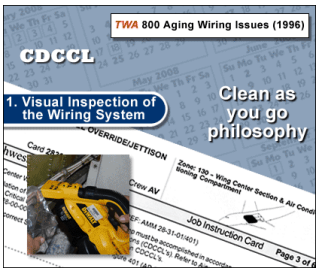
SFAR 88/CDCCL COURSE

Welcome to Fuel Tank Safety Training - AD Mandated Course

- The purpose of this course is for you to become familiar with the requirements for:
  - **Critical Design Configuration and Control Limitations (CDCCLs)**; you must comply with these ***mandatory*** SFAR 88 procedures beginning December 16, 2008
  - **Electrical Wiring Interconnection System (EWIS)**; you must immediately comply with these policies and procedures due to NWA policy, but the FAA requires all airlines comply to EWIS beginning 2011



- This course is made up of three topics:
  - **CDCCL** – This topic explains how to follow these instructions when maintaining aircraft and components; you will see a few examples of CDCCLs in documentation
  - **EWIS** – This topic introduces EWIS, related terms and the concept of wiring as a system (rather than as a component)
  - **Clean As You Go** – This topic explains the 'clean as you go' philosophy; this philosophy is a result of EWIS

Fuel Tank Safety History

EWIS, CDCCLs, and the Clean As You Go philosophy were mandated by the FAA in reaction to two aircraft disasters, TWA Flight 800 and Swiss Air Flight 111. The causes of both disasters were likely due to faulty wiring, and in the case of TWA Flight 800 the faulty wiring was over the center wing fuel tank.

Below is a brief explanation of both disasters.

TWA Flight 800 — On July 17, 1996 Flight 800 crashed into the Atlantic Ocean near East Moriches, New York while enroute from JFK to Leonardo da Vinci Airport (FCO) in Rome, Italy. All 230 people on board died. After a four year investigation, it was determined that the probable cause of the crash was due to an explosion of the center wing fuel tank because of faulty wiring.

Swiss Air Flight 111 — On September 2, 1998 Flight 111 crashed into the Atlantic Ocean southwest of Halifax International Airport while enroute from JFK to Cointrin International Airport (GVA) in Geneva, Switzerland. All 229 people on board died. After a four year investigation, it was determined that the inflight fire was due to faulty wiring, leading to instrument failure and loss of control.

Reconstruction of TWA 800 wreckage at the Naval Weapons Industrial Reserve Plant.

Reconstruction of Swiss Air 111 wreckage at the Shearwater Canadian Forces Base.

Topic 1: Critical Design Configuration Control Limitation (CDCCL)

CDCCL is a mandatory requirement of SFAR 88. As stated earlier in this course, SFAR 88 is the regulation that establishes requirements for fuel system safety.

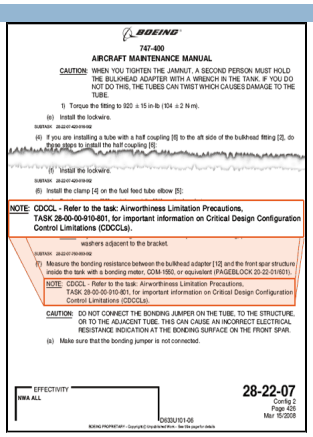
CDCCLs identify certain design configuration features that prevent a fuel tank ignition source during the operational life of an aircraft.

CDCCLs are statements that you will encounter in different maintenance documentation, including the AMM, and vendor and component manuals.

Whenever you see a CDCCL in any documentation, you must follow its instructions exactly.

Examples of tasks that include CDCCLs are:
- The bonding and grounding of fuel system components
- The routing of fuel system wiring
- The maintenance of the center wing sump pump drain valve

NOTE: CDCCLs affect all aircraft fleets.



BOEING

747-400

AIRCRAFT MAINTENANCE MANUAL

CAUTION: WHEN YOU TIGHTEN THE JAMNUT, A SECOND PERSON MUST HOLD THE BULKHEAD ADAPTER WITH A WRENCH IN THE TANK. IF YOU DO NOT DO THIS, THE TUBES CAN TWIST WHICH CAUSES DAMAGE TO THE TUBE.

1) Torque the fitting to 920 ± 15 in-lb (104 ± 2 N·m).

(e) Install the lockwire.

SUBTASK 28-22-07-420-019-002

(4) If you are installing a tube with a half coupling [6] to the aft side of the bulkhead fitting [2], do these steps to install the half coupling [6]:

(f) Install the lockwire.

SUBTASK 28-22-07-420-019-003

(5) Install the clamp [4] on the fuel feed tube elbow [5]:

NOTE: CDCCL - Refer to the task: Airworthiness Limitation Precautions, TASK 28-00-00-910-801, for important information on Critical Design Configuration Control Limitations (CDCCLs).

washers adjacent to the bracket.

SUBTASK 28-22-07-790-003-002

(f) Measure the bonding resistance between the bulkhead adapter [12] and the front spar structure inside the tank with a bonding meter, COM-1850, or equivalent (PAGEBLOCK 20-22-01/601).

NOTE: CDCCL - Refer to the task: Airworthiness Limitation Precautions, TASK 28-00-00-910-801, for important information on Critical Design Configuration Control Limitations (CDCCLs).

CAUTION: DO NOT CONNECT THE BONDING JUMPER ON THE TUBE, TO THE STRUCTURE, OR TO THE ADJACENT TUBE. THIS CAN CAUSE AN INCORRECT ELECTRICAL RESISTANCE INDICATION AT THE BONDING SURFACE ON THE FRONT SPAR.

(a) Make sure that the bonding jumper is not connected.

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SFAR 88 and Non-Routine Tasks

Fuel system maintenance and repair are typically non-routine tasks, so you will not receive a job card. However, while performing maintenance on the fuel system, you still need to comply with SFAR 88 requirements, which include following CDCCL procedures and treating the wiring in the area as a wiring system. **CDCCLs are unique and specific for each fleet type.**

Here are three instances where you must follow CDCCL procedures and SFAR 88 requirements when maintaining or repairing the fuel system:

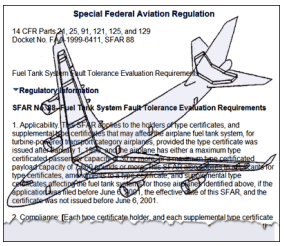
☐ Any time you access floor panels over the center wing tank on 747 and 757 aircraft, you must conduct a detailed inspection of the wire bundles routed over the center wing fuel tank

☐ Any time a fuel pump circuit breaker is tripped, you must:

- ◘ Follow the OEM troubleshooting procedures: these are located in the COM for when the aircraft is in the air, and the FIM or TSM for when the aircraft is on the ground
- ◘ Isolate and correct the fault that caused the circuit breaker to trip before resetting the circuit breaker

☐ Any time you perform maintenance on the Fuel Quantity Indicating System (FQIS) wire bundle in the unpressurized zone (outside of fuselage), you must inspect the connectors and conduct a Loop Resistance Test

IMPORTANT: If work is assigned, and subject to an SFAR 88 or a CDCCL procedure, the task must be followed and completed in its entirety in order for the task to be closed. For example, an MEL cannot be closed if the procedure includes a CDCCL requiring a loop resistance check. But, this check cannot be performed even though all other maintenance steps have been completed. (The MEL must remain as an open and active MEL, and deferred for later completion).



Special Federal Aviation Regulation

14 CFR Parts 21, 25, 91, 121, 125, and 129
Docket No. FAA-1999-6411; SFAR 88

Fuel Tank System Fault Tolerance Evaluation Requirements

Regulatory Information

SFAR No. 88—Fuel Tank System Fault Tolerance Evaluation Requirements

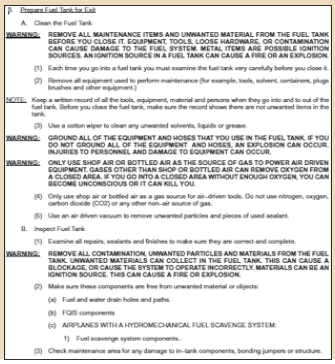
1. Applicability. This SFAR applies to the holders of type certificates, and supplemental type certificates that may affect the airplane fuel tank system, for turbine powered transport category airplanes, provided the type certificate was issued after January 1, 1958, and the airplane has either a maximum type certificated passenger capacity of 30 or more, or a maximum type certificated payload capacity of 7,500 pounds or more. This SFAR also applies to applicants for type certificates, amendments to a type certificate, and supplemental type certificates affecting the fuel tank system for those airplanes identified above, if the application was filed before June 6, 2001, the effective date of this SFAR, and the certificate was not issued before June 6, 2001.

2. Compliance. Each type certificate holder, and each supplemental type certificate

Additional Examples of SFAR 88 and Non-routine Tasks

The following pages contains additional examples of SFAR 88 and non-routine tasks where you must follow CDCCL procedures. SFAR 88 and CDCCL procedural requirements can be found in any fleet type or aircraft, these are just representative examples of what might be required.

Note: All work must be documented and reference the applicable manuals, for example: AMM, SRM and CMM.



Prepare Fuel Tank for Exit

A. Clean the Fuel Tank

WARNING: REMOVE ALL MAINTENANCE ITEMS AND UNWANTED MATERIAL FROM THE FUEL TANK BEFORE YOU CLOSE IT. EQUIPMENT, TOOLS, LOOSE HARDWARE, OR CONTAMINATION CAN CAUSE DAMAGE TO THE FUEL SYSTEM. METAL ITEMS ARE POSSIBLE IGNITION SOURCES. AN IGNITION SOURCE IN A FUEL TANK CAN CAUSE A FIRE OR AN EXPLOSION.

(1) Each time you go into a fuel tank you must examine the fuel tank very carefully before you close it.

(2) Remove all equipment used to perform maintenance (for example, tools, solvent, containers, plugs brushes and other equipment.)

NOTE: Keep a written record of all the tools, equipment, material and persons when they go into and to out of the fuel tank. Before you close the fuel tank, make sure the record shows there are not unwanted items in the tank.

(3) Use a cotton wiper to clean any unwanted solvents, liquids or grease.

WARNING: GROUND ALL OF THE EQUIPMENT AND HOSES THAT YOU USE IN THE FUEL TANK. IF YOU DO NOT GROUND ALL OF THE EQUIPMENT AND HOSES, AN EXPLOSION CAN OCCUR. INJURIES TO PERSONNEL AND DAMAGE TO EQUIPMENT CAN OCCUR.

WARNING: ONLY USE SHOP AIR OR BOTTLED AIR AS THE SOURCE OF GAS TO POWER AIR DRIVEN EQUIPMENT. GASES OTHER THAN SHOP OR BOTTLED AIR CAN REMOVE OXYGEN FROM A CLOSED AREA. IF YOU GO INTO A CLOSED AREA WITHOUT ENOUGH OXYGEN, YOU CAN BECOME UNCONSCIOUS OR IT CAN KILL YOU.

(4) Only use shop air or bottled air as a gas source for air–driven tools. Do not use nitrogen, oxygen, carbon dioxide (CO2) or any other non–air source of gas.

(5) Use an air driven vacuum to remove unwanted particles and pieces of used sealant.

B. Inspect Fuel Tank

(1) Examine all repairs, sealants and finishes to make sure they are correct and complete.

WARNING: REMOVE ALL CONTAMINATION, UNWANTED PARTICLES AND MATERIALS FROM THE FUEL TANK. UNWANTED MATERIALS CAN COLLECT IN THE FUEL TANK. THIS CAN CAUSE A BLOCKAGE, OR CAUSE THE SYSTEM TO OPERATE INCORRECTLY. MATERIALS CAN BE AN IGNITION SOURCE. THIS CAN CAUSE A FIRE OR EXPLOSION.

(2) Make sure these components are free from unwanted material or objects:

(a) Fuel and water drain holes and paths.

(b) FQIS components

(c) AIRPLANES WITH A HYDROMECHANICAL FUEL SCAVENGE SYSTEM:

1) Fuel scavenge system components.

(3) Check maintenance area for any damage to in–tank components, bonding jumpers or structure.

Example 1

DC9 fuel tank maintenance practices for preparing the fuel tank for exit, AMM 28-00-00 page 219, which requires multiple check point items upon closing the fuel tank.

(3) Connect electrical connector to pump. Tighten square nut to torque of 250 to 275 inch–pounds.

CAUTION: DO NOT DISTURB ROUND CONNECTOR NUT OR HEX HOSE NUT. KEEP PLUG AND RECEPTACLE DRY AND FREE OF CONTAMINATION. IF PLUG AND INSERTS BECOME WET WITH FUEL, CLEAN AND DRY IMMEDIATELY WITH SOFT, CLEAN COTTON CLOTH OR OTHER SUITABLE MEANS.

(a) Inspection of the pump connector torque must be witnessed by a second individual. If a second individual is not available, double check the torque and confirm by applying a torque stripe (integral fuel tank coating/DMS 1850–3A) to the connector every time a pump connector is installed.

1) Above step is a Critical Design Configuration Control Limitation (CDCCL) procedure. For important information on CDCCLs, see AMM 28–10–01/201, Airworthiness Limitation Precautions.

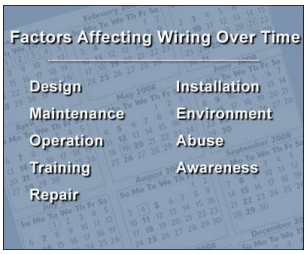
(4) Engage fingers of pump installation and removal tool with locking ring on pump (see Figure 202).

Example 2

DC9 fuel boost pump removal and replacement, AMM 28-20-07 page 202 paragraph B, requires a second set of eyes to witness the torque of the pump electrical connector

Topic 2: Electrical Wiring Interconnection System (EWIS)

- In this topic, you will learn:
  - The EWIS-related terms and regulations, including SFAR 88, Enhanced Zonal Analysis Program (EZAP) and Enhanced Airworthiness Program for Airline Systems (EAPAS)
  - The importance of regarding wiring as a system
- Aircraft wiring, especially those on aging aircraft, can be affected by many factors. Several are listed on the graphic on the left. The policies of EAPAS and EWIS require that you visually inspect the wiring in the area you are performing maintenance. This extra effort on your part helps ensure that aircraft wiring is in good working order to help ensure aircraft safety.



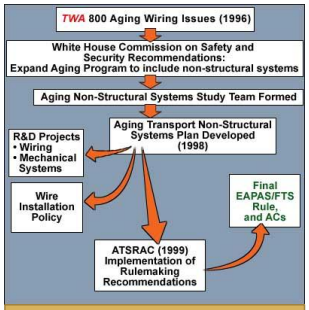
EAPAS, EWIS, and SFAR 88

The FAA's Enhanced Airworthiness Program for Airline Systems (EAPAS) is part of the aging aircraft initiative to enhance safety. EAPAS requires taking additional safety measures to protect Electrical Wiring and Interconnection Systems (EWIS).

The FAA defines EWIS as:
Any wire, wiring device, or combination of these, including termination devices, installed in the airplane for transmitting electrical energy between two or more termination points.
Also, the Special Federal Aircraft Regulation (SFAR) 88, regulates fuel system safety by minimizing fuel ignition sources. Because electrical components are present in the fuel pumping and fuel level indications system, it overlaps with EAPAS.
EAPAS, EWIS and EZAP affect how you do your work by requiring you to:

- Regard wiring as a system (not as a component)
- Visually inspect the area around the wiring system before performing maintenance
- Clean as you go during any aircraft maintenance

EAPAS also requires engineers to conduct an Enhanced Zonal Analysis Program (EZAP) analysis to determine how wiring systems might be affected due to maintenance in the area. Engineers use these analyses to create work cards.



This diagram illustrates how the FAA's wiring safety programs came into existence.

Topic 3: Clean As You Go

In this topic, you will learn about the importance of the clean as you go philosophy.

The **clean as you go philosophy** is part of the EWIS program. Cleaning the work area before, during and after maintenance is another way to help protect wiring systems, especially those on aging aircraft. In addition to visually inspecting the wiring system for possible wear and/or contamination, you are also responsible for making sure that a wiring system does not become contaminated while performing maintenance.

The clean as you go philosophy requires you to:

1. Conduct a general visual inspection of the area to determine what possible contaminants could come in contact with the wiring system during maintenance.
2. Protect the wiring system by covering it with a plastic sheet, cloth or other protective covering before performing maintenance in the area.
3. Clean the area of any debris, liquids, metal shavings and filings, etc. using a vacuum or brush after completing maintenance.
4. Remove the cover from the wiring system.
5. Reclean the area.

The EWIS System Program is a cultural change that demands that extra measures are taken so that the maintenance area remains in a clean state to protect aging systems.

Fuel Tank Safety Training - AD Mandated Training Summary

In this course you reviewed:

- The importance of following CDCCLs exactly as they read in any maintenance documentation, including those that are associated with non-routine tasks
- The EWIS-related terms and regulations, including SFAR 88, Enhanced Zonal Analysis Program (EZAP), Enhanced Airworthiness Program for Airline Systems (EAPAS)
- The need for a General Visual Inspection (GVI) of the wiring system and the area around it
- The importance of regarding wiring as a system
- The **clean as you go philosophy** intends to protect wiring systems while maintenance is performed
- The SFAR-88 and CDCCL programs went into effect Dec 16, 2008 and must be followed from that date forward