DEPARTMENT OF DEFENSE
UNITED STATES AIR FORCE

MIL-HDBK-516C CHANGE NOTICE No. 516CN-6

AIRWORTHINESS BOARD DETERMINATION MIL-HDBK-516C CHANGE NOTICE	1. DATE (*YYYYMMDD*) 20180405
2. ALFCMC/EZ POINT OF CONTACT Tom Condron, AFLCMC/EZFA	3. PHONE *(DSN)* 785-2023
4. BOARD SECRETARIAT Michelle Edgell, AFLCMC/EZSA	5. PHONE *(DSN)* 986-9576
6. SUMMARY OF AIRWORTHINESS BOARD DETERMINATION / MIL-HDBK-516C CHANGE **(See attached Airworthiness Board charts for more information.)** MIL-HDBK-516C Section 8.4 Fire Protection Change impacts paragraphs: • Modified Referenced Documents: 2.2.1, 5.3.2, 19.1.1, 19.1.5 • Modified Criterion - 8.4.3.2 Safety Critical Components – no change to method of compliance or standard. • Modified Standard - 8.4.4 Drainage and Ventilation – no change to criterion or method of compliance. • New Method of Compliance - 8.4.15 Protection of Inhabited and Critical Areas – no change to criterion or standard.	
7. TAA SIGNATURE K W Barker 5 Apr 18 KENNETH W. BARKER, Ph.D, SL Acting Director, Engineering and Technical Management/Services USAF Technical Airworthiness Authority	8. ORGANIZATION AFLCMC/EN-EZ

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USAF Airworthiness Change Notice Board

Section 8.4 (Fire Protection) Updates

05 Apr 18

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Change Notice (CN) Overview

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- **Title:** Fire Protection Updates (four updates proposed)
- **Date Proposed:** 30NOV2017
- **POC:** Tom Condron, EZFA, DSN 785-2023
- **Revision To**: CN Proposal Revises MIL-HDBK-516C

Part	Paragraph(s) Impacted	Impact to C/S/MOC			
		Title	New	Modified	No Change
a	2.2.1, 5.3.2, 19.1.1, and 19.1.5	(Referenced Documents)		X	
b	8.4.3.2 Safety critical components	Criterion Standard MOC		X	 X X
c	8.4.4 Drainage and ventilation	Criterion Standard MOC		 X 	X X
d	8.4.15 Protection of inhabited and critical areas	Criterion Standard MOC	 X		X X

C = Criterion S = Standard MOC = Method of Compliance

Rationale for Part a
(Referenced Documents)

- **Rationale:**
  - MIL-HDBK-516C currently lists "MIL-HDBK-1587" *Material and Process Requirements for Air Force Weapon Systems* as a referenced document
    - There is no MIL-**HDBK**-1587 document
    - The reference should be to MIL-**STD**-1587
  - The reference should be changed to MIL-STD-1587 *Materials and Process Requirements for Aerospace Weapon Systems*
  - MIL-HDBK-1587 is referenced in Criteria: 5.3.2, 19.1.1, and 19.1.5 – These criteria will be updated to reference MIL-**STD**-1587

Cancellation of MIL-HDBK-1587

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Data updated: 14 Dec 2017. Document Details

Document ID: MIL-HDBK-1587 Scroll down to access document images

Overview

Title: Materials and Process Requirements for Air Force Weapons Systems (S/S by MIL-STD-1587)

Scope: This standard establishes the requirements for materials and processes used during design and production of aerospace weapons systems. When used in conjunction with Mil-Std-1530, the other integrity program documents (Mil-Std-1783, Mil-Std-1798, etc.) and Mil-Std-1568, it is expected that structurally reliable aerospace systems having a good balance between acquisition costs and life cycle costs will result.

Status: Canceled **Cancellation Date:** 21-JUN-2017

FSC/Area: MFFP **Doc Category:** Department of Defense Handbook

Responsibilities

Lead Standardization Activity: MR Army Research Laboratory, Weapons and Materials Research Directorate

Preparing Activity: AS Naval Air Systems Command

Coordination: Limited

Navy Custodian: AS Naval Air Systems Command

Changes to military standards or handbooks issued after August 1, 2003 are incorporated in the modified document.

Revision History

Click on column headings for a description of column content.

Media	Document Part Description	Dist Stmt	Document Date	Pages	Size
	Notice 1 - Cancellation	A	21-JUN-2017	1	14.0 KB
	Base Document	A	18-JUL-1996	36	2002.7 KB

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Reinstatement of MIL-STD-1587

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NOT MEASUREMENT SENSITIVE

MIL-STD-1587D
21 June 2017
SUPERSEDING
MIL-HDBK-1587(USAF)
18 July 1996
MIL-STD-1587C(USAF)
21 July 1992

DEPARTMENT OF DEFENSE

DESIGN CRITERIA STANDARD

MATERIAL AND PROCESS REQUIREMENTS FOR
AEROSPACE WEAPONS SYSTEMS

Reinstated after 21 June 2017 and may be used for new and existing designs and acquisitions.

AMSC 9823 AREA MFFP

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Rationale for Part b (8.4.3.2)

- **Rationale:**
  - As currently written, the criterion would require all safety-critical components to withstand fire and heat to a predetermined level
    - This criterion should be applicable only to those safety critical components installed in an aircraft fire zone (e.g. fuel and hydraulic shut-off valves) that must remain operational when exposed to fire for some period of time
    - Equipment not installed in an aircraft fire zone (e.g. flight control computer) are never expected to be exposed to a fire; therefore, being able to withstand fire and heat (from a fire) is not applicable
  - The proposed change limits the scope of this criterion to safety critical equipment installed in aircraft fire zones

Proposed Criterion (8.4.3.2)

- ***Criterion:*** Verify that provisions exist for air vehicle system safety-critical components that are installed in a fire zone to withstand fire and heat to a predetermined safe level.

- No changes to Standard or MOC for this criterion

Markup Key: Current Text [~~Proposed Deletion~~] [Proposed Addition]

Rationale for Part c (8.4.4)

- **Rationale:**
  - As currently written, the standard requires that all drainage and ventilation collection systems on the aircraft be fire hardened.
    - "Fire hardened" is not a standard term
    - The standard terms are:
      - "Fire Proof" – able to withstand 2000°F flame with a heat flux of 10 (Btu/sec)/ft^2 for 15 minutes
      - "Fire Resistant" – able to withstand 2000°F flame with a heat flux of 10 (Btu/sec)/ft^2 for 5 minutes
    - Only drainage and ventilation collection systems that pass through or drain/ventilate a fire zone need to be fire resistant. None need to be fire proof.

Proposed Standard (8.4.4)

- ***Standard:*** Drainage systems remove all hazardous quantities of flammable liquids. Ventilation systems that operate in flight provide adequate active ventilation for flammable fluid leakage zones (e.g., 1 volumetric air change per minute for flammable fluid leakage zones) and fire zones (e.g., 2-3 volumetric air changes per minute for fire zones). Drainage and ventilation collection systems that pass through or ventilate/drain fire zones resist a flame of 2000°F with a heat flux of 10 (Btu/sec)/ft^2 for five minutes without leakage, unless a failure of such lines and fittings will not result in or add to a fire hazard ~~are fire hardened~~. Drains and vent systems for flammable zones are separated from other systems. Drains and vent systems for ignition zones are separated from other systems.

- No changes to Criterion or MOC for this criterion

Markup Key: Current Text [~~Proposed Deletion~~] [Proposed Addition]

Rationale for Part d (8.4.15)

- **Rationale:**
  - As currently written, the MOC is an exact repeat of the Standard
  - The current MOC does not provide guidance regarding the expected method of showing compliance
  - The proposed MOC is taken from draft MIL-HDBK-516C

Proposed Method of Compliance (8.4.15)

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- ***MOC:*** ~~[Provisions exist to prevent smoke, vapors, extinguishing agents, flames or fumes from creating a safety of flight condition for the air vehicle, creating an unacceptable hazard to personnel or adversely affecting flight critical sensors. The unmanned aircraft system control station is protected to National Fire Protection Association standards.]~~
- ***MOC:*** Analysis of the air vehicle system verifies that provisions are provided for the protection of the crew and personnel from smoke and other hazardous vapors. Ground/flight test and demonstration verifies flight critical sensor bays are protected from hazardous quantities of smoke, flames and extinguishing agents. Ground and flight demonstrations verify that the crew and personnel are protected from smoke and extinguishing agents. A typical means of compliance would be to show that fire zones are separated from inhabited areas and flight-critical sensor bays by fire barriers that can withstand a 2000^{o} F flame for 15 minutes using standard test methods and that the fire barrier will also prevent hazardous quantities of smoke or extinguishing agent from entering inhabited areas or flight-critical sensor bays. For unmanned systems, the aircraft control stations is protected to National Fire Protection Association standards.

- No changes to Criterion or Standard for this criterion

Markup Key: Current Text [~~Proposed Deletion~~] [Proposed Addition]

Specific Comments

- **Organization:** US Army (Craig Mosley and Normal Duffell)
- **Comments:**
  - Requested MOC for Criterion 8.4.15 match what was agreed to when -516C was originally approved
  - Identified a mistake in the title of MIL-STD-1587
- **Response:** Incorporated comments

- NAVAIR Fire Protection Engineer (Mike Cosgrove) concurred with update.

Specific Comments

- **Organization:** Joint Strike Fighter (F-35A CE)
- **Comment:** For criterion 8.4.15, requested greater specifics as to what type of analysis, any desired margin (by analysis), and if there are any testing required to verify analysis results
- **Response:** Compliance is configuration dependent; therefore, an absolute statement of what is required is not possible. To help with understanding what is wanted to demonstrate airworthiness regarding this criterion a "typical means of compliance" statement was added to the Method of Compliance.

Specific Comments

- **Organization**: Geoffrey Butler at GA-ASI
- **Comment 1: On slide 7, following "Criterion," I suggest editing it to read (changes shown in red text): "Criterion: Verify that provisions exist for air vehicle system safety-critical components that are installed in a fire zone or flammable leakage zone adjacent to the fire zone to withstand fire and heat to a predetermined safe level." This would then be consistent with other regulations (MIL-HDBK-516C 8.4.8, STANAG 4671 USAR .865, STANAG 4671 USAR 1351e)**

- **Response**: Disagree with proposed change
  - If an intense fire such as described in the Standard for this criterion, were present in other than a fire zone – loss of aircraft would be expected and it is not practical to design otherwise (or else those compartments would be designated as fire zones).

Specific Comments

- **Organization**: Geoffrey Butler at GA-ASI
- **Comment 2**: **On slide 9, the text reads, "Drainage and ventilation collection systems that pass through or ventilate/drain fire zones resist a flame of 2000°F with a heat flux of 10 (Btu/sec)/ft2 for at least five minutes without leakage, unless a failure of such lines and fittings …" I recommend you delete "at least."**
- **Response**: Change incorporated
  - The proposed change conveys the same intended information and uses fewer words.

Specific Comments

- **Organization**: General Electric (Engines)
- **Comment**: For Criterion 8.4.4
  - Ventilation lines running to fire zones should meet the same requirement as drains
- **Response**: Disagree with this change
  - Fire zone ventilation lines should meet the requirements of 8.4.13. The extra verbiage was inserted to make it clear that:
    - Only those drains/vents that run through a fire zone need to be fire resistant
    - "fire hardened" is not a standard term so the term was changed to a standard term with a defined meaning (MIL-HDBK-221, Fire Protection Design Handbook for U.S. Navy Aircraft Powered by Turbine Engines)

Recommend Approval/No Comment

The following organizations either recommended approval or had no comments:

- **Rolls Royce** -- no comments or problems with the changes
- **Big Safari Chief Engineer** -- reviewed and is okay with the change
- **Boeing (Glen Winkler)** -- does not have any additional comments to the proposed change
- **Lockheed Martin (Don Roberts)** -- No inputs to the draft change notice.
- **Pratt & Whitney** -- No objections from PW perspective for the MIL-HDBK-516 Change Notice Proposal.
- **Air Force Safety Center** -- Subject matter experts at the AF Safety Center have reviewed the proposed change and have no comments or questions.
- **F-15 Chief Engineer** -- No issues with the proposed MIL-HDBK-516C Fire Protection CN. Concur with proposal.

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Recommendation

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Role	Organization	Coordination	Approve	Disapprove	Comment
TA	AFLCMC/EZFA	Tricia Hicks	X		
TA	AFLCMC/EZFS	Greg Schoeppner	X		
TD	AFLCMC/EZA	Mike Knisely	X		
TD	AFLCMC/EZF	Larry Rogers	X		
TD	AFLCMC/EZS	William Mejias	X		

- **Recommendation:**

[X] **Approve** [ ] **Disapprove**

Organization	Coordination	Concur	Non-Concur	Comment
US Army	Craig Mosley	X		
US Army	Norman Duffell	X		
US Navy	Rich Adams	X		
US Navy	Mike Cosgrove	X		

Backup Slides

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Excerpts from MIL-HDBK-221

2.4.6 DRAINAGE IN POTENTIAL FIRE ZONES

Vent and drain lines and fittings in potential fire zones carrying flammable fluids or vapors shall be made of material that resists a flame of 2000°F for at least five minutes without leakage, unless a failure of such lines and fittings will not result in or add to a fire hazard.

2.11.1.2.3 AIR DUCTS

Air ducts passing through potential fire zones, when allowed to burn through, might give a fire the opportunity to travel from one fire zone to another or to the rest of the aircraft, and they may also allow a high air mass flow to enter the potential fire zone and feed the fire. Such air ducts shall be made of stainless steel or titanium not less than 0.015 inches thick, or equivalent material, where they pass through fire zones. Air ducts originating in fire zones shall be made of stainless steel or titanium not less than 0.015 inches thick, or equivalent material, for a sufficient distance beyond the fire barrier to assure that any fire can be contained within the duct. For air ducts originating in potential fire zones, and flowing air to potential fire zones shutoff means shall be provided as required by 2.11.1.4.

Excerpts from MIL-HDBK-221

2.11.1.2.1 FIREWALLS

Firewalls separate potential fire zones from adjacent compartments of the aircraft. Firewalls shall be made of stainless steel or titanium, at least 0.012 inches thick, or equivalent material. Titanium shall not be used for firewall material in the vicinity of burner cans, where molten material can drip on it when a burnthrough occurs, or when the firewall is a vital load-carrying structural member. The firewall shall be as tight as possible; a hole of 0.04 inches diameter in a firewall 0.015 inches thick can cause propagation of flames through the firewall. Firewall connectors and the passage of all plumbing, ducts, wiring, controls, etc., through firewalls shall be as fireproof as the firewall itself, i.e., under no conditions of fire shall fire penetrate through the firewall because of failure of fittings. Firewalls may buckle severely due to heat, therefore access doors or joints shall be avoided in firewalls. If access doors or joints must be provided in firewalls for justifiable reasons, they shall be closed by closely spaced fasteners of such type that hazardous gaps will not result during a fire. Whenever a firewall is closer than eight inches from the outer case of a combustor, additional protection shall be considered against the torchlike flame resulting from a burned-through combustor. All grommets and fillers used at points where items pass through firewalls shall be made of material possessing the same fireproof characteristics as the firewall material. Fillers shall be used sparingly and only where necessary. Consideration shall be given to the difficulties of removing and replacing any movable pieces of airframe which have been sealed with fillers. Unique firewall connectors or passages shall be demonstrated to be satisfactory by actual test. Firewalls should not be stressed by airloads, mounted equipment, etc., so that early failure would occur due to the loss of strength, even though flame penetration was not imminent.

Excerpts from JSSG-2009, Appendix G (Fire Protection)

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G.3.4.7.20 Fire barriers.

Fire barriers shall be provided to control the spread of fire between specified compartments and adjoining compartments and areas. The barriers between ___(TBS 1)___ and ___(TBS 2)___ areas shall withstand temperatures of ___(TBS 3)___ °F for ___(TBS 4)___ minutes without ___(TBS 5)___.

TBS 3, TBS 4, TBS 5: The materials used in the fire barrier should be fireproof and able to withstand a 2000°F flame for 15 minutes using standard test methods under the environmental conditions that exist at the installed location, especially pressure differentials and vibration.