

# ***Airborne Warning and Control Systems Program Office***

---

*Integrity - Service - Excellence*



## **Lessons Learned from a Mature DMSMS Program**

**9th Annual Systems Engineering Conference**



**U.S. AIR FORCE**

---

SQNLDR P.D.Weeding  
3 Eglin Street, Building 1612  
Hanscom AFB, MA 01731  
DSN 478-7714  
Commercial (781)-377-7714  
Fax (781)-377-1069



U.S. AIR FORCE

# Overview



- **Scope of Effort**
- **DMSMS Goals**
- **Lessons Learned**
- **Summary**



U.S. AIR FORCE

## Fleet Facts



- **Design:** Modified Boeing 707/320
- **Function:** Airborne surveillance, command, control and communications (*High Demand*)
- **Fleet Size:** 33 Aircraft (*Low Density - Small Fleet*)
- **Age:** 30 years old
- **Annual Hours:** 18,000
- **Service Life:** Extended to 2035+
- **Community Partners:** NATO 17, United Kingdom 7, Saudi Arabia 5, France 4, and Japan 4 Boeing 767 Aircraft



U.S. AIR FORCE

# ***Vision and Mission***

---

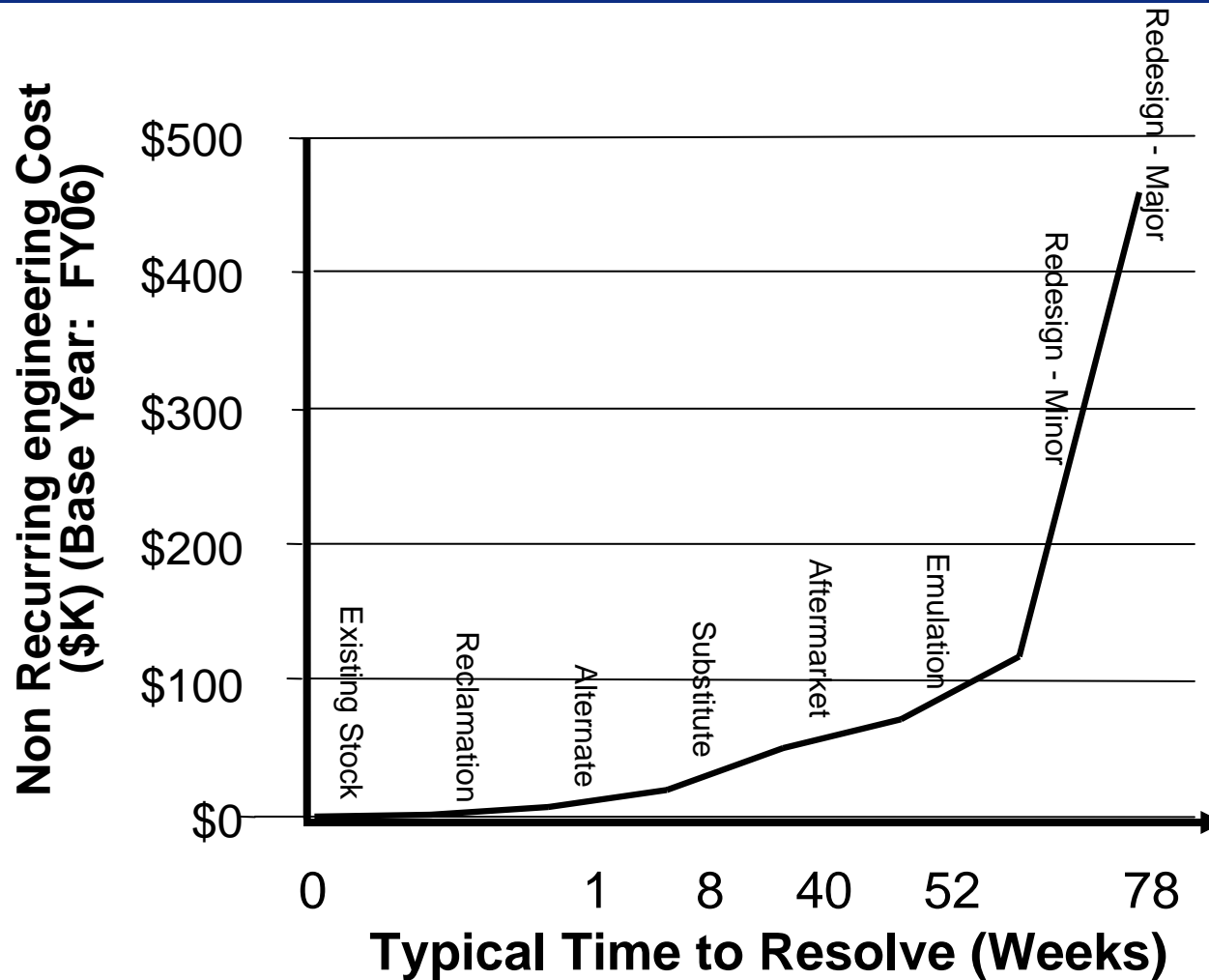


- **Vision - “To never have an AWACS E-3 become mission incapable due to the impact of DMSMS”**
- **Mission - “To develop and implement an integrated proactive DMSMS program in support of the AWACS Program Office”**
- **Goal - “Drive down Total Ownership Costs”**



U.S. AIR FORCE

# “Theoretical” Solutions – Cost and Time



Data Source: DMEA Cost Metrics

*Integrity - Service - Excellence*



U.S. AIR FORCE

# Impact to AWACS



**DMSMS Impacts all  
AWACS commodities**



**Air Frames**  
Cockpit, Fuselage, Leading  
Edge Panels and Doors

**Mechanical**  
Engines, Hydraulic, Landing  
Gear and Flight Controls

**Special Tooling and Jigs**

**Avionics:**  
HF, VHF, UHF, Intercom,  
IFF and Emergency Comm

**AWACS Unique Equipment**  
Surveillance Radar, ESM  
IFF, etc.

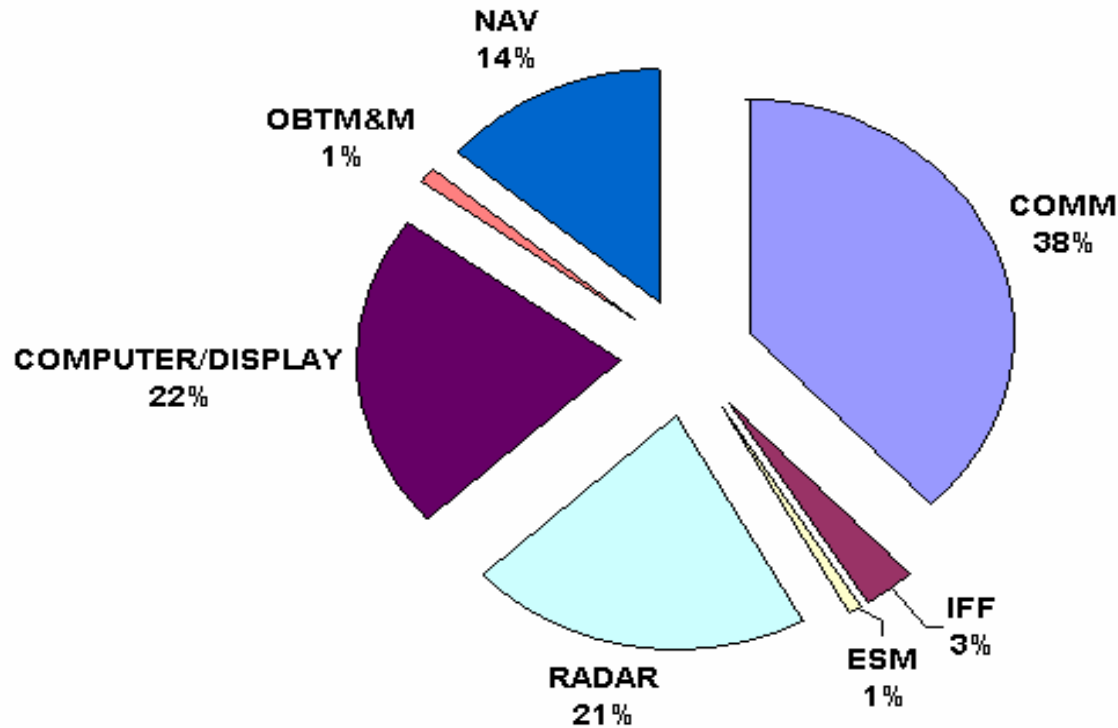


U.S. AIR FORCE

# Prime Mission Equipment Obsolescence over next 6 years



Prime Mission Equipment  
% of Total Obsolete





U.S. AIR FORCE

## ***551 ELSG DMSMS Objectives***



- Identify and capture existing aircraft configuration
- DMSMS focus on current issues and future mods
- Address present and future supportability concerns
- Preserve system and end-item OSS&E
- Coordinate and consolidate community efforts
- Integrate and implement resolutions (*recommendations*)
- Mitigate electronic and mechanical obsolescence
- Reduce both sustainment and development costs
- Institutionalize proactive DMSMS processes
  - Pinpoint end-item and system drivers to analyze
  - Track all DMSMS tasks (WG database)

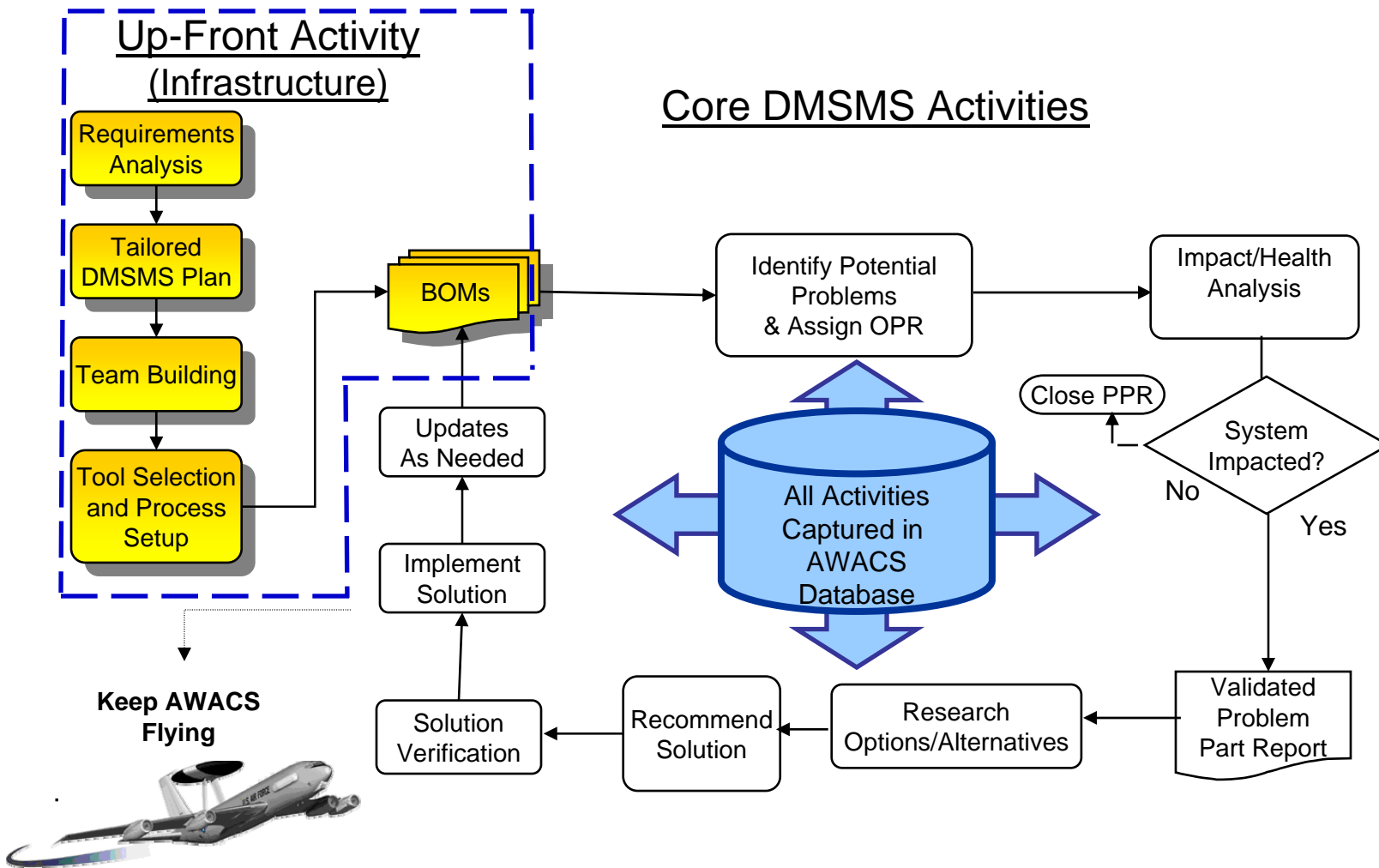




U.S. AIR FORCE



# 551<sup>st</sup> DMSMS Process Flow



*Integrity - Service - Excellence*



**U.S. AIR FORCE**

# Operational Impact Analysis (OIA)\*



MDS	Avg Operating Hours	Avg QPA	Avg App %																							
E003A		1	100																							
E003B	2715	1	100																							
E003C	1700	1	100																							

Part Number	Noun	NIIN	Initial QTY Spares	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
<b>LRU</b>																								
	Air Speed Indicator		16	16	16	14	12	10	7	4	1	-2	-5	-8	-11	-15	-19	-23	-27	-31	-36	-41	-46	-51
			16	16300	17100	17000	16800	17100	17300	17300	17300	17300	17300	17300	17300	17300	17300	17300	17300	17300	17300	17300	17300	17300
<b>SRUs</b>																								
	Bridge And Failure Monitor		3	2	0	-2	-4	-6	-9	-12	-15	-18	-21	-24	-27	-31	-35	-39	-43	-47	-52	-57	-62	-67
	Amplifier And Modulator		2	2	1	0	-1	-2	-4	-5	-7	-8	-10	-11	-13	-15	-17	-19	-21	-23	-25	-28	-30	-33

\* The OIA is an ARINC Proprietary Tool



U.S. AIR FORCE

# AWACS Priority Database



**LRU Analysis**

**Aircraft**

E003B	AWACS
E003C	AWACS

LRU JETD: [Redacted]

System: INSTRUMENTS End Item: FLIGHT DIRECTOR SYSTEM

Status: Work Pool Go To: [Redacted]

Description: Control, Mode Selector

Part Number: [Redacted]

CAGE: [Redacted]

NSN: [Redacted]

WUC: 51000

Part Status: [Redacted]

Priority: TRank: 4 Rank: 27 Score: 3.23 Evaluation Date: 06-Jan-2006  PPR Required  Is SRU

OIA/PPR Schedule Other

Start OIA Revisit Date: 21-Mar-2007  Complete?

OIA Complete?  Deferred?

Green:	Yellow:	Red:	Repl:
2015	2016	2017	2016

Deferral Comment: [Redacted]

Start PPR Revisit Date: [Redacted]  Complete?

PPR Generated?  Deferred?

Sent to IPT: [Redacted]  Comp? LAR: [Redacted]  Comp?

Deferral Comment: [Redacted]

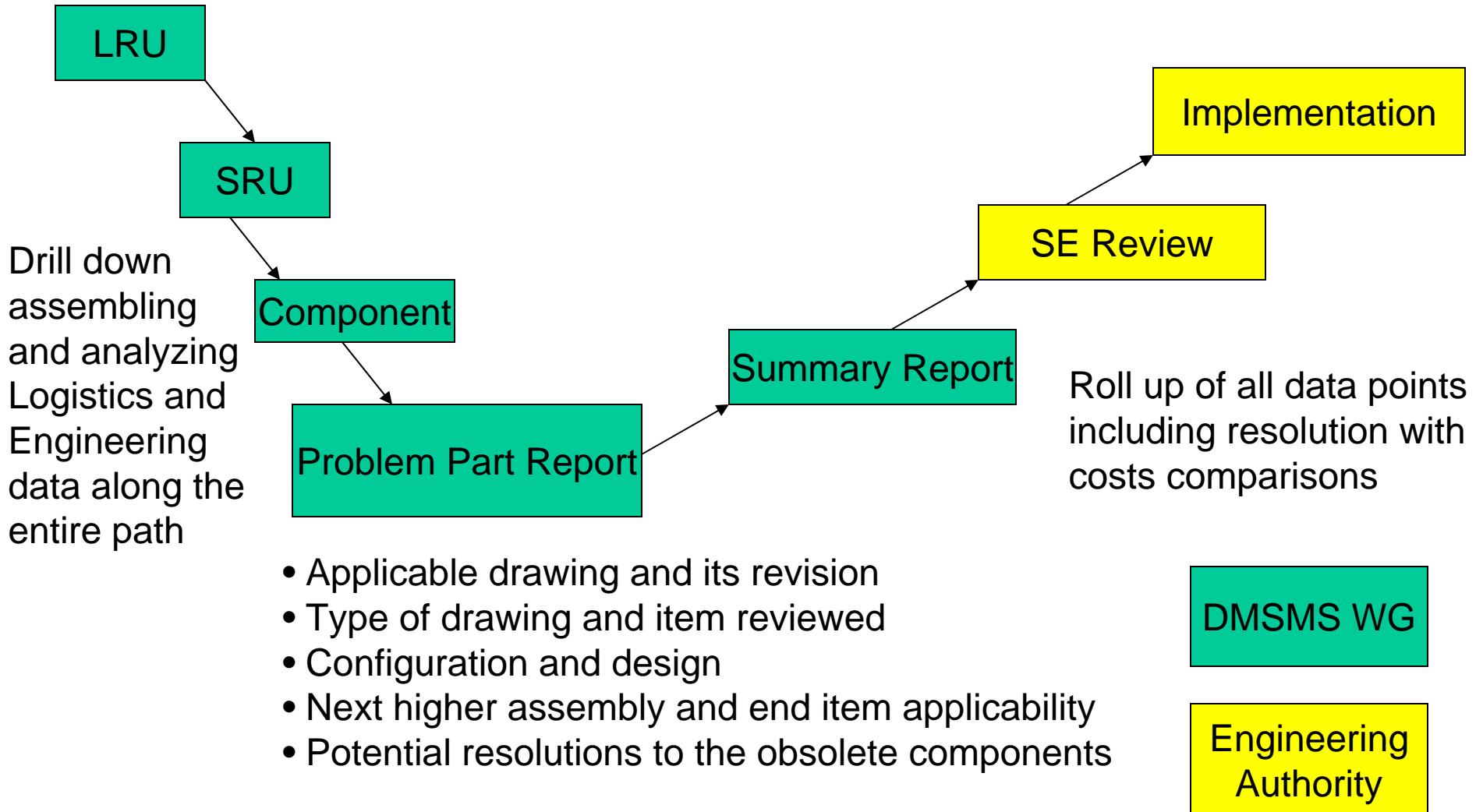
- SQL Database
- Stores
- Calculates
- Exports
- Schedules

\* The Priority Database is an ARINC Proprietary Tool



U.S. AIR FORCE

# DMSMS Approach





U.S. AIR FORCE

# 551<sup>st</sup> ELSG Data Repository



**Aircraft/System application**

**Technical characteristics**

**PPR/Resolution data**

**Part Number Browser**

PN: [redacted] Cage: 10138

Description: Bearing, Ball, Annular, Flanged

SMR: PADZZ FSC: [redacted] NIIN: [redacted]

TypeItem: M Cat: C Health: [redacted]

Remarks:

**Indenture Tree**

- 109090 10138 Remote Attitude Indicator
  - 101801 10138 Internal Mechanism Assembly
    - 102255 10138 Mechanism Assembly
      - 102256 10138 Roll Mechanism Assembly
        - 10322-004 10138 Bearing, Ball, Annular, Flanged

Technical Characteristics Table:

IPB PN	Supply	Part Nbr Data	Procurement Data		
TO Nbr	Fig	Sheet	Index	Cust	
5F8-3-27-4	8	0	22	LGE	Procurement data
5F8-3-27-4	8	0	8	LGE	
5F8-3-31-4	3	0	66	LGE	
5F8-3-31-4	7	0	20	LGE	

**TO references**

**Related part number data**

**Supply data**

**Procurement data**

Record: 19207 of 103513

Record: 1 of 4

Delete Print Close



U.S. AIR FORCE

# ALARM© Snapshot



- **ARINC Process:** Assess obsolescence characteristics of each component in an end item BOM, assign risk rating, roll up to LRU rating, and rank the LRU relative to other LRUs:

LRU Individual Risk

SRU Individual Risk

Component Risk Associated With SRU (High Risk Only)

Control Panel

LRU: [ ] Rows: 25 Type: [ ] Org: [ ] MDS: [ ] Go

PN	CAGE	DESCRIPTION	CMPTS	NSL	NSN	COMPOSITE	# CMPT
		INDICATOR, AIRSPEED, MACH, ANGLE OF A	1385	53.967%		2596.57	2413
		GYROSTABILIZED PLATFORM	931	39.742%		2374.38	2501
		INERTIAL MEASUREMENT UNIT MX-10142W	1012	45.949%		2281.47	1181
		INERTIAL NAVIGATION UNIT ASSEMBLY	1311	54.157%		1938.3	2389
						1846.38	8124

TYPE	PN	CAGE	SPT	LRV	RISK
LRU		N/A	L	L	L
SRU		N/A	M	N/A	L
SRU		N/A	H	N/A	H
SRU		N/A	M	N/A	L
SRU		N/A	M	N/A	L
SRU		N/A	I	N/A	I

TYPE	PN	CAGE	SPT	LRV	CRV	STATUS
C		H	H	L	L	M
C		H	H	L	L	L
C		H	H	L	L	M
C		H	H	L	L	L
C		H	M	M	I	I

PN: [ ] CAGE: 55972 FSC: 5935 NIIN: [ ]

Description: CONNECTOR, RECEPTACLE, ELECTRICAL

SDS: SSE CAGE Stat: A

On-Hand: 0 On-Order: 0 QFD: 0 NSD: 0 Horizon: WSIC: MIEC:

TO Nbr	Figure	Idx	Sheet
	3	15	1
	6	2	1

MDS List

Hide Detail >> Analysis Unload Close

LRU Rank Order by Composite Risk

Can be reported by:

- Specified LRU
- Top 25, 50, 100
- Type (electronic vs. Mechanical)
- By organization within specified MDS

As you mine down from The first to the third list box, general information about the LRU/ SRU/ Component is displayed



U.S. AIR FORCE

# ALARM© Shapshot



## ■ ARINC Process

Identify “High” risk component items and perform engineering assessment to determine unique component characteristics contributing to obsolescence risk:

- Technical data completeness
- Special material and processes
- Special test equipment/tools
- Chemicals
- Sources

Manual Process

LRU: PN: [REDACTED] CAGE: [REDACTED] Description: ATTITUDE HEADING GYROSCOPE SET

Component: PN: [REDACTED] CAGE: [REDACTED] Description: SETSCREW  
FSC: 5305 NIIN: [REDACTED]

Drawing #: AN565

LRU: [REDACTED] Component: [REDACTED] Drawing #: AN565

Technical Data | Material and Processes | Special Test Equipment/Tools | Chemicals | Sources | Risk Summary

Rev #: 7 Rev Date: 01-Dec-1999 Repository: DLA Drawing CAGE: [REDACTED] Design Activity: [REDACTED] Drawing Type: MIL-SPEC Drawing Rights: UNRES Data Complete: YES

By CompID

Type	Value	Criticality
SOCKET DIAMETER	0.62 MAX, 0.61 MIN	

Alternates:

Type	PN	CAGE	NSN	SO
------	----	------	-----	----

Comment: The Drawing AN565 is inactive and was replaced by doc number AIA/NAS NASM565 dated 07/01/2001 and is current.

Unassign Drawing# Save Close



U.S. AIR FORCE

# ALARM© Shapshot



## ■ ARINC Process

Create mechanical attribute library

- Data availability
- Applicable specifications/standards and their status
- Tool availability
- Banned chemicals
- Sources no bid

Data stored based on drawing, allows multiple PNs within drawing to be documented and retained

PN specific data stored separately

As library grows for each category of data, less information to manually document





U.S. AIR FORCE

# Lessons Learned



- **VHF radio**
  - **One of the first systems on which an evaluation a DMSMS was developed**
    - Assumed configuration in predictive health tool was correct
    - Performed assessment even though OIA showed no support impacts up to 2024
    - Did not research if system was to be replaced
  - **Learned configuration in predictive health tool did not include all SRUs (Over 20 CCAs not assessed)**
    - Researched drawing data to extract correct configuration
  - **Found out system was scheduled to be replaced in 2010**
  - **Changed process to include system manager in determining if DMSMS assessment required and when system was scheduled for replacement**



U.S. AIR FORCE

# Lessons Learned



- **Standardized Central Air Data Computer (SCADC) and UHF Radio**
  - **USAF program offices and FMS customers concerned that a new modified SCADC would not be supportable**
  - **UHF radio DMSMS issues raised by FMS community**
  - **DMSMS assessments initiated**
    - **OIAs for the SCADC and UHF radio showed that no obsolescence impact to mission support due to large number of spares in the supply system**
      - **SCADC removed from decommissioned fleet (C-141, 2 per), and spares placed in inventory (over 400)**
      - **UHF radio inventory build up due to replacement of radio on some fleets**
  - **Determined that even though obsolescence may adversely impact SRUs:**
    - **If enough LRU spares (serviceable and repairable) exist, obsolescence impacts are negated because cannibalization can support extended requirements**
    - **Use preliminary OIA to determine which LRUs to assess (if green through 2026 or green past replacement date, defer analysis)**
- **Must take supply chain into account versus only obsolescence data**



U.S. AIR FORCE

# Lessons Learned



- **Large Systems**
  - **Radar**
    - Over NNN LRUs in the radar system
    - Top NN obsolescence LRUs in the radar
    - Inundated the engineering authority for the radar with proposed resolutions to obsolescence
  - Decision made to alternate between radar and other system LRUs
  - Otherwise could have spent entire contract period on a single system
  - **Need to show DMSMS working for all stakeholders in the your community**



**U.S. AIR FORCE**

# ***Lessons Learned***



- **Data key to success**
  - **Configuration data**
  - **Technical Data**
  - **Market Surveys for COTS**
  
- **Teaming Required**
  - **MOAs mapped out and agreed upon**
  - **WG responsibilities defined**
    - **Due to differing DMSMS methodologies across user community**
  
- **Return on Investment (ROI)**
  - **None experienced without implementation of solutions**
  - **POM justification can be generated in proactive program**
  - **DMSMS focus on current issues and future mods**
  
- **Data points**
  - **Just a starting point...no one tool is enough**
  - **Prioritization...assessment of Supply Chain can focus resources**
  - **Focus on areas with greatest impact**



**U.S. AIR FORCE**

# ***Lessons Learned***



- **Proactive...Cost Avoidance growth per year**
  - **2003- \$823,500**
  - **Resolutions- 153**
  - **ROI- 4.1 to 1**
  
  - **2004- \$2.56M**
  - **Resolutions- 354**
  - **ROI- 5.6 to 1**
  
  - **2005- \$3.80M**
  - **Resolutions- 184**
  - **ROI- 16.1 to 1**
  
  - **To date 2006- \$2.96M**
  - **Resolutions- 146**
  - **ROI- 15.7 to 1**



U.S. AIR FORCE



# QUESTIONS



*Integrity - Service - Excellence*