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20 October 1958
Superseding
MIL-T-7378(USAF)
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MILITARY SPECIFICATION

TANKS, FUEL, AIRCRAFT, EXTERNAL, AUXILIARY, REMOVABLE

1. SCOPE

1.1 SCOPE.- This specification establishes the requirements for continuous service jettisonable and nonjettisonable auxiliary external aircraft fuel tanks.

1.2 CLASSIFICATION.- Removable auxiliary external fuel tanks covered by this specification shall be one of the following classes as specified: (see 6.4)

Class 1 - Disassembled, Nestable
Class 2 - Assembled

2. APPLICABLE DOCUMENTS

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

SPECIFICATIONS

Federal

NN-P-515	Plywood, Container Grade
QQ-S-781	Strapping; Flat; Steel
RR-S-141	Screening, Wire, Insect
TT-P-664	Primer, Coating, Synthetic, Rust-Inhibiting, Lacquer-Resisting
TT-V-119	Varnish, Spar, Phenolic-Resin

Military

MIL-P-116	Preservation, Methods of
MIL-B-121	Barrier Material, Greaseproofed, Flexible (Waterproofed)
MIL-C-490	Cleaning and Preparation Of Ferrous and Zinc Coated Surfaces For Organic Protective Coatings
MIL-S-3136	Standards Test Fluids Hydrocarbon And Iso-Octane

FSC 1640

MIL-C-4556	Coating, Interior, Fuel and Water Resistant
MIL-D-5028	Drawings and Data Lists: Preparation of Manufacturers' (For Production Aeronautical and Associated Equipment)
MIL-F-5030	Felt; Hair
MIL-C-5541	Chemical Films For Aluminum And Aluminum Alloys
MIL-P-5610	Parachutes and Parachute Component Parts, Packaging and Packing For Domestic and Overseas Shipment Of
MIL-S-5700	Structural Criteria, Piloted Airplanes (This title is Unclassified; the specification is Confidential)
MIL-L-6047	Lacquer, Aromatic Fuel Resistant
MIL-C-6054	Container: Steel Shipping
MIL-C-6529	Corrosion Preventive, Aircraft Engine
MIL-P-6889	Primer; Zinc-Chromate, For Aircraft Use
MIL-V-6894	Varnish, Oil Type, Gloss Finish, Glyceryl Phthalate Base
MIL-P-6906	Plates, Information and Identification
MIL-L-7178	Lacquer, Cellulose Nitrate, Gloss, For Aircraft Use
MIL-C-7244	Cap and Adapter Unit, Tank Filler
MIL-C-7439	Coating System, Elastometric, Rain Erosion Resistant and Rain Erosion Resistant With Anti-Static Treatment, For Exterior Aircraft and Missile Plastic Parts
MIL-E-7729	Enamel, Gloss, Aircraft Application
MIL-S-7742	Screw Threads, Standard, Aeronautical
MIL-C-7769	Cushioning Material, Bound Fiber
MIL-A-8591	Airborne Stores and Associated Suspension Equipment; General Design Criteria For
MIL-A-8625	Anodic Coatings, For Aluminum and Aluminum Alloys
MIL-F-8785	Flying Qualities of Piloted Airplanes (This title is Unclassified; the specification is Confidential)
MIL-T-9107	Test Reports, Preparation Of
MIL-B-9361	Box, Metal, Fuel Tank, Aircraft, External, Nested
MIL-C-9437	Crate, Wood, Open, Fuel Tank, External, Assembled
MIL-C-16173	Corrosion Preventive Compound, Solvent Cutback, Cold-Application
MIL-S-25015	Spinning Requirements For Airplanes
MIL-V-25023	Valve, Fuel Drain, Self-Locking
MIL-N-25027	Nut, Self-Locking, 250°F, 550°F, and 800°F

MIL-I-26860 Indicator, Humidity, Plug, Color Change

STANDARDS

Military

MIL-STD-129	Marking for Shipment and Storage
MIL-STD-130	Identification Marking of U.S. Military Property
MS20995	Wire, Lock
MS29513	Packing "O" Ring Hydrocarbon Fuel Resistant
MS33586	Metals, Definition of Dissimilar
MS33588	Nuts and Plate Nuts, Self Locking, Functional Limitations Of

PUBLICATIONS

Air Force Aeronautical Bulletin

No. 143	Specifications and Standards; Use of
No. 438	Age Controls For Synthetic Rubber Parts

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

3. REQUIREMENTS

3.1 PREPRODUCTION.- This specification makes provisions for preproduction testing.

3.2 COMPONENTS.- The external auxiliary fuel tanks shall consist of suspension parts, integral pylon and fairing (if required), fuel and pressure lines, single point and inflight refueling provisions, filler unit, fuel outlet line, vent fittings and plugs, drains, strainer, quick disconnects, fins, internal stiffners, baffles and check valves, and all other parts necessary to make a complete installation on the applicable aircraft or pylon.

3.3 SELECTION OF SPECIFICATIONS AND STANDARDS.- Specifications and standards for necessary commodities and services not specified herein shall be selected according to ANA Bulletin 143 except as provided in 3.3.1 and 3.3.2.

3.3.1 COMMERCIAL PARTS.- Commercial parts having suitable properties may be used where, on the date of invitation for bids, there are no suitable standard parts. In any case, commercial utility parts, like screws, bolts, nuts, cotter pins, having suitable properties may be used provided:

a. They can be replaced by the standard parts (MS or AN) without alteration.

b. The corresponding standard part numbers are referenced in the parts list and, if practical, on the contractor's drawings.

3.3.2 STANDARD PARTS.- With the exception in 3.3.1, MS and AN Standard parts shall be used where they suit the purpose. They shall be identified on the drawings by their part numbers.

3.4 MATERIALS.- Materials shall conform to applicable specifications or shall be as specified herein. Materials which are not covered by applicable specifications, or which are not specifically described herein, shall be of the best commercial quality, of the lightest practicable weight and suitable for the purpose intended.

3.4.1 METALS.- Metals shall be of the corrosion resisting type or suitably treated to resist corrosion due to fuels, salt spray, or atmospheric conditions likely to be encountered in storage or during normal service use.

3.4.1.1 DISSIMILAR METALS.- Unless suitably protected against electrolytic corrosion, dissimilar metals shall not be used in intimate contact with each other. Dissimilar metals are defined in Standard MS33586.

3.4.1.2 MAGNESIUM.- The use of magnesium is prohibited in tank skins or other tank parts which come in contact with fuel.

3.4.2 PLASTICS.- Plastic materials and process specifications covering plastics shall be approved by the procuring activity. These materials shall be fuel resistant and resistant to the environmental conditions described in 3.4.1. Emphasis shall be placed on the use of plastics in lieu of metals in tank body fabrication, where possible.

3.4.3 SYNTHETIC.- For tanks which include parts fabricated of synthetic material in contact with fuel, manufacturers shall maintain quality control of subsequent batches to provide for uniformity.

3.4.3.1 AGE CONTROLS.- Age controls for synthetic rubber parts shall comply with requirements of ANA Bulletin 438.

3.5 DESIGN.- Fuel tanks shall be designed to carry fuel without leakage, and simultaneously shall comprise the necessary strength to provide adequately for combined loads and stresses as outlined in 3.5.6. All tanks shall be designed to last the life of the aircraft. The tanks shall be so designed that those parts, that will receive the maximum amount of wear or have a limited service life, can be readily replaced.

3.5.1 CAPACITY.- The design capacity shall be as specified by the procuring activity or the airframe manufacturer. The usable capacity shall not be less than that approved by the procuring activity nor more than 1 percent in excess of the design capacity.

3.5.1.1 EXPANSION SPACE.- An expansion volume of 3 percent of the total tank volume shall be provided.

3.5.1.2 WATER SUMP CAPACITY.- The sump capacity shall be 1 pint for each 50 gallons of tank capacity, but in no case shall sump capacity be less than 1 pint. Normally the sump shall be the space between the bottom of the fuel outlet pipe and the bottom of the tank.

3.5.2 WEIGHT.- Emphasis shall be placed on design to create the lightest weight tank that will meet the requirements of this specification. The weight of production tanks shall be within ±2 percent of the average weight of the first 10 production tanks manufactured after final preproduction approval of the tank.

3.5.2.1 CENTER OF GRAVITY.- The tank center of gravity location and travel with varying quantities of fuel within the tank shall be such that there will be no adverse effects on the aircraft structure, on the aerodynamic and flutter characteristics of the aircraft, or on the jettison characteristics of the tank over the entire flight range. If the center of gravity is a critical parameter suitable means shall be employed to prevent detrimental changes in center of gravity due to fuel movement.

3.5.3 SCREW THREADS.- Screw threads shall be in accordance with Specification MIL-S-7742.

3.5.3.1 LOCKING OF THREADED PARTS.- All threaded parts shall be securely locked by safety wiring, self locking nuts, cotter pins, or other approved means. Safety wire shall have a minimum diameter of 0.032 inch and shall conform to Standard MS20995. Self locking nuts shall be of the all metal type conforming to Specification MIL-N-25027, and shall be used in accordance with Standard MS33588. Staking and the use of lockwashers is not permitted.

3.5.4 GROUNDING PROVISIONS.- Plastic tanks shall incorporate suitable grounding provisions to prevent a build-up of electric potential on metallic components. Grounding provisions shall not project into the airstream. A grounding jack for ground refueling shall be provided for all tanks and shall be located near the filler opening.

3.5.5 AIRCRAFT INSTALLATION.- Tanks shall require a minimum of time and effort to install and remove. The weight and number of permanent installation provisions on the aircraft shall be kept to a minimum. These provisions shall be kept within the contour of the aircraft wherever possible in order to minimize drag after the release of the tanks. (See 6.5).

3.5.6 DESIGN LOAD REQUIREMENTS.- The design of the tank assembly and suspension equipment shall comprise the necessary strength to provide adequately for combined stresses caused by the following:

a. Flexing resulting from vibration.

b. Loads incident to taxiing, takeoff and landing including catapulting and arresting where applicable.

c. Hydraulic surge of fluid incident to all dynamic conditions of flight.

d. Pressure loads caused by hydro-static head of fluid during level flight or maneuvers, or caused by gases, if any, used to pressurize the fluid tanks.

e. Inertia and airloads incident to all flight conditions falling within the airplane V-n diagram with the tanks installed. The inertia loads shall consider full fuel and partial fuel conditions.

3.5.6.1 INERTIA LOADS.- The inertia load requirements for tanks are as follows:

a. Tanks designed for a specific aircraft model shall be designed for the limit load factors of the applicable aircraft.

b. Tanks not designed for a specific aircraft model shall use figures 1 and 2 to specify the magnitude and direction of the vertical, lateral, and longitudinal load factors, and the rotational accelerations, acting at the center of gravity of the fuel tank during flight, arrested landing and catapulting. The loading conditions occurring as a result of nonarrested landing and noncatapulted

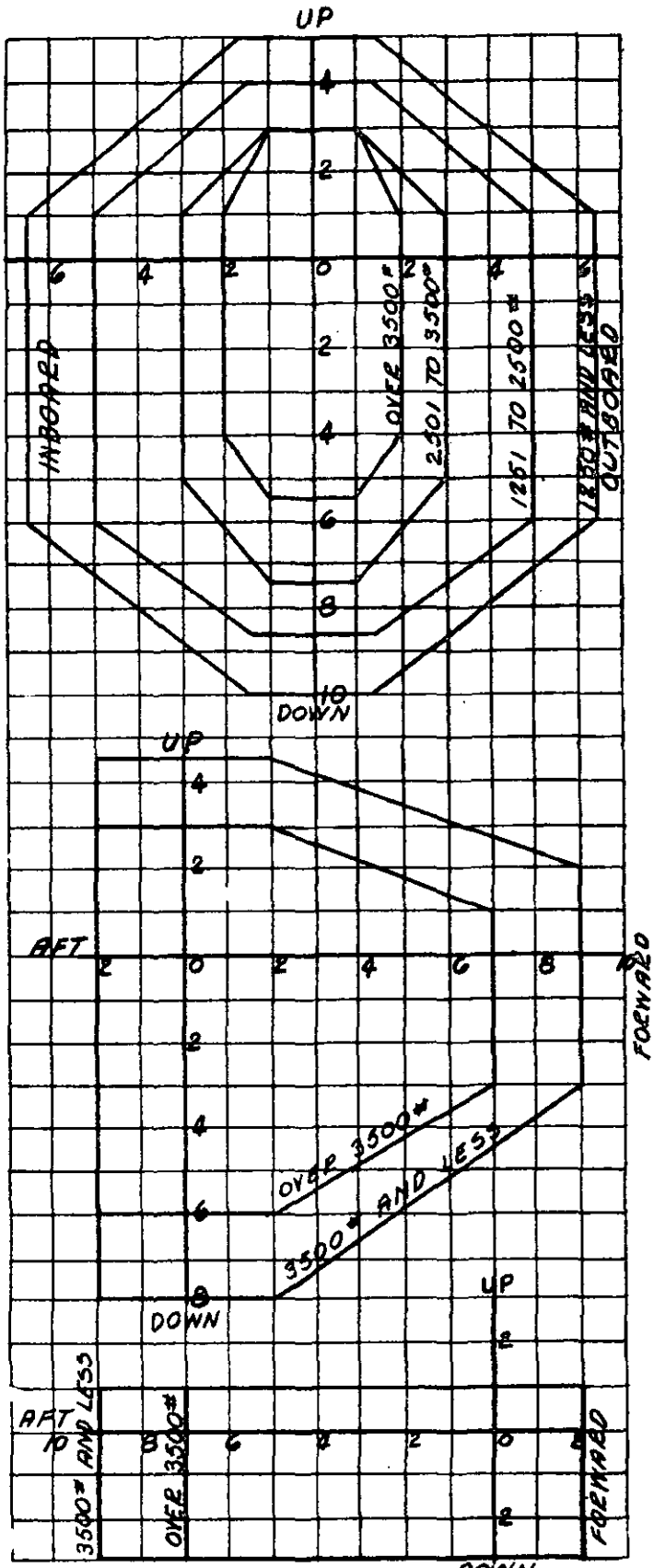


FIGURE 1 DESIGN LIMIT LOAD FACTORS FOR WING-MOUNTED STORES

FLIGHT

W	2500# AND LESS	2501# TO 3500#	OVER 3500#
n_x	± 2	± 2	± 1.5
$\ddot{\theta}$	± 6	± 5	± 2.5
$\ddot{\psi}$	0	0	0

ARRESTED LANDING

W	3500# AND LESS	OVER 3500#
n_y	± 1.5	± 1.5
$\ddot{\theta}$	± 12	± 10
$\ddot{\psi}$	± 6	± 5

CATAPULTING

W	3500# AND LESS	OVER 3500#
n_y	± 1.5	± 1.0
$\ddot{\theta}$	± 12	± 10
$\ddot{\psi}$	± 4	± 4

DIAGRAMS AND TABLES ARE LABELED AS TO APPLICABLE WEIGHT CATEGORIES.

SYMBOLS:

W = WEIGHT OF FUEL TANK CONTAINING FULL FUEL LOAD

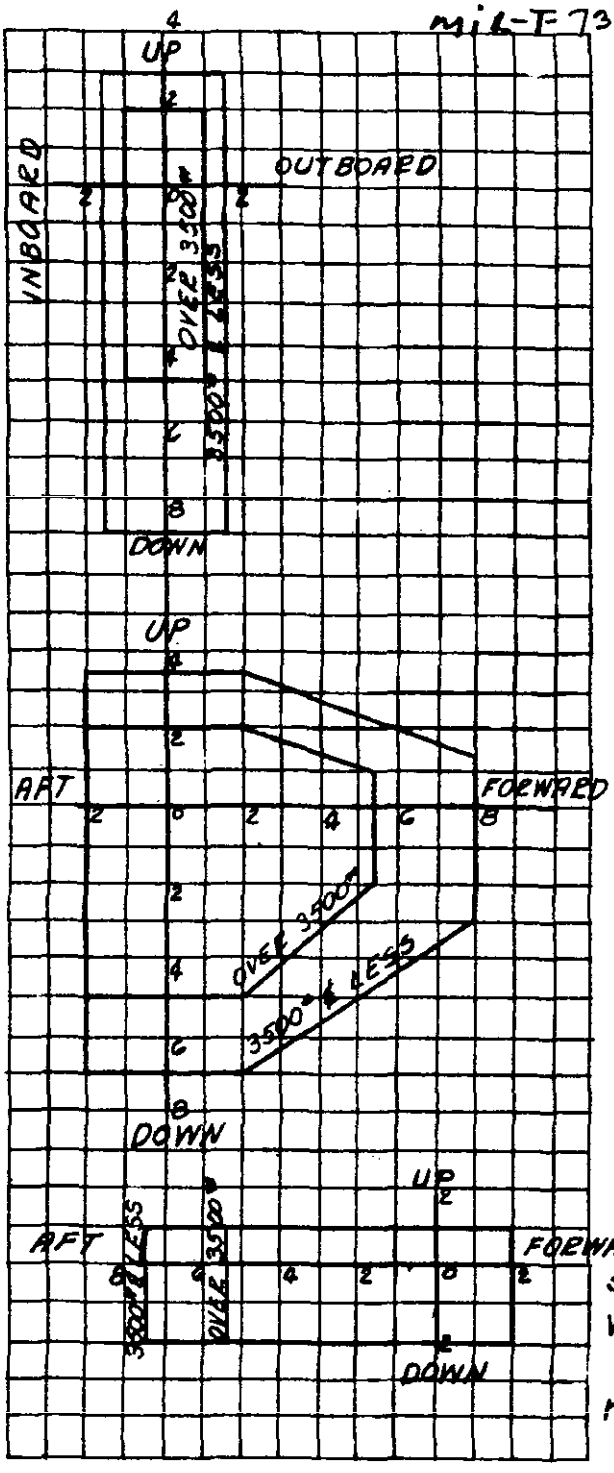
n_x = LOAD FACTOR IN FORE-AND-AFT DIRECTION.

n_y = LOAD FACTOR IN SIDEWARD DIRECTION.

$\ddot{\theta}$ = PITCHING ACCELERATION, RADIANS/SEC^2.

$\ddot{\psi}$ = YAWING ACCELERATION, RADIANS/SEC^2.

NOTE: REFERENCE AXES ARE AIRCRAFT BODY AXES.



NOTE: REFERENCE AXES ARE AIRCRAFT BODY AXES.

FLIGHT

W	3500# AND LESS	OVER 3500#
n_x	± 2	± 1.5
$\ddot{\theta}$	± 6	± 2.5
$\ddot{\psi}$	0	0

ARRESTED LANDING

W	3500# AND LESS	OVER 3500#
n_y	± 1.5	± 1.0
$\ddot{\theta}$	± 12	± 10
$\ddot{\psi}$	± 6	± 5

CATAPULTING

W	3500# AND LESS	OVER 3500#
n_y	± 1.5	± 1.0
$\ddot{\theta}$	± 12	± 10
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DIAGRAMS AND TABLES ARE LABELED AS TO APPLICABLE WEIGHT CATEGORIES.

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n_x = LOAD FACTOR IN FORE-AND-AFT DIRECTION.

n_y = LOAD FACTOR IN SIDEWARD DIRECTION.

$\ddot{\theta}$ = PITCHING ACCELERATION, RADIANS / SEC^2.

$\ddot{\psi}$ = YAWING ACCELERATION, RADIANS / SEC^2.

FIGURE 2 DESIGN LIMIT LOAD FACTORS FOR FUSELAGE-MOUNTED STORES

take-offs are considered to be contained within the envelope of flight load factors. Design loads shall be determined for all critical combinations of load factors and rotational accelerations specified on or within the limits defined by the applicable diagrams and associated tables.

3.5.6.2 AERODYNAMIC LOADS.- Consideration shall be given to aerodynamic loads acting on the fuel tank during the flight conditions considered for the inertia loads of 3.5.6.1. The aerodynamic loads shall include interference effects of the tank when installed on an aircraft. Body alone data shall not be used.

3.5.6.3 INSTALLATION PRELOADS.- In determining the total loads for design, consideration shall be given to the preloads imposed in mounting the tank on the aircraft.

3.5.6.4 ULTIMATE LOADS.- For structural design purposes the limit loads of 3.5.6.1, 3.5.6.2 and 3.5.6.3 shall be increased by a factor of safety of 1.50 to attain the ultimate design loads.

3.5.6.5 MAGNIFICATION FACTORS.- Owing to the structural flexibility of the aircraft and tank installation, the acceleration experienced by the tank, as a result of accelerations imposed on the aircraft, may be amplified. An allowance for this amplification has been included in establishing the magnitudes of the parameters of figures 1 and 2, and the application of additional magnification factors is not required. For those cases in which the tanks are designed for a specific aircraft model and if specific data from dynamic analysis for the aircraft and tanks during catapulting and arrested landing operations are not available, a dynamic magnification factor of 1.6 shall be used for fore-and-aft loads, and 1.3 for vertical loads for both the catapulting and arresting landing conditions.

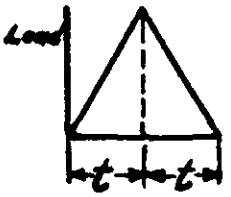
3.5.6.6 JETTISONING LOADS.- When a jettison mechanism is provided, the tank, in any fuel condition shall withstand one release from the jettisoning mechanism without significant permanent set. Wing tip tanks which are jettisonable shall be released simultaneously, or within one second of each other.

3.5.6.7 INTERNAL PRESSURE.- Tanks under loading conditions shall be considered to be pressurized to working pressure or ambient pressure, whichever is more critical.

3.5.6.8 TIME RATES.- For those cases in which the functioning of the fuel tanks or its internal components may be affected by the dynamic application of load, and when specific data are not available,

the time histories of application of critical combinations of load factors and rotational accelerations shall be as follows:

For flight: t = 0.30 sec to 1.0 sec
For landing: t = 0.03 sec to 0.10 sec
For catapulting: t = 0.05 sec to 0.15 sec



3.5.7 FLIGHT CHARACTERISTICS.- The addition of external tanks to an aircraft shall not adversely affect the flight characteristics of the aircraft on which they are installed to such an extent as to result in an inability to comply with the requirements of Specification MIL-F-8785 and MIL-S-25015, as applicable. The tanks shall be aerodynamically clean.

3.5.7.1 BUFFETING.- The tank installation shall cause no excessive buffeting or erratic trim changes up to the maximum dive speed and Mach number of the applicable aircraft with tanks installed.

3.5.7.2 FLUTTER.- Careful flutter analysis shall be conducted to insure safe flutter characteristics throughout the speed and altitude range and for all attitudes and maneuvers which the aircraft will perform with the tanks installed. Full and empty external fuel tank conditions as well as partially full, level flight conditions shall be investigated. In addition, for partially full conditions, the forward center of gravity condition, caused by all fuel moving forward, and the aft center of gravity condition, caused by aft shift of fuel, shall be investigated. In the event that flutter studies indicate low flutter speeds or marginal flutter safety due to adverse frequency ratios, wing-external tank flutter model tests shall be conducted to accurately determine the actual flutter characteristics and, where necessary, to evolve means for increasing flutter speeds. Ground vibration test results and external tank mass properties shall be submitted to substantiate parameters employed in the flutter analysis or simulated in the flutter model. Flight flutter tests may be required if expected margins of safety against flutter are small.

3.5.7.3 STRUCTURAL INTEGRITY.- The tank shall withstand combined inertia, aerodynamic, installation and pressure loads as specified in 3.5.6.1, 3.5.6.2, 3.5.6.3 and 3.5.6.7, respectively, without any deformation that might adversely affect the aerodynamic characteristics as specified in 3.5.7.

3.5.7.3.1 MAXIMUM PERMISSIBLE SPEEDS.- The tank shall be designed to be carried at the maximum dive speed attainable by the applicable aircraft with tanks installed.

3.5.8 NESTING RATIO.- Class 1 tanks shall have a minimum nesting ratio of 8:1 (see 6.3.1)

3.5.8.1 ASSEMBLY TIME.- Class 1 tanks shall be capable of being unpackaged and assembled within the man-hours shown in table I, adjusted in accordance with note 1. The tanks and containers shall be so constructed that special tools are not required and assembly within the maximum time specified will be accomplished completely with manually operated tools and equipment. Use of power-driven tools or equipment shall be prohibited during assembly time test (see 6.3.2)

TABLE I

Tank Assembly Time

Capacity-Gallons	Man-Hours (Maximum)
Up to 300	1
301 to 699	1.5
700 to 1000	2
over 1000	2.5

Note 1: To determine total allowable assembly time, as defined above, add 10 man-minutes for unpackaging each tank in the container to the appropriate table value.

Note 2: Class 1 tanks with capacities in excess of 1000 gallons are not recommended because of the difficulty of uncrating and assembly under field conditions.

3.6 CONSTRUCTION

3.6.1 RIVETING.- Riveting operations shall be carefully performed to insure that the rivets are tight and satisfactorily headed. Riveting through the tank wall shall not be permitted.

3.6.2 WELDING.- All welding of tank skins shall be accomplished using an inert gas arc welding process. The use of spot welding and seam welding shall be prohibited in the tank walls.

3.6.3 "O" RINGS.- All fuel and pressure seals shall incorporate the use of "O" rings conforming to the material as specified in Standard MS29513. The use of flat gaskets shall be avoided where possible.

3.7 PERFORMANCE.- The tank and each component part thereof shall satisfy the following performance requirements.

3.7.1 PRESSURE

3.7.1.1 DISASSEMBLED TANKS.- Each section of a disassembled tank shall be submerged in water and subjected to an internal pressure of 20 psig for at least 2 minutes. There shall be no evidence of escaping air bubbles.

3.7.1.2 ASSEMBLED TANKS.- The assembled tanks shall be submerged in water and subjected to an internal pressure of 1.25 times operating pressure of the tank, when installed on the applicable aircraft, or 20 psig, whichever is greater. For non-pressure tanks a test pressure of 5 psig shall be used. There shall be no evidence of escaping air bubbles.

3.7.2 LEAKAGE.- The tanks shall be submerged in water and subjected to 1.25 times normal operating pressure. For non-pressurized tanks a test pressure of 5 psig shall be used. There shall be no evidence of escaping air bubbles.

3.7.3 SLOSH VIBRATION AND VIBRATION.- The tanks shall be subjected to the vibrator and rocker assembly tests described herein. There shall be no structural damage or evidence of leakage.

3.7.4 LOW TEMPERATURE.- The tanks shall be subjected to a temperature of -65° ± 5°F and this temperature held for a minimum of three days. There shall be no evidence of leakage.

3.7.5 ULTIMATE PRESSURE (PRESSURIZED TANKS).- The tanks shall be subjected to hydrostatic pressure equal to 1.5 times operating pressure or 30 psig, whichever is greater, and held for a minimum of 2 minutes. There shall be no evidence of permanent set, distortion, or failure of any kind.

3.7.6 BURST PRESSURE (PRESSURIZED TANKS).- The tanks shall be subjected to a hydrostatic pressure of not less than 2.5 times the maximum operating pressure encountered in any prescribed flight conditions or equal to the maximum pressurizing system malfunctioning pressure, whichever is greater. There shall be no evidence of rupture.

3.7.7 STRUCTURAL.- The tanks shall be subjected to vertical, side, and aft loads of the structural tests as herein described. There shall be no evidence of permanent set.

3.7.8 FLIGHT.- The tanks shall be required to perform satisfactorily when subjected to the flight test described herein.

3.7.9 FIT CHECK.- The fit check of the tank system, as installed on the applicable aircraft, shall meet the requirements of the fit check test described herein.

3.8 DETAILS OF COMPONENTS

3.8.1 SUSPENSION PARTS.- Tanks shall be provided with means of suspending them from the applicable aircraft. The location of the suspension system shall be as shown in Specification MIL-A-8591. Suspension lugs shall be removable.

3.8.1.1 SWAY BRACES.- Where applicable, sway braces shall be furnished in accordance with Specification MIL-A-8591.

3.8.2 FUEL OUTLET LINE.- Fuel outlet lines shall be provided and so located that connection to the fuel system of the aircraft, on which the tanks will be mounted, may be readily made. Such connection shall be leakproof, but shall not prevent clean separation of an empty or full tank. The fuel outlet line shall be so arranged that the rated capacity of the tanks may be utilized with the aircraft in a normal cruise attitude and so installed as to be free of restrictions and sharp bends.

3.8.2.1 FUEL OUTLET LINE SUPPORT.- The outlet line support shall be designed to the strength requirements of 3.5.6.1. A means of definitely locating and supporting the lower end of the outlet line at a fixed distance from the bottom of the tank shall be provided.

3.8.3 SINGLE POINT AND IN-FLIGHT REFUELING PROVISIONS.- When the external tanks are specified for an aircraft equipped with single point or in-flight refueling systems, the external tanks shall be made adaptable to these systems.

3.8.4 FILLER UNIT.- A suitable filler unit shall be provided conforming to Specification MIL-C-7244.

3.8.5 VENT FITTING.- When applicable, ram type vents shall be located at the forward part of the tank with a minimum vent diameter of 0.5 inch for tanks of 100 gallons capacity or less, 0.75 inch for tanks of more than 100 gallons capacity but less than 350 gallons, and a 1.25 inch for tanks with a capacity of 350 gallons or greater. The vent system shall be designed so that proper venting is obtained during flight maneuvers likely to be performed by the particular aircraft to which the tanks are applied. The design shall be such that siphoning or spillage will be prevented in flight, during catapulting, and arrested landings. The vents shall be designed to minimize entry of dirt, oil, water, or other foreign matter into the tanks.

3.8.6 DRAINS. Drains shall be provided for water removal and be so located that after preflight draining no water can be drawn into the aircraft fuel system under any flight condition. All drain valves used shall be approved by the procuring activity and shall meet the performance requirements of Specification MIL-V-25023. Draining by use of removable screws is not acceptable.

3.8.7 STRAINER.- A noncorrosive fuel strainer of approximately 12 mesh wire screen fabricated in general accordance with Specification RR-S-141 shall be provided at the lower end of the fuel outlet line.

3.8.8 QUICK DISCONNECTS.- Quick disconnects for fuel lines, pressure lines, and electrical wires between the tanks and the aircraft shall be approved by the procuring activity.

3.8.9 FINS.- Fins or displacing struts shall not be used as the primary method of preventing damage to the aircraft when the tank is jettisoned, unless forcible jettison methods are proven unsuitable. Provisions shall be made for the attachment of fins to the tank only if deemed necessary for compliance with the requirement of 3.5.7. Whenever possible, fins for class 2 tanks shall be attached to the tank by means of external fittings.

3.9 INTERCHANGEABILITY.- All parts having the same manufacturer's part number shall be functionally and dimensionally interchangeable. The drawing number requirements of Specification MIL-D-5028 shall govern changes in the manufacturer's part numbers.

3.10 FINISH

3.10.1 ALUMINUM AND ALUMINUM ALLOY TANKS.- Tank parts and tank interiors fabricated of other than aluminum 2S or aluminum alloys 3S, 22 brazing sheet, 52S, 53S, 61S, clad 17S, clad 34S, and clad 75S shall be treated in accordance with Specification MIL-A-8625 or MIL-C-5541. The exterior of tanks not packaged in metal containers, or which are not to be used immediately on aircraft, shall be finished with one coat of zinc chromate primer, Specification MIL-P-6889, plus two coats of aluminized lacquer, Specification MIL-L-7178, or one coat of aluminized varnish, Specification TT-V-119, or MIL-V-6894. For assembled tanks, the interior of such components as fins, fairings, tailcones, etc., shall be finished with one coat of zinc chromate primer, Specification MIL-P-6889.

3.10.2 STEEL TANKS.- The interior shall be finished using Specification MIL-C-490 phosphate treatment, and then coated with one coat of lacquer, Specification MIL-L-6047, or coating, Specification MIL-C-4556. The exterior of the tanks shall be finished using Specification MIL-C-490 phosphate treatment, and then coated with one coat of primer, Specification MIL-P-6889 or TT-P-664, and one coat of aluminized varnish, Specification TT-V-119 or MIL-V-6894, or two coats of lacquer, Specification MIL-L-7178. For assembled tanks, the interior of such components as fins, fairings, tailcones, etc., shall be finished with one coat of zinc chromate primer, Specification MIL-P-6889.

3.10.3 WOOD (ACTUAL TANK PARTS).- Any tank parts that are specified by the procuring activity to be made from wood, or wood products, shall be finished using 4 coats of varnish, Specification TT-V-119 or MIL-V-6894; or 2 coats of varnish, Specification TT-V-119 or MIL-V-6894, topcoated with 2 coats of lacquer, Specification MIL-L-7178, or 2 coats of enamel Specification MIL-E-7729.

3.10.4 PLASTIC TANKS.- When specified by the procuring activity, the nose section of plastic tanks shall be protected against rain or dust erosion, using metal caps or by applying coatings, Specification MIL-C-7439 type I or type II. Coatings shall be applied in accordance with approved manufacturer's instruction sheet.

3.11 IDENTIFICATION OF PRODUCT.- Equipment, assemblies, and parts shall be marked for identification in accordance with MIL-STD-130. Two nameplates conforming to Specification MIL-P-6906, with the following special marking, shall be included on each tank:

Tank, Fuel, Aircraft, External, Auxiliary, Removable
Class_____
Capacity_____
Weight Empty_____
Specification MIL-T-7378A
Manufacturer's Part No._____
Manufacturer's Serial No._____
Government Order No._____
Stock No._____
Manufacturer's Name or Trademark
U.S. Property

One metal nameplate shall be placed near the filler opening where it can be easily read. The other nameplate, of either metal or fuel resistant plastic, shall be permanently and securely fastened to the inside of the tank, onto a bulkhead or reinforcement, so it may be read upon disassembly.

3.11.1 SYNTHETIC RUBBER PARTS.- Equipment and assemblies containing synthetic rubber parts used in aircraft fuel systems shall be marked in accordance with ANA Bulletin 438.

3.12 WORKMANSHIP.- All details of workmanship shall be sufficiently high grade to insure satisfactory operation and service life. Parts shall not contain sharp edges, burrs, loose chips, dirt, or other foreign matter.

4. QUALITY ASSURANCE PROVISIONS

4.1 CLASSIFICATION OF TESTS.- The inspection and testing of fuel tanks shall be classified as follows:

a.	Acceptance tests	See 4.2
b.	Preproduction testing	See 4.5

4.2 ACCEPTANCE TESTS.- Acceptance tests shall consist of:

a. Individual tests

b. Sampling plans and tests

4.2.1 INDIVIDUAL TESTS.- Each fuel tank shall be subjected to the following tests as described under 4.4 TEST METHODS of this specification:

a.	Examination of product	4.4.1
b.	Pressure tests:	
	(1) Class 1 tanks	4.4.2.1
	(2) Class 2 tanks	4.4.2.2

4.2.2 SAMPLING PLANS AND TESTS

4.2.2.1 SELECTION OF CLASS 1 TANK SAMPLES FOR ASSEMBLED PRESSURE TEST.- At a frequency specified by the procuring activity, tank sections shall be selected at random from the production line, assembled into a complete tank, and subjected to the pressure tests as specified in 4.4.2.1.

4.2.2.2 SELECTION FOR CAPACITY TEST SAMPLES CLASS 1 AND CLASS 2 TANKS.- At intervals specified by the procuring activity, a tank shall be checked for usable fuel capacity with the tank in zero degree attitude. Tanks not meeting the tolerance requirements of 3.5.1 shall be rejected.

4.2.2.3 SELECTION FOR WEIGHT TEST SAMPLES CLASS 1 AND CLASS 2 TANKS.- At intervals specified by the procuring activity, a tank shall be selected and have a weight determination performed in accordance with 4.4.13 to demonstrate compliance with 3.5.2. If during the production of tanks, the weight consistently exceeds the tolerance on one side of the production weight, the procuring activity shall be so informed and all pertinent data shall be supplied including a recommendation for a new production weight, the reason for exceeding the weight tolerances, and a log of tank weights for review and establishment of a new production tank weight.

4.2.2.4 REJECTION AND RETEST.- When one item selected from a production run fails to meet the specification, no items still on hand or later produced shall be accepted until the extent and cause of failure are determined.

4.2.2.5 INDIVIDUAL TESTS MAY CONTINUE.- For production reasons, individual tests may be continued pending the investigation of a sampling test failure. But final acceptance of the entire lot shall not be made until it is determined that the lot meets all the requirements of the specification.

4.2.3 DEFECTS IN ITEMS ALREADY ACCEPTED.- The investigation of a test failure could indicate that defects may exist in items already accepted. If so, the contractor shall fully advise the procuring activity of all defects likely to be found and methods of correcting them.

4.3 TEST CONDITIONS

4.3.1 TANK MOUNTING STRUCTURE.- Unless otherwise specified, the test tanks, complete with all accessories and other parts or acceptable substitutes for those components which might affect the testing of the tanks, shall be supported from either the actual pylon-rack assembly or a suitable jig simulating the aircraft component. Where the tanks are designed for operation on several aircraft, the support jig shall be constructed to duplicate the installation that will produce the most critical hook and sway brace reactions. The test tanks shall be supported to simulate the actual vehicle support. In addition all lines attached to the tanks in the actual aircraft installation shall be included. The minimum length of these lines shall be that length in the actual aircraft installation from the tank to the first support.

4.3.2 TEST FLUIDS.- Test fluids shall be as specified in 4.4.6. In cases where the test fluids are not specified, water may be used.

4.4 TEST METHODS

4.4.1 EXAMINATION OF PRODUCT.- Each fuel tank or fuel tank section, in the case of class 1 tanks, shall be examined to determine conformance with all requirements of this specification with respect to materials, workmanship, design, interchangeability, exterior surface, construction, exterior finishes, markings, and applicable drawings.

4.4.2 PRESSURE

4.4.2.1 CLASS 1 TANKS.- Each section of a class 1 tank shall be submerged in water and subjected to an internal pressure of 20 psig for at least 2 minutes. Leakage as evidenced by escaping air bubbles shall be cause for rejection.

4.4.2.2 CLASS 2 TANKS.- All class 2 tanks shall be subjected to this test with all parts installed as they would be when the tanks are installed on the applicable aircraft. Tanks shall be submerged completely in water or covered completely with soap solution and subjected to an internal pressure of 1.25 times operating pressure of the tank, when installed on the applicable aircraft, or 20 psig, whichever is greater. For nonpressurized tanks a test pressure of 5 psig shall be used. Leakage as indicated by the presence of air bubbles forming in the water or soap solution shall be cause for rejection.

4.4.3 ASSEMBLY.- Assembly tests shall be conducted to demonstrate compliance with 3.5.8.1. They shall be conducted in two phases as outlined in 4.4.3.1 and 4.4.3.2. Results of the assembly shall be subject to the approval of the procuring activity.

4.4.3.1 PHASE I ASSEMBLY.- This test shall be conducted as soon as possible after the fabrication of the first tank to determine whether or not the tank complies with the specified assembly time defined in 3.5.8.1 without allowance for unpacking.

4.4.3.2 PHASE II ASSEMBLY.- This test shall be run on the first full container of tanks to be packaged to determine compliance with assembly time defined in 3.5.8.1 for packaged tanks.

4.4.4 LEAKAGE.- The tanks with all openings sealed shall be subjected to an internal air pressure of 1.25 times normal operating pressure. If the tank is a nonpressurized tank, a test pressure of 5 psig shall be used. The tanks shall then be completely submerged in water or covered completely with soap solution. Leakage as indicated by the presence of air bubbles forming in the water or soap solution shall be cause for rejection. Alternate leakage tests are acceptable if approved by the procuring activity.

4.4.5 SLOSH VIBRATION AND VIBRATION.- The test tank, complete with all caps, vents, gages, fittings, the nameplate, and other parts or accessories that will be mounted on or in the tank, shall be mounted in the support jig and installed on the vibrator and rocker assembly. The centerline of the tank, when mounted on this assembly, shall be at least 20 inches above the slosh axis. In addition, all lines attached to the tank in the actual aircraft installation shall be included. The minimum length of these lines shall be that length, in the actual aircraft installation, from the tank to the first support. The test specimen shall be filled two thirds full with water at ambient temperature and simultaneously slosh and vibration tested in accordance with the applicable conditions specified in 4.4.5.1 through 4.4.5.6. Following the simultaneous slosh and vibration test, the tank shall be filled completely with water and vibrated for 10 minutes. At the conclusion of the slosh vibration and vibration test the tank shall be emptied and a leakage check in accordance with 4.4.4 shall be conducted. The tank shall be opened and inspected for evidence of failure, such as sagged panels, buckeled plates, loose bulkheads, loose rivets, or severe metal wear. Any leakage during or after slosh vibration or structural damage shall be cause for rejection.

4.4.5.1 VIBRATION DISPLACEMENT.- The vibration element of the slosh vibration table shall be adjusted to produce a minimum double amplitude of 0.020 inch measured at the attachment points of the tank (points of inherent rigidity). The average amplitude between the top and bottom of the tank at the supporting bulkheads shall be a minimum of 0.032 inch.

4.4.5.1.1 METHOD OF VIBRATION DISPLACEMENT MEASUREMENT.- A suitable electronic vibration measuring instrument shall be used to measure vibration displacement while the tank is being tested. The average peak value, at the point being measured, during a 30 second interval, shall be taken as the value to be recorded.

4.4.5.2 VIBRATION FREQUENCY.- For testing a tank intended for use on an aircraft propelled partially or entirely by reciprocating engines, the vibration frequency shall be 90 +0 -3 percent of the frequency corresponding to normal rated crankshaft speed of the engine used. For testing other aircraft tanks the vibration frequency shall be 2000 +0 -60 cycles per minute.

4.4.5.3 MOUNTING AXIS.- The tank shall be mounted in such a manner that the major (longer) horizontal axis of the tank shall be 90° to the centerline of the axis of the shaft of the rocker assembly platform.

4.4.5.4 SLOSH ROCKING ANGLE.- The slosh rocking angle shall be 30° total, approximately 15° on either side of the horizontal position.

4.4.5.5 TEST WORKING PRESSURE.- The slosh and vibration test shall be conducted with the tank pressurized to the normal working pressure that will be encountered on the aircraft installation.

4.4.5.6 SLOSH VIBRATION TESTING TIME.- Tanks shall be slosh vibrated in one of the following manners:

a. For 25 hours at 16 to 20 slosh cycles per minute.

b. For 25 hours at 10 to 16 slosh cycles per minute with 15 hours of additional slosh only at 10 to 16 slosh cycles per minute.

4.4.6 LOW TEMPERATURE.- The tank shall be filled with fluid conforming to Specification MIL-S-3136, type III, containing a satisfactory staining agent and allowed to stand for a period of 7 days at 110° ± 10°F. The tank shall then be emptied and subjected to air dry out at 160° ± 10°F for 7 days. Following the hot air dry out the tank shall be refilled with fluid conforming to Specification MIL-S-3136, type I, containing a satisfactory staining agent. The temperature of the tank shall be lowered uniformly over a period of 24 hours to a temperature of -65° ± 5°F, by use of external refrigeration and allowed to remain at this temperature for a minimum of 3 days. The temperature of the tank shall then be raised to ambient temperature by use of external warm air over a time period of 5 to 6 hours. Measurements of the following shall be recorded each hour during temperature drop and warm up and included in the preproduction test report:

a. Joint gap measurement.

b. Temperature differential around the circumferential joints of the tanks.

After the tank has returned to ambient temperature, it shall be allowed to stand, to check for leakage. During the temperature drop, warm up, and leak check phases of this test, the tank will be pressurized to the normal working pressure encountered on the aircraft installation. Any leakage shall be considered as a tank failure.

4.4.7 ULTIMATE PRESSURE (PRESSURIZED TANKS).- Upon completion of low temperature test as specified in 4.4.6 the tank shall be subjected internally to hydrostatic pressure equal to 1.5 times operating pressure or 30 psig, whichever is greater, and held for a minimum of 2 minutes. Any evidence of permanent set, distortion, or failure of any kind shall be cause for rejection.

4.4.8 BURST PRESSURE (PRESSURIZED TANKS).- Hydrostatic pressure shall again be applied to the tank. This pressure shall be not less than 2.5 times the maximum operating pressure encountered in any prescribed flight conditions or equal to the maximum pressurizing system malfunctioning pressure, whichever is greater. Evidence of permanent set or distortion shall be permitted, but any evidence of rupture shall be cause for rejection.

4.4.9 STRUCTURAL.- The tank shall be subjected to the following test conditions and shall support these conditions without failure.

4.4.9.1 TEST TANK.- A tank that has not been used for other tests shall be used for this test. The static test tank shall be a complete structure, less such non-structural items as pumps, valves, strainers, etc. It shall be of the same quality workmanship as the flight tank or tanks delivered on the contract and shall be structurally identical to the preproduction sample as indicated in the reports and drawings submitted.

4.4.9.2 TEST TECHNIQUES.- The test techniques of the tank shall be as follows:

a. Where the tank is designed for operation on several aircraft, the support jig shall be constructed to duplicate the installation that will produce the most critical hook and sway brace reactions.

b. Loads shall be introduced into the test tank by means of tension pads, internal formers, and external straps. Of these methods tension pads are preferable in that they allow a better load distribution and are less susceptable to local overloading difficulties. Care shall be taken to insure that the load application devices do not materially affect the strength of the test tank by introducing artificial stiffness, etc.

c. All applied test loads shall be suitably monitered by calibrated equipment (pressure gages, load dynamometers, etc.) so that acceptable test accuracy is obtained.

d. Internal pressure, where applicable, shall be applied pneumatically or hydraulically and the pressure suitably monitored with calibrated measuring devices.

e. Tare weight of store and all load application devices shall be accounted for in all test loadings. Particular care shall be taken when dense fluids (water, etc.) are used for introducing internal pressure so that true incremental loads for all load components are obtained. Independent application of combined load components (that is vertical, side, and aft loads) are preferable over resultant load application to facilitate maintaining correct relationship of load components with each other for full range of load from zero to ultimate.

4.4.9.3 TEST LOADS.- The test loads of the tank shall be as follows:

a. The loads used in the static test program shall be those resulting from the design criteria of 3.5.6.1.

b. Sufficient test conditions shall be investigated to insure complete coverage of critical loading conditions on all structural components of the tank. Internal pressure shall be considered acting with external loads where applicable.

c. All test conditions shall be conducted to 100 percent ultimate load. The tank structure shall support limit test loads without permanent set in any portion of the structure exceeding that outlined in Specification MIL-S-5700. Whether or not permanent set has occurred will be determined by the procuring activity from the data and observations recorded during the test. The structural test article shall support ultimate test loads without failure.

4.4.10 FLIGHT TEST PROCEDURES.- If the given size and aerodynamically shaped tank has not been tested on the aircraft for which the tanks are to be procured, then upon satisfactory completion of all laboratory preproduction tests, additional sets of test tanks of the same design, which have not been subjected to laboratory tests, shall be flight tested to determine compliance with 3.5.7. The contractor shall submit a flight test program, 90 days prior to the projected date of the beginning of flight test and obtain approval of the procuring activity, before flight test is begun.

4.4.10.1 JETTISON.- Flight tests shall be conducted to determine the jettisonability of the tanks in full, partially

full and empty conditions, and for all flight conditions falling within the aircraft V-N (velocity-load factor) diagram, with the following exceptions:

a. spins

b. maneuvers involving negative "G" with half full to full tanks.

4.4.10.2 FLUTTER.- Where it is determined to be necessary by the procuring activity, flutter testing shall be accomplished to determine compliance with 3.5.7.2.

4.4.11 FIT CHECKS.- If the tank is being produced for a specific aircraft application, a fit check shall be performed on at least two aircraft of the applicable series of aircraft. The contractor shall assume responsibility for this fit check and a functional check of the tank system while installed on the aircraft. Results of the fit check and functional tests shall be included in the final preproduction test report.

4.4.12 CAPACITY.- The capacity of the tank shall be checked to determine compliance with the tolerance requirements specified in 3.5.1 and to comply with the capacity specified on the nameplate in 3.11.

4.4.12.1 EXPANSION SPACE.- The expansion volume of the tank shall be checked to determine compliance with the requirements of 3.5.1.1.

4.4.12.2 WATER SUMP CAPACITY.- The sump capacity of the tank shall be checked to determine compliance with the requirements of 3.5.1.2.

4.4.13 WEIGHT.- The weight of the tank shall be checked to determine compliance with the requirements of 3.5.2.

4.4.13.1 CENTER OF GRAVITY.- The center of gravity of the tank shall comply with the requirements of 3.5.2.1.

4.5 PREPRODUCTION TESTING

4.5.1 PREPRODUCTION TEST SAMPLES.- The preproduction test samples shall consist of models representative of the production equipment. They shall be tested at a laboratory designated by the procuring activity or, when so stated in the contract, at the contractor's plant under the supervision of the procuring activity.

4.5.1.1 DATA TO BE SUBMITTED PRIOR TO PREPRODUCTION TESTING

4.5.1.1.1 PRELIMINARY DRAWINGS.- Preliminary design drawings shall be furnished the procuring activity in triplicate, prior to the fabrication of the perproduction sample of a new design, which shall be preproduction tested. Approval of drawings shall be obtained from the procuring activity prior to fabrication of the preproduction sample.

4.5.1.1.2 STRUCTURAL TEST REPORTS.- Prior to conducting tests, a test outline consisting of details of the method of test and outlining the critical test conditions shall be submitted to the procuring activity for approval. Final test reports shall include:

a. Complete description of test article including dimensions, etc.

b. Detail of method of loading.

c. Quantitative loads analysis of critical test conditions to include lug and swey brace reactions, tank shear and bending moment curves, and fin loads if applicable. Quantitative data are also required to support elimination of conditions, if such occurs.

d. Test log sheets presenting deflection data and other test observations made.

e. Description of any failures and rework made.

f. Photographs of typical test set-ups and detail photographs of all failures, etc.

4.5.1.1.3 GEOMETRICAL DATA.- The following data shall be supplied by the tank contractor prior to or concurrent with the submittal of the preproduction structural report:

a. Filling capacity of the tank at pitch angles from -10 to +10 degrees.

b. Rolling and pitching moments of inertia about axes through the center of gravity of the tank for empty, 1/4, 1/2, 3/4, and full conditions.

c. Tank center of gravity locations from nose of tank for various fuel loadings, from empty to full for tank center line pitch angles from -90 to +90 degrees.

4.5.1.1.4 PREPRODUCTION TEST DRAWINGS.- If any preproduction testing is to be performed by the procuring activity, the following drawings shall be provided to the procuring activity:

a. One complete set of assembly drawings for article to be tested.

b. One drawing giving complete mounting dimensions.

4.5.2 PREPRODUCTION TESTS.- Preproduction testing shall consist of all tests of table II.

TABLE II

Preproduction Tests

Leakage	4.4.4	
Slosh vibration and vibration	4.4.5	
Low temperature	4.4.6	
Ultimate pressure	4.4.7	1/
Assembly	4.4.3	
Burst pressure	4.4.8	
Structural	4.4.9	
Flight test procedures	4.4.10	2/
Flutter	4.4.10.2	3/
Fit check	4.4.11	4/
Capacity	4.4.12	
Weight	4.4.13	

1/ Tests above the double line are to be run in the order shown, other tests may be run in any order desired.

2/ Tanks that have had no previous laboratory testing performed on them shall be used for flight test.

3/ This test shall be conducted only if the flutter analysis of 3.5.7.2 indicates that it is necessary and then only if the procuring activity specifies that it shall be conducted.

4/ Fit check may be accomplished concurrently with flight tests.

4.5.3 PREPRODUCTION TEST REPORT.- After the contractor completes the preproduction tests, he shall prepare a preproduction test report according to Specification MIL-T-9107 and furnish three complete copies of the report to the procuring activity. The results of more than one test may be included in one report, however the report must be received no later than 1 month after the completion date of the earliest test completed.

5. PREPARATION FOR DELIVERY

5.1 GENERAL.- The preparation for delivery shall be the same levels A, B, and C.

5.2 CLASS 2 TANKS.- All class 2 tanks unless otherwise specified shall be packed in wooden crates conforming to Specification MIL-C-9437 in unit quantities of 1 each. All items and instructions necessary to install the tank on the applicable aircraft and pylon shall be included in the same package as the tanks.

5.2.1 PRESERVATION AND INTERIOR PACKAGING

5.2.1.1 DETACHED COMPONENT PARTS

5.2.1.1.1 SMALL COMPONENT PARTS.- All small component parts, including nuts, bolts, washers, fittings, etc. shall be preserved in accordance with method II-D, Specification MIL-P-116 except that metal containers shall conform to Specification MIL-C-6054. Test requirements of Specification MIL-P-116 other than the quick-leak test are waived. Exposed threaded surfaces of the closure device shall be coated with material conforming to Specification MIL-C-16173, grade 1. The metal container shall enclose the contents in a snug, tight fitting manner and shall be securely fastened to the interior of the crate in such a manner as not to trap water. Metal strapping, when used, shall conform to Specification QQ-S-781, type B. When items, i.e., shackles, have been operationally preserved depreservation is not required. Shackles shall not be installed and will be treated as small component parts.

5.2.1.1.2 LARGE COMPONENT PARTS.- Large component parts such as tailcones, stabilizers, fins and fairings, etc., shall require the same treatment as the tank exterior and shall be packaged with the tank in such a manner that water will not collect.

5.2.1.1.3 PARACHUTES.- The parachutes shall be packaged in accordance with MIL-P-5610, process type I. The folded parachute shall be tagged or placarded to specify that the parachute is not packed for service.

5.2.1.2 TANK PRESERVATION.- The interior of all class 2 tanks shall be fogged with preservative in accordance with Specification MIL-C-6529, type III, introduced by means of pressure spray for complete atomization. The tank shall be vented at a point the farthest distance practicable from the point of introduction of the oil during

spraying operations. The amount of the preservative shall be a minimum of 0.12 cc per square foot of internal surface area. Exterior steel fittings installed on the tank, seam welds, and bolted or riveted joints shall be coated with preservative compound, Specification MIL-C-16173, grade 1.

5.2.1.3 CLOSURES.- Class 2 tank interiors shall be protected against the entrance of dirt or other foreign material by sealing the exterior openings with easily removable, noncorrosive, nonhygroscopic closures which, when installed, shall withstand an internal pressure of ±5 psig and shall not damage the tank openings. The closures shall be capable of removal by hand or by the use of common hand tools. Where necessary to prevent tank collapse during air shipment and normal temperature change provisions shall be made in the closures to relieve negative pressures.

5.2.2 POSITIONING AND CUSHIONING.- The class 2 tank shall be supported within the container so as to meet the requirements specified in Specification MIL-C-9437. Tanks shall be placed horizontally in the crate in such a position that any pockets, wells, or fuel and air openings are in a position to prevent water entering the tank or collecting in the pockets. Where possible, the position and support of the tank should be maintained by use of fixtures from the container to aircraft attaching points to preclude damage of tank surfaces. Metal strapping shall not be used to suspend or secure tanks in position. Where blocking, bracing, and cushioning for component parts is necessary, it shall be accomplished so as to meet the requirements of Specification MIL-C-9437. When a wood substitute is used as a blocking or bracing material, approval of the procuring activity shall be required. Where plywood is used, it shall conform to Specification NN-P-515, type I, class 2, or type II, class 2. When a cushioning material is used, it shall conform to Specification MIL-C-7769. At contact points the tank and large component parts shall be protected by barrier materials conforming to Specification MIL-B-121, grade A.

5.2.2.1 TANK MOUNTING FIXTURES.- When tank mounting fixtures are used they and their attaching parts shall be coated with material conforming to Specification MIL-C-16173, grade 1.

5.3 CLASS 1 TANKS.- Class 1 tanks and components shall be preserved in accordance with Specification MIL-P-116, method II-D, and packed in metal containers conforming to Specification MIL-B-9361. Each shipping container shall include all necessary equipment and instructions required for the complete assembly and installation on the applicable aircraft or pylon of each tank packaged within the container.

5.3.1 CONTAINER CONDITION.- At time of use the container interior shall be free of accumulated water, dirt or other foreign material and all defects, i.e., improper or obliterated markings, shipped paint, corrosion, and damaged parts shall be repaired or replaced.

5.3.2 HUMIDITY INDICATORS.- A humidity indicator conforming to Specification MIL-I-26860 shall be inserted in the receptacle provided.

5.3.3 POSITIONING AND CUSHIONING.- The class 1 tanks and component parts shall be supported within the container so as to meet the requirements of Specification MIL-B-9361. When cushioning material is used, it shall conform to Specification MIL-F-5030 or MIL-C-7769. At contact points with cushioning material, the tank or component parts shall be protected with barrier material conforming to Specification MIL-B-121, grade A, when the material in contact therewith has a pH factor of less than 6.5 or greater than 7.5.

5.3.4 All exposed operating surfaces of closure device and exposed threaded surfaces shall be treated with material conforming to the requirements of Specification MIL-C-16173.

5.4 MARKING.- Interior packages and exterior shipping containers shall be marked in accordance with MIL-STD-129. The nomenclature shall be "Tank, Fuel, Aircraft, External, Auxiliary, Removable". Additional markings shall include tank serial number(s) and cure date of oldest "O" ring contained therein as prescribed in ANA Bulletin 438. Interior packages shall also contain the legend, if applicable, "Parachute not packed for operational use".

5.4.1 In Class 1 tank packages, inspection shall be made of the humidity indicator immediately prior to shipment. The desiccant and indicator shall be replaced in those instances where a relative humidity approaching 40 percent is indicated.

5.5 SHIPPING ARRANGEMENT.- The practice of standing containers on end for shipment is prohibited.

5.5.1 CLASS 1 TANKS.- Class 1 tanks shall be shipped in containers meeting the nesting ratio requirement as specified in 3.5.8 (See 6.3.1).

5.5.2 CLASS 2 TANKS.- Class 2 tanks shall be shipped and stored completely assembled and shall incorporate provisions for internal inspection and minor repairs.

6. NOTES

6.1 INTENDED USE.- The auxiliary external fuel tanks designed and manufactured in accordance with this specification are intended for use on all military aircraft requiring the use of these tanks for carrying fuel external to the aircraft.

6.2 ORDERING DATA.- Procurement documents should specify the following:

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

b. Number of samples and point of testing.

c. Applicable levels of preservation and packaging, and packing.

6.3 DEFINITIONS

6.3.1 NESTING RATIO.- Nesting ratio shall be defined as the ratio of the number of Class 1 tanks in containers that can be shipped on a railroad flat car to the number of Class 2 tanks in containers that may be shipped on the same flat car. Use the railroad flat car length for Class 1 tank containers, which would be optimum for Class 2 tank containers, since the use of different length flat cars for Class 2 tank containers versus Class 1 would give a false nesting ratio. The width and height limitations of the railroad flat car will be 10 feet and 11 feet, respectively.

6.3.2 ASSEMBLY TIME.- Assembly time shall be defined as the continuous time from the opening of the container until the time when one tank is assembled ready for use on the aircraft.

6.4 SUPERSESSION DATA.- Class 1 tanks of this revision supersede type I and type II of the original MIL-T-7378 and class 2 tanks of this revision supersede type III and type IV of the original MIL-T-7378. Class 1 and class 2, however, are both continuous service tanks, whereas MIL-T-7378 covered both continuous and limited service tanks. Limited service tanks will no longer be procured.

6.5 AIRCRAFT INSTALLATION.- The following aircraft installation design requirements for external fuel tanks are applicable to this specification and will be inserted in the Handbook Of Instructions For Aircraft Designers at the next revision thereof.

a. Ground clearance shall be sufficient to prevent ground contact under any combination of the following static or dynamic ground conditions:

(1) One or more tires flat.

(2) One or more shock absorbers flat.

(3) Pitching, caused by variations in runway surface, amounting to 3 inches between nose and main wheels or forward and aft main wheels.

(4) Rolling, caused by variations in runway surface, amounting to 3 inches between opposite main wheels, or between main wheels and outriggers.

(5) Rotation of the aircraft about its center of gravity or about the main wheels to attain take-off attitude.

b. Sufficient clearance and access shall be provided for installing, filling, draining, and removing the tanks.

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