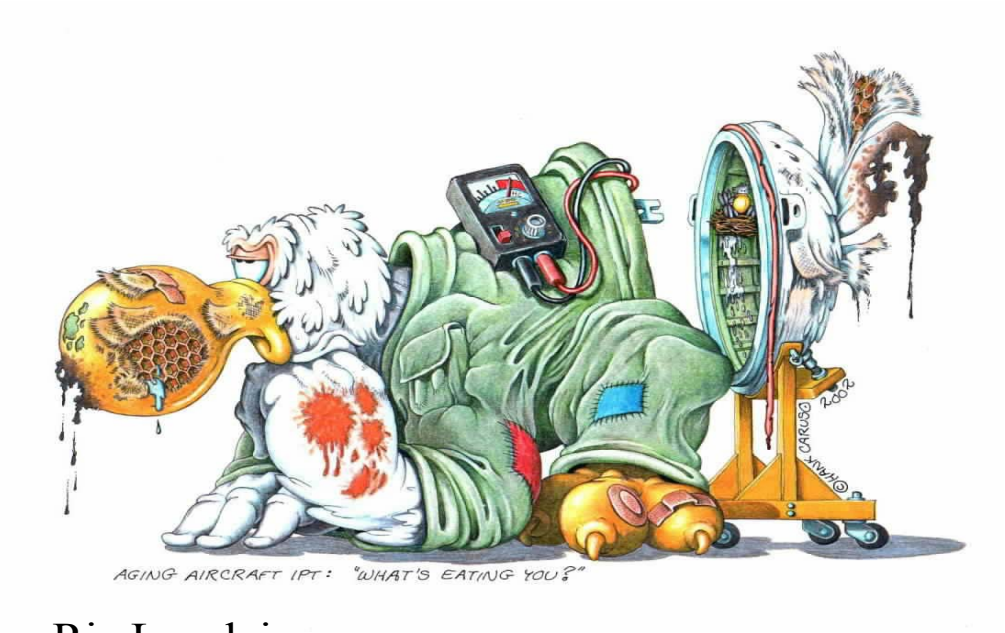
Aging Aircraft Integrated Product Team



JCAA

GIDEP Workshop

14-15 Dec 05

Ric Loeslein
Aging Aircraft Integrated Product Team
DMSMS Team Lead
Naval Air Systems Command
Patuxent River, MD
301-342-2179
George.Loeslein@navy.mil

Who is the JCAA?

Vision

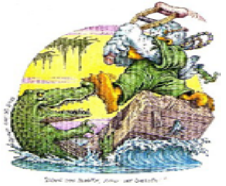
Jointly Identify, Investigate, and Implement Programs that will Field Products to Improve the *Availability* and *Affordability* of all the Services' and Agencies' Aging Aeronautical Systems.

Process

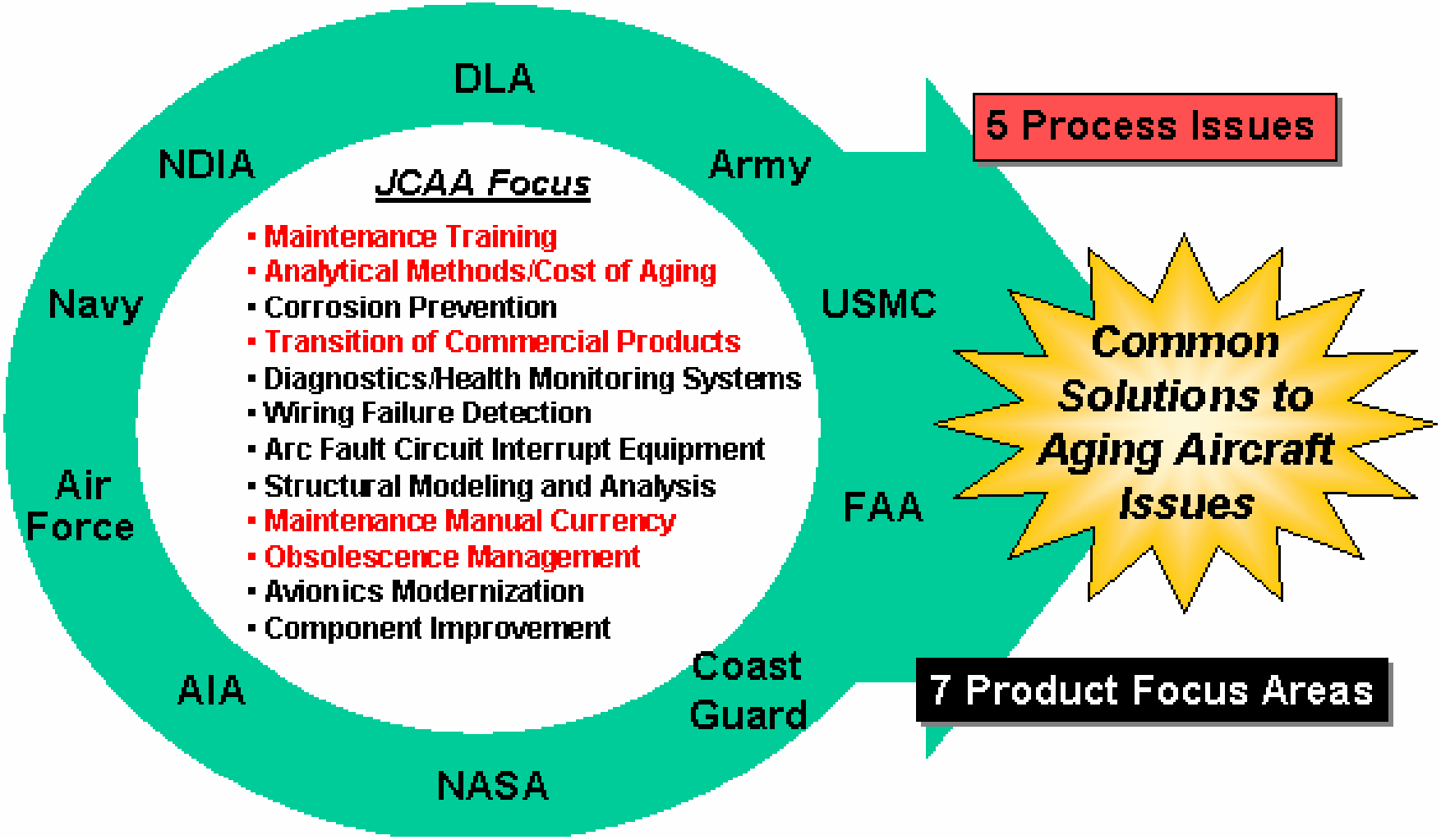
Through the use of Integrated Roadmaps, Shared Data and Analyses, the JCAA will:

- Identify Process Recommendations & Improvements
- Advocate/Enable Promising Technology
- Facilitate Transition of Technology/Program Opportunities
- Promote Knowledge Management on Aging Aircraft
- Coordinate Funding for Promising Areas

National Strategy Focus

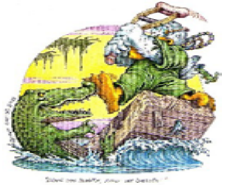


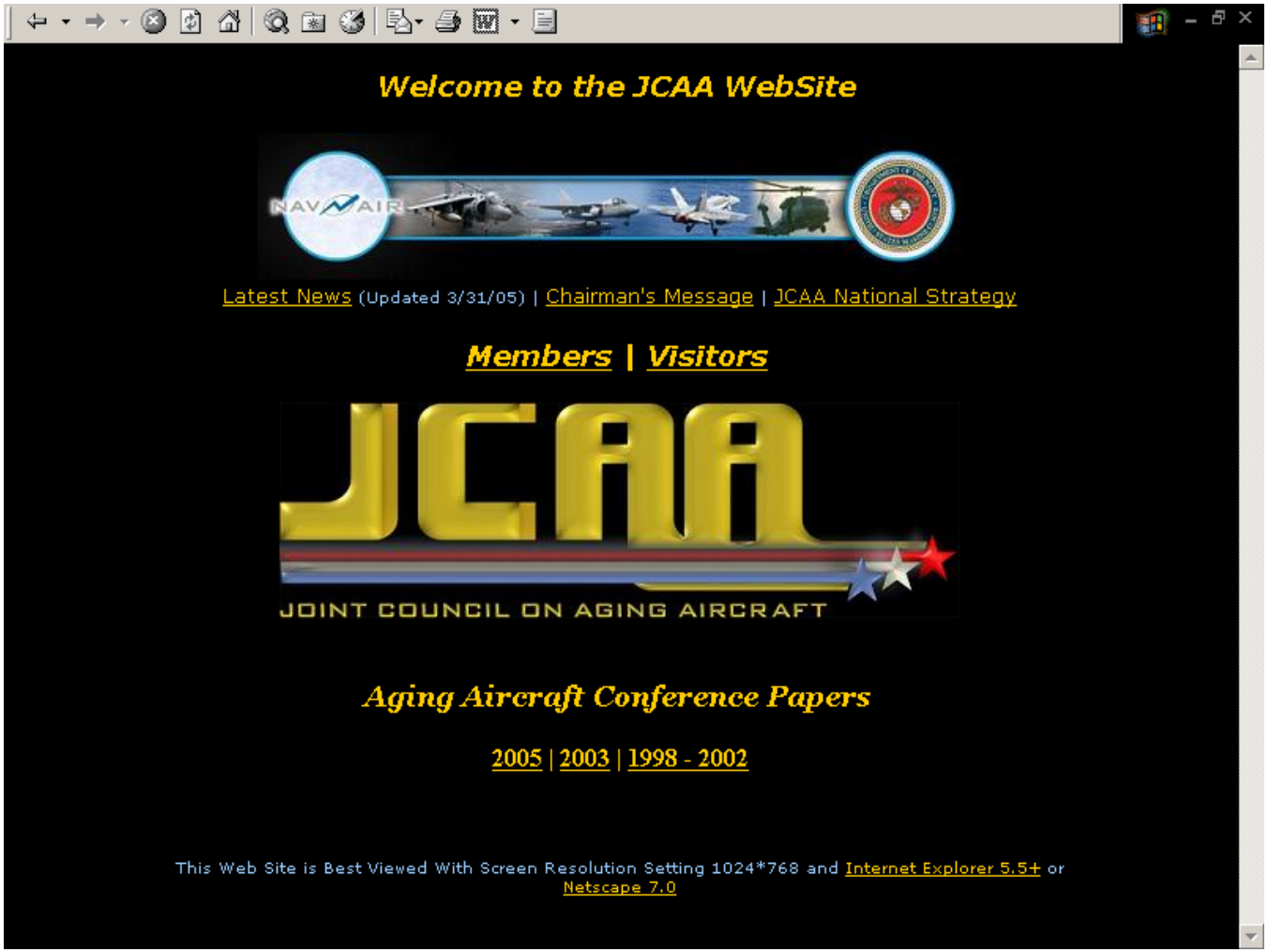
Aging Aircraft IPT



OSD and JLC Charged JCAA to Develop a National Strategy

JCAA Website



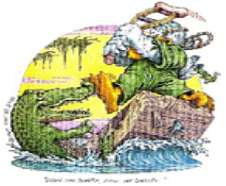


http://www.jcaa.us

Aging Aircraft Team Initiatives:

General Series Publications

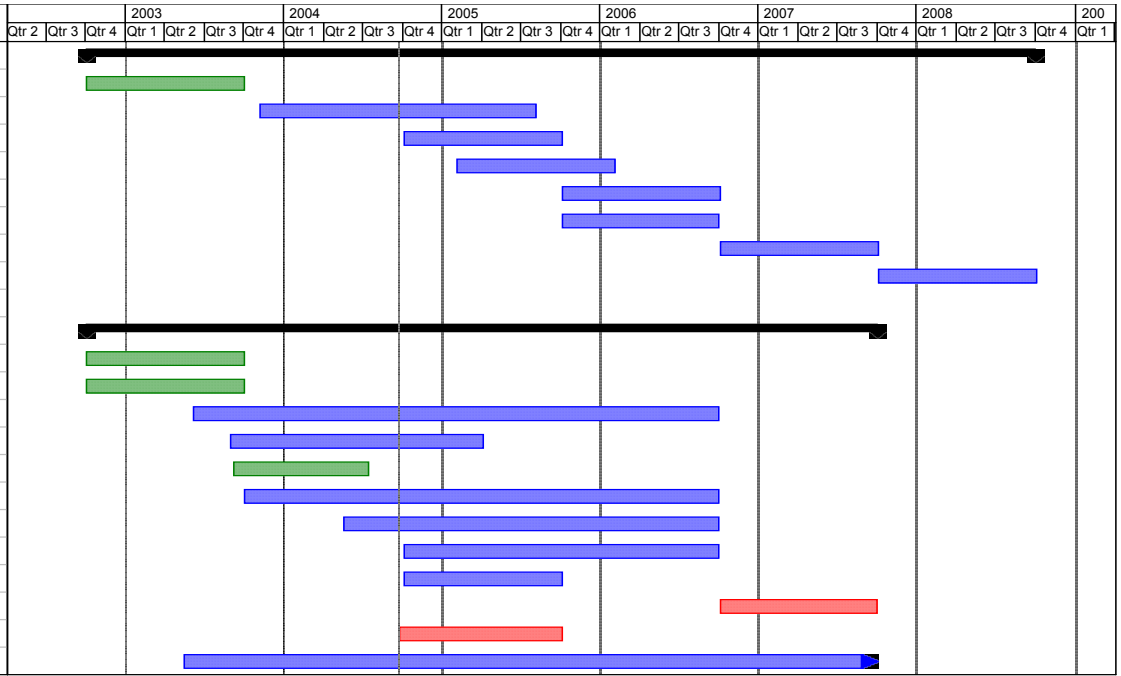
General Series Pubs



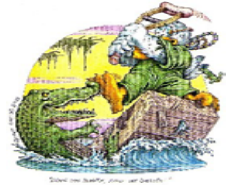
Aging Aircraft IPT

- Common Maintenance Procedures Utilized in All Platforms
- Number 1 Way to Transition New Maintenance Technology
- *Always* underfunded
- JCAA Coordinating Updates

ID	Task Name	Duration
1	**Technology Roadmaps**	**1565 days**
2	Joint Services CPC Roadmap	261 days
3	Joint Services NDI - Prognostics/Diagnostics Roadmap	456 days
4	Joint Services Protective Finishing System Roadmap	261 days
5	Joint Services Coatings Removal Roadmap	261 days
6	Joint Services Corrosion Mapping Roadmap	261 days
7	Joint Services Inorganic Coating/Plating Roadmap	260 days
8	Joint Services Cleaning and Preservation Roadmap	260 days
9	Joint Services Maintenance Practices Roadmap	260 days
10		
11	**Collaborative Technology Initiatives**	**1305 days**
12	Clear Water Rinse	261 days
13	Corrosion Kits	261 days
14	Geographic Corrosion Assessment	870 days
15	CPC Spec Updates	417 days
16	OSD Corrosion Guide Aerospace Annex	223 days
17	AMCOM-NAVAIR Corrosion Partnership	784 days
18	Corrosivity Sensor Initiative	620 days
19	AVDEC Gasket OSD Initiative	521 days
20	OSD Mg Finishing Effort	261 days
21	New Coating Evaluation	260 days
22	Avionics Corrosion Issues - TBD	270 days
23	OSD Corrosion IPT	1145 days



01-1A-509 Corrosion Control



Aging Aircraft IPT

The Challenge

- Duplication
  - 01-1A-509 (Airframe)
  - 16-1-540 (Avionics)

The Team

- U.S. Navy/U.S. Marine Corps
  - North Island
  - China Lake
  - FFT
- U.S. Air Force
  - Warner Robins
- U. S. Army

The Product

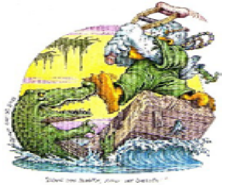
- Revise NA-01-1A-509
- Revise NA 01-1A-540
- Volumize data
- Hard Copy/CD released Mar 05

NA 01-1A-501-1 TM 1-1500-344-23-1 TO 1-1-689-1	NA 01-1A-501-2 TM 1-1500-344-23-2	NA 01-1A-501-3 TM 1-1500-344-23-3 TO 1-1-689-3	NA 01-1A-501-4 TM 1-1500-344-23-4	NA 01-1A-501-5 TM 1-1500-344-23-5 TO 1-1-689-5
Corrosion Program and Corrosion Theory	Aircraft Corrosion Control	Avionics and Electronics Corrosion Control	Consumable Materials and Equipment - Airframes	Consumable Materials and Equipment Avionics
1 MAR 05	1 MAR 05	1 MAR 05	1 MAR 05	1 MAR 05

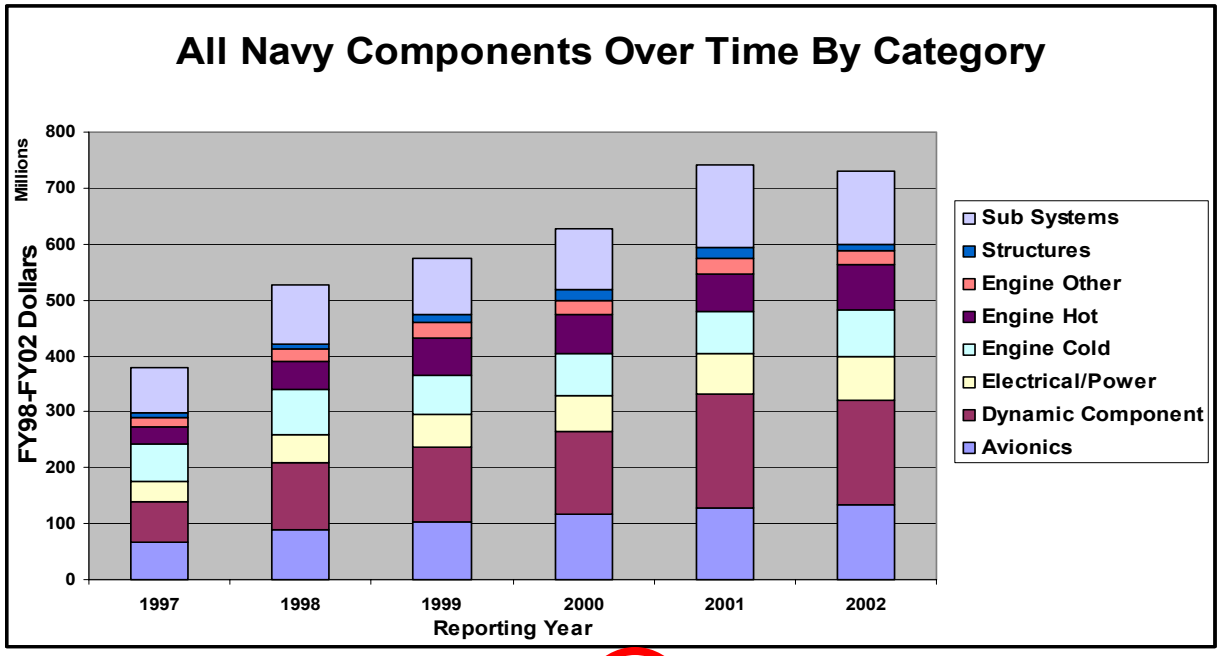
Aging Aircraft Team Initiatives:

Avionics and Airframe Parts Obsolescence

DMSMS / Obsolescence Policy "The Problem"



Aging Aircraft IPT

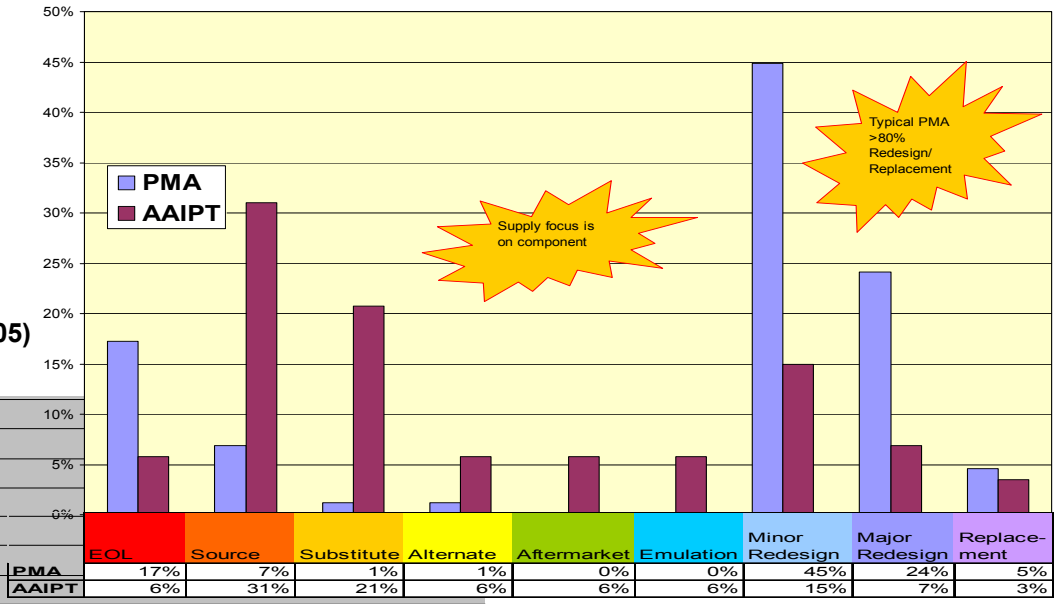


- **Component Repair growing by an average of 7.8% per year**
- ***Obsolescence a Key Factor for Avionics Cost Growth***
- Obsolescence impact to Naval Aviation alone = **$750M**
- PMA 265-$18M
- **PMA 275-$32M AVOIDED**

Root Cause Analysis	Age	Obs	Vndr	Dsgn	Log	New Item	Maint Plan
Avionics	27.5%	45.0%	1.3%	8.1%	8.1%	9.4%	0.6%
Dynamic Component	61.0%	0.0%	7.3%	3.7%	11.0%	12.2%	4.9%
Electrical/Power	40.6%	4.7%	6.3%	37.5%	3.1%	3.1%	4.7%
Engine Cold	64.2%	0.0%	0.0%	0.0%	7.7%	28.2%	0.0%
Engine Hot	86.2%	0.0%	0.0%	0.0%	0.0%	10.3%	3.4%
Engine Other	46.7%	8.3%	0.0%	23.3%	20.0%	1.7%	0.0%
Structures	76.7%	3.3%	0.0%	13.3%	0.0%	3.3%	3.3%
Sub Systems	52.9%	5.9%	4.4%	10.3%	14.7%	10.3%	1.5%

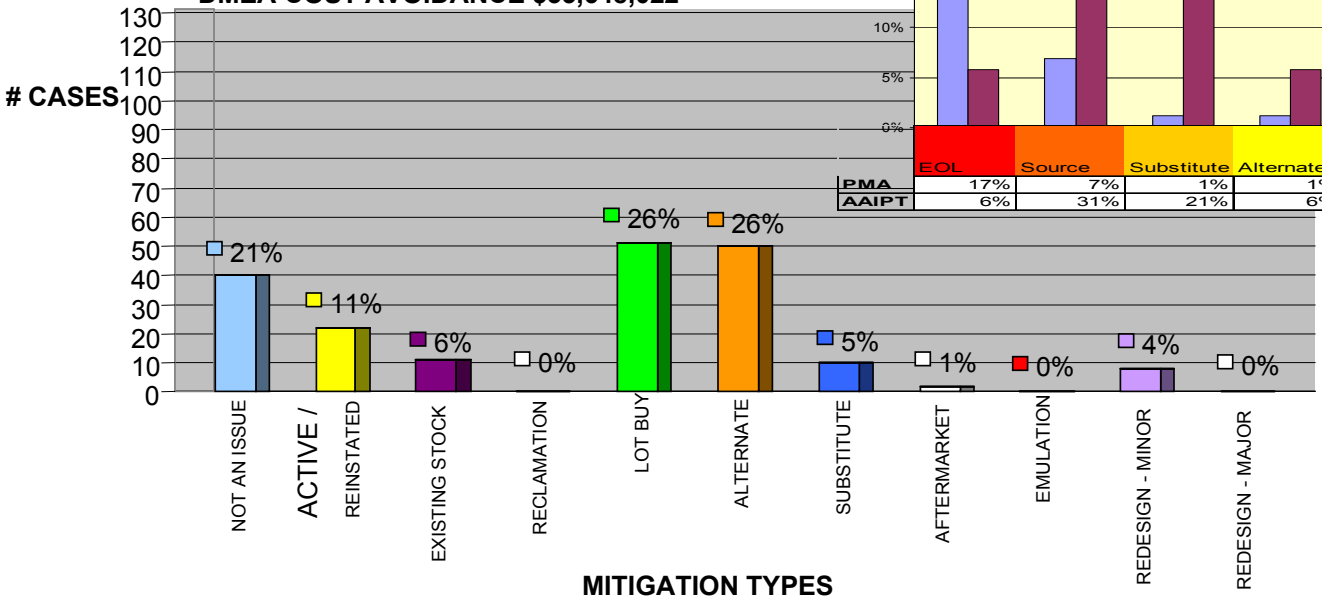
Spectrum of Potential Solutions

Component Solution ---------- System Replacement

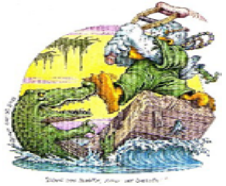


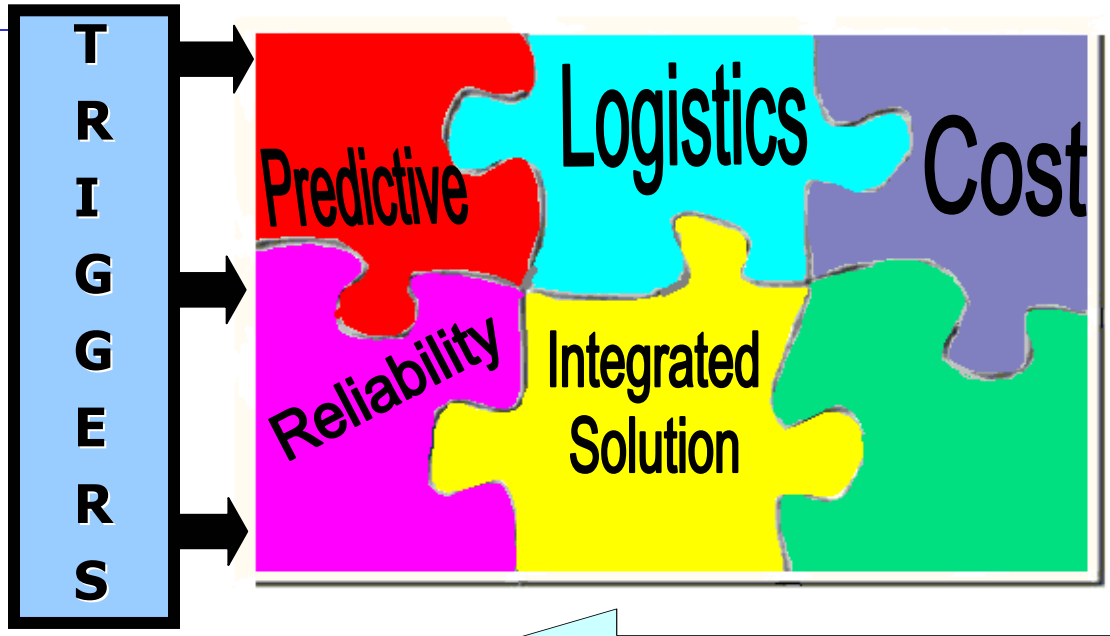
V-22 OBSOLESCENCE MANAGEMENT TEAM RESOLUTIONS (2005)

DMEA COST AVOIDANCE $33,648,022



Full Spectrum Obsolescence Support





Standardized approach

- **Multiple tools for each phase**
- **Waterfall charts**
- **Tracking of Metrics**
- **Certified Costs**

Component Solution----------System Replacement

Procurement:

- **SOW preparation**
- **Re-engineering**
- **Supplier obsolescence plans**
- **Component Selection**
- **Architecture Refresh options**

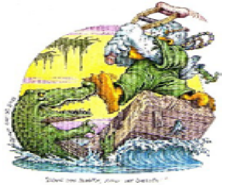
Process:

- **Tools Re-engineering**
- **Metrics**
- **Training**

Sustainment:

- **"Hot Line Support**
- **Re-engineering options**
- **System Analysis and Support**

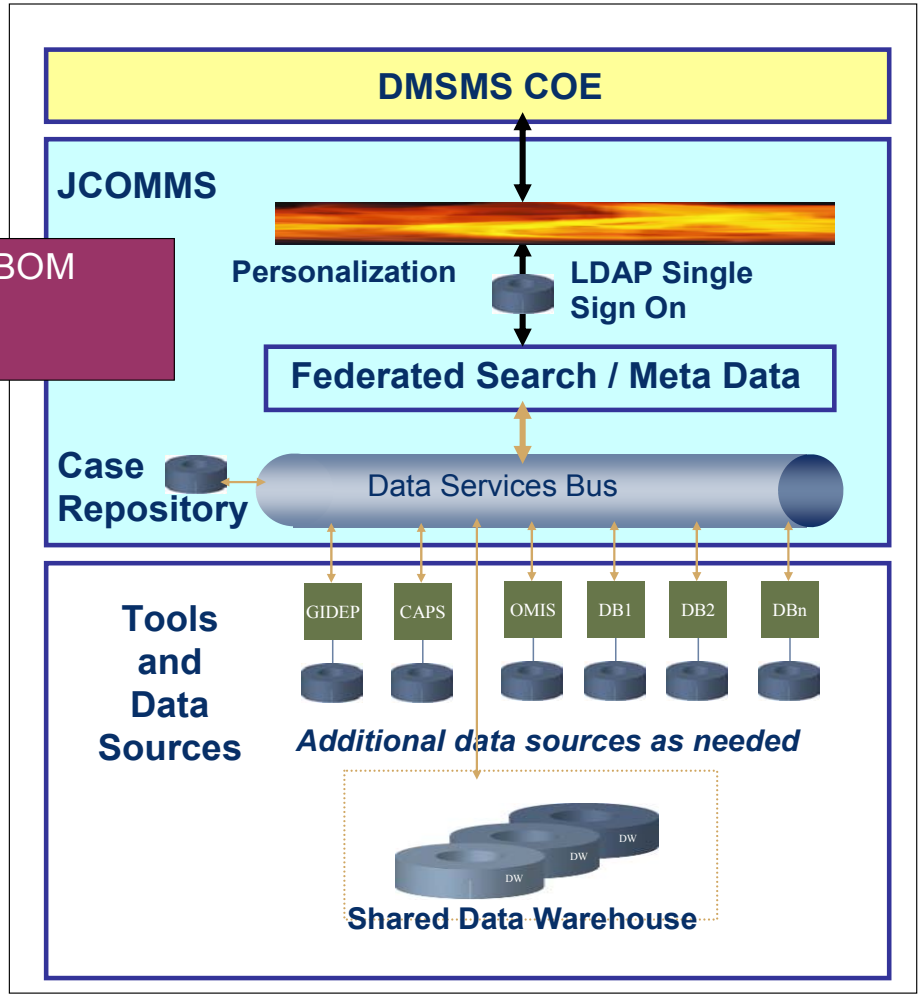
JCOMMS System Architecture



Aging Aircraft IPT

System Architecture

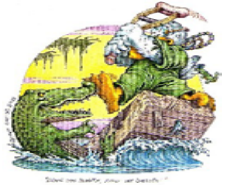
Part Number /BOM Cleansing and Formatting



- Solution Sharing
- Data Translation
- Piece Part Search
- Simultaneous Search
- Parametric Search
- Solution Search
- Predictive Obsolescence
- Personalization

Future – ERP and Depot Repair Data

JCOMMS - Targeted Data Sources and Tools Integration



Aging Aircraft IPT

Data Sources and Tools

Access Tools
- FedLog/FLIS
- PC Link

Aggregated Parts Sources
- Shared Data Warehouse
- Part Miner

Clearing House for Information
- ILS
- IHS Specs & Standards

Inventory Management
- WebCATS
- DSCC
- Haystack

Maintenance Information
- LMDSS

Predictive Tools
- Q-STAR
- Total Parts Plus
- TACTRAC-Comet
- CAPS Expert

Publication
- NATEC
- GIDEP
- Avionics Installation Plan

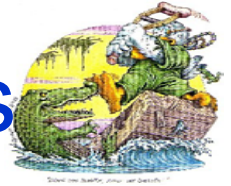
Sustainment Tools
- AVCOM
- Horizon
- Sunset
- OMIS
- EPIC
- Sustain

Technical Drawings
- JEDMICS (Medals)

Supplier
- Sarnoff
- Lansdale
- Rochester
- Fairchild
- Motorola
- Micro Semi
- National Semi
- TI
- QP Semi
- Cypress
- Intersil

- This list represents an independent view of the potential data sources and tools that will be considered under the JCOMMS Discovery
- And is JOINT across DoD

JCOMMS – Wild Card LM45 Results



Demo

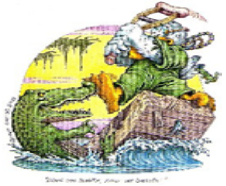
Aging Aircraft IPT

Document Matches: 15

Number of results displayed: 15

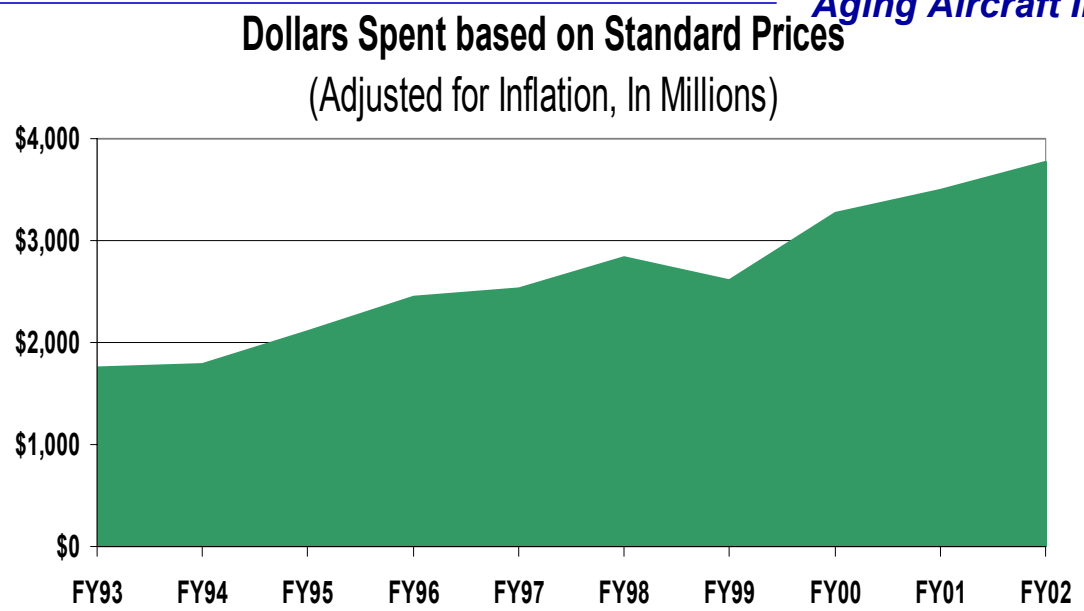
ID	Manufacturer	Description	Originator	Phone Number	Source
... LM4546AVH LM4546AVH ...					
LM4558N	NATIONAL SEMICONDUCTOR CORPORATION DIV HIGH RELIAB	MICROCIRCUIT,LINEAR			FLIS
LM4550VH					GIDEP DMS Notices
LM4550VH	National Semiconductor Corp	IC,SOUNDCARD CIRCUITS,QFP,48PIN,PLASTIC			CAPS
LM4548AVH	National Semiconductor Corp	IC,SOUNDCARD CIRCUITS,CMOS,QFP,48PIN,PLASTIC			CAPS
LM4546AVH	National Semiconductor Corp	IC,SOUNDCARD CIRCUITS,QFP,48PIN,PLASTIC			CAPS
LM4550VHX	National Semiconductor Corp	IC,SOUNDCARD CIRCUITS,QFP,48PIN,PLASTIC			CAPS
LM4550VHX					GIDEP DMS Notices
LM4548AVH					GIDEP DMS Notices
LM4546AVH					GIDEP DMS Notices
LM4546AVHX	National Semiconductor Corp	IC,SOUNDCARD CIRCUITS,QFP,48PIN,PLASTIC			CAPS
LM4548AVHX	National Semiconductor Corp	IC,SOUNDCARD CIRCUITS,CMOS,QFP,48PIN,PLASTIC			CAPS
LM4546AVHX					GIDEP DMS Notices
LM4548AVHX					GIDEP DMS Notices
LM4558N	LOCKMART	NSC	RICK.CAHN doug44		JCOMMS Cases

FastTrack – The Need



DLA Managed Consumables Have Experienced Significant Increases in Acquisition Costs

- **Many different FSCs**
  - **Many are simple structural parts**
- **up to 300% increase**
- **increased use of OEM's for "readiness at all cost" solutions**



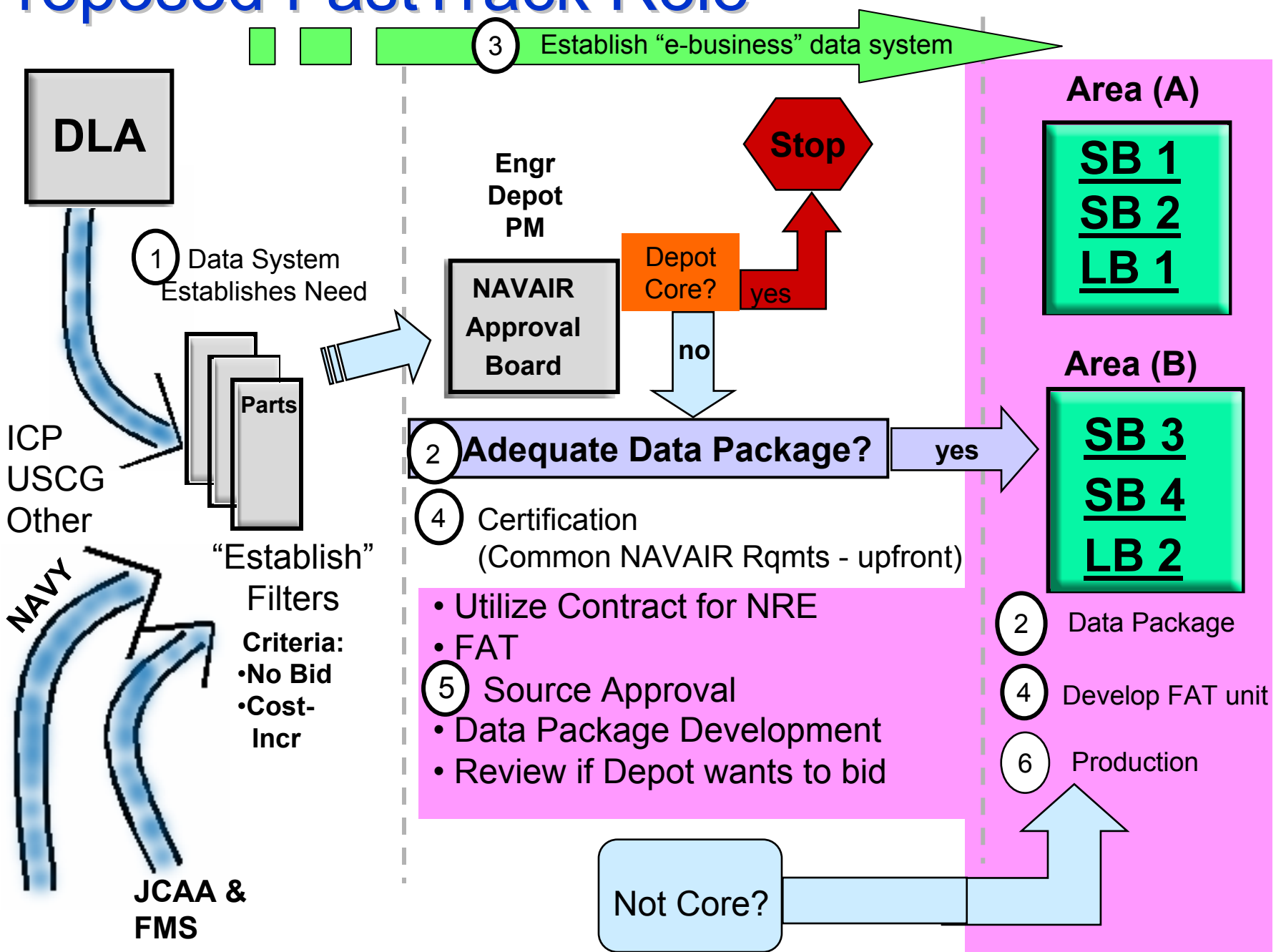
All Aviation Consumable Items - Dollar Demand Chart

DLA Managed items one of two major issues in depot cost growth

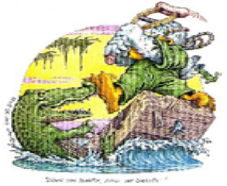
Process to qualify alternate sources severely fragmented and inefficient

Program Teams Don't have the Resources to Establish Stand Alone Contracts for Individual Parts

Proposed FastTrack Role



Obsolescence & FastTrack Overview



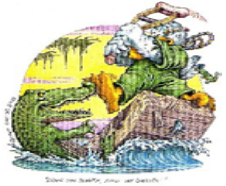
- **Obsolescence offers both Challenges and Opportunity**
- **Need to be Proactive and attack the cause of Obsolescence**
  - **Teaming with Industry**
  - **Establish "Standards" for Electronic Parts management**
  - **Balance new design practices, tools and more robust mitigation efforts**
  - **Champion new technologies**

Opportunity to get in on the Ground Floor

Aging Aircraft Team Initiatives:

Airframe Corrosion

Corrosion Products



- **Touch-Up Aerosol Primers & Topcoats**
- Isocyanate Investigation
- Sacrificial Coating Repair
- **Clear Water Rinse System**
- **Corrosion Repair Kit**
- Specifications Update
- **AvDec Sealants**
- Magnesium Treatment
- OSD CPC Guidebook Appendix K

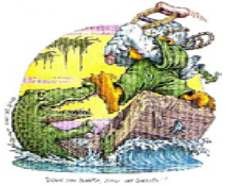
Touch-Up Aerosol Primers and Topcoats

Objective: Evaluate performance of commercial off-the-shelf aerosol products conforming to MIL-SPEC for touch-up painting.

Background: Non-approved aerosol coatings (A-A-2786 & PWC) do not provide adequate corrosion protection, weather resistance, durability, nor are they resistant to operational fluids. Used extensively by O- and I- level maintenance activities, and IMC sites.

Status: Product screening and initial corrosion testing is complete. Follow-On testing underway and when complete Implementation planned for FY05.

Clear Water Rinse System



Aging Aircraft IPT

Description:

Automated taxi-thru Clear Water Rinse System (CWRS) for aircraft upon return to airfield after completion of daily mission or training exercises.

A closed loop CWRS with filtration to remove heavy metal contaminants, salts, oils and greases.

Date Action Initiated/Due:

June 2004

Status:

Approved Army project with initial lease for Hunter AAF, GA

OSD FY05 funding - $2M (Hunter AAF)

Service FY05 matching - $3M (SWA)

Aeronautical:

Rotary Wing

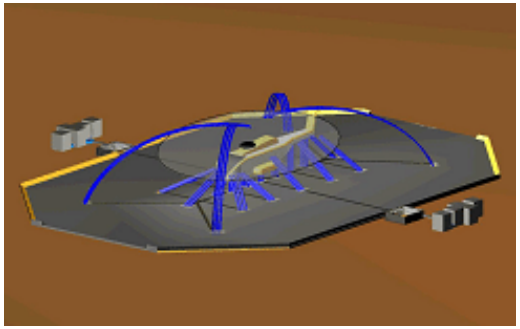
Services/Agencies Impacted:

All Rotary Wing Owners

ILS Elements:

Leased/Transportable System

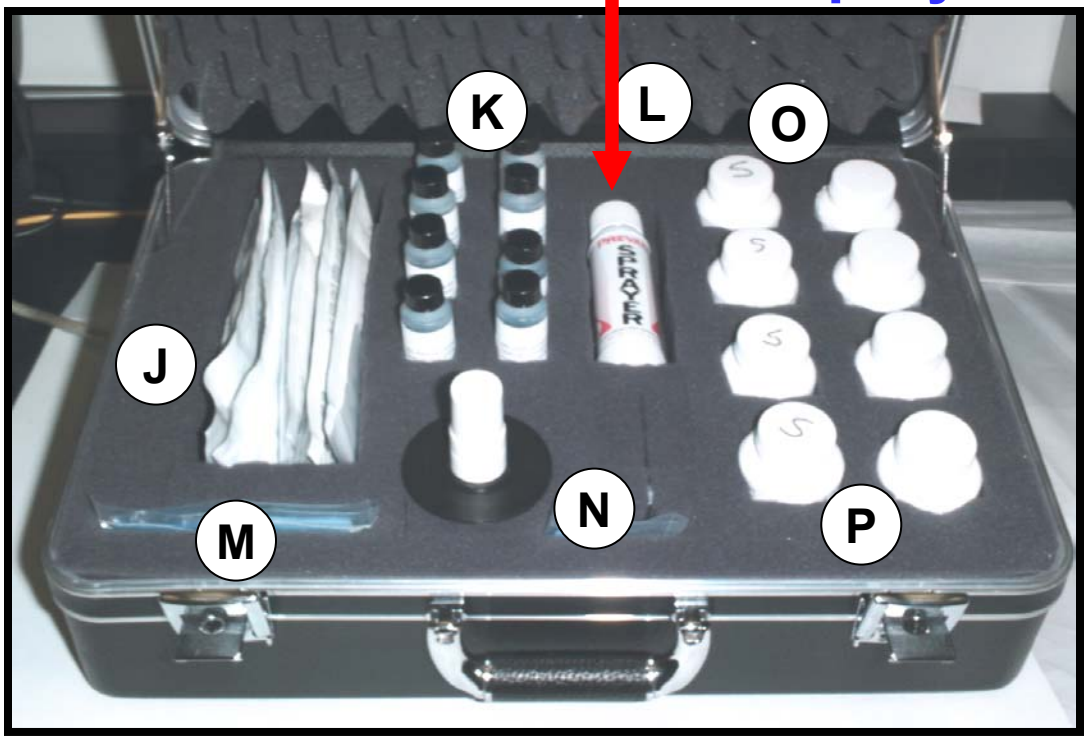
Contractor Logistic Support (CLS)



Corrosion Repair Kit

K. One-component primer
And one-component topcoat

L. **Pre Val**
Aerosol sprayer



J. Primer
and Topcoat
Sempens

O. Two-component
polyurethane
brush or
sprayable topcoat

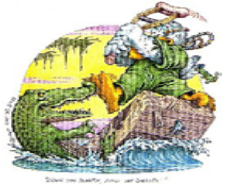
M. Pre-moistened
abrasive pads and
towelettes

N. Chromate conversion
coating pen

P. One-component brush or
sprayable polyurethane
topcoat

Short term solutions for the maintainer

CPC and AvDec Sealants



Aging Aircraft IPT

Description:

Antenna, static wick, other electrical interfaces and floorboards pose corrosion problems for aviation platforms.

Current corrosion prevention schemes are not sufficient and lead to high component scrap rates, maintenance Man hours and prematurely damaged structure.

Date Action Initiated/Due:

Start Jan 2005

Status:

Approved project

OSD FY05 funding - $2.91M

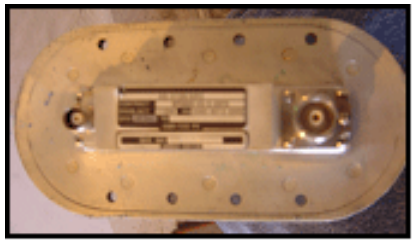
Service FY05 matching - $3.832M

Air Force, Navy and USCG successfully demonstrated

Aeronautical:

Without AvDEC gasket

With AvDEC gasket



ILS Elements:

Maintenance Planning

Manpower & Personnel

Supply Support

Training & Training Support

Air Vehicle Bonding Repair

Processes for Austere Bonding

PROBLEM

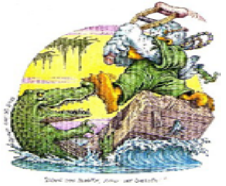
- Difficult to effect bonded repairs in austere environments (esp. blowing sand)
- Limits effectiveness of patches, and increases repair time for forward deployed units
- Can force delayed repairs

SOLUTION

- Commercially available hazmat removal bags could fulfill this requirement. Need to develop use procedures and put in –21 or TMS SRMs. Could also provide procedures for manufacturing bags from scratch.
- Commercial bags provided to recently deploying H-46 squadron HMM-261 for prototype.

Aging Aircraft Team Initiatives: Wiring Team

Integrated Wiring Strategy



Aging Aircraft IPT

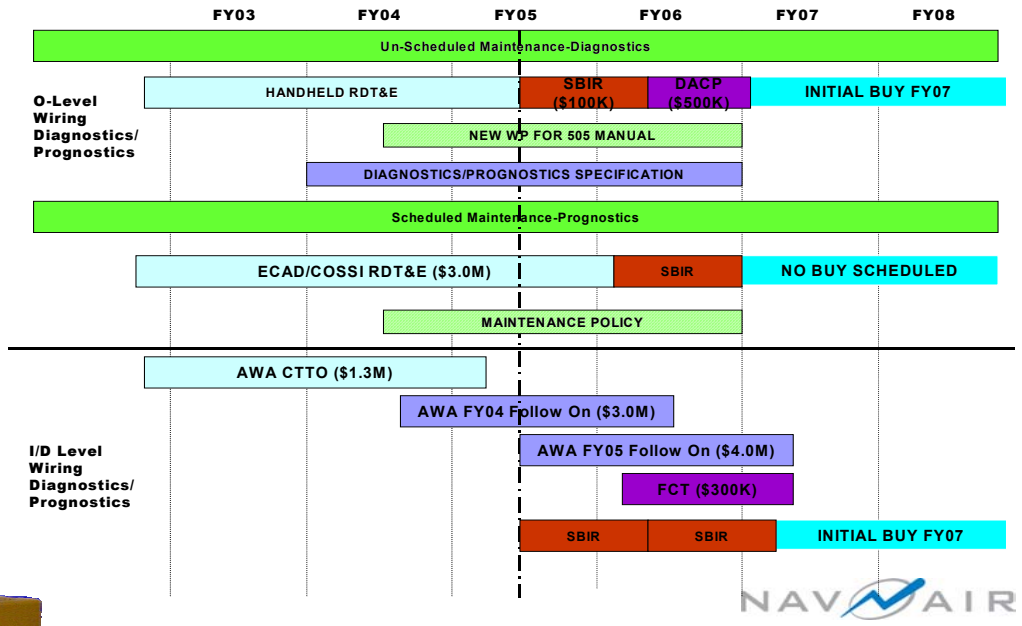
ARC Fault Circuit Breaker

- Reduction in aircraft fires
- Support standardization
- **Joint Logistics Package and Procurement**

AWA (Off-Line Diagnostics) Program

- Develop and Field Depot level Wiring Diagnostic Tool
- Standing Wave Reflectometry (SWR)
- 128,000 point switching

Wiring Diag/Prog Efforts

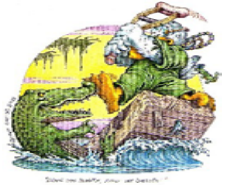


Balance of technology, conditioned based maintenance (CBM), training and publications

Continuous Tech Insertion

Integrated Roadmap – coordinated Procurement

Arc Fault Circuit Breaker
Timeline



Aging Aircraft IPT

JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC JAN FEB MAR

Testing - 14105

Ops Test

B-2 & F-15 Fit Ck

Testing - 3320

Ops Test

2 month delay, EMI problems
Replacement Units – 15 Jun
SOF still on schedule

Delivery

Eaton 3 Ph (P-3)

SOF

Eaton DC (F-18)

Ametek DC (F-18/H-60)

Amatek 3 Ph (P-3)

Eaton DC (F-18/H-60)

ILS ELEMENT PLANNING

6-7 Apr 05 28-29 Jun 3-4 Aug 15 Sep

Core Team Meet

Conf Call

TRL & LRA

Maint Planning

Delivered

Update

FMECA/RCM

Maint. Concept Best Practices

Documentation

Supply Support

14105 Qualified Parts List/ Others TBD

Platform Requirements

SAE Meeting – 20th
Approve 1st Slash Sheet

Support Equipment

Funded

Deliver to SAE

Training TBD

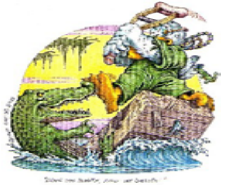
Specification

Define Tasks

Trng Cmnd Rev

Training

Arc Fault Circuit Breaker



Aging Aircraft IPT

Purpose/Description of Issue:

- The FAA, USAF, USN are jointly developing the arc fault circuit breakers and a core logistics package must be developed prior to implementation

End Product/Outcome:

- Common Core Logistics Elements & Processes will be identified/addressed
- **QPL (Jan 06) ** (168 DLA $, 50k Contr)**
- **Common Training (Mar 06) (FY-06)**
- **Maintenance Concept Doc (Sep 06) ****
- **Navy FY-05 40k Wyle)**
- **Procurement contract (TBD) **(DLA cost**
- **Support equipment (TBD) **(200k DLA funding)**

** FUNDED

Task Group Composition:

- USN Bob Ernst (4.1D)
- USN Andrew Yang (4.4.4.3); Chuck Singer (4.4.4.1); Rick Clarkson (3.1.4)
- USAF **Terry Miller (ASC/AAAV)**
- USCG Keith Stevenson
- USA Jean Grotophorst (AMSRD-AMR-SE-IO-VE)
- DLA Dale Roberts (DSCR)
- FAA Mike Walz (Adjunct member)

Metrics:

- Reduction in aircraft fires
- Support standardization
- Time to transition technology

AWA Diagnostic Tester

The Problem: Navy Wiring Defects Impact Safety, Readiness, Cost

- **Safety Impact**:
- 2.5 electrical fires/month
- During 30 month period, lost 2 aircraft due to electrical fires
- 540 in-flight aborts/year
- Hazardous Material Reports (HMRs)
  - Chafing conditions are our number one safety issue with regard to wiring
  - Hazardous incidents are increasing as aircraft age
- **Readiness Impact:**
- 1,400 mission aborts/year
- Effectively average 125 NMC aircraft per year due to faulty wiring

- **Affordability/Cost Impact:**
- Approximately $94M in NFF eqpmt removals due to undiagnosed wiring problems on an annual basis
- 1-2M operational MMhrs/year spent repairing wire problems
- **Most time spent trouble-shooting, isolating, & locating wire faults**
- **This information is known to be under-reported**
- Could be as high as 4M MMhrs/year

AWA Diagnostic Tester

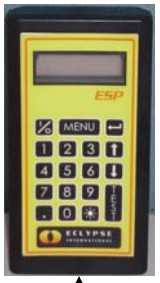
- MULTIPLE FREQUENCY TEST PROTOCOL PER WIRE PATH
  - NON-DESTRUCTIVE
- BASIC CHECK IS FAST & AUTOMATIC
  - ✓ OPENS (ISOLATION)
  - ✓ SHORTS (CONTINUITY)
  - ✓ DISTANCE IN FT/INCHES OR METERS/CM OR ALL INCHES
  - ✓ SOME WAVEFORM ANALYSIS CAPABILITY
- PROCEDURES ARE MENU DRIVEN

Single Circuit Path

Multiple Circuit Paths + Multiple Leads

Ready for Fielding

AWA TEST SYSTEMS



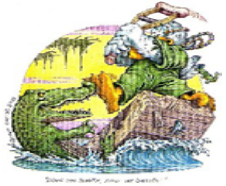
Hand Held Unit

AWA TESTS CIRCUITS USING NASA PATENTED TECHNOLOGY- STANDING WAVE REFLECTOMETRY (SWR)

Ruggedized Laptop

Test Box + Expansion Units

AWA Diagnostic Tester



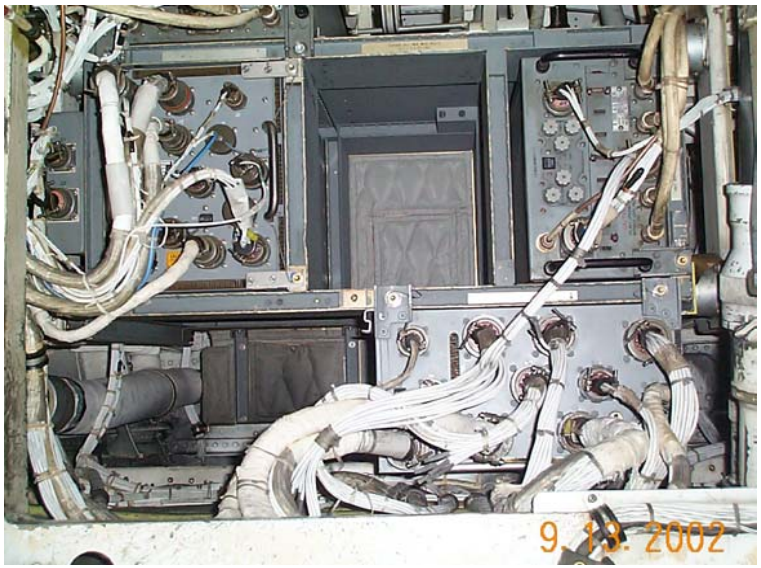
Aging Aircraft IPT

Wiring System – Degraders & Cost

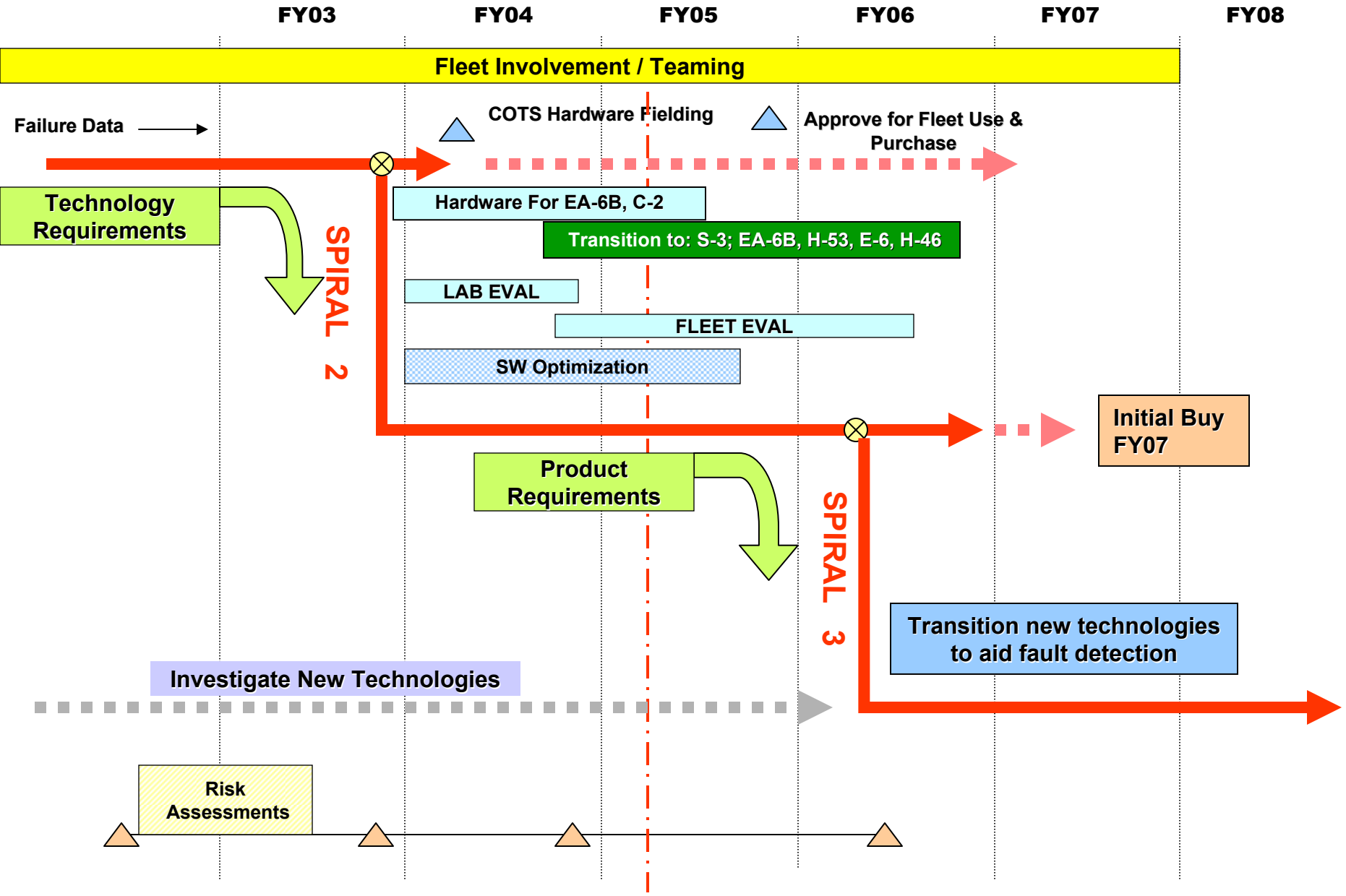
Why Should You Care About Wiring Systems?

- **An Indispensable System**
- **Impacts Safety and Mission Readiness**
- **High Cost Of False Equipment Removals**
- **Complexity and Density Is Increasing**
- **Experiences Aging Effects**

- **Safety Degrader**
- **Readiness Degrader**
- **Millions Of MMH**
- **Escalating Cost**



AWA Diagnostic Tester



Aging Aircraft Team Initiatives:

Avionics

Industry Consensus Definition:
Aerospace Qualified Electronic Component

The intent of this definition of an Aerospace Qualified Electronic Component (AQEC) is to (a) ensure that electronic components used in aerospace applications are reliable in those applications; (b) provide aerospace access to component manufacturers' commercial-off-the-shelf (COTS) products at acceptable cost; (c) minimize deviations from the component manufacturers' COTS products; (d) have little or no negative impact on the AQEC suppliers' operating or business procedures; and (e) promote communication between the component manufacturer and the aerospace users.

This definition is not to be imposed upon AQEC suppliers or users, but to be negotiated among them.

1. The AQEC should have the following features:

   –Designed, fabricated, assembled, and **tested in accordance with the component manufacturers'** requirements for (COTS) products;

   –**Qualified in accordance with the component manufacturer's standards** and specifications for the manufacturer's COTS products;

   –Subject to the component manufacturer's design, manufacturing, quality assurance, and quality systems standards, technical specifications, procedures, and other similar requirements for COTS products.

2.In order to be considered an AQEC, the component manufacturer's COTS component should undergo testing and/or analysis to **assess its reliability in the aerospace application**. The process used to do so should be mutually agreed upon by the AQEC suppliers and users.

3.The configuration of the device should **remain stable for a specified period of time**. (This may be done in a variety of ways, but one example would be to characterize given lots of devices as AQEC, in sufficient quantities to supply the aerospace market for agreed-upon periods of time.)

Lead Free Solder

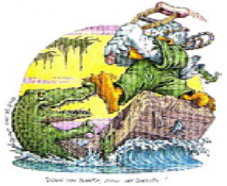
EU Directive 2002/95 & 96/EC:

New electrical and electronic equipment put on the market after 1 July 2006 shall not contain lead or other hazardous materials

Similar legislation being implemented in:

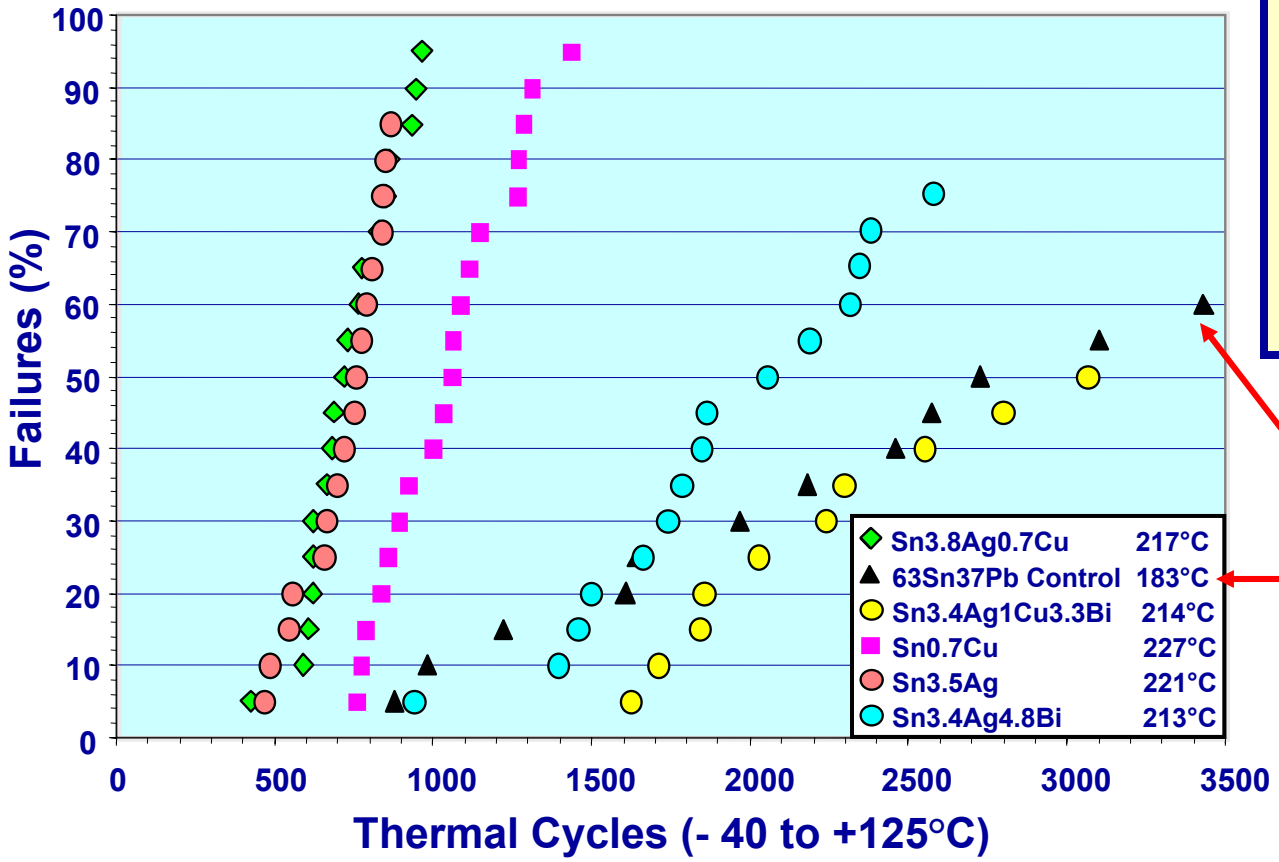
- China
- A number of US states

Pb-Free Electronics will have New and Varied Solders, Changes in Component Finishes, and Possibly Changes in PWB Materials and Finishes



Aging Aircraft IPT

♦ • **Sn-3.8Ag-0.7Cu, an industry Pb-free favorite, fails prematurely**

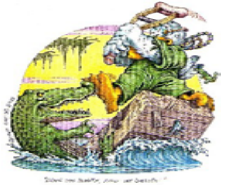


Risk Issues:

- **Higher processing temp.**
  - **enhances CTE effects**
  - **can greatly reduce component service life**
- **Pb contamination can positively or negatively impact Pb-free solders**

Current Solder Alloy

Next Aging Aircraft Conference



9TH JOINT FAA/DOD/NASA
CONFERENCE ON AGING AIRCRAFT
MARCH 6-9, 2006 • HYATT REGENCY-ATLANTA, GA

Sat., May 14, 2005

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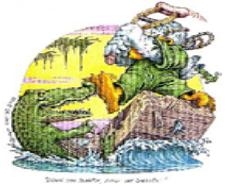
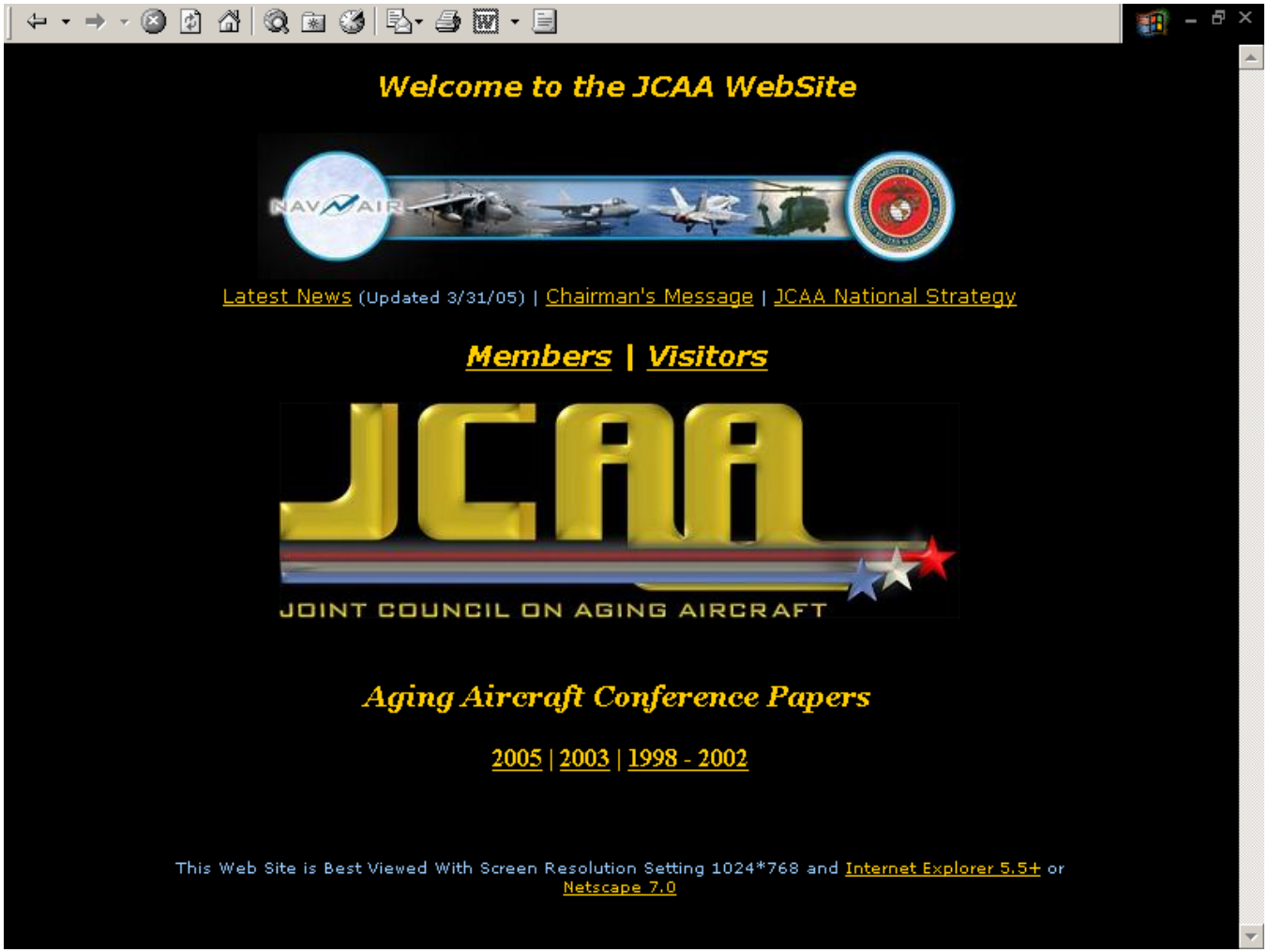
Questions?

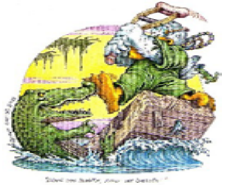
JCAA Website





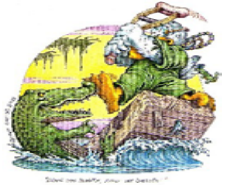
http://www.jcaa.us

Summary



- Solutions to Aging Aircraft problems are available.
- Integrated Roadmaps optimize balance of new technology, COTS insertion and logistics
- Need to partner with Industry to find the best of breed
  - NTSC/JCAA resources provide leverage
- Need to focus on real *"Cost Wise"* Solutions for our legacy fleet

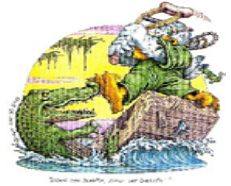
Teaming Strategy



JCAA Teaming Strategy

1. We don't have enough resources to do it alone
2. Teaming does not mean money changes hands
   - You do something, we do something else
   - Joint testing. Data exchange
3. US AAIPT will fund the initial steps
   - P-3 Full Scale Fatigue Test as a model
   - Joint development and data sharing; FMS participates in out year requirements
4. What companies, new technology do you want us to evaluate?

Teaming Example



Sample obsolescence Process...

	FMS Customer	NAVAIR/AAIPT	Other DoD	Contractor
Establish Triggers	Joint	Joint	Joint	Joint
Configuration Baseline	Primary	Assist	Assist	Assist
Preliminary Assessment	Assist	Primary	Assist	Assist
Integrate Supply/Demand	Joint	Joint	Joint	Joint
Determine Corrective Action	Primary	Assist	Assist	Assist
Foster Collaboration	Joint	Primary	Joint	Joint

Many components can be completed by others

- **outside of the US DoD and DoD contractors**

Real Savings is

- **in the use of a common process and toolset**
- **Sharing of NRE and solutions**

What's the best teaming arrangement for YOU!