

Aeronautical Systems Center

Rapidly delivering war-winning capability



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**Operational Safety,
Suitability, &
Effectiveness
for the
Aeronautical Enterprise
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The purpose of this presentation is to give an overview of OSS&E, as applied to the Aeronautical Enterprise.



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Overview

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- **Background**
- **Responsibilities**
- **OSS&E Baseline Preservation**
- **Implementation**
- **Guidance and Training**
- **Summary**

2

These are the topics that will be discussed.



What's OSS&E?



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Establishment, preservation, and updating of...



Operational Safety
Operational Suitability
Operational Effectiveness



...baseline characteristics of systems and end-items over their operational life

AFPD 63-12 & AFI 63-1201

3

In it's simplest terms, OSS&E is:

The establishment, preservation, and updating of the OSS&E baseline that controls the key safety, suitability, and effectiveness characteristics of a system or end-item.



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Why Do OSS&E?



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- To ensure that competent people are making reasonable decisions to prevent loss of capability to our operators
- To help focus resources on things that have most impact on preserving key system/end-item characteristics throughout sustainment



4

OSS&E doesn't ask us to do anything, functionally, that we haven't always been required to do to assure Air Force systems and end-items remain operationally safe, suitable, and effective throughout their operational life.

Somewhere along the way, however, we dropped some of the discipline.



Major Tenets of OSS&E



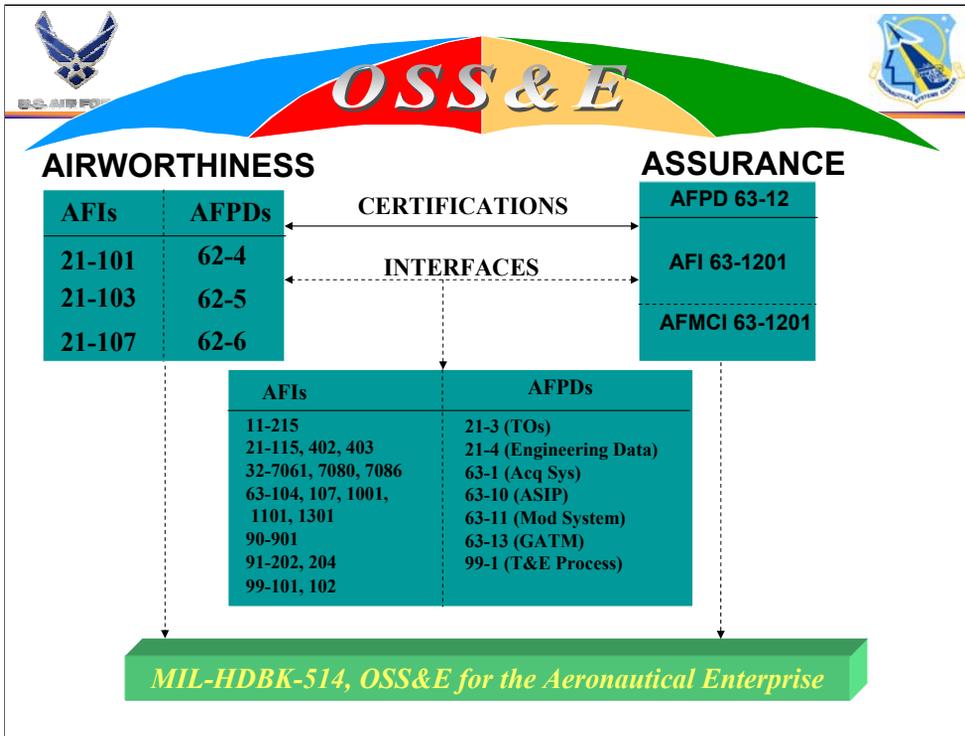
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- **Establish clear responsibility & accountability**
 - Single manager (SM) & chief engineer (CE)
 - Major Command (MAJCOM)
 - Document clear delegation of authority to supporting organizations
- **Re-invigorate systems engineering process**
 - Disciplined engineering processes
 - Configuration management
 - Operational risk management
 - Systems safety
 - Accomplish and preserve required certifications
 - Airworthiness
 - Seek Eagle

5

The primary thrust of OSS&E has been to clarify responsibility and accountability, to establish clear lines of authority when tasks have been delegated to other organizations, and to re-invigorate the systems engineering process during sustainment. Authority can be delegated, not responsibility.



OSS&E is not a process or a certification. It can be best viewed as an umbrella that pulls together all other existing requirements and processes for sustainment of Air Force systems and end items.

All of these documents, and more, are referenced in MIL-HDBK-514.



OSS&E/Airworthiness Policies



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OSS&E			Airworthiness
AFPD 63-12	AFI 63-1201	AFMCI 63-1201	AFPD 62-6
<ul style="list-style-type: none"> • OSS&E RQMT • MAJCOM role • AFMC role • SM responsibilities 	<ul style="list-style-type: none"> • Specific MAJCOM responsibilities • AFMC establishes processes & tech stds for assuring and preserving OSS&E • Specific SM responsibilities 	<ul style="list-style-type: none"> • Specific AFMC responsibilities • Product Line technical resp. • Chief Engineer responsibilities • Each Product Center develop guidance, tools, and training for product lines 	<ul style="list-style-type: none"> • Airworthiness cert required • ASC-chaired board controls cert criteria • SM certifies

MIL-HDBK-514, OSS&E for the Aeronautical Enterprise

- Provides guidance for implementing & preserving OSS&E
- Also provides guidance for airworthiness certification

MIL-HDBK-516A, Airworthiness Certification Criteria

7

Many people have mistakenly equated OSS&E with airworthiness certification. Airworthiness is part of the safety component of OSS&E.

Airworthiness certification is only one of the many certifications that the SM must accomplish or obtain to assure OSS&E of his/her fleet (AFI 63-1201, para. 2.8.7).



OSS&E Assurance and Airworthiness Certification



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- **OSS&E Assurance** - A planned and systematic pattern of actions necessary to provide confidence that expected performance, with respect to operational safety, suitability, and effectiveness, is maintained
 - Establish the OSS&E baseline
 - Preserve the OSS&E baseline throughout the operational life of the system
- **Airworthiness Certification** - The documented decision by the SM that the aircraft meets the airworthiness certification criteria

8

There is no such thing as OSS&E certification. There is OSS&E assurance, which is not the same as airworthiness certification as indicated here.



OSS&E and Airworthiness Certification Policy Impact



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BEFORE

- Center focus on airworthiness
- Accountability resides with SM
- Sound systems engineering process inferred
- Airworthiness process & criteria implicit through application of MIL SPECs and STDs

AFTER

- Air Force focus on airworthiness
- Strengthened SM accountability and added chief engineer accountability
- Re-invigorated systems engineering rigor/discipline through policy
- Airworthiness certification against explicit criteria required by policy
- Explicitly details MAJCOM config. management requirements

9

This chart shows some of the impacts these new policies have had on the Aeronautical Enterprise.



Operational Safety Definition



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The *condition of having acceptable risk to life, health, property, or environment* caused by a system or subsystem when employing that system or subsystem in an operational environment. This requires the identification of hazards, assessment of risk, determination of mitigating measures, and acceptance of residual risk

10

Here is the “operational safety” definition that was developed specifically for OSS&E.



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Operational Suitability Definition

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The *degree to which a system can be placed satisfactorily in field use*, with consideration given to availability, compatibility, transportability, interoperability, reliability, wartime use rates, maintainability, safety, human factors, manpower supportability, logistics supportability, natural environmental effects and impacts, and documentation and training requirements

11

The “operational suitability” definition came from the operational test and evaluation instruction (AFI 99-102).



Operational Effectiveness Definition



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The overall ***degree of mission accomplishment*** of a system used by representative personnel in the environment planned or expected (e.g., natural, electronic, threat) for operational employment of the system which considers organization, doctrine, tactics, survivability, vulnerability, and threat (including countermeasures, initial nuclear weapons effects, and nuclear, biological, and chemical contamination threats)

12

The “operational effectiveness” definition also came from the operational test and evaluation instruction (AFI 99-102).



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Applicability



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- **Policy applies to all operational systems and end-items managed by the Air Force**
 - Includes those operated by the Air National Guard and Air Force Reserve
 - Includes those procured, operated, and/or maintained for other government agencies

13

OSS&E applies to fielded systems and end items, including those operated by the Air National Guard and AF Reserve. Systems in development, like the F/A-22, must be fully compliant with the OSS&E policy and instructions prior to Initial Operational Capability declaration.



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System/End-Item Definition

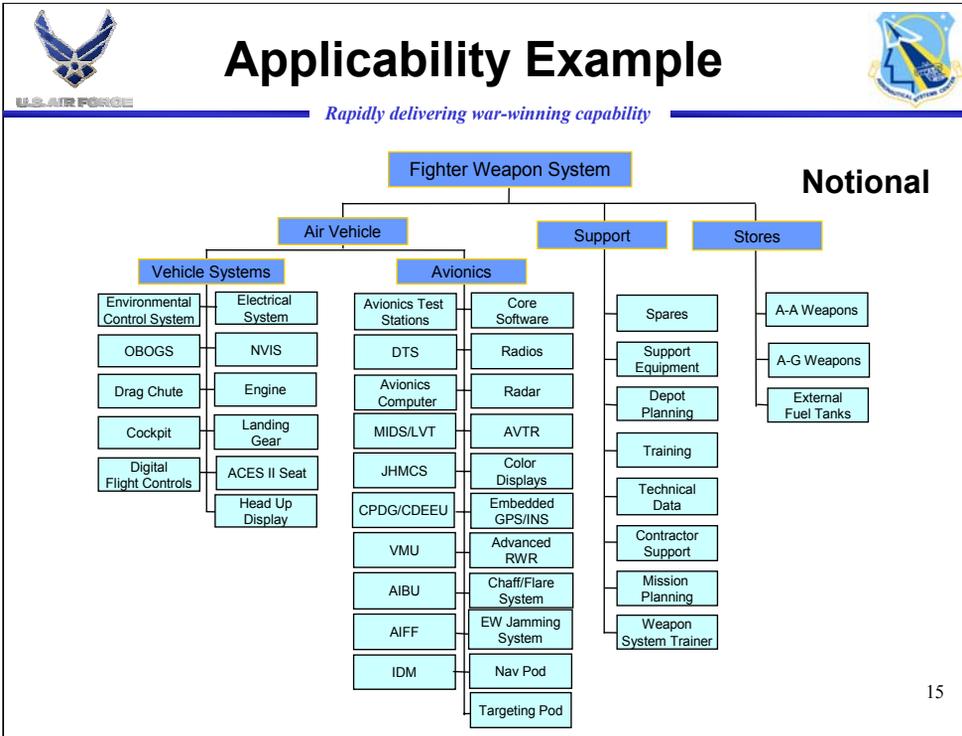


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- **System - A specific grouping of components or elements designed and integrated to perform a military function. (e.g., A-10 weapon system, T-6 training system)**
- **End-item - Equipment that can be used by itself to perform a military function. (e.g., LANTIRN navigation pod, 60K Loader)**
 - Provides a unique military function or enhanced military capability to a system
 - Has a distinct management activity to control its technical and performance baseline

14

OSS&E applies to everything in sustainment that meets either of these definitions.



Let's look briefly at an example of applicability.

Here we have a fighter weapon system and its components. Although OSS&E applies to all elements of the fielded system, OSS&E assurance is managed at the system and end item level.

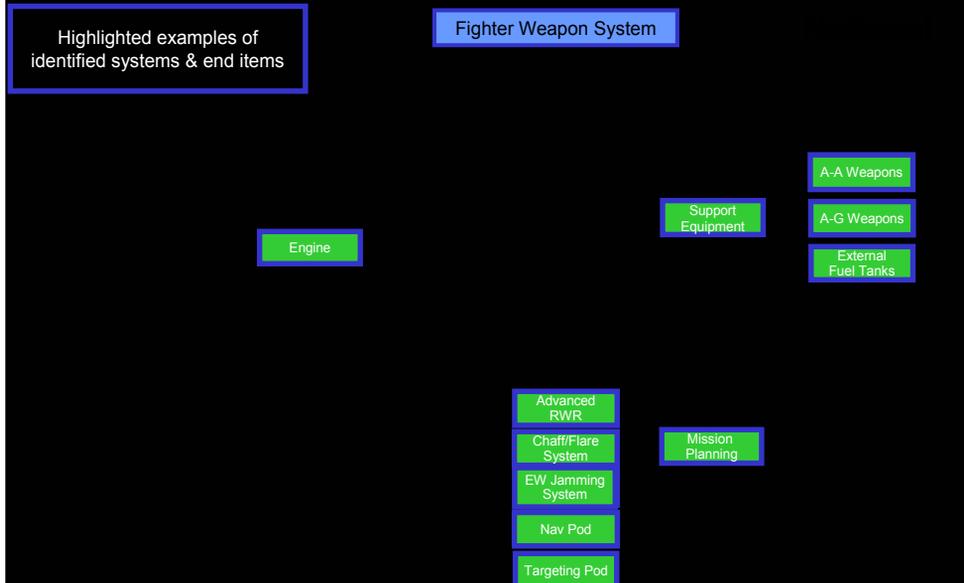


Applicability Example



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All the highlighted items are tracked as the system and its associated end-items.



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Overview



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- Background
- **Responsibilities**
- OSS&E Baseline Preservation
- Implementation
- Guidance and Training
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17

Let's talk now about the individual responsibilities.



SM Responsibilities



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AFPD 63-12 and AFI 63-1201

- **Ensure and preserve the OSS&E baselines, throughout the operational life, of the systems and end-items they manage**
- **Responsible authority for approving all configuration and maintenance changes and modifications**
- **Develop, verify, update, track, and maintain OSS&E baselines in coordination with operational command**
- **Use a disciplined engineering process over the system and end-item operational life**
- **Establish and define relationships with supporting managers**

18

These responsibilities emphasize the disciplined engineering approach and formal relationships required during sustainment.



SM Responsibilities (Cont'd)



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AFPD 63-12 and AFI 63-1201

- **Use fielded performance data to continuously evaluate system and end-item performance**
- **Select and qualify maintenance, supply, and repair sources or provide selection criteria and recommendations to selection authority**
- **Accomplish/obtain all required supporting certifications**
- **Evaluate potential total ownership cost impacts of operational, configuration, maintenance, or part changes**
- **Track and take appropriate action on mishap recommendations**

19

Airworthiness certification is one of the required certifications. All functional areas of a program office have a share in assuring OSS&E as indicated by these responsibilities.



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User Responsibilities



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AFPD 63-12 and AFI 63-1201

- **Notify SM prior to implementing any operational change**
- **Obtain approval from SM prior to implementing any configuration or maintenance change**
- **Develop OSS&E baseline with SM**
- **Report any degradation of baselined characteristics to SM**
- **Ensure operation and maintenance training supports preservation of OSS&E**
- **Ensure and preserve OSS&E for all systems and end items directly acquired**

20

The user has a very important role in assuring OSS&E, both for the systems and end items managed by a program office and for those managed internally.

One implementation requirement is to obtain user coordination on the OSS&E baseline.



Chief/Lead Engineer Responsibilities



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AFMCI 63-1201

- **Responsible and accountable to SM for consistent application of a disciplined engineering process**
- **Ensure any delegated authority for technical activities is to technically competent organic or contractor organization**
- **Responsible for system/end-item configurations, including supply items and user initiated changes**
- **Ensure development and maintenance of technical data required for OSS&E baseline preservation**

21

You'll notice that the chief engineer's responsibilities mirror the single manager's.



Chief/Lead Engineer Responsibilities (Cont'd)



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AFMCI 63-1201

- **Develop sustainment actions from fielded performance data to prevent OSS&E degradation**
- **Ensure manufacturing and repair quality**
- **Provide selection and qualification criteria for new sources of supply and maintenance**
- **Monitor available data sources for relevant information (e.g., FAA Airworthiness Directives, airworthiness advisories, OEM service info, DR system, GIDEP)**
- **Coordinate OSS&E assurance with other Centers when more than one product line is involved**

22

The CE must determine if identified problems effect OSS&E assurance of his/her system.



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Overview



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OSS&E Baseline Definition



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Measurable, top level parameters that characterize system performance, capabilities, and certifications that merit the attention of senior level using command and program office leadership



Here's the definition of the OSS&E baseline. It is not the same as a configuration baseline. These characteristics would typically be derived from the Acquisition Program Baseline, key performance parameters, and existing metrics reports.

I'll illustrate with examples...



OSS&E Baseline Examples



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<u>Safety</u>	<u>Suitability</u>	<u>Effectiveness</u>
Cumulative Risk Hazard Index	Mission Capability Rate	Range
Loss Rate	Mean Time Between Failure	Payload
Airworthiness Certification	Integrated Combat Turnaround Time	Defensive Countermeasures
Nuclear Certification	Weapon System Reliability	Radar Cross Section
Air Transportability Certification	Frequency Spectrum Certification	Acoustic Signature
Stores Certification	GATM Certification	Gun Circular Error Probability

25

Here are some key performance parameters and certifications to consider, including all of the “ilities”. Some of these parameters are not directly measurable through metrics.



Mandatory Process Elements (AFI 63-1201)



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- **Disciplined engineering process**
 - Operational risk management
 - Systems safety
 - Configuration management
 - Test and evaluation
 - Technical orders and technical data
 - Total ownership cost
- **Inspections and maintenance**
- **Sources of maintenance and repair**
- **Source of supply**
- **Training**

26

The requirements for each of these OSS&E process elements are defined in AFI 63-1201. Each program must document how they are complying with these requirements.



Mandatory Process Elements (Cont'd) (AFI 63-1201)



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- **Certifications**
 - Airworthiness
 - GATM/Nav Safety
 - Cargo air transportability and airdrop
 - Joint interoperability
 - Simulator
 - Seek Eagle
 - Nuclear safety
 - Frequency spectrum
 - Laser radiation
 - IFF transponder
 - System security
- **Operations and maintenance**
- **Technology demonstrations**

There's no OSS&E certification; there's OSS&E assurance

27

Here are some of the certifications that may be required. They are listed in MIL-HDBK-514 with a link to their governing documents.



Preserving OSS&E



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- **Metrics**
 - **OSS&E Implementation**
 - Applies to legacy systems and end items
 - All must achieve full compliance by FY 05
 - **Fleet health**
 - Used to gauge continuing achievement of OSS&E baseline
 - Obtained directly or indirectly from field data
- **Health assessment**
 - **Limited physical configuration audit to verify compliance with required modifications or to determine if unauthorized modifications have been done**
 - **Operational Utility Evaluation (OUE) or Force Development Evaluation (FDE) to determine aggregate impact of numerous changes, system age, environment, etc. on effectiveness**

28

There are two kinds of OSS&E metrics:

The six levels of OSS&E implementation apply to legacy systems and end items and those not fully compliant when placed into operation use.

The fleet health metrics are unique to each program and are used to verify continued compliance with the OSS&E baseline.

These health assessment ideas can be used when necessary to aid in assuring OSS&E of a fielded system or end item. The OUE and FDE are governed by AFI 99-102.



OSS&E Health Metrics Reporting

HQ AFMC/EN Concept

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OSS&E Scorecard (NOTIONAL)
ASC Fielded Systems Portfolio

	Operational Safety	Operational Suitability	Operational Effectiveness
AC-130U	Green	Green	Green
B-1B	Green	Yellow	Green
B-2	Green	Green	Green
C-17	Green	Green	Green
C-32	Green	Green	Green
C-37	Green	Green	Green
EC-130E	Green	Green	Green
EC-130H	Green	Green	Green
F-16	Green	Yellow	Green
F-117	Green	Green	Green
RC-135	Green	Green	Green
Senior Scout	Green	Green	Green
T-1A	Yellow	Green	Green
U-2	Green	Green	Yellow

Color determined jointly by the lead command and SM

29

HQ AFMC/ENPD is leading the implementation effort to define/develop the web-based tool used to collect and report the OSS&E health metrics status for each system and end-item.



Overview



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OSS&E Implementation Levels

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- **Level 1 - Chief engineer assigned**
 - System/end-item and CE on OSS&E list
 - Process in place to update system & end-item list
- **Level 2 - Configuration control processes established**
 - Configuration control processes documented, operating, and training requirements identified
 - Delegated authority identified and documented
- **Level 3 - Plan to assure and preserve OSS&E documented**
 - Coordinated with appropriate product, logistic, test, & specialty centers
 - Approved by center commander (part I) and SM (part II)

The six levels of implementation and their exit criteria are defined in MIL-HDBK-514.



OSS&E Implementation Levels (Cont'd)



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- **Level 4 - OSS&E baselines developed and coordinated with user**
 - Critical characteristics for safety, suitability, and effectiveness selected
 - OSS&E baseline and metrics coordinated with user
- **Level 5 - OSS&E assessment of fielded systems/end items**
 - OSS&E baseline disconnects identified
 - Recommended corrective actions provided to users
- **Level 6 - full OSS&E policy compliance**
 - Corrective actions completed
 - Required certifications in place and maintained
 - Metrics and feedback systems monitoring OSS&E health
 - Processes in place to maintain OSS&E baseline

32

The implementation status of systems and end items listed as OSS&E reportable on the Air Force Systems and End-Items List are reported to HQ AFMC.



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OSS&E for the Aeronautical Enterprise



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MIL-HDBK-514

- **Guidance for implementing and preserving OSS&E assurance for the Aeronautical Enterprise**
 - New and legacy programs, including commercial-derivative aircraft
 - OSS&E management plan
 - Mandatory process elements
- **Guidance in implementing and preserving airworthiness certification**

34

This document is applicable to all USAF systems and end-items and designated system and end-items procured, operated, and/or maintained by the Air Force for other governments managed through the Aeronautical Enterprise. Although other methods can satisfy the requirements set forth in the policy directive and instructions, this handbook provides a framework that satisfies those requirements. This military handbook provides guidance for implementing and preserving a solid OSS&E program for the Aeronautical Enterprise.



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OSS&E Plan Part I Implementation Plan



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- Single manager's assessment
- System/end-item description
- OSS&E baseline establishment and management
- Organizational management relationships
- Training
- Funding
- Schedule

35

Here's the outline for Part I of the OSS&E plan.

You'll notice that most of the information is programmatic, not technical. This is information the PM needs to input, not the chief (or lead) engineer.



OSS&E Plan Part II Internal Management Plan



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- **OSS&E baseline**
- **Organizational management relationships**
- **OSS&E process elements**
 - Disciplined engineering process
 - Inspections and maintenance
 - Sources of maintenance and repair
 - Source of supply
 - Training
 - Certifications
 - Operations and maintenance
 - Technology demonstrations
- **Metrics**

Embodies or references SPO and contractor processes

36

Here's the outline for Part II of the plan.

Now you're getting into a lot more detail on how you're going to manage OSS&E assurance during sustainment.

Proper definition of the OSS&E baseline, and the associated metrics, is essential for effective implementation of this part of the OSS&E plan.

Management agreements with other organizations that manage pieces of the system are summarized here.

The requirements for each of these OSS&E process elements are defined in AFI 63-1201. Each program must document how they are complying with these requirements.



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ASC OSS&E Restricted Website

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- **Policy**
- **Guidance**
 - MIL-HDBK-514
 - OSS&E plan memo
 - C-5 OSS&E Pilot Program, CE Team Report
- **Training**
- **Current information**
- **Other sites**
- **Airworthiness**
 - Policy
 - Guidance and tools
 - Current information
 - Airworthiness Certification Criteria Control Board
 - Advisories

37

Here's some of the things you'll find on the ASC/EN restricted website.



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Training



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- **Enterprise-wide web-based training**
- **Three levels of training available**
 - **Overview (updated)**
 - **Functional area**
 - **Single manager (updated)**
 - **Supply chain manager**
 - **MAJCOM (updated)**
 - **Chief/lead engineer**
 - **Equipment specialist**
 - **Enterprise**
 - **Aeronautical**
 - **Command & Control**

38

The overview course is the starting point for everyone. The functional area courses deal with how the OSS&E policy impacts the functional area. The enterprise training provides more detail on the unique aspects of OSS&E application to the enterprise.



Overview



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Summary



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- **Operational safety, suitability, & effectiveness policy applies to operational Air Force systems and end items**
- **Clear responsibility & accountability established or strengthened**
- **The ASC OSS&E restricted website is a valuable implementation resource**