U.S. AIR FORCE

Fundamentals of USAF Airworthiness Process

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USAF AW PROCESS ASSUMPTIONS

- **USAF Airworthiness Process has hidden assumptions:**
  - **USAF owns or has possession of FMS aircraft**
  - **Aircraft Program Office (and Engineering Team) exists and is responsible for executing the Airworthiness Process**
  - **The Aircraft Program Office is the repository of prior Airworthiness Artifacts**
  - **The Technical Airworthiness Authority (TAA) provides an independent airworthiness assessment/approval.**
  - **The TAA does not design or test aircraft modifications.**

Program Elements

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Civil Operations		USAF Operations
Maint Manual	→	TO 00-5-1
A.I.P. (Insp Prog)	→	TO 00-20-1
Organization (Org Chart)	→	AFI 38-101 (Org Chart)
Training (Mx & Ops)	→	AFI 36-2201
Mx Scheduling	→	TO 00-20-1
Mx Recording & Record Keeping	→	TO 00-20-2

Assumes Industry Infrastructure

Assumes USAF Infrastructure

“It’s a Small World After All “

Agenda

- Key Terms and Definitions
- Airworthiness Policy
- Airworthiness Process Overview
  - Airworthiness Planning / Airworthiness Determination Form
  - Certification Basis
  - Compliance Review
  - Risk Acceptance
  - Flight Authorization
- Summary
- Questions
- Lisa's Final Observations

Key Airworthiness Terms and Definitions

(Reference: DoDD 5030.61, DOD Airworthiness Policy)

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- **Airworthiness - The property of an air system configuration to safely attain, sustain, and complete flight in accordance with approved usage limits**
- **Airworthiness Assessment - A technical evaluation of data against specific airworthiness criteria and determination of residual risk**
- **Airworthiness Approval**
  - **Documents issued by an empowered airworthiness authority that affirm:**
    - **Appropriate tenets of the airworthiness process are met**
    - **Aircraft/air system was assessed against required airworthiness standards**
    - **Residual risk to aircrew, ground crew, passengers, or to other third parties has been accepted by the appropriate authority**
  - **USAF Flight Authorization = Airworthiness Approval:**
    Military Type Certificate (MTC) or Military Flight Release (MFR)

All Airworthiness Authorities (DoD, FAA, Foreign Civil & Military) have different terms and definitions, but the concept is the same

Airworthiness Policy Structure

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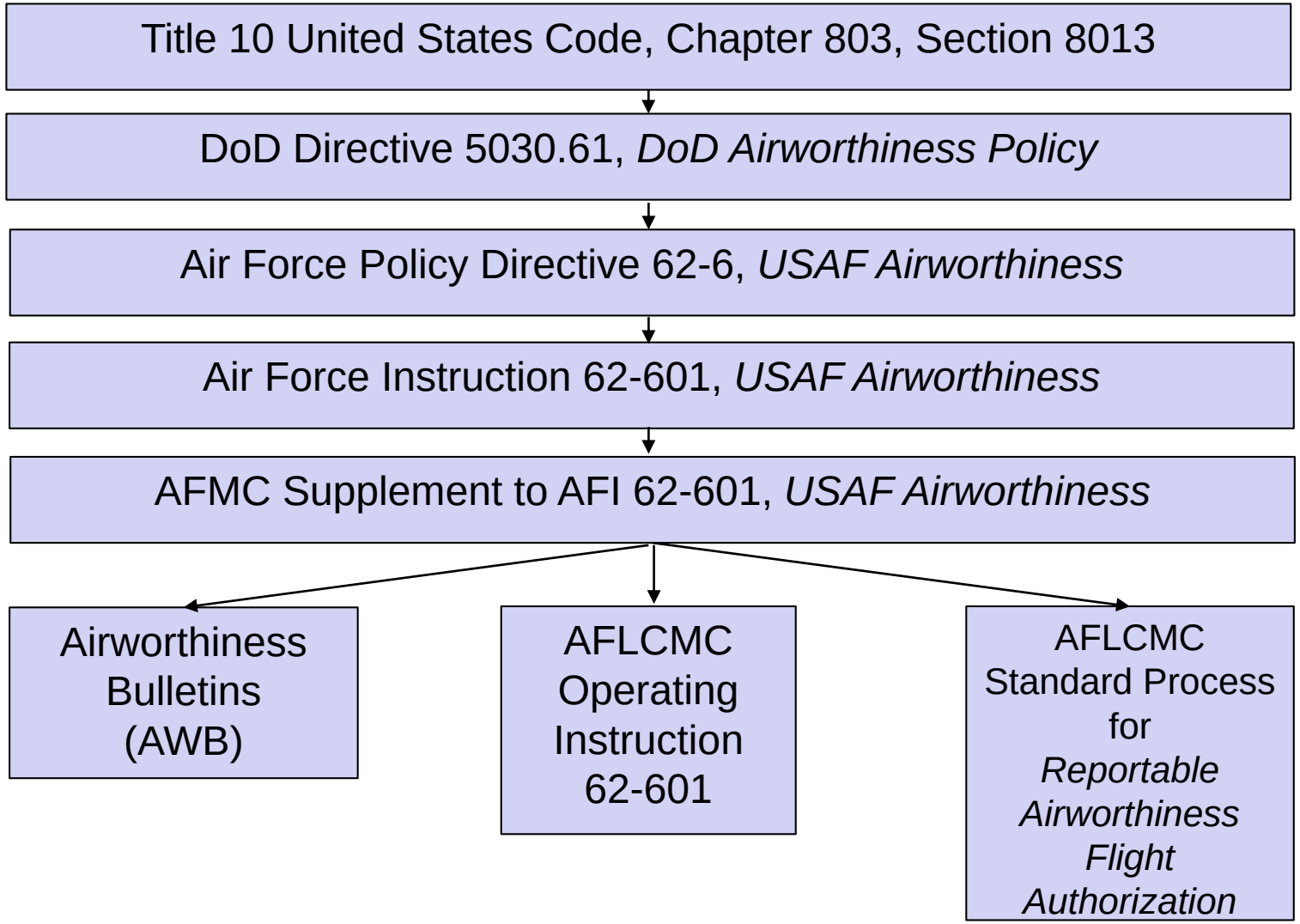

Key Airworthiness Activities

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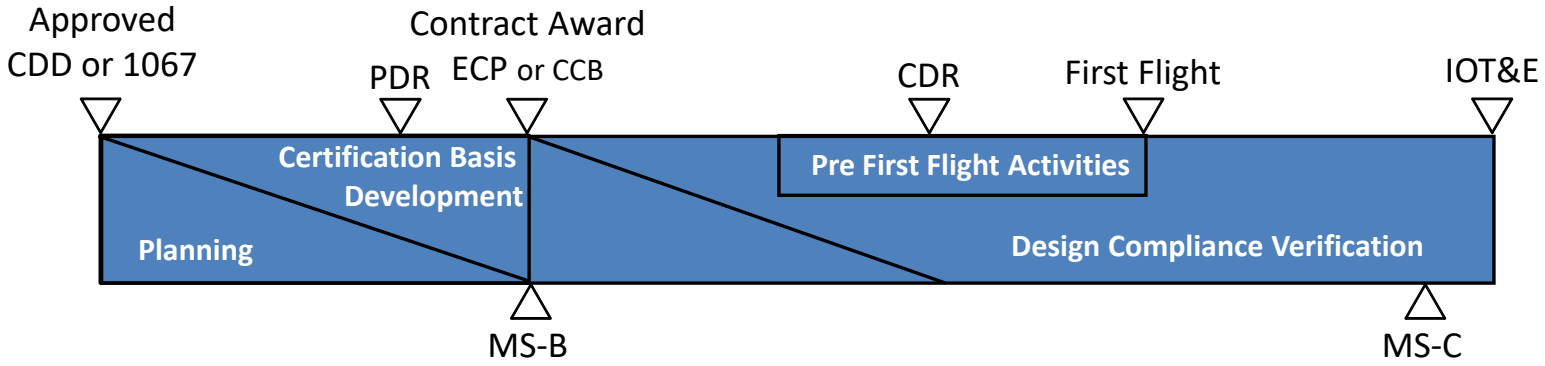

- **Overlay Airworthiness Certification**
- **Key Activities:**
  - **Airworthiness Planning**
  - **Certification Basis Development**
  - **First Flight**
  - **Design Compliance Verification**

USAF Airworthiness Data Package

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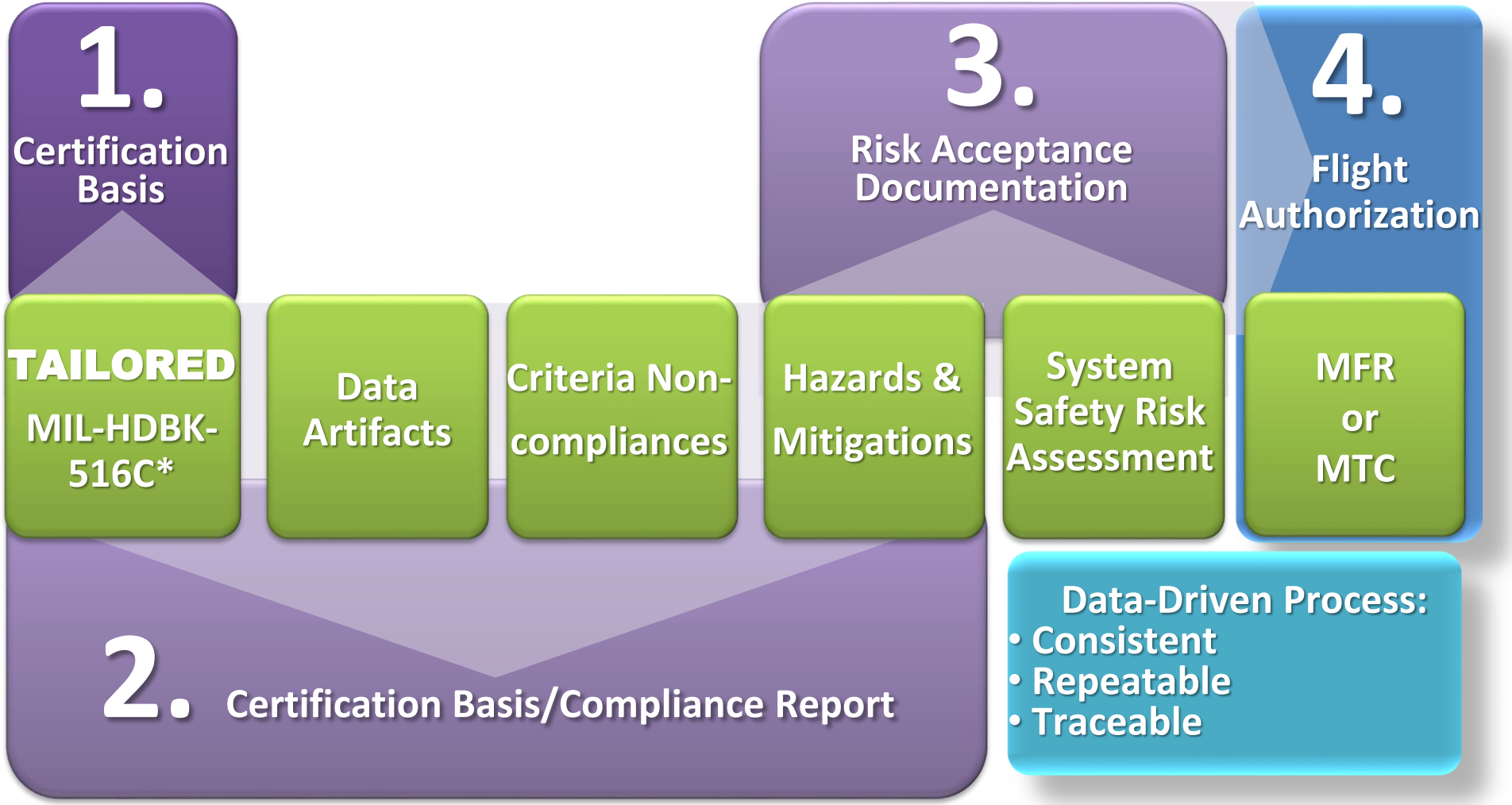

*** USAF required Criteria, Standards, and Methods of Compliance**

Airworthiness Project Phases

Design-Based

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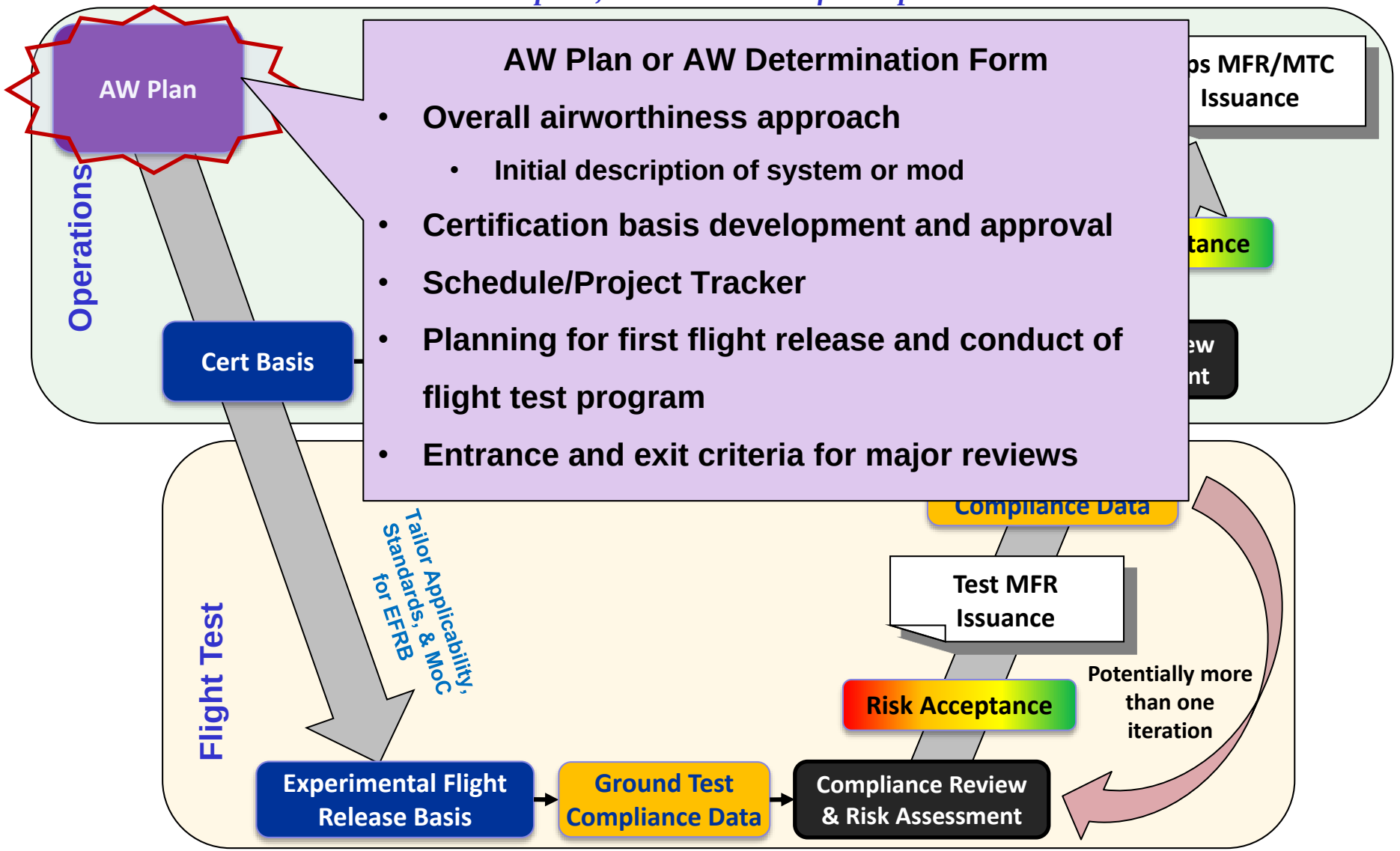

Airworthiness Determination Form: Impact & Reportability

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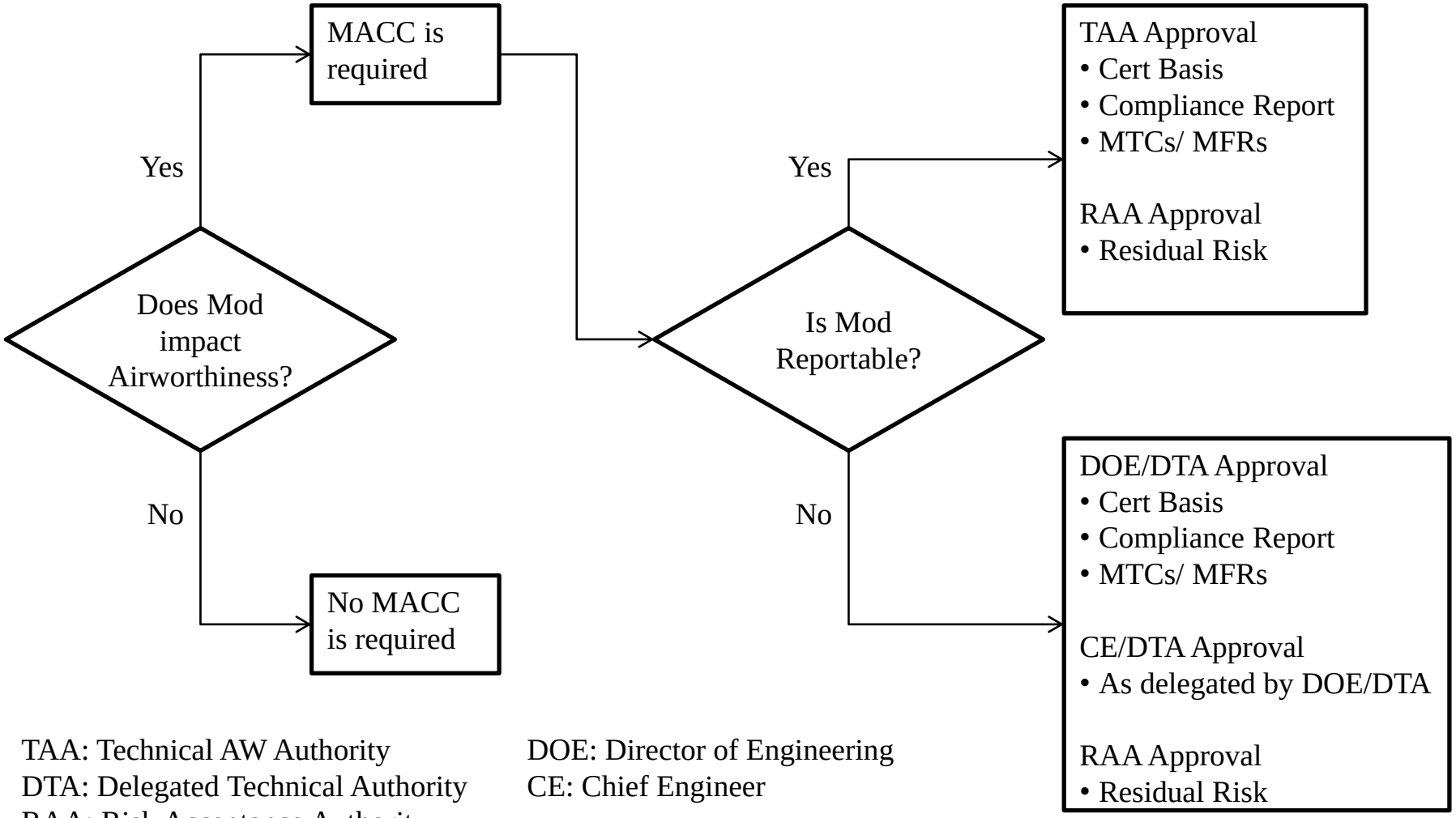

TAA: Technical AW Authority
DTA: Delegated Technical Authority
RAA: Risk Acceptance Authority

DOE: Director of Engineering
CE: Chief Engineer

USAF Airworthiness Data Package

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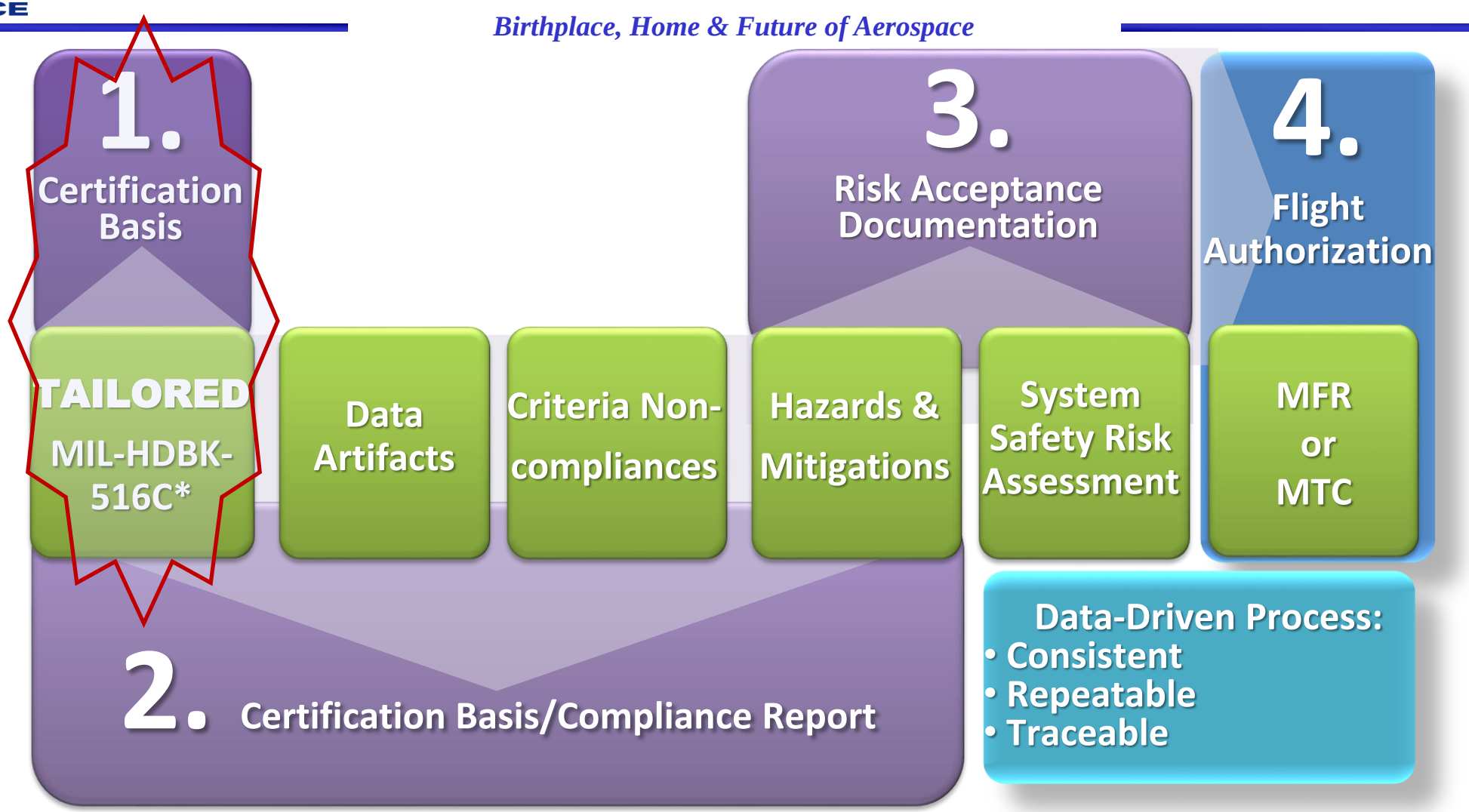
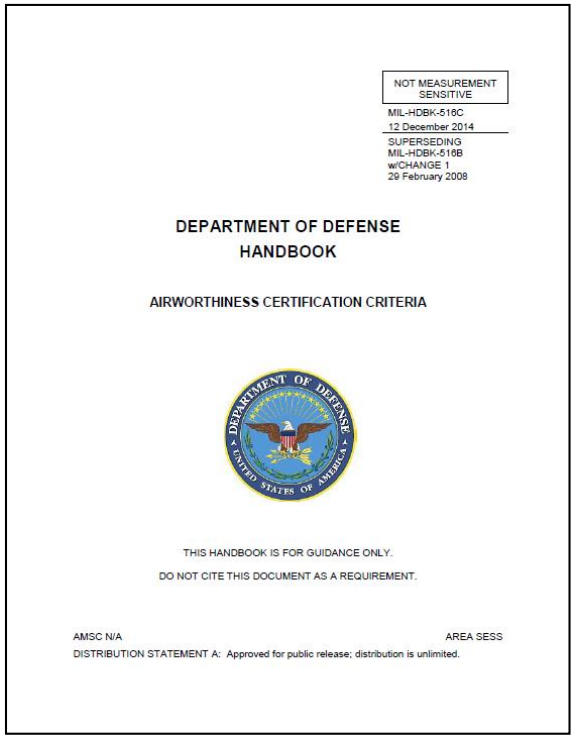


*** USAF required Criteria, Standards, and Methods of Compliance**

4.0	Systems Engineering
5.0	Structures
6.0	Flight technology
7.0	Propulsion and Propulsion Installations
8.0	Air Vehicle Subsystems
9.0	Crew Systems
10.0	Diagnostic Systems
11.0	Avionics
12.0	Electrical Systems
13.0	Electromagnetic Environmental Effects
14.0	System Safety
15.0	Computer Systems and Software
16.0	Maintenance
17.0	Armament and Stores Integration
18.0	Passenger Safety
19.0	Materials
20.0	Air Transportability, Airdrop, Mission/Test Equipment and Cargo/Payload Safety



NOT MEASUREMENT SENSITIVE

MIL-HDBK-516C
12 December 2014

SUPERSEDING
MIL-HDBK-516B
w/CHANGE 1
29 February 2008

DEPARTMENT OF DEFENSE
HANDBOOK

AIRWORTHINESS CERTIFICATION CRITERIA

THIS HANDBOOK IS FOR GUIDANCE ONLY.
DO NOT CITE THIS DOCUMENT AS A REQUIREMENT.

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Airworthiness Project Phases

Design-Based

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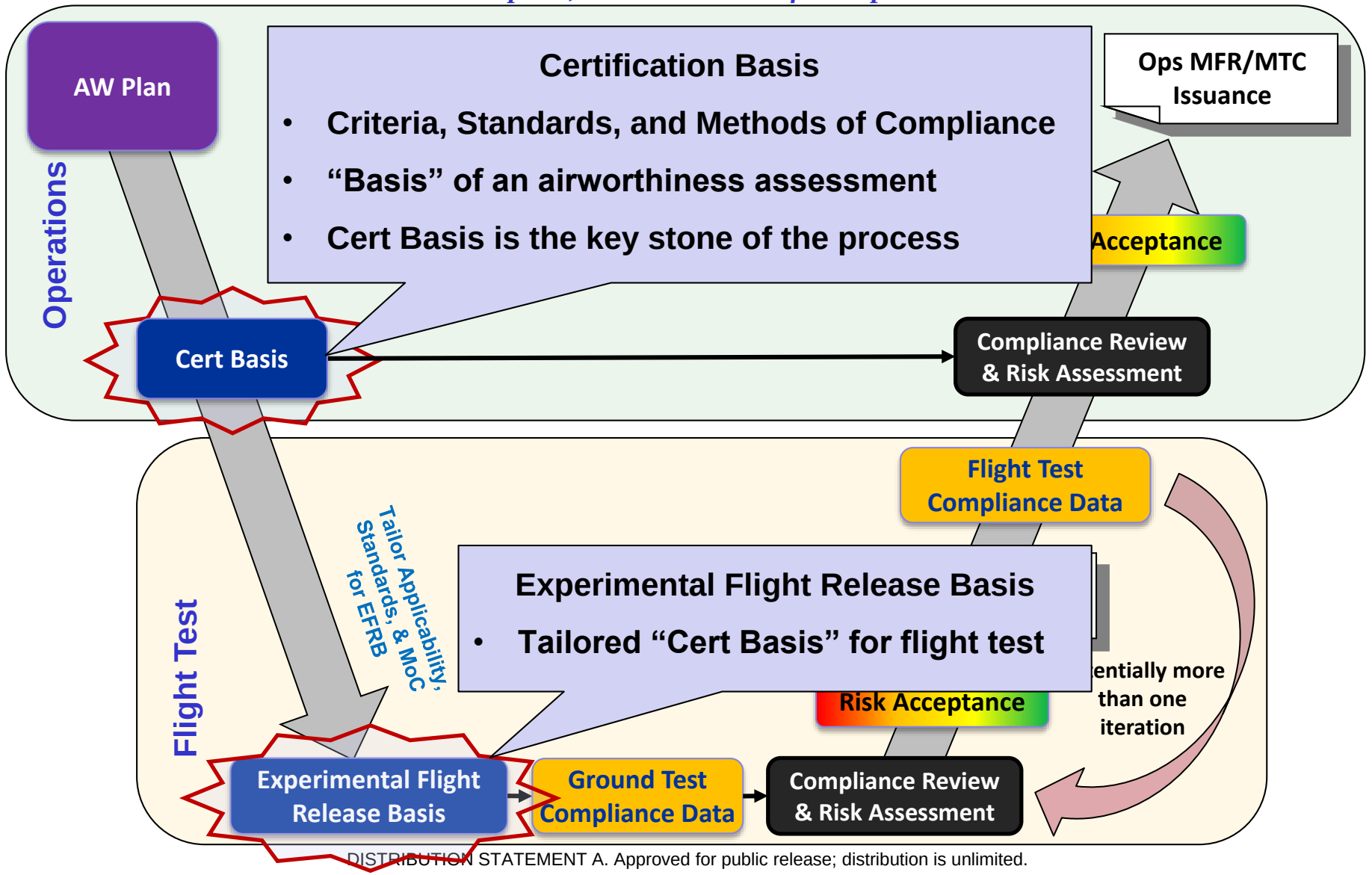

Certification Basis Analogy

AWB-004

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One might equate the establishment of a certification basis to that of a high jump competition in track and field. For example:

a. **Criterion:** The criterion is that the athlete must jump over the bar without knocking it off. This is not debatable or tailorable.

b. **Standard:** How high is the bar set? Note that the bar may be set at different heights depending upon the type of athlete (e.g., male, female, age group, etc.). Similarly, for the same given airworthiness criterion, the standards for a fighter aircraft may be significantly different than that required for a tanker aircraft.

c. **Method of Compliance:** Generally, how must the athlete go over the bar? Must they go over the bar and have the exact clearance measured (test)? Can they go over the bar and have no measurement beyond that done (demonstration)? Can they simply say “I have done this before and will provide proof” (similarity)?

Airworthiness Project Phases
Design-Based
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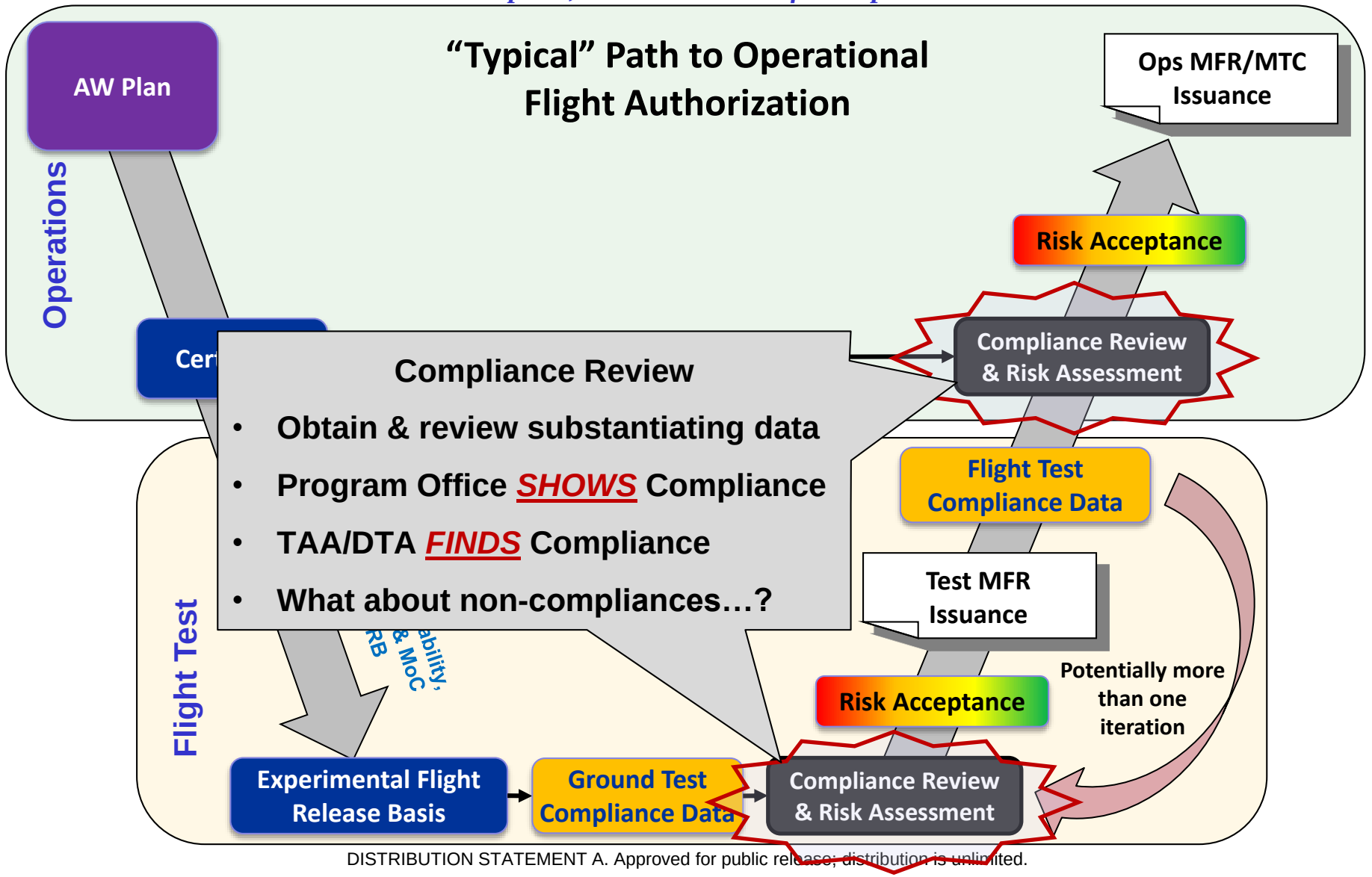

Airworthiness Project Phases

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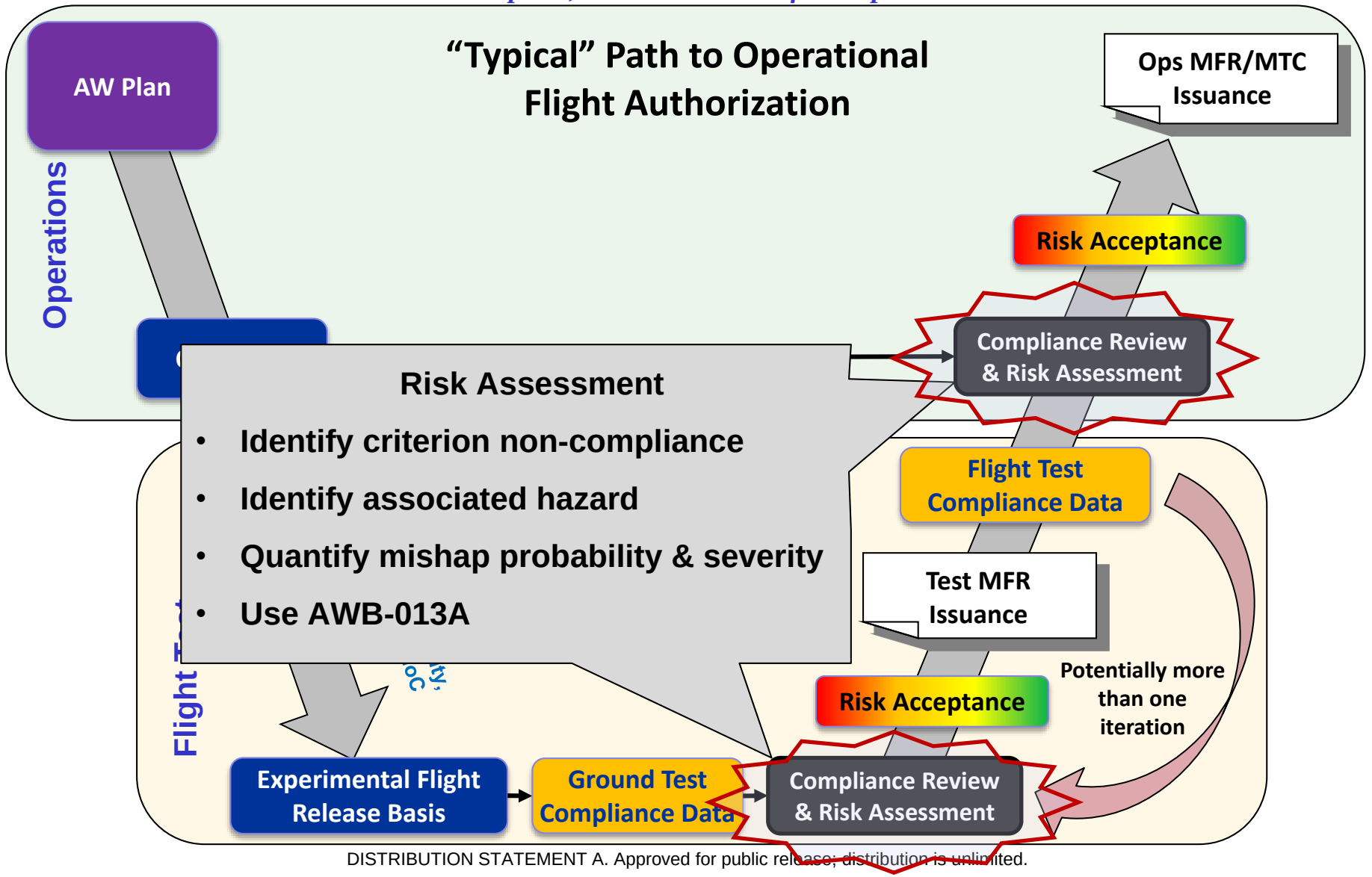

AW Risk Matrix:
Airworthiness Bulletin #013A
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AFLCMC ENGINEERING

Revised 12/18/12 Frequency Ranges

X >= 100

10 >= X <100

1 >= X <10

0.01 >= X <1

0.001 >= X <0.01

Added Category & Frequency, 12/18

HAZARD CATEGORIZATION		SEVERITY*			
		CATASTROPHIC (1)	CRITICAL (2)	MARGINAL (3)	NEGLIGIBLE (4)
* FREQUENCY *	FREQUENT (A) = or > 100/100K flt hrs	1	3	7	13
	PROBABLE (B) 10-99/100K flt hrs	2	5	9	16
	OCCASIONAL (C) 1.0-9.9/100K flt hrs	4	6	11	18
	REMOTE (D) 0.01-0.99/100K flt hrs	8	10	14	19
	IMPROBABLE (E) = or < 0.01/100K flt hrs	12	15	17	20
VERY IMPROBABLE (F) <0.001/100K flt hrs		VERY IMPROBABLE			

* Per 100K flt hrs

HIGH	CAE Risk Acceptance HRI = 1 through 5	MEDIUM	PM Risk Acceptance HRI = 10 through 17
SERIOUS	PEO Level Risk Acceptance HRI = 6 through 9	LOW	Risk Acceptance As Directed HRI = 18 through 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

Airworthiness Project Phases
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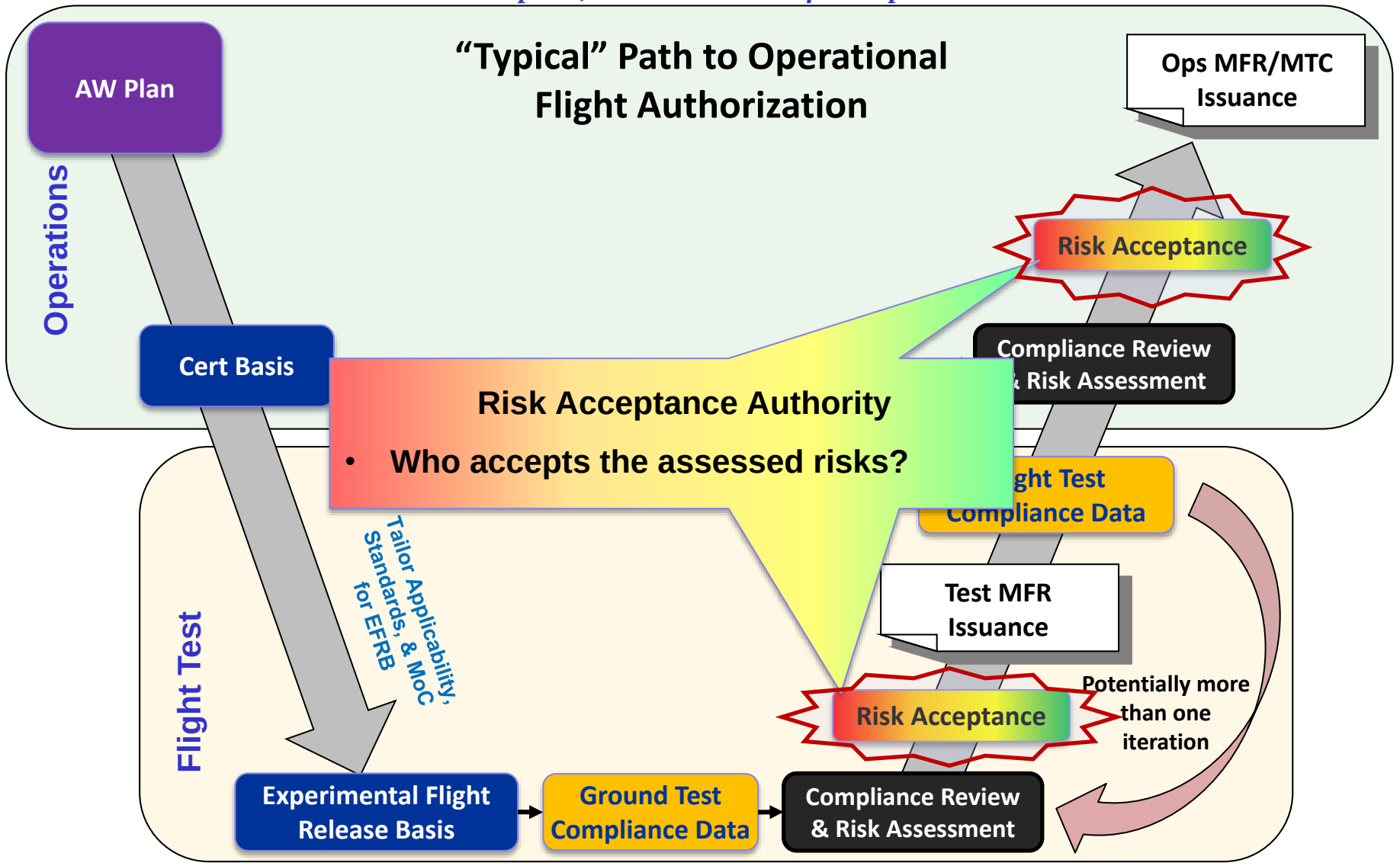

Risk Acceptance Authority:

Criteria Non-Compliance

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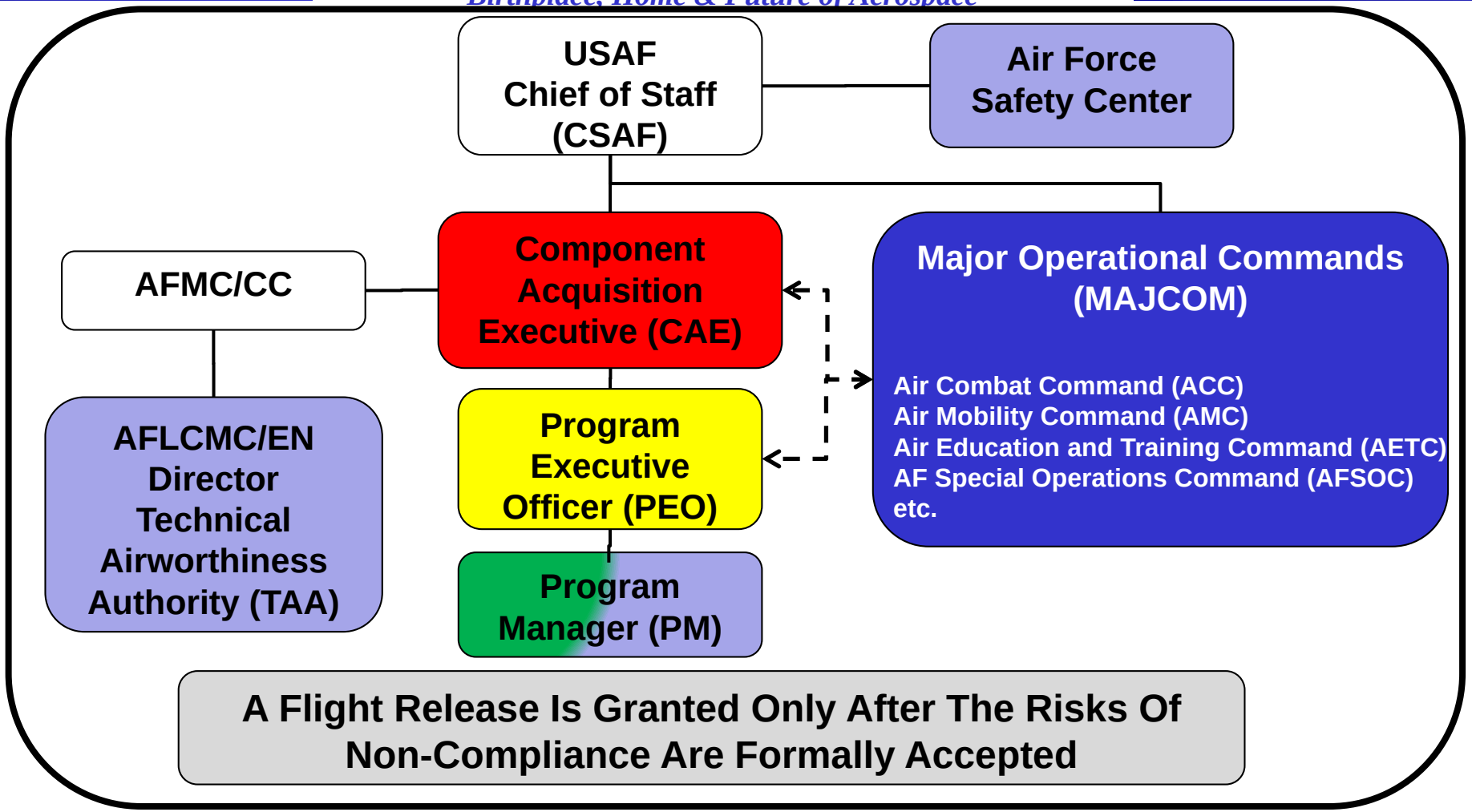
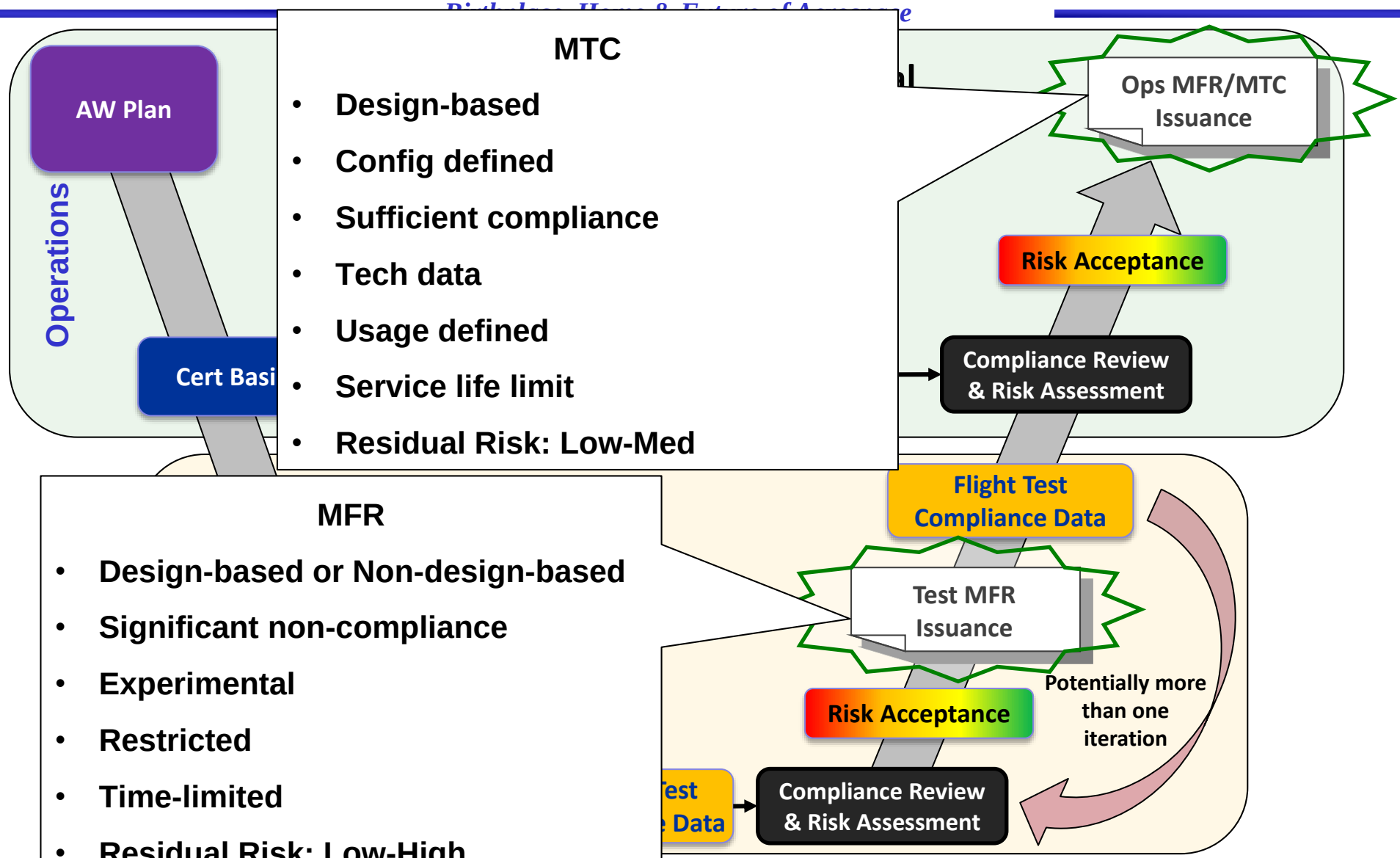


Risk Identification	Low to Medium Risk Acceptance (Acquisition)	Serious Risk Acceptance (Acquisition)	High Risk Acceptance (Acquisition)	Operational Risk Acceptance (Serious and High)

Airworthiness Project Phases

Design-Based



MTC

- Design-based
- Config defined
- Sufficient compliance
- Tech data
- Usage defined
- Service life limit
- Residual Risk: Low-Med

MFR

- Design-based or Non-design-based
- Significant non-compliance
- Experimental
- Restricted
- Time-limited
- Residual Risk: Low-High

Airworthiness Process

Data-Driven Processes

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Airworthiness Project Phases

Design-Based

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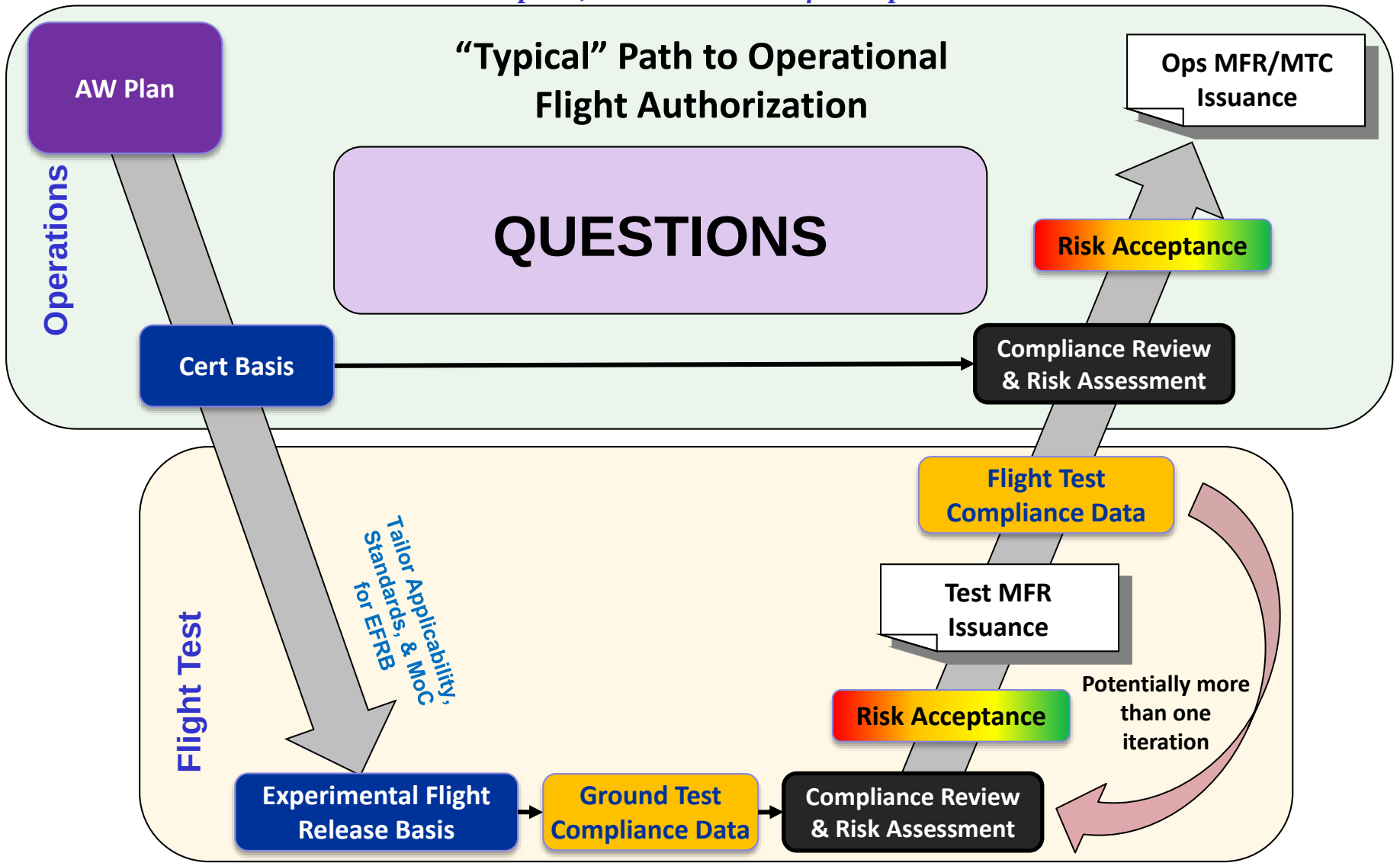

Observations of a soon to be 6 knot Engineer

- **Living Between the Cracks**
- **FAA**
- **USAF as AA vs Regulatory Agency**
- **Define your future or have it defined for you**