53.6	513.3	12.0	.9897	.9470	28.33	2004.00	.2274	.9568	.9782	.7317	1110.7	657.6	.3707	1.6300	1,500
2,000	51.8	511.5	11.0	.9862	.9298	27.82	1967.68	.2241	.9428	.9710	.7210	1108.7	656.5	.3697	1.6499	2,000
2,500	50.1	509.8	10.0	.9828	.9129	27.32	1931.90	.2208	.9289	.9638	.7103	1106.8	655.3	.3687	1.6700	2,500
3,000	48.3	508.0	9.0	.9794	.8952	26.82	1896.64	.2175	.9151	.9566	.6998	1104.9	654.2	.3677	1.6905	3,000
3,500	46.5	506.2	8.0	.9759	.8798	26.33	1861.91	.2143	.9015	.9495	.6894	1102.9	653.0	.3667	1.7113	3,500
4,000	44.7	504.4	7.1	.9725	.8637	25.84	1827.70	.2111	.8881	.9424	.6792	1101.0	651.9	.3657	1.7324	4,000
4,500	42.9	502.6	6.1	.9691	.8477	25.37	1793.99	.2079	.8748	.9353	.6690	1099.0	650.7	.3647	1.7538	4,500
5,000	41.1	500.8	5.1	.9656	.8320	24.90	1760.79	.2048	.8617	.9283	.6590	1097.1	649.6	.3637	1.7756	5,000
5,500	39.4	499.1	4.1	.9622	.8166	24.43	1728.10	.2017	.8487	.9212	.6490	1095.1	648.4	.3626	1.7977	5,500
6,000	37.6	497.3	3.1	.9587	.8014	23.98	1695.89	.1987	.8359	.9143	.6392	1093.2	647.3	.3616	1.8202	6,000
6,500	35.8	495.5	2.1	.9553	.7864	23.53	1664.17	.1957	.8232	.9073	.6295	1091.2	646.1	.3606	1.8430	6,500
7,000	34.0	493.7	1.1	.9519	.7716	23.09	1632.94	.1927	.8106	.9004	.6199	1089.3	644.9	.3596	1.8662	7,000
7,500	32.2	491.9	.1	.9484	.7571	22.65	1602.18	.1897	.7983	.8935	.6105	1087.3	643.8	.3586	1.8898	7,500
8,000	30.4	490.1	-.9	.9450	.7428	22.22	1571.89	.1868	.7860	.8866	.6011	1085.3	642.6	.3575	1.9137	8,000
8,500	28.7	488.4	-1.9	.9416	.7287	21.80	1542.06	.1840	.7739	.8797	.5918	1083.3	641.4	.3565	1.9381	8,500
9,000	26.9	486.6	-2.8	.9381	.7148	21.39	1512.70	.1811	.7620	.8729	.5827	1081.4	640.3	.3555	1.9628	9,000
9,500	25.1	484.8	-3.8	.9347	.7012	20.98	1483.79	.1783	.7501	.8661	.5737	1079.4	639.1	.3544	1.9879	9,500
10,000	23.3	483.0	-4.8	.9312	.6877	20.58	1455.33	.1755	.7385	.8593	.5647	1077.4	637.9	.3534	2.0135	10,000
10,500	21.5	481.2	-5.8	.9278	.6745	20.18	1427.31	.1728	.7269	.8526	.5559	1075.4	636.7	.3524	2.0394	10,500
11,000	19.7	479.4	-6.8	.9244	.6614	19.79	1399.74	.1701	.7155	.8459	.5472	1073.5	635.6	.3513	2.0658	11,000
11,500	18.0	477.7	-7.8	.9209	.6486	19.41	1372.59	.1674	.7043	.8392	.5386	1071.4	634.4	.3503	2.0926	11,500
12,000	16.2	475.9	-8.8	.9175	.6360	19.03	1345.87	.1648	.6932	.8326	.5301	1069.4	633.2	.3493	2.1199	12,000
12,500	14.4	474.1	-9.8	.9141	.6236	18.66	1319.58	.1621	.6822	.8259	.5217	1067.4	632.0	.3482	2.1476	12,500
13,000	12.6	472.3	-10.8	.9106	.6113	18.29	1293.70	.1596	.6713	.8193	.5134	1065.4	630.8	.3472	2.1758	13,000
13,500	10.8	470.5	-11.8	.9072	.5993	17.93	1268.24	.1570	.6616	.8128	.5052	1063.4	629.6	.3461	2.2045	13,500
14,000	9.0	468.7	-12.8	.9037	.5875	17.58	1243.18	.1545	.6500	.8062	.4971	1061.4	628.4	.3451	2.2336	14,000
14,500	7.3	467.0	-13.7	.9003	.5758	17.23	1218.53	.1520	.6396	.7997	.4891	1059.3	627.2	.3440	2.2632	14,500
15,000	5.5	465.2	-14.7	.8969	.5643	16.89	1194.27	.1496	.6292	.7932	.4812	1057.3	626.0	.3430	2.2934	15,000
15,500	3.7	463.4	-15.7	.8934	.5531	16.55	1170.40	.1471	.6190	.7868	.4734	1055.3	624.8	.3419	2.3240	15,500
16,000	1.9	461.6	-16.7	.8900	.5420	16.22	1146.93	.1447	.6090	.7804	.4657	1053.3	623.6	.3409	2.3552	16,000
16,500	.1	459.8	-17.7	.8866	.5311	15.89	1123.83	.1424	.5990	.7740	.4581	1051.2	622.4	.3398	2.3869	16,500
17,000	-1.7	458.0	-18.7	.8831	.5203	15.57	1101.12	.1400	.5892	.7676	.4506	1049.2	621.2	.3388	2.4191	17,000

TABLE IV. Standard day atmosphere. - Continued

Altitude h ft	Temperature °F	Temperature °R	Temperature °C	Temp Ratio θ	Press Ratio δ	Pressure in Hg	Pressure lb/ft²	Density ρ × 10² slugs/ft³ ρ	Density Ratio σ	Sq Root of Density Ratio $(\sigma)^{\frac{1}{2}}$	Specific Weight w × 10 lb/ft³	Speed of Sound ft/sec	Speed of Sound knots	Abs μ × 10⁶ lb-sec/ft²	Kin ν × 10⁶ ft²/sec	Altitude h ft
17,500	-3.4	456.3	-19.7	.8797	.5098	15.25	1078.77	.1377	.5795	.7612	.4432	1047.1	620.0	.3377	2.4519	17,500
18,000	-5.2	454.5	-20.7	.8762	.4994	14.94	1056.80	.1355	.5699	.7549	.4358	1045.1	618.8	.3367	2.4853	18,000
18,500	-7.0	452.7	-21.7	.8728	.4892	14.64	1035.19	.1332	.5605	.7486	.4286	1043.0	617.6	.3356	2.5193	18,500
19,000	-8.8	450.9	-22.7	.8694	.4791	14.34	1013.94	.1310	.5511	.7424	.4215	1041.0	616.4	.3345	2.5538	19,000
19,500	-10.6	449.1	-23.6	.8659	.4693	14.04	993.04	.1288	.5419	.7361	.4144	1038.9	615.1	.3335	2.5889	19,500
20,000	-12.4	447.3	-24.6	.8625	.4595	13.75	972.49	.1266	.5328	.7299	.4075	1036.9	613.9	.3324	2.6247	20,000
20,500	-14.1	445.6	-25.6	.8591	.4500	13.46	952.29	.1245	.5238	.7238	.4006	1034.8	612.7	.3313	2.6611	20,500
21,000	-15.9	443.8	-26.6	.8556	.4406	13.18	932.43	.1224	.5150	.7176	.3938	1032.7	611.5	.3303	2.6981	21,000
21,500	-17.7	442.0	-27.6	.8522	.4314	12.91	912.91	.1203	.5062	.7115	.3871	1030.6	610.2	.3292	2.7358	21,500
22,000	-19.5	440.2	-28.6	.8487	.4223	12.64	893.72	.1183	.4976	.7054	.3805	1028.6	609.0	.3281	2.7742	22,000
22,500	-21.3	438.4	-29.6	.8453	.4134	12.37	874.85	.1162	.4891	.6993	.3740	1026.5	607.8	.3270	2.8133	22,500
23,000	-23.0	436.7	-30.6	.8419	.4046	12.11	856.31	.1142	.4806	.6933	.3676	1024.4	606.5	.3259	2.8530	23,000
23,500	-24.8	434.9	-31.6	.8384	.3960	11.85	838.09	.1123	.4724	.6873	.3612	1022.3	605.3	.3249	2.8935	23,500
24,000	-26.6	433.1	-32.6	.8350	.3876	11.60	820.19	.1103	.4642	.6813	.3550	1020.2	604.1	.3238	2.9347	24,000
24,500	-28.4	431.3	-33.6	.8316	.3793	11.35	802.60	.1084	.4561	.6753	.3488	1018.1	602.8	.3227	2.9767	24,500
25,000	-30.2	429.5	-34.5	.8281	.3711	11.10	785.31	.1065	.4481	.6694	.3427	1016.0	601.6	.3216	3.0194	25,000
25,500	-32.0	427.7	-35.5	.8247	.3631	10.86	768.33	.1046	.4402	.6635	.3367	1013.9	600.3	.3205	3.0629	25,500
26,000	-33.7	426.0	-36.5	.8212	.3552	10.63	751.64	.1028	.4325	.6576	.3307	1011.8	599.1	.3194	3.1072	26,000
26,500	-35.5	424.2	-37.5	.8178	.3474	10.40	735.25	.1010	.4248	.6518	.3249	1009.6	597.8	.3183	3.1523	26,500
27,000	-37.3	422.4	-38.5	.8144	.3398	10.17	719.15	.0992	.4173	.6460	.3191	1007.5	596.5	.3172	3.1983	27,000
27,500	-39.1	420.6	-39.5	.8109	.3324	9.94	703.34	.0974	.4098	.6402	.3134	1005.4	595.3	.3161	3.2451	27,500
28,000	-40.9	418.8	-40.5	.8075	.3250	9.72	687.81	.0957	.4025	.6344	.3078	1003.2	594.0	.3150	3.2928	28,000
28,500	-42.7	417.0	-41.5	.8041	.3178	9.51	672.55	.0939	.3953	.6287	.3023	1001.1	592.8	.3139	3.3414	28,500
29,000	-44.4	415.3	-42.5	.8006	.3107	9.30	657.58	.0923	.3881	.6230	.2968	999.0	591.8	.3128	3.3909	29,000
29,500	-46.2	413.5	-43.5	.7972	.3038	9.09	642.87	.0906	.3811	.6173	.2914	996.8	590.2	.3117	3.4414	29,500
30,000	-48.0	411.7	-44.5	.7937	.2970	8.89	628.43	.0889	.3741	.6117	.2861	994.7	588.9	.3106	3.4928	30,000
30,500	-49.8	409.9	-45.4	.7903	.2903	8.69	614.26	.0873	.3673	.6060	.2809	992.5	587.7	.3095	3.5452	30,500
31,000	-51.6	408.1	-46.4	.7869	.2937	8.49	600.34	.0857	.3605	.6004	.2757	990.4	586.4	.3084	3.5986	31,000
31,500	-53.4	406.3	-47.4	.7834	.2772	8.30	586.69	.0841	.3539	.5949	.2706	988.2	585.1	.3073	3.6530	31,500
32,000	-55.1	404.6	-48.4	.7800	.2709	8.11	573.28	.0826	.3473	.5893	.2656	986.0	583.8	.3061	3.7085	32,000
32,500	-56.9	402.8	-49.4	.7766	.2647	7.92	560.12	.0810	.3408	.5838	.2607	983.9	582.5	.3050	3.7650	32,500
33,000	-58.7	401.0	-50.4	.7731	.2586	7.74	547.21	.0795	.3345	.5783	.2558	981.7	581.2	.3039	3.8227	33,000
33,500	-60.5	399.2	-51.4	.7697	.2526	7.56	534.55	.0780	.3282	.5629	.2510	979.5	579.9	.3028	3.8814	33,500
34,000	-62.3	397.4	-52.4	.7662	.2467	7.38	522.11	.0765	.3220	.5674	.2462	977.3	578.7	.3016	3.9414	34,000
34,500	-64.1	395.6	-53.4	.7628	.2410	7.21	509.92	.0751	.3159	.5620	.2416	975.1	577.4	.3005	4.0025	34,500

TABLE IV. Standard day atmosphere. - Continued

Altitude h ft	Temperature °F	Temperature °R	Temperature °C	Temp Ratio θ	Press Ratio δ	Pressure in Hg	Pressure lb/ft²	Density ρ × 10² slugs/ft³ ρ	Density Ratio σ	Sq Root of Density Ratio $(\sigma)^{\frac{1}{2}}$	Specific Weight w × 10 lb/ft²	Speed of Sound ft/sec	Speed of Sound knots	Abs μ × 10⁶ lb-sec/ft²	Kin √ × 10⁴ ft²/sec	Altitude h ft
35,000	-65.8	393.9	-54.4	.7594	.2353	7.04	497.96	.0737	.3099	.5567	.2370	972.9	576.0	.2994	4.0648	35,000
35,500	-67.6	392.1	-55.3	.7559	.2298	6.87	486.22	.0722	.3039	.5513	.2324	970.7	574.7	.2983	4.1284	35,500
36,000	-69.4	390.3	-56.3	.7525	.2243	6.71	474.71	.0709	.2981	.5460	.2280	968.5	573.4	.2971	4.1933	36,000
36,500	-69.7	390.0	-56.5	.7519	.2190	6.55	463.44	.0692	.2913	.5397	.2227	968.1	573.2	.2969	4.2887	36,500
37,000	-69.7	390.0	-56.5	.7519	.2138	6.40	452.44	.0676	.2844	.5332	.2175	968.1	573.2	.2969	4.3930	37,000
37,500	-69.7	390.9	-56.5	.7519	.2087	6.25	441.69	.0660	.2775	.5269	.2123	968.1	573.2	.2969	4.4999	37,500
38,000	-69.7	390.9	-56.5	.7519	.2038	6.10	431.20	.0644	.2710	.5206	.2073	968.1	573.2	.2969	4.6093	38,000
38,500	-69.7	390.0	-56.5	.7519	.1989	5.95	420.96	.0629	.2646	.5144	.2023	968.1	573.2	.2969	4.7214	38,500
39,000	-69.7	390.0	-56.5	.7519	.1942	5.81	410.97	.0614	.2583	.5082	.1975	968.1	573.2	.2969	4.8363	39,000
39,500	-69.7	390.0	-56.5	.7519	.1896	5.67	401.21	.0599	.2522	.5022	.1928	968.1	573.2	.2969	4.9539	39,500
40,000	-69.7	390.0	-56.5	.7519	.1851	5.54	391.68	.0585	2462	.4962	.1883	968.1	573.2	.2969	5.0744	40,000
40,500	-69.7	390.0	-56.5	.7519	.1807	5.41	382.38	.0571	.2403	.4902	.1838	968.1	573.2	.2969	5.1978	40,500
41,000	-69.7	390.0	-56.5	.7519	.1764	5.28	373.30	.0558	.2346	.4844	.1794	968.1	573.2	.2969	5.3242	41,000
41,500	-69.7	390.0	-56.5	.7519	.1722	5.15	364.44	.0544	.2290	.4786	.1752	968.1	573.2	.2969	5.4537	41,500
42,000	-69.7	390.0	-56.5	.7519	.1681	5.03	355.78	.0531	.2236	.4729	.1710	968.1	573.2	.2969	5.5864	42,000
42,500	-69.7	390.0	-56.5	.7519	.1641	4.91	347.34	.0519	.2183	.4672	.1669	968.1	573.2	.2969	5.7223	42,500
43,000	-69.7	390.0	-56.5	.7519	.1602	4.79	339.09	.0507	.2131	.4616	.1630	968.1	573.2	.2969	5.8614	43,000
43,500	-69.7	390.0	-56.5	.7519	.1564	4.68	331.04	.0495	.2081	.4561	.1591	968.1	573.2	.2969	6.0040	43,500
44,000	-69.7	390.0	-56.5	.7519	.1527	4.57	323.18	.0483	.2031	.4507	.1553	968.1	573.2	.2969	6.1500	44,000
44,500	-69.7	390.0	-56.5	.7519	.1491	4.46	315.50	.0471	.1983	.4453	.1516	968.1	573.2	.2969	6.2996	44,500
45,000	-69.7	390.0	-56.5	.7519	.1455	4.35	308.01	.0460	.1936	.4400	.1480	968.1	573.2	.2969	6.4529	45,000
45,500	-69.7	390.0	-56.5	.7519	.1421	4.25	300.70	.0449	.1890	.4347	.1445	968.1	573.2	.2969	6.6098	45,500
46,000	-69.7	390.0	-56.5	.7519	.1387	4.15	293.56	.0439	.1845	.4295	.1411	968.1	573.2	.2969	6.7706	46,000
46,500	-69.7	390.0	-56.5	.7519	.1354	4.05	286.59	.0428	.1801	.4244	.1377	968.1	573.2	.2969	6.9353	46,500
47,000	-69.7	390.0	-56.5	.7519	.1322	3.96	279.78	.0418	.1758	.4193	.1345	968.1	573.2	.2969	7.1039	47,000
47,500	-69.7	390.0	-56.5	.7519	.1291	3.86	273.14	.0408	.1717	.4143	.1313	968.1	573.2	.2969	7.2767	47,500
48,000	-69.7	390.0	-56.5	.7519	.1260	3.77	266.65	.0398	.1676	.4094	.1282	968.1	573.2	.2969	7.4537	48,000
48,500	-69.7	390.0	-56.5	.7519	.1230	3.68	260.32	.0389	.1636	.4045	.1251	968.1	573.2	.2969	7.6350	48,500
49,000	-69.7	390.0	-56.5	.7519	.1201	3.59	254.14	.0380	.1597	.3997	.1221	968.1	573.2	.2969	7.8207	49,000
49,500	-69.7	390.0	-56.5	.7519	.1172	3.51	248.10	.0371	.1559	.3949	.1192	968.1	573.2	.2969	8.0110	49,500
50,000	-69.7	390.0	-56.5	.7519	.1145	3.42	242.21	.0362	.1522	.3902	.1164	968.1	573.2	.2969	8.2058	50,000
50,500	-69.7	390.0	-56.5	.7519	.1117	3.34	236.46	.0353	.1486	.3855	.1137	968.1	573.2	.2969	8.4054	50,500
51,000	-69.7	390.0	-56.5	.7519	.1091	3.26	230.85	.0345	.1451	.3809	.1110	968.1	573.2	.2969	8.6098	51,000
51,500	-69.7	390.0	-56.5	.7519	.1065	3.19	225.36	.0337	.1416	.3764	.1083	968.1	573.2	.2969	8.8193	51,500
52,000	-69.7	390.0	-56.5	.7519	.1040	3.11	220.01	.0329	.1383	.3719	.1057	968.1	573.2	.2969	9.0338	52,000

TABLE IV. Standard day atmosphere. - Continued

Altitude h ft'	Temperature °F	Temperature °R	Temperature °C	Temp Ratio θ	Press Ratio δ	Pressure in Hg	Pressure lb/ft²	Density ρ × 10³ slugs/ft³ ρ	Density Ratio σ	Sq Root of Density Ratio (σ) ½	Specific Weight w × 10 lb/ft³	Speed of Sound ft/sec	Speed of Sound knots	Abs μ × 10⁶ lb-sec/ft²	Kin ν × 10⁴ ft²/sec	Altitude h ft'
52,500	-69.7	390.0	-56.5	.7519	.1015	3.04	214.79	.0321	.1315	.3674	.1032	968.1	573.2	.2969	9.2535	52,500
53,000	-69.7	390.0	-56.5	.7519	.0991	2.96	209.69	.0313	.1318	.3630	.1008	968.1	573.2	.2969	9.4786	53,000
53,500	-69.7	390.0	-56.5	.7519	.0967	2.89	204.71	.0306	.1287	.3587	.0984	968.1	573.2	.2969	9.7091	53,500
54,000	-69.7	390.0	-56.5	.7519	.0944	2.83	199.85	.0299	.1256	.3544	.0961	968.1	573.2	.2969	9.9453	54,000
54,500	-69.7	390.0	-56.5	.7519	.0922	2.76	195.10	.0291	.1226	.3502	.0938	968.1	573.2	.2969	10.1872	54,500
55,000	-69.7	390.0	-56.5	.7519	.0900	2.69	190.47	.0285	.1197	.3460	.0915	968.1	573.2	.2969	10.4349	55,000
55,500	-69.7	390.0	-56.5	.7519	.0879	2.63	185.95	.0278	.1169	.3419	.0894	968.1	573.2	.2969	10.6888	55,500
56,000	-69.7	390.0	-56.5	.7519	.0858	2.57	181.53	.0271	.1141	.3378	.0873	968.1	573.2	.2969	10.9487	56,000
56,500	-69.7	390.0	-56.5	.7519	.0837	2.51	177.22	.0265	.1114	.3337	.0852	968.1	573.2	.2969	11.2150	56,500
57,000	-69.7	390.0	-56.5	.7519	.0818	2.45	173.01	.0258	.1087	.3298	.0832	968.1	573.2	.2969	11.4878	57,000
57,500	-69.7	390.0	-56.5	.7519	.0798	2.39	168.91	.0252	.1062	.3258	.0812	968.1	573.2	.2969	11.7672	57,500
58,000	-69.7	390.0	-56.5	.7519	.0779	2.33	164.89	.0246	.1036	.3219	.0793	968.1	573.2	.2969	12.0535	58,000
58,500	-69.7	390.0	-56.5	.7519	.0761	2.28	160.98	.0240	.1012	.3181	.0774	968.1	573.2	.2969	12.3466	58,500
59,000	-69.7	390.0	-56.5	.7519	.0743	2.22	156.16	.0235	.0988	.3143	.0755	968.1	573.2	.2969	12.6469	59,000
59,500	-69.7	390.0	-56.5	.7519	.0725	2.17	153.42	.0229	.0964	.3105	.0737	968.1	573.2	.2969	12.9545	59,500
60,000	-69.7	390.0	-56.5	.7519	.0708	2.12	149.78	.0224	.0941	.3068	.0720	968.1	573.2	.2969	13.2696	60,000
60,500	-69.7	390.0	-56.5	.7519	.0691	2.07	146.23	.0218	.0919	.3032	.0703	968.1	573.2	.2969	13.5924	60,500
61,000	-69.7	390.0	-56.5	.7519	.0675	2.02	142.75	.0213	.0897	.2995	.0686	968.1	573.2	.2969	13.9230	61,000
61,500	-69.7	390.0	-56.5	.7519	.0659	1.97	139.36	.0208	.0876	.2960	.0670	968.1	573.2	.2969	14.2617	61,500
62,000	-69.7	390.0	-56.5	.7519	.0643	1.92	136.05	.0203	.0855	.2924	.0654	968.1	573.2	.2969	14.6085	62,000
62,500	-69.7	390.0	-56.5	.7519	.0628	1.88	132.82	.0198	.0835	.2889	.0638	968.1	573.2	.2969	14.9639	62,500
63,000	-69.7	390.0	-56.5	.7519	.0613	1.83	129.67	.0194	.0815	.2855	.0623	968.1	573.2	.2969	15.3278	63,000
63,500	-69.7	390.0	-56.5	.7519	.0598	1.79	126.59	.0189	.0796	.2821	.0608	968.1	573.2	.2969	15.7006	63,500
64,000	-69.7	390.0	-56.5	.7519	.0584	1.75	123.58	.0185	.0777	.2787	.0594	968.1	573.2	.2969	16.0825	64,000
64,500	-69.7	390.0	-56.5	.7519	.0570	1.71	120.65	.0180	.0758	.2754	.0580	968.1	573.2	.2969	16.4737	64,500
65,000	-69.7	390.0	-56.5	.7519	.0557	1.67	117.78	.0176	.0740	.2721	.0566	968.1	573.2	.2969	16.8744	65,000
65,500	-69.7	390.0	-56.5	.7519	.0543	1.63	114.99	.0172	.0723	.2688	.0553	968.1	573.2	.2969	17.2848	65,500
66,000	-69.5	390.2	-56.4	.7523	.0530	1.59	112.26	.0168	.0705	.2655	.0539	968.3	573.4	.2970	17.7230	66,000
66,500	-69.2	390.5	-56.2	.7528	.0518	1.55	109.59	.0164	.0688	.2623	.0526	968.7	573.6	.2972	18.1776	66,500
67,000	-69.0	390.7	-56.1	.7533	.0506	1.51	106.99	.0160	.0671	.2591	.0513	969.0	573.8	.2974	18.6436	67,000
67,500	-68.7	391.0	-55.9	.7539	.0494	1.48	104.45	.0156	.0655	.2559	.0501	969.4	574.0	.2976	19.1212	67,500
68,000	-68.4	391.3	-55.8	.7544	.0482	1.44	101.98	.0152	.0639	.2527	.0488	969.7	574.2	.2977	19.6107	68,000
68,500	-68.1	391.6	-55.6	.7549	.0470	1.41	99.56	.0148	.0623	.2496	.0477	970.0	574.4	.2979	20.1123	68,500
69,000	-67.9	391.8	-55.5	.7554	.0459	1.37	97.20	.0145	.0608	.2466	.0465	970.4	574.6	.2981	20.6265	69,000
69,500	-67.6	392.1	-55.3	.7560	.0448	1.34	94.90	.0141	.0593	.2436	.0454	970.7	574.8	.2983	21.1533	69,500

TABLE IV. Standard day atmosphere. - Continued

Altitude h ft	Temperature °F	Temperature °R	Temperature °C	Temp Ratio θ	Press Ratio δ	Pressure in Hg	Pressure lb/ft²	Density ρ × 10³ slugs/ft³ ρ	Density Ratio σ	Sq Root of Density Ratio $(\sigma)^{\frac{1}{2}}$	Specific Weight w × 10 lb/ft³	Speed of Sound ft/sec	Speed of Sound knots	Abs μ × 10⁶ lb-sec/ft²	Kin ν × 10⁴ ft²/sec	Altitude h ft
70,000	-67.3	392.4	-55.2	.7565	.0438	1.31	92.66	.0138	.0579	.2406	.0443	971.1	575.0	.2984	21.6933	70,000
70,500	-67.1	392.6	-55.0	.7570	.0428	1.28	90.47	.0134	.0565	.2376	.0432	971.4	575.2	.2986	22.2466	70,500
71,000	-66.8	392.9	-54.9	.7576	.0417	1.25	88.34	.0131	.0551	.2347	.0421	971.7	575.4	.2988	22.8137	71,000
71,500	-66.5	393.2	-54.7	.7581	.0408	1.22	86.25	.0128	.0538	.2319	.0411	972.1	575.6	.2990	23.3948	71,500
72,000	-66.2	393.5	-54.6	.7586	.0398	1.19	84.22	.0125	.0525	.2290	.0401	972.4	575.8	.2991	23.9903	72,000
72,500	-66.0	393.7	-54.4	.7591	.0389	1.16	82.24	.0122	.0512	.2262	.0391	972.8	576.0	.2993	24.6005	72,500
73,000	-65.7	394.0	-54.3	.7597	.0379	1.14	80.30	.0119	.0499	.2235	.0382	973.1	576.2	.2995	25.2257	73,000
73,500	-65.4	394.3	-54.1	.7602	.0371	1.11	78.41	.0116	.0487	.2208	.0373	973.4	576.4	.2997	25.8665	73,500
74,000	-65.1	394.6	-54.0	.7607	.0362	1.08	76.57	.0113	.0476	.2181	.0364	973.8	576.6	.2998	26.5230	74,000
74,500	-64.9	394.8	-53.8	.7613	.0353	1.06	74.77	.0110	.0464	.2154	.0355	974.1	576.8	.3000	27.1957	74,500
75,000	-64.6	395.1	-53.7	.7618	.0345	1.03	73.01	.0108	.0453	.2128	.0346	974.4	577.0	.3002	27.8850	75,000
75,500	-64.3	395.4	-53.5	.7623	.0337	1.01	71.30	.0105	.0442	.2102	.0338	974.8	577.2	.3004	28.5912	75,500
76,000	-64.0	395.7	-53.4	.7638	.0329	.98	69.63	.0103	.0431	.2077	.0330	975.1	577.4	.3005	29.3148	76,000
76,500	-63.8	395.9	-53.2	.7634	.0321	.96	68.00	.0100	.0421	.2052	.0322	975.5	577.6	.3007	30.0563	76,500
77,000	-63.5	396.2	-53.0	.7639	.0314	.94	66.41	.0098	.0411	.2027	.0314	975.8	577.8	.3009	30.8159	77,000
77,500	-63.2	396.5	-52.9	.7644	.0306	.92	64.85	.0095	.0401	.2002	.0307	976.1	578.0	.3011	21.5942	77,500
78,000	-62.9	396.8	-52.7	.7650	.0299	.90	63.34	.0093	.0391	.1978	.0299	976.5	578.2	.3012	32.3916	78,000
78,500	-62.7	397.0	-52.6	.7655	.0292	.87	61.86	.0091	.0382	.1954	.0292	976.8	578.4	.3014	33.2085	78,500
79,000	-62.4	397.3	-52.4	.7660	.0285	.85	60.41	.0089	.0373	.1930	.0285	977.1	578.6	.3016	34.0454	79,000
79,500	-62.1	397.6	-52.3	.7666	.0279	.83	59.00	.0086	.0364	.1907	.0278	977.5	578.8	.3017	34.9029	79,500
80,000	-61.8	397.9	-52.1	.7671	.0272	.81	57.63	.0084	.0355	.1884	.0271	977.8	579.0	.3019	35.7813	80,000
80,500	-61.6	398.1	-52.0	.7676	.0266	.80	56.28	.0082	.0346	.1861	.0265	978.2	579.2	.3021	36.6811	80,500
81,000	-61.3	398.4	-51.8	.7681	.0260	.78	54.97	.0089	.0338	.1839	.0259	978.5	579.4	.3023	37.6030	81,000
81,500	-61.0	398.7	-51.7	.7687	.0254	.76	53.70	.0078	.0330	.1817	.0252	978.8	579.6	.3024	38.5474	81,500
82,000	-60.7	399.0	-51.5	.7692	.0248	.74	52.45	.0077	.0322	.1795	.0246	979.2	579.8	.3026	39.5148	82,000
82,500	-60.5	399.2	-51.4	.7697	.0242	.72	51.23	.0075	.0314	.1773	.0241	979.5	580.0	.3028	40.5058	82,500
83,000	-60.2	399.5	-51.2	.7703	.0236	.71	50.04	.0073	.0307	.1752	.0235	979.8	580.2	.3030	41.5209	83,000
83,500	-59.9	399.8	-51.1	.7708	.0231	.69	48.88	.0071	.0300	.1731	.0229	980.2	580.4	.3031	42.5608	83,500
84,000	-59.6	400.1	-50.9	.7713	.0226	.68	47.74	.0070	.0293	.1710	.0224	980.5	580.6	.3033	43.6259	84,000
84,500	-59.4	400.3	-50.8	.7718	.0220	.66	46.64	.0068	.0286	.1690	.0218	980.9	580.8	.3035	44.7170	84,500
85,000	-59.1	400.6	-50.6	.7724	.0215	.64	45.56	.0066	.0279	.1670	.0213	981.2	581.0	.3037	45.8345	85,000
85,500	-58.8	400.9	-50.5	.7729	.0210	.63	44.50	.0065	.0272	.1650	.0208	981.5	581.2	.3038	46.9792	85,500
86,000	-58.5	401.2	-50.3	.7734	.0205	.61	43.47	.0063	.0266	.1630	.0203	981.9	581.4	.3040	48.1516	86,000
86,500	-58.3	401.4	-50.2	.7740	.0201	.60	42.47	.0062	.0259	.1610	.0198	982.2	581.6	.3042	49.3525	86,500
87,000	-58.0	401.7	-50.0	.7745	.0196	.59	41.49	.0060	.0253	.1591	.0194	982.5	581.8	.3043	50.5825	87,000
87,500	-57.7	402.0	-49.8	.7750	.0192	.57	40.53	.0059	.0247	.1572	.0189	982.9	582.0	.3045	51.8422	87,500

TABLE IV. Standard day atmosphere. - Continued

Altitude h ft	Temperature °F	Temperature °R	Temperature °C	Temp Ratio θ	Press Ratio δ	Pressure in Hg	Pressure lb/ft²	Density ρ × 10² slugs/ft³ ρ	Density Ratio σ	Sq Root of Density Ratio (σ) ½	Specific Weight w × 10 lb/ft²	Speed of Sound ft/sec	Speed of Sound knots	Abs μ × 10⁶ lb-sec/ft²	Kin √ × 10⁴ ft²/sec	Altitude h ft
88,000	-57.4	402.3	-49.7	.7755	.0187	.56	39.60	.0057	.0241	.1553	.0185	983.2	582.2	.3047	53.1324	88,000
88,500	-57.2	402.5	-49.5	.7761	.0183	.55	38.68	.0056	.0236	.1535	.0180	983.5	582.4	.3049	54.4538	88,500
89,000	-56.9	402.8	-49.4	.7766	.0179	.53	37.79	.0055	.0230	.1516	.0176	983.9	582.5	.3050	55.8072	89,000
89,500	-56.6	403.1	-49.2	.7771	.0174	.52	36.92	.0053	.0225	.1498	.0172	984.2	582.7	.3052	57.1932	89,500
90,000	-56.4	403.3	-49.1	.7777	.0170	.51	36.07	.0052	.0219	.1481	.0168	984.5	582.9	.3054	58.6126	90,000
90,500	-56.1	403.6	-48.9	.7782	.0167	.50	35.24	.0051	.0214	.1463	.0164	984.9	583.1	.3056	60.0663	90,500
91,000	-55.8	403.9	-48.8	.7787	.0163	.49	34.43	.0050	.0209	.1446	.0160	985.2	583.3	.3057	61.5550	91,000
91,500	-55.5	404.2	-48.6	.7792	.0159	.48	33.46	.0048	.0204	.1428	.0156	985.5	583.5	.3059	63.0795	91,500
92,000	-55.3	404.4	-48.5	.7798	.0155	.46	32.87	.0047	.0199	.1411	.0152	985.9	583.7	.3061	64.6407	92,000
92,500	-55.0	404.7	-48.3	.7803	.0152	.45	32.12	.0046	.0195	.1395	.0149	986.2	583.9	.3062	66.2394	92,500
93,000	-54.7	405.0	-48.2	.7808	.0148	.44	31.38	.0045	.0190	.1378	.0145	986.5	584.1	.3064	67.8766	93,000
93,500	-54.4	405.3	-48.0	.7814	.0145	.43	30.65	.0044	.0185	.1362	.0142	986.9	584.3	.3066	69.5530	93,500
94,000	-54.2	405.5	-47.9	.7819	.0142	.42	29.96	.0043	.0181	.1346	.0138	987.2	584.5	.3068	71.2697	94,000
94,500	-53.9	405.8	-47.7	.7824	.0138	.41	29.28	.0042	.0177	.1330	.0135	987.5	584.7	.3069	73.0275	94,500
95,000	-53.6	406.1	-47.6	.7829	.0135	.40	28.61	.0041	.0173	.1314	.0132	987.9	584.9	.3071	74.8275	95,000
95,500	-53.3	406.4	-47.4	.7835	.0132	.40	27.96	.0040	.0169	.1299	.0129	988.2	585.1	.3073	76.6705	95,500
96,000	-53.1	406.6	-47.3	.7840	.0129	.39	27.32	.0039	.0165	.1283	.0126	988.5	585.3	.3074	78.5577	96,000
96,500	-52.8	406.9	-47.1	.7845	.0126	.38	26.70	.0038	.0161	.1268	.0123	988.9	585.5	.3076	80.4900	96,500
97,000	-52.5	407.2	-47.0	.7851	.0123	.37	26.09	.0037	.0157	.1253	.0120	989.2	585.7	.3078	82.4684	97,000
97,500	-52.2	407.5	-46.8	.7856	.0120	.36	25.49	.0036	.0153	.1238	.0117	989.5	585.9	.3080	84.4941	97,500
98,000	-52.0	407.7	-46.6	.7861	.0118	.35	24.91	.0036	.0150	.1224	.0115	989.9	586.1	.3081	86.5681	98,000
98,500	-51.7	408.0	-46.5	.7866	.0115	.34	24.35	.0035	.0146	.1209	.0112	990.2	586.3	.3083	88.6915	98,500
99,000	-51.4	408.3	-46.3	.7872	.0112	.34	23.79	.0034	.0143	.1195	.0109	990.5	586.5	.3085	90.8656	99,000
99,500	-51.1	408.6	-46.2	.7877	.0110	.33	23.25	.0033	.0139	.1181	.0107	990.9	586.7	.3086	93.0914	99,500
100,000	-50.9	408.8	-46.0	.7882	.0107	.32	22.72	.0032	.0136	.1167	.0104	991.2	586.9	.3088	95.3702	100,000

TABLE V. Tropical day atmosphere.

Altitude h* ft'	Temperature °F	Temperature °R	Temperature °C	Temp Ratio θ	Press Ratio δ	Pressure in Hg	Pressure lb/ft²	Density ρ × 10² slugs/ft³ ρ	Density Ratio σ	Sq Root of Density Ratio $(\sigma)^{\frac{1}{2}}$	Specific Weight w × 10 lb/ft²	Speed of Sound ft/sec	Speed of Sound knots	Abs μ × 10⁶ lb-sec/ft²	Kin ν × 10⁴ ft²/sec	Altitude h* ft'
0	89.8	549.5	32.1	1.0594	.9999	29.92	2116.10	.2243	.9438	.9715	.7218	1149.1	680.4	.3907	1.7417	0
500	88.0	547.7	31.1	1.0559	.9830	29.41	2080.26	.2213	.9310	.9649	.7120	1147.2	679.3	.3897	1.7613	500
1,000	86.1	545.8	30.1	1.0524	.9663	28.91	2044.90	.2183	.9162	.9582	.7022	1145.3	678.1	.3887	1.7811	1,000
1,500	84.3	544.0	29.1	1.0488	.9498	28.42	2010.03	.2153	.9056	.9516	.6926	1143.4	677.0	.3877	1.8013	1,500
2,000	82.5	542.2	28.0	1.0453	.9336	27.93	1975.65	.2123	.8931	.9451	.6830	1141.4	675.9	.3867	1.8217	2,000
2,500	80.6	540.3	27.0	1.0418	.9175	27.45	1941.73	.2094	.8808	.9385	.6736	1139.5	674.7	.3857	1.8425	2,500
3,000	78.8	538.5	26.0	1.0382	.9017	26.98	1908.29	.2064	.8686	.9320	.6642	1137.6	673.6	.3847	1.8635	3,000
3,500	77.0	536.7	25.0	1.0347	.8862	26.51	1875.31	.2036	.8565	.9255	.6550	1135.6	672.4	.3837	1.8849	3,500
4,000	75.1	534.8	24.0	1.0311	.8708	26.06	1842.79	.2007	.8445	.9190	.6458	1133.7	671.3	.3827	1.9065	4,000
4,500	73.3	533.0	22.9	1.0276	.8556	25.60	1810.72	.1979	.8327	.9125	.6368	1131.7	670.1	.3817	1.9285	4,500
5,000	71.5	531.2	21.9	1.0241	.8407	25.15	1779.11	.1951	.8209	.9061	.6278	1129.8	669.0	.3807	1.9508	5,000
5,500	69.6	529.3	20.9	1.0205	.8260	24.71	1747.94	.1924	.8094	.8996	.6190	1127.8	667.8	.3797	1.9735	5,500
6,000	67.8	527.5	19.9	1.0170	.8115	24.28	1717.21	.1897	.7979	.8933	.6102	1125.9	666.6	.3786	1.9965	6,000
6,500	65.9	525.6	18.9	1.0135	.7971	23.85	1686.92	.1870	.7866	.8869	.6015	1123.9	665.5	.3776	2.0198	6,500
7,000	64.1	523.8	17.8	1.0099	.7830	23.43	1657.06	.1843	.7753	.8805	.5929	1122.0	664.3	.3766	2.0435	7,000
7,500	62.3	522.0	16.8	1.0064	.7691	23.01	1627.62	.1817	.7642	.8742	.5845	1120.0	663.2	.3756	2.0675	7,500
8,000	60.4	520.1	15.8	1.0028	.7554	22.60	1598.61	.1790	.7533	.8679	.5761	1118.0	662.0	.3745	2.0919	8,000
8,500	58.6	518.3	14.8	.9993	.7419	22.20	1570.02	.1765	.7424	.8616	.5678	1116.1	660.8	.3735	2.1167	8,500
9,000	56.8	516.5	13.8	.9958	.7286	21.80	1541.83	.1739	.7317	.8554	.5596	1114.1	659.6	.3725	2.1418	9,000
9,500	54.9	514.6	12.7	.9922	.7155	21.41	1514.06	.1714	.7211	.8492	.5514	1112.1	658.5	.3715	2.1673	9,500
10,000	53.1	512.8	11.7	.9887	.7025	21.02	1486.69	.1689	.7106	.8429	.5434	1110.1	657.3	.3704	2.1933	10,000
10,500	51.3	511.0	10.7	.9852	.6898	20.64	1459.72	.1664	.7002	.8368	.5355	1108.1	656.1	.3694	2.2196	10,500
11,000	49.4	509.1	9.7	.9816	.6770	20.26	1432.64	.1639	.6897	.8305	.5274	1106.1	654.9	.3684	2.2471	11,000
11,500	47.6	507.3	8.7	.9781	.6646	19.89	1406.46	.1615	.6795	.8243	.5197	1104.1	653.8	.3673	2.2743	11,500
12,000	45.8	505.5	7.6	.9745	.6524	19.52	1380.67	.1591	.6695	.8182	.5120	1102.1	652.6	.3663	2.3018	12,000
12,500	43.9	503.6	6.6	.9710	.6404	19.16	1355.26	.1568	.6595	.8121	.5044	1100.1	651.4	.3652	2.3298	12,500
13,000	42.1	501.8	5.6	.9675	.6286	18.81	1330.23	.1544	.6497	.8061	.4969	1098.1	650.2	.3642	2.3583	13,000
13,500	40.3	500.0	4.6	.9639	.6169	18.46	1305.57	.1521	.6400	.8000	.4895	1096.1	649.0	.3632	2.3872	13,500
14,000	38.4	498.1	3.6	.9604	.6055	18.12	1281.28	.1498	.6304	.7940	.4821	1094.1	647.8	.3621	2.4165	14,000
14,500	36.6	496.3	2.6	.9569	.5942	17.78	1257.36	.1476	.6209	.7880	.4749	1092.1	646.6	.3611	2.4464	14,500
15,000	34.8	494.5	1.5	.9533	.5830	17.44	1233.80	.1454	.6116	.7820	.4677	1090.1	645.4	.3600	2.4767	15,000
15,500	32.9	492.6	.5	.9498	.5721	17.12	1210.59	.1432	.6023	.7761	.4606	1088.1	644.2	.3590	2.5074	15,500
16,000	31.1	490.8	-.5	.9463	.5613	16.79	1187.74	.1410	.5931	.7701	.4536	1086.0	643.0	.3579	2.5387	16,000
16,500	29.3	489.0	-1.5	.9427	.5506	16.48	1165.23	.1388	.5841	.7642	.4467	1084.0	641.8	.3569	2.5705	16,500
17,000	27.4	487.1	-2.5	.9392	.5401	16.16	1143.07	.1367	.5751	.7584	.4398	1082.0	640.6	.3558	2.6027	17,000

*Geopotential Feet

TABLE V. Tropical day atmosphere. - Continued

Altitude h* ft´	Temperature °F	Temperature °R	Temperature °C	Temp Ratio θ	Press Ratio δ	Pressure in Hg	Pressure lb/ft²	Density ρ × 10² slugs/ft³ ρ	Density Ratio σ	Sq Root of Density Ratio $(\sigma)^{\frac{1}{2}}$	Specific Weight w × 10 lb/ft²	Speed of Sound ft/sec	Speed of Sound knots	Abs μ × 10⁶ lb-sec/ft²	Kin ν × 10⁴ ft²/sec	Altitude h* ft´
17,500	25.6	485.3	-3.6	.9357	.5298	15.85	1121.25	.1346	.5663	.7525	.4331	1079.9	639.4	.3547	2.6355	17,500
18,000	23.8	483.5	-4.6	.9321	.5197	15.55	1099.76	.1325	.5575	.7467	.4264	1077.9	638.2	.3537	2.6689	18,000
18,500	21.9	481.6	-5.6	.9286	.5097	15.25	1078.81	.1305	.5489	.7409	.4198	1075.8	637.0	.3526	2.7027	18,500
19,000	20.1	479.8	-6.6	.9250	.4998	14.96	1057.78	.1284	.5403	.7351	.4132	1073.8	635.8	.3516	2.7372	19,000
19,500	18.3	478.0	-7.6	.9215	.4902	14.67	1037.28	.1264	.4319	.7293	.4068	1071.7	634.6	.3505	2.7722	19,500
20,000	16.4	476.1	-8.7	.9180	.4806	14.38	1017.10	.1244	.5236	.7236	.4004	1069.7	633.4	.3494	2.8077	20,000
20,500	14.6	474.3	-9.7	.9144	.4712	14.10	997.24	.1225	.5153	.7179	.3941	1067.6	632.1	.3483	2.8439	20,500
21,000	12.8	472.5	-10.7	.9109	.4620	13.82	977.69	.1206	.5072	.7122	.2879	1065.6	630.9	.3473	2.8806	21,000
21,500	10.9	470.6	-11.7	.9074	.4527	13.55	958.01	.1186	.4989	.7063	.3815	1063.5	629.7	.3462	2.9194	21,500
22,000	9.1	468.8	-12.7	.9038	.4438	13.28	939.08	.1167	.4910	.7007	.3755	1061.4	628.5	.3451	2.9574	22,000
22,500	7.3	467.0	-13.7	.9003	.4350	13.01	920.46	.1148	.4831	.4951	.3695	1059.3	627.2	.3449	2.9960	22,500
23,000	5.4	465.1	-14.8	.8968	.4263	12.76	902.13	.1130	.4754	.6895	.3635	1057.2	626.0	.3430	3.0354	23,000
23,500	3.6	463.3	-15.8	.8932	.4178	12.50	884.10	.1112	.4677	.6839	.3577	1055.2	624.8	.3419	3.0753	23,500
24,000	1.8	461.5	-16.8	.8897	.4094	12.25	866.36	.1094	.4601	.6783	.3519	1053.1	623.5	.3408	3.1160	24,000
24,500	-.1	459.6	-17.8	.8862	.4011	12.00	848.91	.1076	.4527	.6728	.3462	1051.0	622.3	.3397	3.1573	24,500
25,000	-1.9	457.8	-18.8	.8826	.3930	11.76	831.74	.1058	.4453	.6673	.3405	1048.9	621.0	.3386	3.1993	25,000
25,500	-3.7	456.0	-19.9	.8791	.3851	11.52	814.86	.1041	.4380	.6618	.3350	1046.8	619.8	.3375	3.2421	25,500
26,000	-5.6	454.1	-20.9	.8756	.3772	11.29	798.25	.1024	.4308	.6564	.3295	1044.7	618.6	.3364	3.2856	26,000
26,500	-7.4	452.3	-21.9	.8720	.3695	11.06	781.91	.1007	.4237	.6509	.3240	1042.6	617.3	.3354	3.3299	26,500
27,000	-9.2	450.5	-22.9	.8685	.3619	10.83	765.84	.0990	.4167	.6455	.3187	1040.4	616.0	.3343	3.3749	27,000
27,500	-11.1	448.6	-23.9	.8650	.3544	10.60	750.04	.0974	.4098	.6401	.3134	1038.3	614.8	.3332	3.4207	27,500
28,000	-12.9	446.8	-24.9	.8614	.3471	10.39	734.50	.0958	.4029	.6348	.3081	1036.2	613.5	.3321	3.4673	28,000
28,500	-14.7	445.0	-26.0	.8479	.3399	10.17	719.23	.0942	.3962	.6294	.3030	1034.1	612.3	.3310	3.5147	28,500
29,000	-16.6	443.1	-27.0	.8544	.3328	9.96	704.21	.0926	.3895	.6241	.2979	1031.9	611.0	.3299	3.5630	29,000
29,500	-18.4	441.3	-28.0	.8508	.3258	9.75	689.44	.0910	.3829	.6188	.2928	1029.8	609.7	.3288	3.6121	29,500
30,000	-20.2	439.5	-29.0	.8473	.3189	9.54	674.92	.0895	.3764	.6135	.2879	1027.7	608.5	.3276	3.6620	30,000
30,500	-22.1	437.6	-30.0	.8437	.3122	9.34	660.65	.0879	.3700	.6083	.2830	1025.5	607.2	.3265	3.7129	30,500
31,000	-23.9	435.8	-31.1	.8402	.3056	9.14	646.63	.0864	.3637	.6030	.2781	1023.4	605.9	.3254	3.7647	31,000
31,500	-25.7	434.0	-32.1	.8367	.2990	8.95	632.84	.0850	.3574	.5978	.2733	1021.3	604.7	.3243	3.8174	31,500
32,000	-27.6	432.1	-33.1	.8331	.2925	8.75	619.03	.0835	.3511	.5925	.2685	1019.1	603.4	.3232	3.8727	32,000
32,500	-29.4	430.3	-34.1	.8296	.2862	8.56	605.72	.0820	.3450	.5874	.2639	1016.9	602.1	.3221	3.9273	32,500
33,000	-31.2	428.5	-35.1	.8261	.2800	8.38	592.64	.0806	.3390	.5822	.2593	1014.7	600.8	.3209	3.9829	33,000
33,500	-33.1	426.6	-36.2	.8225	.2740	8.20	579.79	.0792	.3331	.5771	.2547	1012.5	599.5	.3198	4.0395	33,500
34,000	-34.9	424.8	-37.2	.8180	.2680	8.02	567.17	.0778	.3272	.5721	.2503	1010.4	598.2	.3187	4.0972	34,000
34,500	-36.8	422.9	-38.2	.8154	.2621	7.84	554.76	.0764	.3215	.5670	.2459	1008.2	596.9	.3176	4.1559	34,500

*Geopotential Feet

TABLE V. Tropical day atmosphere. - Continued

Altitude h* ft	Temperature °F	Temperature °R	Temperature °C	Temp Ratio θ	Press Ratio δ	Pressure in Hg	Pressure lb/ft²	Density ρ × 10² slugs/ft³ ρ	Density Ratio σ	Sq Root of Density Ratio $(\sigma)^{\frac{1}{2}}$	Specific Weight w × 10 lb/ft³	Speed of Sound ft/sec	Speed of Sound knots	Abs μ × 10⁶ lb-sec/ft²	Kin ν × 10⁴ ft²/sec	Altitude h* ft
35,000	-38.6	421.1	-39.2	.8119	.2564	7.67	542.58	.0751	.3158	.5620	.2415	1006.0	595.6	.3164	4.2158	35,000
35,500	-40.4	419.3	-40.2	.8084	.2507	7.50	530.61	.0737	.3102	.5569	.2372	1003.8	594.3	.3153	4.2767	35,500
36,000	-42.3	417.4	-41.3	.8048	.2452	7.34	518.86	.0724	.3046	.5519	.2330	1001.6	593.0	.3142	4.3387	36,000
36,500	-44.1	415.6	-42.3	.8013	.2397	7.17	507.31	.0711	.2992	.5470	.2288	999.4	591.7	.3130	4.4019	36,500
37,000	-45.9	413.8	-43.3	.7977	.2344	7.01	495.98	.0698	.2938	.5420	.2247	997.2	590.4	.3119	4.4663	37,000
37,500	-47.8	411.9	-44.3	.7942	.2291	6.86	484.85	.0686	.2885	.5371	.2206	995.0	589.1	.3107	4.5320	37,500
38,000	-49.6	410.1	-45.3	.7907	.2239	6.70	473.92	.0673	.2832	.5322	.2166	992.7	587.8	.3096	4.5988	38,000
38,500	-51.4	408.3	-46.4	.7871	.2189	6.55	463.18	.0661	.2781	.5273	.2127	990.5	586.5	.3085	4.6670	38,500
39,000	-53.3	406.4	-47.4	.7836	.2139	6.40	452.65	.0649	.2730	.5225	.2088	988.3	585.2	.3073	4.7364	39,000
39,500	-55.1	404.6	-48.4	.7800	.2090	6.25	442.31	.0637	.2679	.5176	.2049	986.0	583.8	.3062	4.8072	39,500
40,000	-56.9	402.8	-49.4	.7765	.2042	6.11	432.16	.0625	.2630	.5128	.2011	983.8	582.5	.3050	4.8793	40,000
40,500	-58.8	400.9	-50.4	.7730	.1995	5.97	422.20	.0613	.2581	.5080	.1974	981.6	581.2	.3038	4.9528	40,500
41,000	-60.6	399.1	-51.5	.7694	.1949	5.83	412 42	.0602	.2533	.5033	.1937	979.3	579.9	.3027	5.0278	41,000
41,500	-62.5	397.2	-52.5	.7659	.1904	5.70	402.83	.0591	.2485	.4985	.1901	977.1	578.5	.3015	5.1042	41,500
42,000	-64.3	395.4	-53.5	.7624	.1859	5.56	393.41	.0580	.2439	.4938	.1865	974.8	577.2	.3004	5.1821	42,000
42,500	-66.1	393.6	-54.5	.7588	.1815	5.43	384.03	.0568	.2392	.4890	.1829	972.5	575.8	.2992	5.2635	42,500
43,000	-68.0	391.7	-55.5	.7553	.1772	5.30	374.97	.0558	.2346	.4844	.1794	970.3	574.5	.2980	5.3446	43,000
43,500	-69.8	389.9	-56.6	.7517	.1730	5.18	366.09	.0547	.2301	.4797	.1760	968.0	573.1	.2969	5.4272	43,500
44,000	-71.6	388.1	-57.6	.7482	.1689	5.05	357.37	.0536	.2257	.4751	.1726	965.7	571.3	.2957	5.5115	44,000
44,500	-73.5	386.2	-58.6	.7446	.1648	4.93	348.83	.0526	.2214	.4705	.1693	963.4	570.4	.2945	5.5975	44,500
45,000	-75.3	384.4	-59.6	.7411	.1609	4.81	340.44	.0516	.2171	.4659	.1660	961.1	569.1	.2933	5.6852	45,000
45,500	-77.2	382.5	-60.6	.7376	.1570	4.70	332.22	.0506	.2129	.4614	.1628	958.8	567.7	.2922	5.7746	45,500
46,000	-79.0	380.7	-61.7	.7340	.1532	4.58	324.17	.0496	.2087	.4568	.1596	956.5	566.3	.2910	5.8659	46,000
46,500	-80.8	378.9	-62.7	.7305	.1494	4.47	316.26	.0486	.2046	.4523	.1565	954.2	565.0	.2898	5.9591	46,500
47,000	-82.7	377.0	-63.7	.7269	.1458	4.36	308.52	.0477	.2006	.4478	.1534	951.9	563.6	.2886	6.0542	47,000
47,500	-84.5	375.2	-64.7	.7234	.1422	4.25	300.93	.0467	.1966	.4434	.1503	949.6	562.2	.2874	6.1512	47,500
48,000	-86.3	373.4	-65.7	.7198	.1387	4.15	293.48	.0458	.1927	.4389	.1473	947.2	560.9	.2862	6.2502	48,000
48,500	-88.2	371.5	-66.8	.7163	.1352	4.05	286.19	.0449	.1888	.4345	.1444	944.9	559.5	.2850	6.3513	48,500
49,000	-90.0	369.7	-67.8	.7128	.1319	3.95	279.05	.0440	.1850	.4301	.1415	942.6	558.1	.2838	6.4546	49,000
49,500	-91.9	367.8	-68.8	.7092	.1286	3.85	272.04	.0431	.1813	.4257	.1386	940.2	556.7	.2826	6.5599	49,500
50,000	-93.7	366.0	-69.8	.7057	.1253	3.75	265.18	.0422	.1776	.4214	.1358	937.9	555.3	.2814	6.6675	50,000
50,500	-95.5	364.2	-70.8	.7021	.1221	3.65	258.46	.0413	.1739	.4171	.1330	935.5	553.9	.2802	6.7774	50,500
51,000	-97.4	362.3	-71.9	.6986	.1190	3.56	251.88	.0405	.1704	.4128	.1303	933.1	552.5	.2790	6.8896	51,000
51,500	-99.2	360.5	-72.9	.6950	.1160	3.47	245.43	.0397	.1669	.4085	.1276	930.8	551.1	.2778	7.0043	51,500
52,000	-101.0	358.7	-73.9	.6915	.1129	3.38	238.99	.0388	.1633	.4041	.1249	928.4	549.7	.2766	7.1255	52,000

*Geopotential Feet

TABLE V. Tropical day atmosphere. - Continued

Altitude h* ft'	Temperature °F	Temperature °R	Temperature °C	Temp Ratio θ	Press Ratio δ	Pressure in Hg	Pressure lb/ft²	Density ρ × 10² slugs/ft³ ρ	Density Ratio σ	Sq Root of Density Ratio (σ) ½	Specific Weight w × 10 lb/ft²	Speed of Sound ft/sec	Speed of Sound knots	Abs μ × 10⁶ lb-sec/ft²	Kin ν × 10⁴ ft²/sec	Altitude h* ft'
52,500	-102.9	356.8	-74.9	.6880	.1100	3.29	232.81	.0380	.1599	.3999	.1223	926.0	548.3	.2754	7.2456	52,500
53,000	-104.7	355.0	-75.9	.6845	.1072	3.21	226.76	.0372	.1565	.3957	.1197	923.7	546.9	.2742	7.3683	53,000
53,500	-106.5	353.2	-77.0	.6809	.1044	3.12	220.83	.0364	.1532	.3915	.1172	921.3	545.5	.2730	7.4936	53,500
54,000	-108.3	351.4	-78.0	.6774	.1016	3.04	215.04	.0357	.1500	.3873	.1147	918.9	544.1	.2717	7.6217	54,000
54,500	-110.2	349.5	-79.0	.6739	.0989	2.96	209.36	.0349	.1468	.3832	.1123	916.5	542.7	.2705	7.7527	54,500
55,000	-112.0	347.7	-80.0	.6704	.0963	2.88	203.81	.0341	.1437	.3790	.1099	914.1	541.2	.2693	7.8865	55,000
55,500	-110.8	348.9	-79.3	.6727	.0937	2.81	198.39	.0331	.1394	.3733	.1066	915.7	542.2	.2701	8.1538	55,500
56,000	-109.6	350.1	-78.7	.6750	.0913	2.73	193.14	.0321	.1352	.3677	.1034	917.2	543.1	.2709	8.4288	56,000
56,500	-108.4	351.3	-78.0	.6773	.0889	2.66	188.05	.0312	.1312	.3622	.1003	918.8	544.0	.2717	8.7120	56,500
57,000	-107.2	352.5	-77.3	.6796	.0865	2.59	183.11	.0303	.1273	.3568	.0974	920.4	545.0	.2725	9.0044	57,000
57,500	-106.0	353.7	-76.7	.6819	.0843	2.52	178.32	.0294	.1236	.3515	.0945	921.9	545.9	.2733	9.3055	57,500
58,000	-104.8	354.9	-76.0	.6843	.0821	2.46	173.66	.0285	.1199	.3463	.0917	923.5	546.8	.2741	9.6156	58,000
58,500	-103.6	356.1	-75.3	.6866	.0799	2.39	169.14	.0277	.1164	.3412	.0890	925.1	547.7	.2749	9.9348	58,500
59,000	-102.4	357.3	-74.7	.6889	.0779	2.33	164.76	.0269	.1130	.3362	.0864	926.7	548.7	.2757	10.2635	59,000
59,500	-101.2	358.5	-74.0	.6912	.0758	2.27	160.50	.0261	.1097	.3312	.0839	928.2	549.6	.2765	10.6019	59,500
60,000	-100.0	359.7	-73.3	.6935	.0739	2.21	156.36	.0253	.1065	.3264	.0815	929.8	550.5	.2773	10.9503	60,000
60,500	-98.8	360.9	-72.7	.6959	.0720	2.15	152.35	.0246	.1035	.3216	.0791	931.3	551.4	.2781	11.3088	60,500
61,000	-97.6	362.1	-72.0	.6982	.0701	2.10	148.41	.0239	.1004	.3169	.0768	932.9	552.4	.2789	11.6809	61,000
61,500	-96.4	363.3	-71.3	.7005	.0683	2.04	144.62	.0232	.0976	.3123	.0746	934.4	553.3	.2797	12.0605	61,500
62,000	-95.2	364.5	-70.6	.7028	.0666	1.99	140.95	.0225	.0948	.3078	.0725	936.0	554.2	.2804	12.4510	62,000
62,500	-94.0	365.7	-70.0	.7051	.0649	1.94	137.38	.0219	.0921	.3034	.0704	937.5	555.1	.2812	12.8527	62,500
63,000	-92.8	366.9	-69.3	.7075	.0633	1.89	133.91	.0213	.0894	.2991	.0684	939.0	556.0	.2820	13.2661	63,000
63,500	-91.6	368.1	-68.6	.7098	.0617	1.85	130.54	.0207	.0869	.2948	.0665	940.6	556.9	.2828	13.6912	63,500
64,000	-90.4	369.3	-68.0	.7121	.0601	1.80	127.26	.0201	.0844	.2906	.0646	942.1	557.8	.2836	14.1285	64,000
64,500	-89.2	370.5	-67.3	.7144	.0586	1.75	124.08	.0195	.0821	.2865	.0628	943.6	558.7	.2844	14.5783	64,500
65,000	-88.0	271.7	-66.6	.7167	.0572	1.71	120.98	.0190	.0798	.2824	.0610	945.2	559.6	.2852	15.0408	65,000
65,500	-86.8	372.9	-66.0	.7190	.0557	1.67	117.98	.0184	.0775	.2784	.0593	946.7	560.5	.2859	15.5164	65,500
66,000	-85.6	374.1	-65.3	.7213	.0544	1.63	115.03	.0179	.0754	.2745	.0576	948.2	561.4	.2867	16.0086	66,000
66,500	-84.4	375.3	-64.6	.7236	.0530	1.59	112.18	.0174	.0733	.2707	.0560	949.7	562.3	.2875	16.5110	66,500
67,000	-83.2	376.5	-64.0	.7259	.0517	1.55	109.42	.0169	.0712	.2669	.0545	951.2	563.2	.2883	17.0275	67,000
67,500	-82.0	377.7	-63.3	.7283	.0504	1.51	106.74	.0165	.0693	.2632	.0530	952.7	564.1	.2890	17.5583	67,500
68,000	-80.8	378.9	-62.7	.7306	.0492	1.47	104.13	.0160	.0674	.2595	.0515	954.3	565.0	.2898	18.1039	68,000
68,500	-79.6	380.1	-62.0	.7329	.0480	1.44	101.59	.0156	.0655	.2559	.0501	955.8	565.9	.2906	18.6646	68,500
69,000	-78.4	381.3	-61.3	.7352	.0468	1.40	99.12	.0151	.0637	.2524	.0487	957.3	566.8	.2914	19.2408	69,000
69,500	-77.2	382.5	-60.7	.7375	.0457	1.37	96.71	.0147	.0620	.2489	.0474	958.8	567.7	.2921	19.8329	69,500

*Geopotential Feet

TABLE V. Tropical day atmosphere. - Continued

Altitude h* ft	Temperature °F	Temperature °R	Temperature °C	Temp Ratio θ	Press Ratio δ	Pressure in Hg	Pressure lb/ft²	Density ρ × 10² slugs/ft³ ρ	Density Ratio σ	Sq Root of Density Ratio $(\sigma)^{\frac{1}{2}}$	Specific Weight w × 10 lb/ft²	Speed of Sound ft/sec	Speed of Sound knots	Abs μ × 10⁶ lb-sec/ft²	Kin ν × 10⁴ ft²/sec	Altitude h* ft
70,000	-76.0	383.7	-60.0	.7398	.0446	1.33	94.38	.0143	.0603	.2455	.0461	960.3	568.6	.2929	20.4411	70,000
70,500	-75.4	384.3	-59.6	.7410	.0435	1.30	92.11	.0140	.0587	.2424	.0449	961.1	569.0	.2933	21.0078	70,500
71,000	-74.7	385.0	-59.3	.7423	.0425	1.27	89.90	.0136	.0572	.2392	.0438	961.9	569.5	.2937	21.5945	71,000
71,500	-74.0	385.7	-58.9	.7436	.0415	1.24	87.74	.0133	.0558	.2361	.0426	962.7	570.0	.2942	22.1965	71,500
72,000	-73.4	386.3	-58.5	.7449	.0405	1.21	85.63	.0129	.0543	.2331	.0415	963.6	570.5	.2946	22.8141	72,000
72,500	-72.7	387.0	-58.2	.7461	.0395	1.18	83.58	.0126	.0529	.2301	.0405	964.4	571.0	.2950	23.4478	72,500
73,000	-72.0	387.7	-57.8	.7474	.0386	1.15	81.58	.0123	.0516	.2271	.0394	965.2	571.5	.2954	24.0980	73,000
73,500	-71.4	388.3	-57.4	.7487	.0376	1.13	79.64	.0119	.0503	.2242	.0384	966.0	572.0	.2959	24.7650	73,500
74,000	-70.7	389.0	-57.1	.7500	.0367	1.10	77.74	.0116	.0490	.2213	.0375	966.9	572.5	.2963	25.5593	74,000
74,500	-70.0	389.7	-56.7	.7513	.0359	1.07	75.89	.0113	.0477	.2185	.0365	967.7	573.0	.2967	26.1513	74,500
75,000	-69.4	390.3	-56.3	.7425	.0350	1.05	74.09	.0111	.0465	.2157	.0356	968.5	573.5	.2971	26.8713	75,000
75,500	-68.7	391.0	-56.0	.7538	.0342	1.02	72.33	.0108	.0453	.2129	.0347	969.3	573.9	.2976	27.6099	75,500
76,000	-68.1	391.6	-55.6	.7551	.0337	1.01	71.36	.0106	.0447	.2113	.0342	970.1	574.4	.2980	28.0720	76,000
76,500	-67.4	392.3	-55.2	.7564	.0329	.99	69.67	.0103	.0435	.2086	.0333	971.0	574.9	.2984	28.8393	76,500
77,000	-66.7	393.0	-54.9	.7576	.0321	.96	68.03	.0101	.0424	.2060	.0325	971.8	575.4	.2988	29.6263	77,000
77,500	-66.1	393.6	-54.5	.7589	.0314	.94	66.43	.0098	.0414	.2034	.0316	972.6	575.9	.2992	30.4334	77,500
78,000	-65.4	394.3	-54.1	.7601	.0307	.92	64.87	.0096	.0403	.2008	.0308	973.4	576.3	.2996	31.2611	78,000
78,500	-64.8	394.9	-53.8	.7614	.0299	.90	63.34	.0093	.0393	.1983	.0301	974.2	576.8	.3001	32.1098	78,500
79,000	-64.1	395.6	-53.4	.7626	.0292	.87	61.86	.0091	.0383	.1958	.0293	975.0	577.3	.3005	32.9800	79,000
79,500	-63.5	396.2	-53.0	.7639	.0285	.85	60.41	.0089	.0374	.1933	.0286	975.8	577.8	.3009	33.8724	79,500
80,000	-62.8	396.9	-52.7	.7652	.0279	.83	59.00	.0087	.0364	.1909	.0279	976.6	578.2	.3013	34.7873	80,000
80,500	-62.2	397.5	-52.3	.7664	.0272	.81	57.63	.0084	.0355	.1885	.0272	977.4	578.7	.3017	35.7254	80,500
81,000	-61.5	398.2	-52.0	.7677	.0269	.81	56.94	.0083	.0351	.1872	.0268	978.2	579.2	.3021	36.2640	81,000
81,500	-60.9	398.8	-51.6	.7690	.0263	.79	55.62	.0081	.0342	.1849	.0261	979.0	579.7	.3025	37.2403	81,500
82,000	-60.2	399.5	-51.2	.7702	.0257	.77	54.33	.0079	.0333	.1826	.0255	979.8	580.2	.3030	38.2411	82,000
82,500	-59.5	400.2	-50.9	.7715	.0251	.75	53.07	.0077	.0325	.1803	.0249	980.6	580.6	.3034	39.2670	82,500
83,000	-58.9	400.8	-50.5	.7728	.0245	.73	51.84	.0075	.0317	.1780	.0242	981.5	581.1	.3038	40.3187	83,000
83,500	-58.2	401.5	-50.1	.7741	.0239	.72	50.65	.0073	.0309	.1758	.0236	982.3	581.6	.3042	41.3967	83,500
84,000	-57.5	402.2	-49.7	.7754	.0234	.70	49.48	.0072	.0302	.1736	.0231	983.1	582.1	.3046	42.5017	84,000
84,500	-56.9	402.8	-49.4	.7766	.0228	.68	48.34	.0070	.0294	.1715	.0225	983.9	582.6	.3050	43.6342	84,500
85,000	-56.2	403.5	-49.0	.7779	.0223	.67	47.23	.0068	.0287	.1694	.0219	984.7	583.0	.3055	44.7950	85,000
85,500	-55.6	404.1	-48.6	.7792	.0218	.65	46.14	.0067	.0280	.1673	.0214	985.5	583.5	.3059	45.9846	85,500
86,000	-54.9	404.8	-48.3	.7805	.0213	.64	45.09	.0065	.0273	.1652	.0209	986.3	584.0	.3063	47.2038	86,000
86,500	-54.2	405.5	-47.9	.7817	.0210	.63	44.53	.0064	.0269	.1641	.0206	987.1	584.5	.3067	47.9382	86,500
87,000	-53.6	406.1	-47.5	.7830	.0206	.62	43.51	.0062	.0263	.1620	.0201	987.9	585.0	.3071	49.2052	87,000
87,500	-52.9	406.8	-47.2	.7843	.0201	.60	42.52	.0061	.0256	.1601	.0196	988.7	585.4	.3075	50.5034	87,500

*Geopotential Feet

TABLE V. Tropical day atmosphere. - Continued

Altitude h* ft'	Temperature °F	Temperature °R	Temperature °C	Temp Ratio θ	Press Ratio δ	Pressure in Hg	Pressure lb/ft²	Density ρ × 10² slugs/ft³ ρ	Density Ratio σ	Sq Root of Density Ratio $(\sigma)^{\frac{1}{2}}$	Specific Weight w × 10 lb/ft²	Speed of Sound ft/sec	Speed of Sound knots	Abs μ × 10⁶ lb-sec/ft²	Kin ν × 10⁶ ft²/sec	Altitude h* ft'
88,000	-52.2	407.5	-46.8	.7856	.0196	.59	41.55	.0059	.0250	.1581	.0191	989.5	585.9	.3080	51.8337	88,000
88,500	-51.6	408.1	-46.4	.7869	.0192	.57	40.61	.0058	.0244	.1562	.0187	990.3	586.4	.3084	53.1967	88,500
89,000	-50.9	408.8	-46.1	.7881	.0188	.56	39.69	.0057	.0238	.1543	.0182	991.1	586.9	.3088	54.5932	89,000
89,500	-50.3	409.4	-45.7	.7894	.0183	.55	38.79	.0055	.0232	.1524	.0178	992.0	587.3	.3092	56.0240	89,500
90,000	-49.6	410.1	-45.3	.7907	.0179	.54	37.91	.0054	.0227	.1505	.0173	992.8	587.8	.3096	57.4899	90,000
90,500	-48.9	410.8	-45.0	.7920	.0175	.52	37.06	.0053	.0221	.1487	.0169	993.6	588.3	.3100	59.9916	90,500
91,000	-48.3	411.4	-44.6	.7933	.0171	.51	36.22	.0051	.0216	.1469	.0165	994.4	588.8	.3104	60.5300	91,000
91,500	-47.6	412.1	-44.2	.7945	.0167	.50	35.41	.0040	.0211	.1451	.0161	995.2	589.2	.3109	62.1059	91,500
92,000	-46.9	412.8	-43.9	.7958	.0165	.49	34.92	.0049	.0207	.1440	.0159	996.0	589.7	.3113	63.1595	92,000
92,500	-46.3	413.4	-43.5	.7971	.0161	.48	34.13	.0048	.0202	.1423	.0155	996.7	590.2	.3117	64.7965	92,500
93,000	-45.6	414.1	-43.1	.7983	.0158	.47	33.37	.0047	.0198	.1405	.0151	997.5	590.6	.3121	66.4731	93,000
93,500	-45.0	414.7	-42.8	.7996	.0154	.46	32.62	.0046	.0193	.1389	.0147	998.3	591.1	.3125	68.1903	93,500
94,000	-44.3	415.4	-42.4	.8009	.0151	.45	31.90	.0045	.0188	.1372	.0144	999.1	591.6	.3129	69.9490	94,000
94,500	-43.7	516.0	-42.0	.8021	.0147	.44	31.18	.0044	.0184	.1355	.0140	999.9	592.0	.3133	71.7502	94,500
95,000	-43.0	416.7	-41.7	.8034	.0144	.43	30.49	.0043	.0179	.1339	.0137	1000.7	592.5	.3137	73.5947	95,000
95,500	-42.3	517.4	-41.3	.8047	.0141	.42	29.81	.0042	.0175	.1323	.0134	1001.5	593.0	.3141	75.4836	95,500
96,000	-41.7	418.0	-40.9	.8059	.0138	.41	29.15	.0041	.0171	.1307	.0131	1002.3	593.4	.3145	77.4178	96,000
96,500	-41.0	418.7	-40.6	.8072	.0135	.40	28.51	.0040	.0167	.1292	.0128	1003.1	593.9	.3149	79.3984	96,500
97,000	-40.4	419.3	-40.2	.8085	.0133	.40	28.18	.0039	.0165	.1283	.0126	.003.8	594.4	.3153	80.5446	97,000
97,500	-39.7	420.0	-39.8	.8097	.0130	.39	27.56	.0038	.0161	.1268	.0123	1004.6	594.8	.3157	82.5994	97,500
98,000	-39.1	420.6	-39.5	.8110	.0127	.38	26.95	.0037	.0157	.1253	.0120	1005.5	595.3	.3161	84.7031	98,000
98,500	-38.4	421.3	-39.1	.8123	.0125	.37	26.36	.0036	.0153	.1238	.0117	1006.2	595.8	.3166	86.8570	98,500
99,000	-37.7	442.0	-38.7	.8135	.0122	.36	2578	.0036	.0150	.1224	.0115	1007.0	596.2	.3170	89.0621	99,000
99,500	-37.1	422.6	-38.4	.8148	.0119	.36	25.21	.0035	.0146	.1209	.0112	1007.8	596.7	.3174	91.3196	99,500
100,000	-36.4	423.3	-38.0	.8161	.0117	.35	24.66	.0034	.0143	.1195	.0109	1008.6	597.2	.3178	93.6306	100,000

*Geopotential Feet

TABLE VI. Hot day atmosphere.

Altitude h* ft	Temperature °F	°R	°C	Temp Ratio θ	Press Ratio δ	Pressure in Hg	Pressure lb/ft²	Density ρ × 10² slugs/ft³	Density Ratio σ	Sq Root of Density Ratio $(\sigma)^{\frac{1}{2}}$	Specific Weight w × 10 lb/ft³	Speed of Sound ft/sec	Speed of Sound knots	Viscosity Abs lb-sec/ft² μ × 10⁶	Viscosity Kin ft²/sec ν × 10⁶	Altitude h* ft
0	103.0	562.7	39.4	1.0848	1.	29.92	2116.2	.2192	.9219	.9602	.7050	1162.8	688.9	.3992	1.821	0
500	101.1	560.8	38.4	1.0812	.9821	29.38	2078.2	.2160	.9084	.9531	.6947	1160.9	687.7	.3982	1.843	500
1,000	99.2	558.9	37.3	1.0775	.9644	28.85	2040.8	.2129	.8951	.9461	.6845	1158.9	686.5	.3971	1.865	1,000
1,500	97.3	557.0	36.3	1.0739	.9470	28.33	2005.9	.2097	.8820	.9391	.6745	1156.9	685.4	.3961	1.889	1,500
2,000	95.4	555.1	35.2	1.0702	.9298	27.82	1967.6	.2066	.8689	.9322	.6645	1154.9	684.2	.3950	1.912	2,000
2,500	93.4	553.1	34.1	1.0663	.9129	27.31	1931.8	.2036	.8562	.9253	.6547	1152.9	683.0	.3939	1.935	2,500
3,000	91.5	551.2	33.1	1.0627	.8962	26.82	1896.6	.2006	.8435	.9184	.6450	1150.9	681.8	.3929	1.958	3,000
3,500	89.6	549.3	32.0	1.0590	.8798	26.32	1861.8	.1976	.8310	.9115	.6354	1148.9	680.6	.3918	1.983	3,500
4,000	87.6	547.3	30.9	1.0552	.8637	25.84	1827.6	.1947	.8186	.9048	.6260	1146.8	679.4	.3907	2.007	4,000
4,500	85.7	545.4	29.8	1.0515	.8477	25.36	1793.9	.1917	.8063	.8980	.6166	1144.8	678.2	.3896	2.032	4,500
5,000	83.7	543.4	28.7	1.0476	.8320	24.89	1760.7	.1889	.7943	.8912	.6074	1142.7	677.0	.3885	2.057	5,000
5,500	81.7	541.4	27.6	1.0438	.8166	24.43	1728.0	.1861	.7824	.8846	.5983	1140.6	675.7	.3874	2.082	5,500
6,000	79.8	539.5	26.5	1.0401	.8014	23.98	1695.8	.1832	.7706	.8778	.5892	1138.6	674.5	.3863	2.109	6,000
6,500	77.8	537.5	25.4	1.0363	.7864	23.53	1664.1	.1805	.7590	.8712	.5804	1136.5	673.3	.3852	2.134	6,500
7,000	75.8	535.5	24.3	1.0324	.7716	23.09	1632.9	.1778	.7475	.8646	.5716	1134.4	672.0	.3840	2.160	7,000
7,500	73.8	533.5	23.2	1.0286	.7571	22.65	1602.1	.1751	.7362	.8580	.5630	1132.3	670.8	.3829	2.169	7,500
8,000	71.8	531.5	22.1	1.0247	.7428	22.22	1571.8	.1724	.7250	.8514	.5544	1130.1	669.5	.3818	2.215	8,000
8,500	69.8	529.5	21.0	1.0208	.7287	21.80	1542.0	.1698	.7139	.8449	.5459	1128.0	668.2	.3807	2.242	8,500
9,000	67.8	527.5	19.9	1.0170	.7148	21.39	1512.6	.1672	.7030	.8384	.5375	1125.9	667.0	.3795	2.270	9,000
9,500	65.8	525.5	18.8	1.0131	.7012	20.98	1483.7	.1646	.6921	.8320	.5293	1123.7	665.7	.3784	2.299	9,500
10,000	63.9	523.6	17.7	1.0095	.6877	20.58	1455.3	.1620	.6814	.8254	.5210	1121.7	664.5	.3773	2.329	10,000
10,500	62.0	521.7	16.7	1.0058	.6745	20.18	1427.2	.1595	.6706	.8189	.5128	1119.7	663.3	.3762	2.359	10,500
11,000	60.2	519.9	15.7	1.0023	.6614	19.79	1399.7	.1569	.6600	.8124	.5047	1117.7	662.2	.3752	2.391	11,000
11,500	58.3	518.0	14.6	.9987	.6486	19.41	1372.5	.1545	.6495	.8059	.4967	1115.7	660.9	.3741	2.421	11,500
12,000	56.4	516.1	13.6	.9950	.6360	19.03	1345.8	.1520	.6392	.7995	.4888	1113.6	659.7	.3730	2.454	12,000
12,500	54.5	514.2	12.5	.9913	.6236	18.66	1319.5	.1496	.6291	.7931	.4811	1111.6	658.5	.3719	2.486	12,500
13,000	52.6	512.3	11.4	.9877	.6113	18.29	1293.6	.1472	.6190	.7868	.4734	1109.5	657.3	.3708	2.519	13,000
13,500	50.7	510.4	10.4	.9840	.5993	17.93	1268.2	.1448	.6091	.7805	.4658	1107.5	656.1	.3697	2.553	13,500
14,000	48.8	508.5	9.3	.9804	.5875	17.58	1243.1	.1425	.5993	.7741	.4583	1105.4	654.9	.3686	2.587	14,000
14,500	46.8	506.5	8.2	.9765	.5758	17.23	1218.5	.1402	.5898	.7680	.4510	1103.2	654.2	.3675	2.621	14,500
15,000	44.9	504.5	7.2	.9726	.5643	16.89	1194.2	.1380	.5803	.7618	.4437	1101.0	652.3	.3663	2.654	15,000

*Pressure Altitude

ALPHABETICAL INDEX

CHARTS: STANDARD AIRCRAFT CHARACTERISTICS AND PERFORMANCE, PILOTED AIRCRAFT (FIXED WING)

ALPHABETICAL INDEX (Cont'd)

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