



# 412<sup>th</sup> Test Wing



*War-Winning Capabilities ... On Time, On Cost*



**U.S. AIR FORCE**

## AFTC and Airworthiness Process Changes

**13 May 2015**

**Wayne Hale  
412 TENG/ENI  
661.275.4461**

**Approved for public release; distribution is unlimited.  
412TW-PA-14184**

*Integrity - Service - Excellence*



# Overview



- Introduction
- What is MIL-HDBK-516C, *Airworthiness Certification Criteria*
- Processes
- What Has Changed
- New Forms
  - *T-2 Modification Airworthiness Impact Determination and Preliminary Hazard Analysis*
  - *T-2 Modification Airworthiness Compliance*
  - *Military Flight Release*
- This should give a high level view to set up a risk and airworthiness assessment exercise



# Introduction



- **2010, the Air Force mandated Independent Airworthiness (IAW) assessment program.**
  - **AFI 62-601, *USAF Airworthiness***
  - **Based on MIL-HDBK-516C**
- **IAW requires all aircraft go through a rigorous independent assessment prior to the aircraft released for first flight.**
- **IAW program requires aircraft modifications go through a similar assessment.**
  - **T-2 Mod process now includes a more robust design and review process using MIL-HDBK-516C.**



# MIL-HDBK-516C 12 December 2014



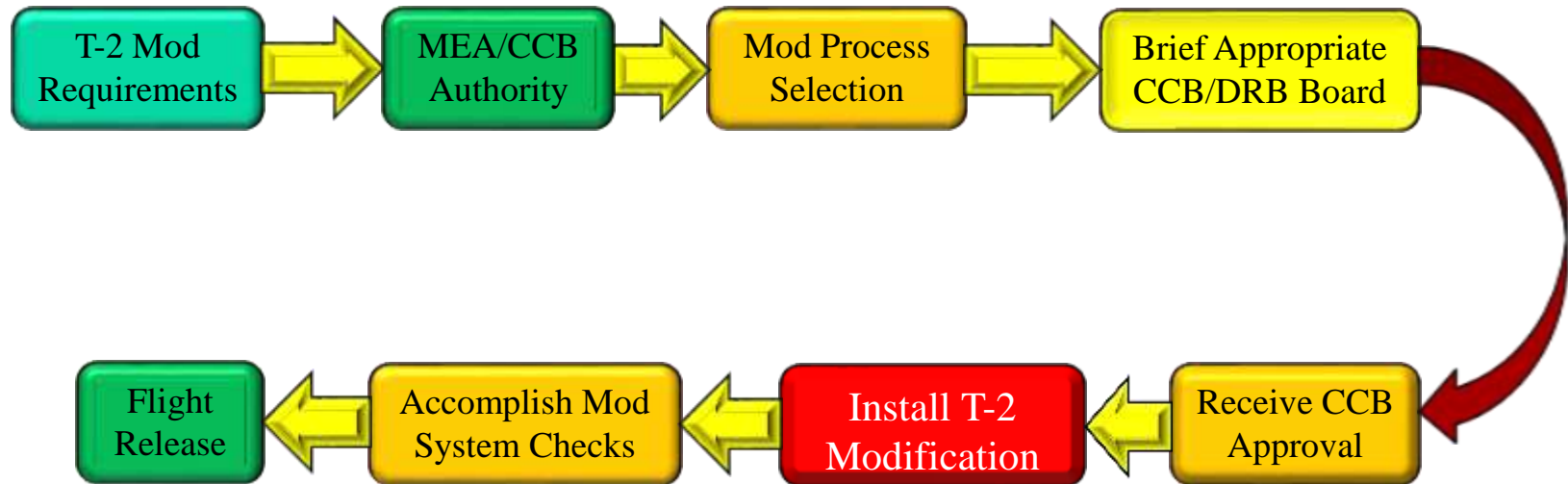
- **Required per AFI 62-601**
- **Based on MIL-HDBK-516C**
  - **Arranged by aircraft subsystems**
  - **Used to Determine Airworthiness Criteria**
    - **Tailored Airworthiness Certification Criteria**
    - **Modification Airworthiness Certification Criteria**
  - **References DoD Specifications and Standards**
  - **References NATO and FAA Documents**
  - **References other Non-Government Publications**
- **Represents System Engineering Approach**



# Current T-2 Mod Process



- Previous T-2 Mod Process per Operating Instructions



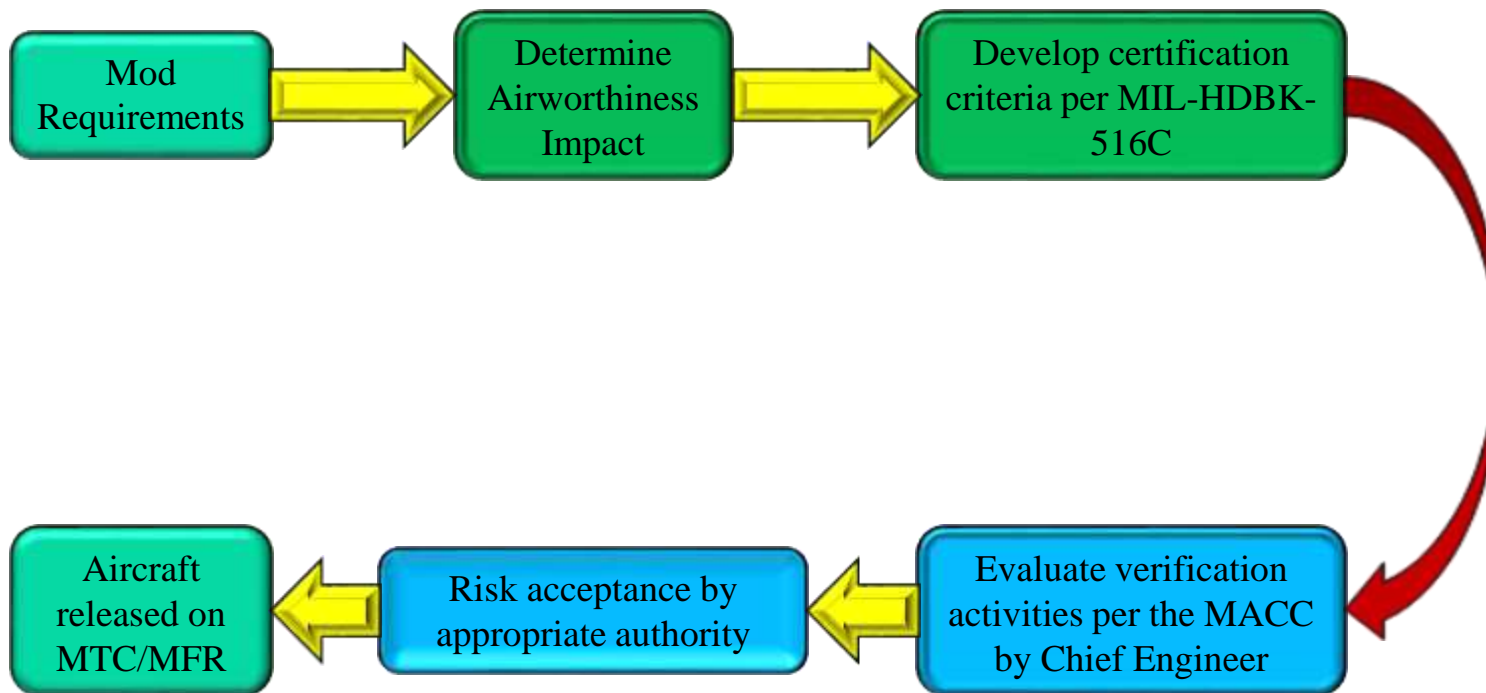
Modification Engineering Authority/MEA  
Configuration Control Board/CCB  
Design Review Board/DRB



# Airworthiness Process



- Airworthiness process per AFI 62-601



Modification Airworthiness Compliance Criteria/MACC  
Military Type Certificate/MTC  
Military Flight Release/MFR



# How to Integrate Processes



- **Generated many questions**
  - How do we integrate?
  - Where do we integrate?
  - Will processes change?
  - Will responsibilities change or grow?
  - Will this add to schedule?





# Integrating Processes



## Old Terminology



- **Major**
  - High Degree of Technical Uncertainty
  - Affects one or more areas
- **Minor**
  - All other modifications



## New Terminology

- **Reportable**
  - Impact to AW
  - High Risk/TAA Approval
- **Nonreportable**
  - Impact to AW
  - Lower Risk/Local Approval
- **No Impact to Airworthiness**
  - Low Risk/Compliant with MIL-HDBK-516C Standards





# Integrating Processes



- **Required Many Meetings with Subject Matter Experts (SME)**
  - AFLCMC
  - AFTC
  - SMEs from 412 TW and 96 TW
    - Engineering
    - Mod/Configuration Management
    - SEEK EAGLE

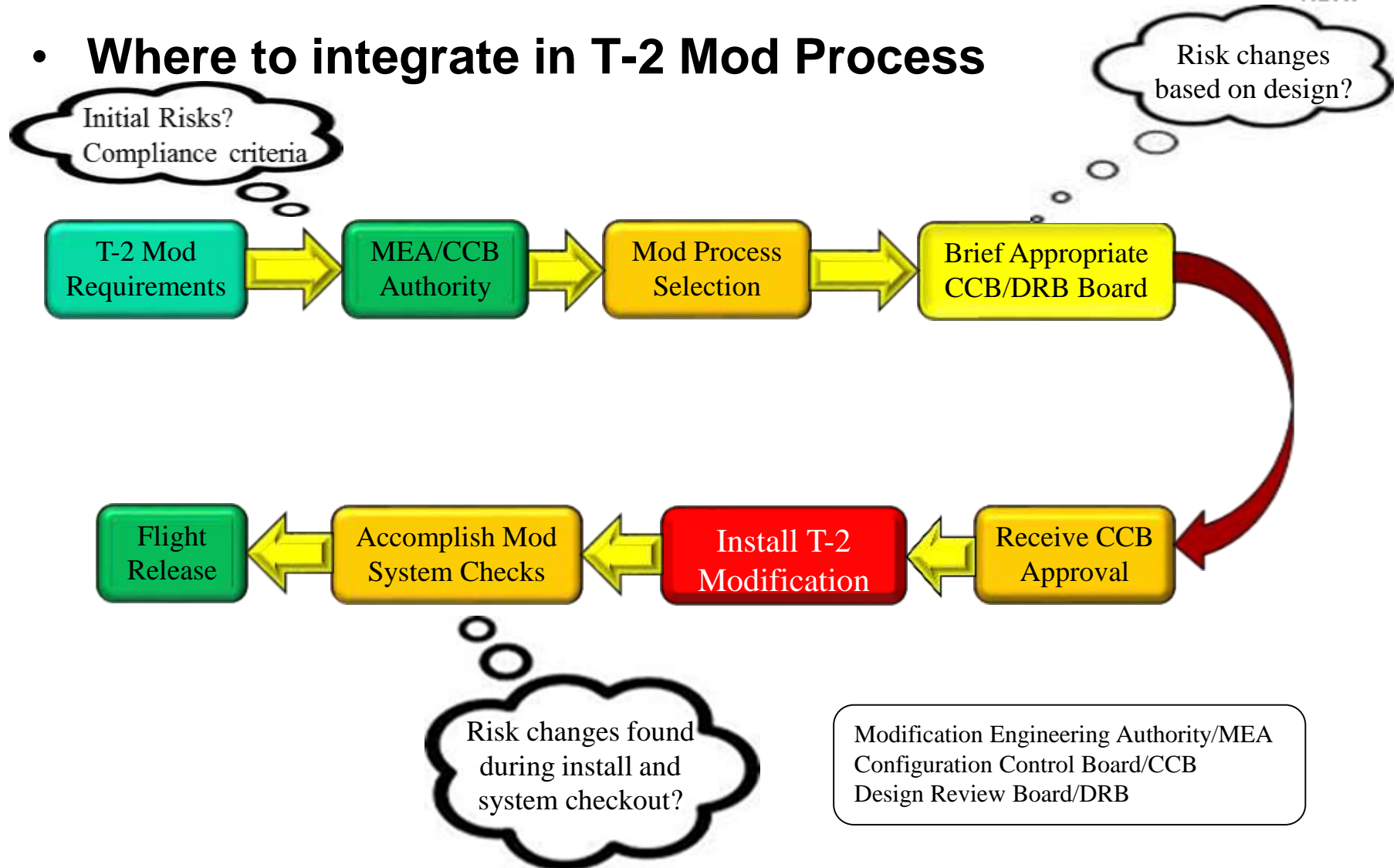




# Current T-2 Mod Process



- Where to integrate in T-2 Mod Process

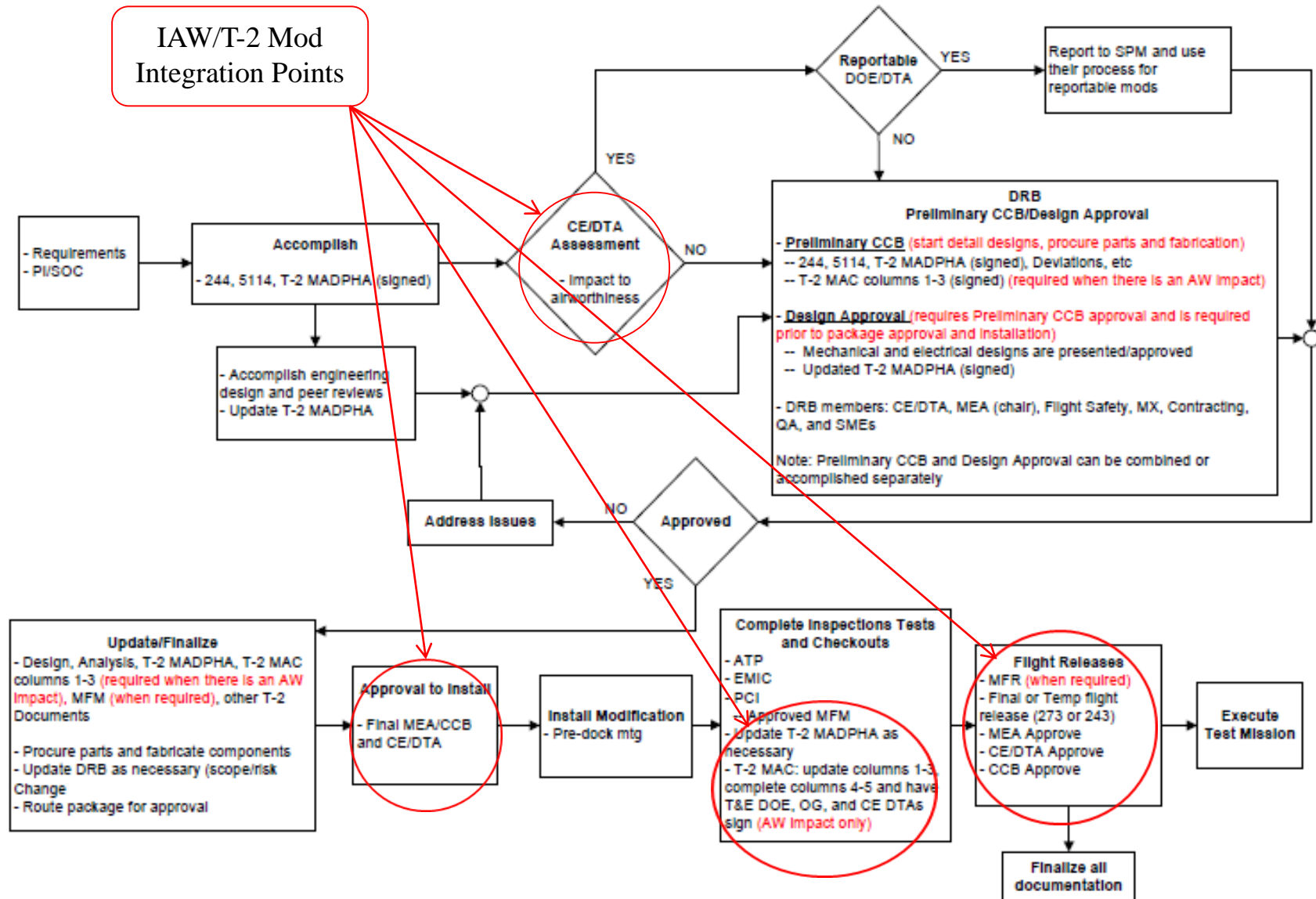




# Updated T-2 Mod Process



412TW





# What Has Changed



- **SME's Recommendations**
  - Update Preliminary Hazards
  - Incorporate AW Determination
  - Show Compliance Within MIL-HDBK-516C
- **Implementation**
  - Preliminary Hazards now accomplished by
    - ***AFTC Form 6238 Modification Airworthiness Impact Determination and Preliminary Hazard Analysis***



# What Has Changed



- **Make Initial Airworthiness Impact Assessment**
  - **AFTC Form 6238 T-2 *Modification Airworthiness Impact Determination and Preliminary Hazard Analysis***



# What Has Changed



412TW

## T-2 MODIFICATION AIRWORTHINESS DETERMINATION AND PRELIMINARY HAZARDS ANALYSIS

MDS: SERIAL NUMBER: MOD NUMBER: DATE:

**INSTRUCTIONS:** Answer the questions and determine AW impact. Hazards checked Yes (Y) in the Applicable column (APP) must also be checked Yes (Y) or No (N) in the Compliance (COMP) column indicating compliance with MIL-HDBK-516C criteria, or as approved by the MEA and CE/DTA. Use the back to expand/explain.

YES	NO	<b>Airworthiness impact questions:</b> <i>A positive response is a good indicator of an AW impact (but is not the final decision)</i> 1) Is re-accomplishment of verification activities required to show compliance to the baseline certification basis? 2) Have any existing safety hazards been impacted or have new safety hazards been identified? 3) Are any safety/flight-critical items, logic and/or functions impacted? 4) Is formal flight test to validate the mod required? 5) Does the operational usage change? 6) Does the flight envelope change? 7) Does the service life change? 8) Other	AIRWORTHINESS IMPACT	
			<input type="checkbox"/> YES	<input type="checkbox"/> NO

Y/N		MIL-HDBK-516C SECTION	Y/N		MIL-HDBK-516C SECTION
APP	COMP		APP	COMP	
		4 - SYSTEMS ENGINEERING			12 - ELECTRICAL SYSTEM
		5 - STRUCTURES			13 - ELECTROMAGNETIC ENVIRONMENTAL EFFECTS (E <sup>3</sup> )
		6 - FLIGHT TECHNOLOGY			14 - SYSTEM SAFETY
		7 - PROPULSION AND PROPULSION INSTALLATIONS			15 - COMPUTER SYSTEMS AND SOFTWARE
		8 - AIR VEHICLE SUBSYSTEMS			16 - MAINTENANCE
		9 - CREW SYSTEMS			17 - ARMAMENT
		10 - DIAGNOSTIC SYSTEMS			18 - PASSENGER SAFETY
		11 - AVIONICS			20 - AIR TRANSPORTABILITY, AIRDROP, MISSION/TEST EQUIPMENT AND CARGO/PAYLOAD SAFETY

**HAZARD AND COMPLIANCE SUMMARIES** (See reverse for summary format)



# What Has Changed



412TW

RECOMMENDATIONS:

SAFETY REVIEW BOARD REQUIRED

SAFETY REVIEW BOARD IS NOT REQUIRED

FLIGHT TEST REQUIRED

FLIGHT TEST IS NOT REQUIRED

NAME, GRADE, AND OFFICE SYMBOL OF MEA

SIGNATURE

DATE

NAME, GRADE, AND OFFICE SYMBOL OF CE/DTA

SIGNATURE

DATE



# What Has Changed



- **T-2 Mods Assessed as Impact to Airworthiness**
  - *Modification Airworthiness Impact Determination and Preliminary Hazard Analysis (AFTC Form 6238)*
- **Determine as Reportable or Nonreportable**
  - *T-2 Modification Airworthiness Compliance (AFTC Form 6239)*
- **T-2 Mods Assessed as Reportable**
  - **Use same forms and return to SPM Chief Engineer and use SPM/Platform process**





# What Has Changed



412TW

## T-2 MODIFICATION AIRWORTHINESS COMPLIANCE

T-2 MODIFICATION NUMBER (ARTIFACT LOCATION)

INSTRUCTIONS: Complete columns 1-3 for affected criteria when a T-2 mod is determined to impact airworthiness. Assign an overall AWHI value to determine reportability. This is the Cert Basis and must be approved/signed by the CE/DOE DTAs. After analyses and tests are accomplished, complete columns 4-5, update the overall AWHI and reportability assessment as necessary. OG accepts/signs for operational risk. This becomes the Compliance Report and must be approved/signed by the CE/DOE DTAs.

Impacted MIL-HDBK-516C Sections	Criteria (specific para #)	Required Analyses/Tests (Include document number when applicable)	Compliance (Y/N-Residual AWHI)	Hazard Summary/Mitigations
<b>4 - Systems Engineering</b> 4.1 <input type="checkbox"/> Design criteria 4.2 <input type="checkbox"/> Tools and databases 4.3 <input type="checkbox"/> Materials selection 4.4 <input type="checkbox"/> Manufacturing and quality 4.5 <input type="checkbox"/> Op. & maint. manuals/TOs 4.6 <input type="checkbox"/> Configuration Management				
<b>5 - Structures</b> 5.1 <input type="checkbox"/> Loads 5.2 <input type="checkbox"/> Structural dynamics 5.3 <input type="checkbox"/> Strength 5.4 <input type="checkbox"/> Damage tolerance and durability (fatigue) 5.5 <input type="checkbox"/> Mass properties 5.6 <input type="checkbox"/> Flight release				
<b>6 - Flight Technology</b> 6.1 <input type="checkbox"/> Flying Qualities 6.2 <input type="checkbox"/> Vehicle Control Functions (VCF) 6.3 <input type="checkbox"/> Air vehicle aerodynamics and performance				
<b>7 - Propulsion</b> 7.1 <input type="checkbox"/> Propulsion risk management 7.2 <input type="checkbox"/> Gas turbine engine applications 7.3 <input type="checkbox"/> Alternate propulsion systems				
<b>8 - Air Vehicle Subsystems</b> 8.1 <input type="checkbox"/> Hydraulic systems				



# What Has Changed



## Reportability Determination/Certification Basis Approval (columns 1-3)

NAME, GRADE, AND OFFICE SYMBOL OF CE/DTA	REPORTABLE: Y/N	DATE	SIGNATURE
NAME, GRADE, AND OFFICE SYMBOL OF DOE/DTA	REPORTABLE: Y/N	DATE	SIGNATURE

## Aircraft Operation Risk Acceptance (For AWHI of 18-20 Squadron CC or equivalent signs, for AWHI of 10-17 Group CC or equivalent signs)

NAME, GRADE, AND OFFICE SYMBOL OF OG	ACCEPT RISK Y/N	DATE	SIGNATURE
--------------------------------------	--------------------	------	-----------

## Compliance Report Approval (columns 4-5)

NAME, GRADE, AND OFFICE SYMBOL OF CE/DTA	DATE	SIGNATURE
NAME, GRADE, AND OFFICE SYMBOL OF DOE/DTA	DATE	SIGNATURE



# What Has Changed



## Overall Airworthiness Hazard Index (AWHI)

The overall modification AWHI is typically the worst of all the sections, however, as several hazards are combined, the resultant overall AWHI could be more extreme due to the interaction between system/subsystem updates as described in AWB-007.

HAZARD CATEGORIZATION		SEVERITY*			
		CATASTROPHIC (1)	CRITICAL (2)	MARGINAL (3)	NEGLIGIBLE (4)
F R E Q U E N C Y	FREQUENT (A) = or > 100/100K ft hrs	1	3	7	13
	PROBABLE (B) 10-99/100K ft hrs	2	5	9	16
	OCCASIONAL (C) 1.0-9.9/100K ft hrs	4	6	11	18
	REMOTE (D) 0.01-0.99/100K ft hrs	8	10	14	19
	IMPROBABLE (E) = or < 0.01/100K ft hrs	12	15	17	20

\*Severity is the worst credible consequence of a hazard in terms of degree of injury, property damage or effect on mission defined below:

- (1) **Catastrophic:** Class A (damage > \$2M / fatality / permanent total disability / loss of Aircraft)
- (2) **Critical:** Class B (\$500K < damage < \$2M / permanent partial disability / hospitalization of 5 or more personnel)
- (3) **Marginal:** Class C (\$50K < damage < \$500K / injury results in 1 or more lost workdays)
- (4) **Negligible:** All other injury/damage less than Class C

(Table Adapted from MIL-STD-882D Table A-I thru Table A-IV)

(For T-2 Modifications, "FREQUENCY" is evaluated for the duration of use within the 100K ft hr aircraft life span)



# What Has Changed



- **Military Flight Release**

- Use for Impact to Airworthiness T-2 Mods



- **No Impact to Airworthiness**



- Still use AFMC Forms

- AFMC Form 272 Physical Configuration Inspection (PCI)
- AFMC Form 243 Temporary Release for Flight (TFR)
- AFMC Form 273 Final Release for Flight (FFR)





# Questions





## **Risk and Airworthiness**

## **Assessment Exercise**