



# Naval Unmanned Aircraft Systems Airworthiness

**Pete Heasley**  
(301) 757-2415  
peter.heasley@navy.mil

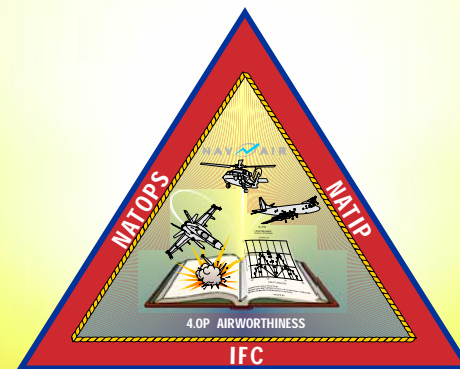
*Presented to:*

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NAV  AIR

# USN/USMC Airworthiness Office Mission



**The Navy's Airworthiness Office (AIR-4.0P) is responsible for the independent engineering assessment of all aircraft (manned and unmanned) and airborne weapon systems to ensure these air vehicles can be operated safely within defined operating limits.**

# Origin of NAVAIR Flight Clearance Authority

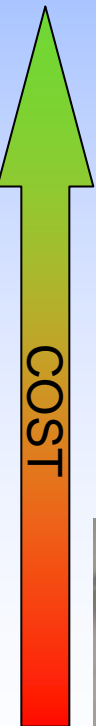


- U.S.C. Title X, Chapter 503, Section 5013, Secretary of the Navy
- SECNAVINST 5400.15B
- CNO has delegated the authority to COMNAVAIRSYSCOM (AIR-00) to issue flight clearances for all Navy/Marine Corps Manned and Unmanned aircraft via the following:
  - For NATOPS: IAW OPNAVINST 3710.7T
  - For NATIP/TACMAN: IAW OPNAVINST 3510.15
  - For Interim Flight Clearances (IFC): IAW 3710.7T
- These Flight Clearances are issued IAW NAVAIRINST 13034.1C



# The Wide Spectrum of Navy UAS Interim Flight Clearances Issued

- Since 2004, Over 240 UAS IFCs issued
- Currently supporting 24 Platforms (examples below)
- No reported flight-related injuries or damage to non-program property



COST



RQ-7 Shadow



Not to scale



WEIGHT

# USN/USMC Flight Clearances for UAS

- In general, a flight clearance is required for any Navy/USMC-owned or Navy/USMC-leased UAS or aerial target IAW OPNAVINST 3710.7T
- UAS IFCs broken down into two major categories (**Standard Airworthiness IFC** and **Safety of Flight IFC**).
- Engineering requirements are tailored based on system complexity, desired usage, expendability, etc. External mitigations (e.g., airspace restrictions) are typically added to the IFC to alleviate/limit risk to third parties
- Not all UAS have to be airworthy, **but all must be safe for flight!** (expendable UA may not have to be airworthy to same threshold commonly associated with non-expendable UAS or manned aircraft)
- If probability of loss is in line with **expendability** of the UAS, and the level of risk associated with personnel, property, equipment, and environment has been identified and accepted by appropriate authorities, a “safety of flight” (SOF) IFC can be granted



# Definition: Airworthiness



B-17

**The property of an air system configuration to:  
safely attain, sustain and terminate flight**

**IAW approved usage limits.**

*Usage limits include: flight limits, fatigue life, maintenance, etc.*

# Definition: Safety of Flight



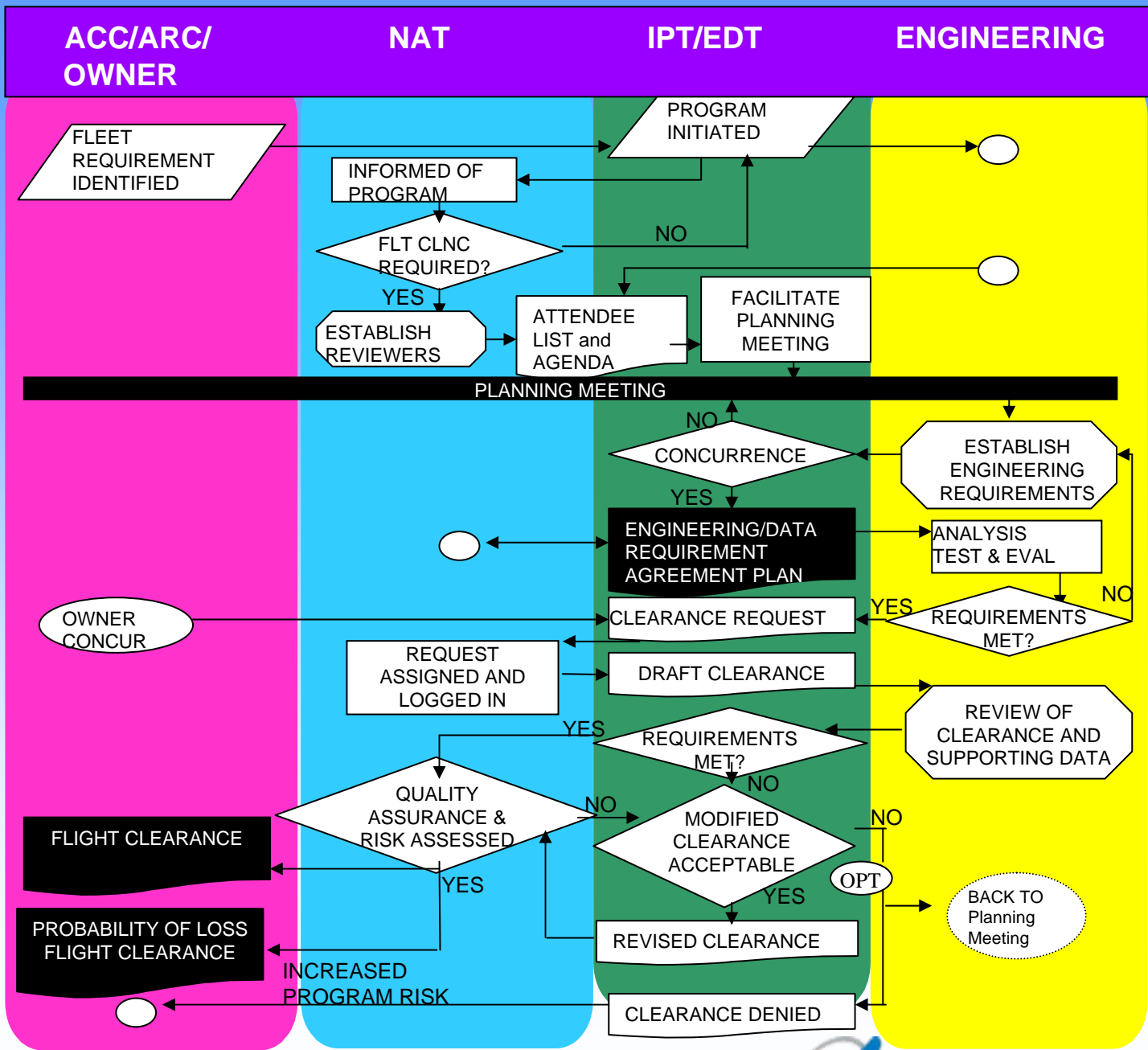
The property of an air system configuration to safely attain, sustain and terminate flight within:

**Prescribed and accepted limits for injury/death to personnel and damage to equipment, property and/or environment.**

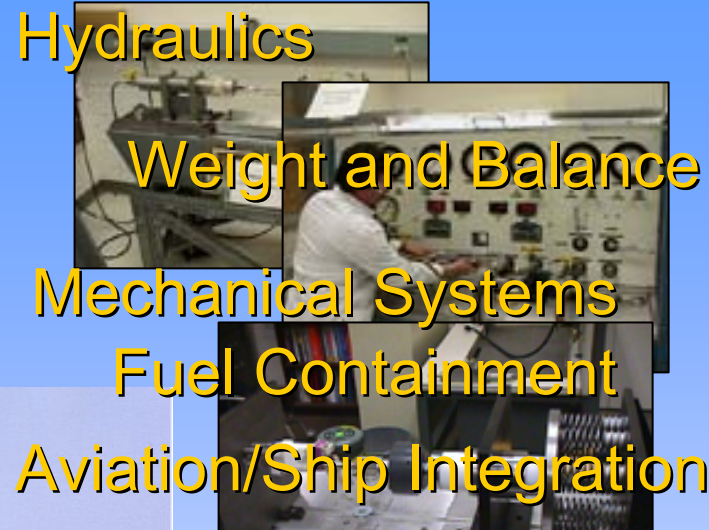
Safety of Flight identifies risks associated with use of aircraft systems and are normally identified by a Hazard Risk Analyses. These risks can be conveyed by **NOTES**, **CAUTIONS** and/or **WARNINGS**.

# The Navy Flight Clearance Process

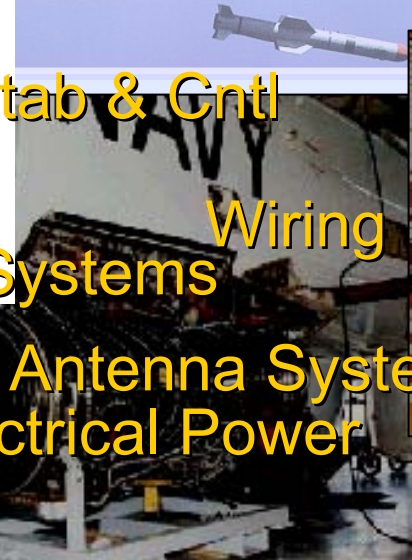
NAVAIRINST  
13034.1C







# Navy Systems Engineering Review



# Example E/DRAP Database

Microsoft Excel - FireScout\_EDRAP\_v5\_2 [Read-Only]

File Edit View Insert Format Tools Data Window Help Adobe PDF

Type a question for help

Arial 10 B I U

Q25

	A	B	C	D	G	H	L	M	N	O	P	Q	
	EDRAP Item No.	MIL HDBK 516A Section No.	MIL-HDBK-516A Section Title	Certification Criteria	Navy POC	Cont IPT Lead	Artifact Classification	Identified Artifacts	Quantity of Identified Artifacts	Submitted Artifacts	Quantity of Submitted Artifacts	Remarks	Flag
1	1276a	8.5.12.4	Air Vehicle Subsystems, Ground Handling	Verify emergency towing capability of the air vehicle to the maximum weight and load requirements.	Barry Walden	Mike Mann	Test Report	393-1100-003, Model 393 Structural Design Criteria DRB 393-1100-010, Tow Fitting Loads 393-1100-041, Static Test Plan	3	393-1100-003, Model 393 Structural Design Criteria DRB 393-1100-010, Tow Fitting Loads 393-1100-041, Static Test Plan	3		Group
21	1277	8.5.12.5	Air Vehicle Subsystems, Ground Handling	Verify that all mooring requirements have been met for all mission weights and environmental conditions, and that these requirements address the defined standard arrangements and interface for mooring to ensure safety.	Barry Walden	Mike Mann	Test Report	393-1100-003, Model 393 Structural Design Criteria DRB 393-1100-010, Tow Fitting Loads 393-1100-041, Static Test Plan 393-1100-041, VTUAV Static Test Plan	4	393-1100-003, Model 393 Structural Design Criteria DRB 393-1100-010, Tow Fitting Loads 393-1100-041, Static Test Plan 393-1100-041, VTUAV Static Test Plan	4		First
22	1277a	8.5.12.5	Air Vehicle Subsystems, Ground Handling	Verify that all mooring requirements have been met for all mission weights and environmental conditions, and that these requirements address the defined standard arrangements and interface for mooring to ensure safety.	Barry Walden	Mike Mann	Test Report	393-1100-003, Model 393 Structural Design Criteria DRB 393-1100-010, Tow Fitting Loads 393-1100-041, Static Test Plan	3	393-1100-003, Model 393 Structural Design Criteria DRB 393-1100-010, Tow Fitting Loads 393-1100-041, Static Test Plan	3		Group
23	1278	8.5.12.8	Air Vehicle Subsystems, Ground Handling	Verify that the air vehicle will not turnover for all mission side loads conditions. All taxi and turn conditions at all gross weights should be covered for all possible struttire conditions and for adversely sloped taxiways and runways.	Barry Walden	Mike Mann	Test Report	393-1100-014, Static Tipover Stability	1	393-1100-014, Static Tipover Stability	1		Group
24	1279a	8.5.12.10	Air Vehicle Subsystems, Ground Handling	Verify that the landing gear systems are compatible with air vehicle structure, weight and balance, and any other systems that interface with the system.	Barry Walden	Mike Mann	Test Report	393-1100-003, Model 393 Structural Design Criteria DRB SA-40B-07-01, Landing Gear Drop Test Proposal	2	393-1100-003, Model 393 Structural Design Criteria DRB SA-40B-07-01, Landing Gear Drop Test Proposal	2		Group
25	1279	8.5.12.10	Air Vehicle Subsystems, Ground Handling	Verify that the landing gear systems are compatible with air vehicle structure, weight and balance, and any other systems that interface with the system.				Criteria DRB SA-40B-07-01, Landing Gear Drop Test Proposal SA-40B-07-02, Landing Gear Drop Test Report SA-40B-03-02, Landing Gear Structural Substantiation 393-1100-041, VTUAV Static Test Plan		Design Criteria DRB SA-40B-07-01, Landing Gear Drop Test Proposal SA-40B-07-02, Landing Gear Drop Test Report SA-40B-03-02, Landing Gear Structural Substantiation 393-1100-041, VTUAV Static Test Plan			

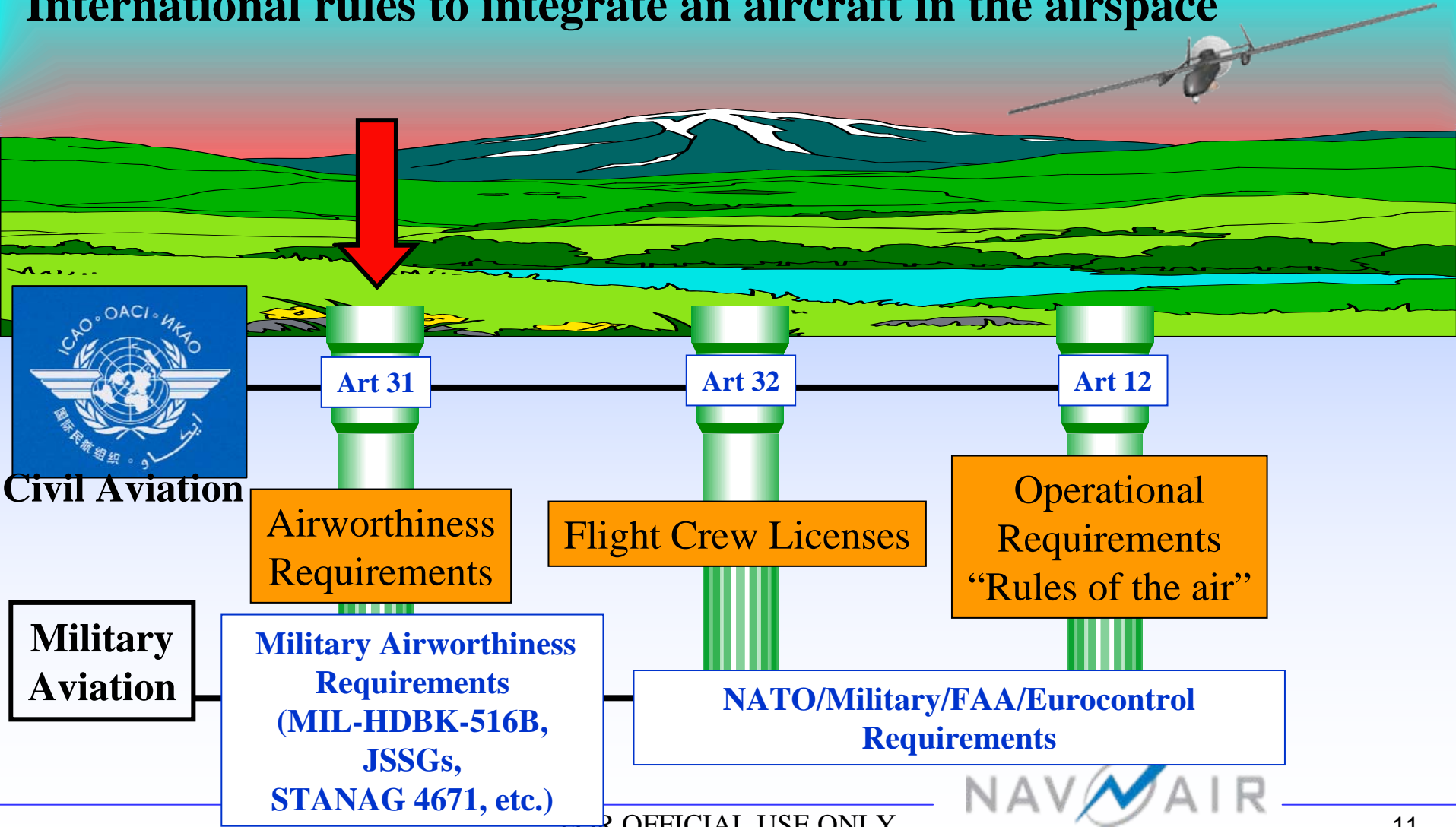
Spreadsheet for each chapter in MIL-HDBK-516 associated with the requirements for each engineering discipline

4.0 Systems Engineering / 5.0 Structures / 6.0 Flight Technology / 7.0 Propulsion / 8.0 Air Vehicle Subsystems / 9.0 Crew Systems / 10.0 Diagnostic System / 11.0 Avionics / 12.0 Electrical / 13.0 EMI

# STANAG 4671 – UAS Airworthiness Design Standards

A critical part of the Airspace Integration picture

## International rules to integrate an aircraft in the airspace



# What Is STANAG 4671?

- Airworthiness Code intended for Fixed-Wing UAVs between 330 lbs and 44,000 lbs
- Based on CS-23 Civil Airworthiness Standard
  - Adds content for UAV-unique components (e.g, C2 datalink)
- Sets minimum airworthiness requirements for UAV Systems for operation outside of segregated airspace
- Recently ratified by the U.S.
  - Awaiting remainder of NATO nations to provide their ratification “status” before promulgation.
- Key standards component of MIL-HDBK-516 tailoring for UAV Systems

MIL-HDBK-516B

STANAG 4671



# Linking DOD Airworthiness Processes

(Improving how the DoD services work together)

## USN

NAVAIRINST 13034.1C Flight Clearance  
Policy for Air Vehicles and Aircraft  
Systems

## USAF

AFPD 62-6 USAF Aircraft  
Airworthiness  
Certification

## USA

AR 70-62  
Airworthiness Qual of  
U.S. Army Aircraft  
Systems

**MIL-HDBK-516B**  
**Airworthiness**  
**Certification**  
**Criteria 26 Sep 05**  
**and**  
**Joint Service MOA**  
**5 Feb 2007**