



AEROSPACE STANDARD	AS8584	REV. B
	Issued 2002-07 Reaffirmed 2007-07 Revised 2008-10 Stabilized 2013-11 Superseding AS8584A	
Brake Systems, Wheel, Military Aircraft		

RATIONALE

Due to current U.S. government rules effecting sharing of information regarding military technology and services (i.e. ITAR, EAR, etc.) further updates to this document will no longer be possible.

STABILIZED NOTICE

This document has been declared "Stabilized" by the SAE A-5A Wheels, Brakes and Skid Controls Committee and will no longer be subjected to periodic reviews for currency. Users are responsible for verifying references and continued suitability of technical requirements. Newer technology may exist.

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1. SCOPE

This SAE Aerospace Standard (AS) defines the requirements for brake systems used on military aircraft equipped with wheel-type landing gears.

1.1 Product Classification

Brake systems shall be either mechanical, hydraulic, pneumatic, electric or a combination of each. Braking force control shall be applied to the brake assembly either through a manually operated system or a power operated system (see 2.2). Classifications of brake system types used in previous military specifications no longer apply but are listed in this document for reference purposes (see 5.1).

2. REFERENCES

2.1 Applicable Documents

The following publications form a part of this document to the extent herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order. In the event of conflict between the text of this document and references cited herein, the text of this document takes precedence. Nothing in this document however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

2.1.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), www.sae.org.

ARP1070	Design of Skid Control and Associated Aircraft Equipment for Total System Compatibility
ARP1493	Wheel and Brake Design and Test Requirements for Military Aircraft

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AIR1907	Automatic Braking Systems Requirements
AIR5372	Information on Brake-By-Wire Brake Control Systems
AS5440	Hydraulic Systems, Aircraft, Design and Installation Requirements for
AS8775	Hydraulic System Components, Aircraft and Missiles, General Specification for
AS22759	Wire, Electrical, Fluoropolymer-Insulated, Copper or Copper Alloy
AS50881	Wiring, Aerospace Vehicle

2.1.2 U.S. Government Publications

Available from the Document Automation and Production Service (DAPS), Building 4/D, 700 Robbins Avenue, Philadelphia, PA 19111-5094, Tel: 215-697-6257, <http://assist.daps.dla.mil/quicksearch/>.

MIL-STD-203	Aircrew Station Controls and Displays: Location, Arrangement and Actuation of, for Fixed Wing Aircraft
MIL-STD-461	Requirements for the Control of Electromagnetic Interface Characteristics of Subsystems and Equipment
MIL-HDBK-470	Designing and Developing Maintainable Products and Systems, Volume I and Volume II
MIL-STD-704	Aircraft Electric, Power Characteristics
MIL-DTL-781	Terminal; Wire Rope Swaging
MIL-STD-790	Established Reliability and High Reliability Qualified Products List Systems for Electrical, Electronic, and Fiber Optic Parts Specifications
MIL-STD-883	Microcircuits
MIL-STD-889	Dissimilar Metals
MIL-HDBK-2084	General Requirements for Maintainability of Avionic and Electronic Systems and Equipment
MIL-W-5013	Wheel and Brake Assemblies, Aircraft General Specification for
MIL-HDBK-5400	Electronic Equipment, Airborne, General Guidelines for
MIL-P-5518	Pneumatic Systems, Aircraft, Design and Installation, General Requirements for (Inactive)
MIL-V-5525	Valves, Aircraft Power Brake
MIL-R-5757	Relays, Electromagnetic, General Specification for
MIL-C-6026	Control Unit, Pressure Generating, Manually Operated, Aircraft Hydraulic Brake System
MIL-PRF-6106	Relays, Electromagnetic, General Specification for
AN6204	Valve, Hydraulic Bleeder
MIL-DTL-7034	Pulleys, Groove, Antifriction Bearing, Grease Lubricated, Aircraft, General Specification for

MIL-S-7742	Screw Threads, Standard, Optimum Selected Series: General Specification for
MIL-C-7979	Cylinder, Hydraulic Brake, Master, Power Assisted
MIL-B-8075	Brake Control Systems, Antiskid, Aircraft Wheels, Instructions for Preparation of Specification for
MIL-D-8708	Demonstration, Aircraft Weapon Systems, General Specification for
MIL-PRF-19500	Semiconductor Devices, General Specification for
MIL-M-38510	Microcircuits, General Specification for
MIL-PRF-38534	Hybrid Microcircuit, General Specifications for
MIL-B-83277	Boots, Flyers FWU-8/P
MIL-DTL-83420	Wire Rope, Flexible, for Aircraft Control
MIL-DTL-83723	Connectors, Electrical, (Circular, Environment Resisting), Receptacles and Plugs, General Specification for

2.1.3 NAS Publications

Available from Aerospace Industries Association, 1000 Wilson Boulevard, Suite 1700, Arlington, VA 22209-3928, Tel: 703-358-1000, www.aia-aerospace.org.

NASM33540

2.2 Definitions

ANTISKID CONTROL SYSTEM: A group of interconnected components that interact to control excessive brake pressure and thus prevent inadvertent tire skidding and contribute to shorter aircraft stopping distances.

AUTOBRAKING CONTROL SYSTEM: Control of braking with an automatic system and the pilot out of the control loop. An input of the desired level of deceleration is made prior to takeoff or landing.

BACKUP BRAKE CONTROL SYSTEM: Control of braking used when normal braking is not available. Backup braking may be activated automatically or may require pilot action. This system is sometimes referred to as an emergency brake system.

BRAKE-BY-WIRE CONTROL SYSTEM: A system where pilots' brake pedal commands are measured using electrical transducers and the corresponding signals are used to provide proportional control of airplane deceleration. This system is described in further detail in AIR5372.

BRAKE DESPIN CONTROL SYSTEM: Deceleration of braked wheels upon landing gear retraction prior to the wheels entering the wheel well.

MANUALLY OPERATED (NON POWERED) BRAKING SYSTEM: A system that provides braking force directly through manual actuation.

NORMAL BRAKE CONTROL SYSTEM: Interconnected components used during routine operations that provide stopping forces proportional to an applied operator input.

PARKING BRAKE SYSTEM: Components that allow the pilot to apply and set sufficient pressure to lock the wheels and which maintain that pressure without aircraft power or further operator action.

POWER OPERATED BRAKING SYSTEM: A system which meters fluid from a pressure generating source proportional to an operator applied input.

WHEEL and BRAKE ASSEMBLIES: Components which convert the braking pressure or signal into torque to slow tire rotation and bring the aircraft to a stop.

3. REQUIREMENTS

3.1 General Requirements

The brake systems covered by this specification shall be operable under all weather conditions and be compatible with the type (temperature range) and class (pressure limits) of hydraulic or pneumatic systems as specified in either AS5440 or MIL-P-5518, whichever is applicable.

3.2 Selection of Specifications and Standards

Specifications and standards for all materials, parts, and Government certification and approval of processes and equipment which are not specifically designated herein and which are necessary for the execution of this specification shall be selected in accordance with procedures established by the procuring activity, except as provided in 3.2.1.

3.2.1 Standard Parts

Standard parts (MS, AN, NAS, AS, etc.) shall be used wherever they are suitable for the purpose and shall be identified on the drawings by their part numbers. Commercial utility parts, such as screws, bolts, nuts, cotter pins, etc., may be used provided they possess suitable properties and are replaceable by the standard parts without alteration, and provided the corresponding standard part numbers are referenced in the parts list, and if practicable, on the supplier's drawings. In the event there is no suitable corresponding standard part in effect on date of invitation for bids, commercial parts may be used provided they conform to all requirements of this specification.

3.3 Materials

Materials used in the brake system components shall be of high quality, suitable for the purpose intended, and shall conform to applicable Government specifications as specified herein.

3.3.1 Dissimilar Metals

The use of dissimilar metals in contact, as defined in MIL-STD-889, shall be avoided. Where complete compliance proves impractical, electrolytic action shall be minimized by plating or some other suitable method of dissimilar surface isolation.

3.3.2 Corrosion Resistance

Corrosion prevention is of prime importance and material selection shall be made accordingly.

3.4 Design and Construction

Detail design and construction of the components and brake system shall conform to the contractor-prepared detail specification and the requirements specified herein. The components shall be suitably sealed against dust, dirt, and moisture to insure satisfactory operation in the aircraft environment. The useful life shall be specified in the detail specification and shall be compatible with the aircraft design useful life.

3.5 System Design Requirements

The following are features that may be required for brake systems depending upon the aircraft configuration and braking requirements. The design and installation of aircraft braking systems shall be in accordance with the applicable requirements of AS5440, MIL-P-5518, and AS8775 and shall employ to the fullest possible extent the standard components listed therein. All detachable components and parts shall be safetied in accordance with NASM33540 or secured by an approved method that will prevent loosening.

3.5.1 Normal Brake Control System

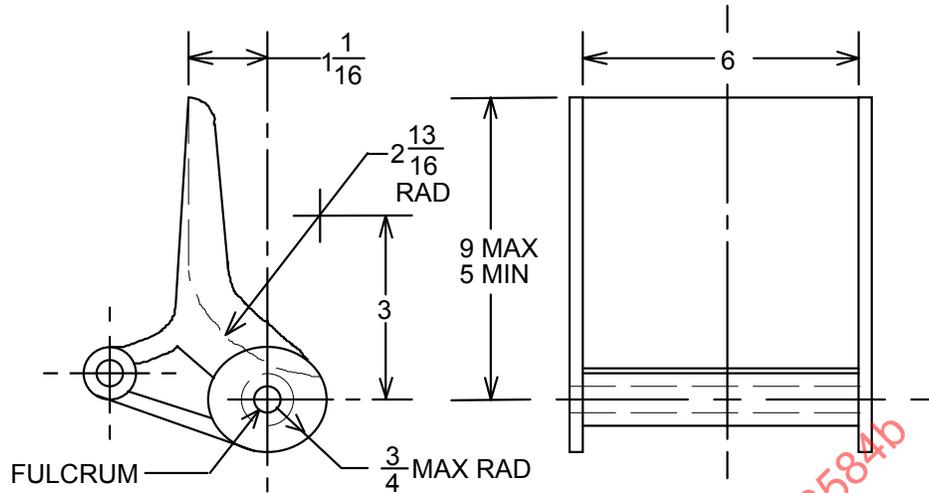
A brake control system shall be provided on all aircraft for normal use during aircraft ground and shipboard maneuvers such as towing, deck spotting, taxiing, engine run-up, rejected take-off (RTO), landing, and parking. Right and left brakes shall be separately actuated and shall be so designed that they can be applied by toe force on brake pedals on the rudder controls, except for bicycle gear or quadricycle gear, where other suitable brake controls may be used subject to approval of the procuring activity. In aircraft with brake controls in multiple crew stations, the application of brake pedals in one station shall not cause brake pedal movement at other crew stations. Pedal location shall conform to the requirements of MIL-STD-203. The brake pedals shall be so designed that a comfortable angle of approximately 90 degrees between the pilot's foot and his lower leg is maintained throughout the full range of movement of the rudder pedals and seat. Sufficient clearance shall be maintained throughout the full range of travel between the pedal or any linkages and other aircraft components. The pedals shall be located to accommodate crewmember boots per MIL-B-83277. Strength shall be provided in the brake pedal and associated linkage to withstand a minimum of 300 pounds applied at the tip of the pedal with no yielding. Figure 1 defines the desired shape of the brake pedals. Brake pedal linkage and control device travel (Figure 2) shall exhibit minimum friction (hysteresis) between pedal force or position and braking force. Means shall be provided to positively return the brake pedals to the brake off position when toe force is removed from the pedals. No pumping shall be required in order to meet deceleration requirements. To the maximum extent possible, but without causing undesirable dynamic torque characteristics, the brake system shall provide braking force sufficient to prevent wheel rotation at maximum engine thrust.

3.5.1.1 Manually Operated Systems

Manual hydraulic braking control systems shall incorporate a brake control unit or units that shall conform to MIL-C-6026. The control unit shall preferably be connected directly to the brake pedal. Total hydraulic displacement of the control unit shall be at least 25 percent greater than the maximum displacement, including line expansion, required to hold the wheels locked as described in 3.5.1.1.1.

3.5.1.1.1 Brake Pedal Dynamics

A foot force of between 15 and 20 pounds at the tip of the pedal shall be required to cause initial movement of the brake pedal. A foot force of between 40 and 65 pounds at the tip of the pedal shall develop the torque required on the landplane landing design gross weight brake stop condition of the table entitled "Wheel Brake Capacity Requirements" of MIL-W-5013. A maximum foot force of 90 pounds at the tip of the pedal shall develop the maximum pilot metered pressure. The brake force thus obtained shall be consistent with the average of the repeated dynamometer tests of the brake in the landplane landing design gross weight condition and maximum design gross weight. The travel of the pedal for full brake application shall be as indicated on Figure 2. It shall not exceed 20 degrees while meeting the requirements above. In all positions of the brake pedal or the rudder linkage and the seat, it shall be possible for the pilot to apply sufficient static brake torque to hold the wheels locked against a 33 degree slope for shipboard aircraft at maximum design gross weight and a 12 degree slope for land based aircraft at design alternate gross weight. It shall be possible to meet this requirement with the brakes at a temperature of 21 °C (70 °F).



DIMENSIONS IN INCHES

FIGURE 1 - BRAKE PEDAL SHAPE

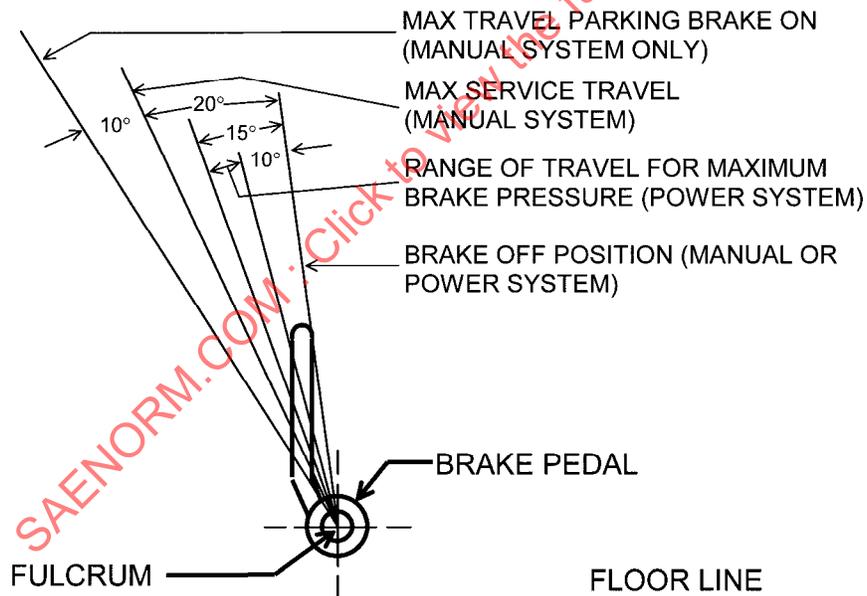


FIGURE 2 - BRAKE PEDAL TRAVEL

3.5.1.2 Power Operated Systems

Power-operated brake control systems shall exhibit no objectionable time lag between pedal movement and brake response. Such systems shall develop "feel" at the pedals, in proportion to the amount of energizing force applied to the brake. Hydraulic power brake valves should conform to MIL-V-5525. The normal brake system, including accumulators if used, shall be designed to prevent depletion of brake pressure supply due to pilot operation during normal landings or ground handling of the aircraft. Consideration should be given to appropriate hydraulic pump operating speeds.

3.5.1.2.1 Brake Pedal Dynamics

A foot force of between 15 and 20 pounds at the tip of the pedal shall be required to cause initial metering through the power brake valve. A foot force of between 40 and 65 pounds at the tip of the pedal shall develop the torque required on the landplane landing design gross weight brake stop condition of the table entitled "Wheel Brake Capacity Requirements" of MIL-W-5013. A maximum foot force of 90 pounds at the tip of the pedal shall develop the maximum pilot metered pressure. The brake pressure thus obtained shall be consistent with the average of the repeated dynamometer tests of the brake in the landplane landing design gross weight condition and maximum design gross weight. In all positions of the brake pedal or the rudder linkage and the seat, it shall be possible for the pilot to apply sufficient static brake torque to hold the wheels locked against a 33 degree slope for shipboard aircraft at maximum design gross weight and a 12 degree slope for land based aircraft at design alternate gross weight. It shall be possible to meet this condition with the brakes at a temperature of 21 °C (70 °F). The travel of the pedals shall be as shown on Figure 2. Pedal travel shall be between 10 and 15 degrees to produce the maximum available brake pressure. In a brake-by-wire system pedal force and travel transducers shall provide similar feel and proportionality as a hydromechanical system.

3.5.2 Antiskid Control System

Unless otherwise specified an antiskid control system shall be provided on all aircraft including short takeoff/short landing aircraft. Helicopters may not require antiskid control. In a brake-by-wire system antiskid control may be integrated with normal braking control such that antiskid becomes part of the normal control logic. Antiskid control systems shall be in accordance with MIL-B-8075 or ARP1070.

3.5.3 Backup Brake Control System

Unless otherwise specified a backup brake control system shall be provided on all aircraft. The backup brake control system shall provide metered differential brake control. The backup system shall provide to the maximum extent possible brake actuation, braking performance and pilot feedback similar to the normal braking system. On aircraft with antiskid control, the backup system may provide antiskid protection provided the backup system has the capacity to bring the aircraft to a stop under skidding conditions. The backup system shall be completely independent of the normal system up to the shuttle valve or equivalent unit at the brake assembly. On aircraft with backup braking and backup steering capability the two backup systems shall be powered from separate backup sources. A system wherein a failure of one-half of the normal system still allows the specified decelerations with differential control is considered equivalent to a separate backup system. When accumulators or air bottles are used for the backup braking, they shall have sufficient capacity to provide at least 10 full brake applications (full pedal stroke and release) without skid control, or full antiskid protection with skid control, assuming brakes are adjusted to recommended clearances, and of which the last application shall provide a minimum coefficient of friction of 0.18 minimum between tire and runway. The volume of hydraulic fluid required should be based on pressures and displacements required to meet the specified deceleration applications considering three of the applications are with cold brakes and seven are with hot brakes. If air bottles are used for the backup system, the lines between the air bottle control valve and the shuttle valve shall be automatically vented to the atmosphere when not in use. Whenever feasible, backup brake systems shall function by continued pressure on the brake pedal. Backup systems shall be designed to facilitate operational checks. The backup brake system shall be designed to preclude entrapment of the normal system fluid within any of the components that could prevent the brake system from operating in the backup mode.

3.5.4 Parking Brake System

Unless otherwise specified a parking brake system shall be provided on all aircraft. The parking brake shall be located and actuated in accordance with MIL-STD-203. A "PARK-ON" indicator in the crew station or an automatic release shall be provided. The parking brake shall provide sufficient braking force in the brake system to develop a torque to hold on a 33-degree slope for shipboard aircraft at maximum design gross weight and a 12-degree slope for land based aircraft at a design alternate gross weight. The parking brake system shall include means to compensate for predicted leakage and temperature variations in the ambient environment and brake system components so that at least 75 percent of the parking brake torque defined above is maintained over a minimum period of 24 hours with engines off. Temperature increases above the initial parking temperature shall not result in excessive pressure in the brake system. No pumping shall be required in order to meet the parking requirements.

3.5.5 Wheel and Brake Assemblies

Wheel and brake assemblies for hydraulic braking systems shall conform to the requirements of MIL-W-5013 or ARP1493.

3.5.6 Autobraking Control System

When specified an autobraking control system conforming to the requirements of AIR1907 shall be provided. The autobraking system shall be pilot-selectable to automatically apply RTO or landing braking force without pilot pedal input. A single action is required to select either RTO or landing mode. Autobraking force shall be applied equally to all brakes without interfering with the antiskid control system. The autobraking system shall not interfere with the pilot's ability to take over normal braking by application of the brake pedals.

3.5.6.1 RTO Mode

In RTO mode, the autobraking shall be designed to apply immediate full braking upon throttle cut and to operate to a full stop. The pilot shall not be capable of selecting RTO mode prior to landing. The autobraking system shall apply full RTO braking force if throttles are advanced while the aircraft accelerates through a predetermined groundspeed, the groundspeed is above that predetermined level, and throttles are then retarded after reaching that predetermined groundspeed.

3.5.6.2 Landing Mode

Landing mode shall not be capable of being selected during takeoff. The pilot shall be able to change the deceleration level at any time. The autobraking system shall smoothly apply braking force to the selected deceleration level after throttles are retarded, the aircraft is on the ground, and wheel spinup has occurred.

3.5.7 Brake Despin Control System

When specified a brake despin control system shall be provided. The brake despin system shall bring brake controlled wheels to a complete stop prior to entering the aircraft wheel wells. Brake torque developed during despin shall not induce detrimental forces into the landing gear while it is locked or in transition.

3.6 General Design Requirements

3.6.1 Ship Based Aircraft

Ship based aircraft shall be capable of using manually generated braking force to hold the aircraft on a 33 degree slope at maximum design gross weight. Where this is not feasible, or if the ship based aircraft has an antiskid control system, the brake control system may boost the manually generated braking force by a power generating system. Ship based aircraft with power generating system shall have power storing provisions incorporated to hold the aircraft on the 33 degree slope without using the normal power generating system. With the power generating system inoperative, the system shall meet the requirements of 3.5.1.1.1, except the deceleration capability between 40 and 65 pounds maximum foot force shall be consistent with the aircraft operational requirements as approved by the procuring activity. With the power generating system operative, the brakes shall meet the requirements of 3.5.1.2.1. During shipboard towing or deck spotting and without aircraft power generating systems, the brake control system shall provide cockpit personnel differential braking capability through the brake pedals for a minimum of 15 full brake applications (full pedal stroke and release) before any power storing provisions must be recharged. Recharging is allowed external to the cockpit, for instance from a connection or pump handle within the wheel well area. A cockpit gauge, indicating the stored charge remaining in the system shall be provided. The braking capacity must be adequate for a minimum aircraft braking coefficient of friction of 0.2. Aircraft that are launched using catapults shall have provisions to automatically prevent brake application during, and 1.5 seconds after, the catapult stroke. This catapult brake release function does not diminish the need for cockpit ergonomics that inhibit inadvertent brake pedal contact by the pilot. It shall be possible for the pilot to quickly disable/bypass the catapult brake release function; activating the backup brake control system, if applicable, is the preferred method. On aircraft with antiskid control the antiskid control logic shall not interpret as impending skidding, and thus not react to, rapid tire deceleration associated with shipboard arrested landings. An antiskid "On/Off" switch, if approved by the procuring activity, may be used to disable skid control during shipboard operations.

3.6.2 Operating Media

Brake control component shall be designed for use with the operating medium mutually determined by the procuring activity and the aircraft manufacturer for the particular application (hydraulic, pneumatic, mechanical, etc.).

3.6.3 Mechanical Requirements

3.6.3.1 Control Cables

Brake control cables shall conform to MIL-DTL-83420. Swaged terminals conforming to MIL-DTL-781 shall be used on the ends of brake control cables. Pulleys conforming to MIL-DTL-7034 shall be used wherever brake control cables change directions more than 5 degrees. There shall be sufficient brake pedal travel to compensate for cable stretch or thermal expansion.

3.6.4 Hydraulic/Pneumatic Requirements

3.6.4.1 Design Analysis

A hydraulic analysis shall be performed to assure that the components of the brake system and antiskid control valve are capable of achieving the required brake application and antiskid response. An analysis of the hydraulic flow transferred to and from the brakes during the most adverse conditions, in addition to the nonbrake flow through valves and modulators, shall show that adequate capacity is provided to prevent any degradation of the brake system performance. The characteristics and the effects of the following items during aircraft braking shall also be considered in the analysis:

Fluid supply to the brake system.

Fluid return to the hydraulic system reservoir including fluid entering the return line from the operation or leakage of hydraulic components other than those in the brake or antiskid control system.

Minimum and maximum ambient and fluid temperatures that will be encountered.

3.6.4.2 Fluid Displacement

Hydraulic fluid volume change shall be a minimum from residual pressure to maximum operating pressure for all brake wear conditions.

3.6.4.3 Brake System Maximum Pressure

The maximum metered brake pressure may be any value up to the maximum hydraulic pressure available at the inlet of the pressure metering control unit. The strength of the brake subsystem components shall be based on the factors of safety specified by the procuring activity.

3.6.4.4 Hydraulic Response Time

Brake systems shall be designed to produce the minimum hydraulic response time within practical limits for improved antiskid control performance. Minimum response time shall be achieved by minimization of major response contributors such as brake displacement, line expansion, line length, and flow restrictions. Antiskid control valves shall be located as close as practical to the brake assemblies to improve hydraulic coupling.

3.6.4.5 Hydraulic Lines

Hydraulic lines for supply and return shall be selected to provide minimum pressure drops compatible with flow requirements of the pressure metering control units, antiskid control valves, and brake assemblies under installed environmental conditions. The utilization of flex hoses between the brake control unit and the wheel shall be held to a minimum to minimize accumulation effect during pressure changes. Brake lines shall be routed to facilitate proper bleeding, and dual brake lines shall be separated to prevent loss due to battle damage or tire rupture. If possible, brake lines that are exposed to potential foreign object or tire failure damage shall be CRES material because of its excellent damage tolerance. Traps or bends in hydraulic lines that might cause air pockets shall be avoided. Wherever practical, the lines shall have a continuous drop from the brake valve or control unit to the brakes. If traps or bends cannot be avoided, then a separate AN6204 or equivalent bleeder valve shall be installed to accomplish proper bleeding in accordance with AS5440. If hydraulic fuses are located in lines to be bled, they shall have manual overrides to permit fast and reliable bleeding.

3.6.4.6 Fluid Contamination

Filtration shall be provided as required to ensure satisfactory brake control valve and antiskid control valve performance. The filter shall retain all particles that can adversely affect valve operations. If a component has a self-contained inlet filter, the absolute particle size rating of any upstream filters shall not be larger than the nominal particle size rating of the self-contained filter. Reverse bleeding of the brake system shall be limited to those installations that provide adequate internal or external means to prevent entry of contaminants into hydraulic components. Some antiskid control valves, for example, can be rendered inoperative if contaminants reach valve spools and orifices. Self-contained inlet filters in these control valves are not effective during reverse bleeding.

3.6.4.7 Control Valves

When equipped with a shutoff valve, the control valve shall be designed to be suitable for the pressures generated with the shutoff valve actuated.

3.6.4.8 Ports and Passages

The ports and internal fluid passages shall be sized to permit adequate flow to and from the brake and antiskid control valves. Consideration shall include the desired initial brake response from the fully released position against residual pressure to the brake applied position in addition to subsequent cyclic application of the antiskid control valve. Ports and internal fluid passages shall be designed to assure minimum air entrapment and minimum flow restrictions.

3.6.4.9 Master Cylinders

Power assisted master cylinders shall conform to MIL-C-7979.

3.6.5 Electrical Requirements

3.6.5.1 Electronic Components

All electronic assemblies should be designed in accordance with MIL-HDBK-5400. Special attention shall be given to the following: moisture proofing of assemblies, including connectors; providing system component and tolerance compatibility throughout the extremes of the aircraft temperature environment and maintenance requirements; and tolerance to the electromagnetic interference environment.

3.6.5.2 Electric Power Requirements

When designed for electrical operation, the braking system shall conform to all applicable requirements of MIL-STD-704, and shall give specified performance from the power source configuration specified in the detail specification. During power interruption, as defined in MIL-STD-704, including the 50 millisecond transient, the system shall provide braking force.

3.6.5.3 Bonding

Electrical and electronic units shall have a case ground pin in the connector. All conductive surfaces of the case shall be bonded such that the DC resistance between the case ground pin and any point on the case does not exceed 0.011 ohms.

3.6.5.4 Relays

Relays used in the antiskid system should conform to the applicable requirements of MIL-PRF-6106 and MIL-R-5757.

3.6.5.5 Wiring

External wiring shall be installed in accordance with AS50881, and shall be of the type specified in AS22759. Internal wiring shall be compatible with accepted industry standards and the configuration of the system as installed.

3.6.5.6 Connectors

Component external connectors shall be in accordance with MIL-DTL-83723 Series III, threaded, self-locking. Connectors installed adjacent to each other shall not be physically interchangeable.

3.6.5.7 Electronic Components

Semiconductor devices shall be per MIL-PRF-19500, reliability level JANTXV, or as specified in the detail specification. Digital and linear microcircuits should be per MIL-M-38510, reliability level Class B or higher. If nonstandard hybrid devices are used, it must be demonstrated that no equivalent standard part or combination of parts can be used given the size and performance requirements of the system. If hybrids are used, they shall be produced in a facility certified to comply with MIL-PRF-38534 and tested in accordance with Method 5008 of MIL-STD-883. Passive electronic devices (resistors, capacitors) and relays shall be reliability level "R" or "S" or better. De-rating of electronic components shall conform to the appropriate specification. Any proposed breach of requirements shall require prior approval of the procuring activity.

3.6.5.8 Electromagnetic Interference

The brake system shall be designed to be electromagnetically compatible with the associated aircraft, its subsystems, and the operational environment. Testing shall be in accordance with MIL-STD-461, with the entire brake system considered external to the aircraft.

3.6.6 Failure Detection/Failure Mode

The failure detection circuit, when provided, shall be of the passive type; that is, it will function to provide visual failure indication, without altering remaining braking control capability on wheels where no failure exists. The failure detection system shall provide indication to the pilot of any detectable failure that will adversely affect the performance of the braking system.

3.6.6.1 Failure Modes and Effects

The normal braking system shall provide an indication of failure to the pilot, but shall continue to provide whatever braking capability is available. A cockpit warning indication, preferably mounted in a prominent location within the pilot's field of vision during landing and braking phase of flight, shall be provided to indicate that there has been a system malfunction or a loss of electrical power to the brake control system.