Panel Discussion:
Aging Systems – Classic to Geriatric to Jurassic – When Will it Stop?

Naval Air Systems Command Cost Analysis Department
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29 OCTOBER 2002
OUTLINE

- Age Issues Associated with Military Aircraft
- Increasing Cost Trends
- Linking of Increasing Cost to Age
- Other Influences Increasing Costs
- Need for A Better Understanding of Cost Drivers that are Increasing Operations and Support Costs
**Phase 1**

**New Aircraft**
- Corrosion/inspection are minor issues
- Limited depot work
- Component AVDLR increases driven by increasing failures
- Limited APN-5 funded mods
- Manpower increases absorbed in overall manning structure

**Phase 2**

**Early Mature Stage**
- Corrosion/inspection increasing
- Aircraft in full cycle -- periodic depot visits
- Component AVDLR increases at higher level than Stage 1
- Mods still small but increasing due to safety/requirements
- Manpower implications still hidden within overall manning structure
- Some aircraft becoming hangar queens due to recurring problems

**Phase 3**

**Late Mature Stage**
- Corrosion/inspection are major labor cost drivers
- Periodic depot visits with increasingly severe emergent repairs
- Increasing mods due to add'l reqmt's/svc life extension issues
- Increasing number of hangar queens
- Strong pressures on manning due to increased workload

**Phase 4**

**Final Life Stage**
- Depots deal with major structural issues
- Major SLAP/SLEP req’d to fly due to structural fatigue issues
- Obsolescence becoming major cost driver -- Major mod costs
- Problems fielding deployable units due to smaller population of available airframes and engines
Aircraft Average age INCREASING
Trends Only Stabilize with Current Planner Larger Buys

NOTE: TRENDS ASSUME CURRENT PROCUREMENT PLANS EXECUTED THROUGH 2012
RECENT PRODUCTION CUTS WILL LEAD TO INCREASED AGE
Aircraft Age Implications

If this were 1951... Yalu River, North Korea...

The Threat

**MiG-15 “Faggot”**
- Powerplant: Klimov VK-1
- Thrust: 6,000 Lbs
- Max Speed: 670 mph
- Ceiling: 51,000 ft
- Weapons: 2 23mm cannons, 1 37 mm cannon, Rockets & Bombs

The Response

**Grumman F2F-1**
- Powerplant: PW R-1535-72
- Horsepower: 650
- Max Speed: 231 mph
- Ceiling: 27,100 ft
- Weapons: 2 .30-Cal guns
Increasing Costs
For Aging Force Structure (TY$)

Increases Concentrated on FHP Repair and Modification Lines

Historical Cost Data based on VAMOSC ATMSR data extract from 31AUG01
Flying Hour Program Cost Per Hour (Fuel, Repairable Items, Consumables)

Costs Are Steadily Increasing

- Then Year CPH
- Normalized CPH (FY2002 $)
  - 7.7% growth/yr
  - 5.7% growth/yr
Age Linked to Cost

- Because Aircraft/Equipment Age and Cost of Operations are Trending in Same Directions It Easy Easy to Speculate that This Represents Cause and Effect

- The Relationships are Actually More Complex As Demonstrated by Following Examples
Need for a Better Understanding of Operating Cost Increase Trends

- Several Examples of Age Vs Cost – Or Is it?
- Root Causes for Cost Growth Emphasizing Cost of Repair Components
- Low Volume Repair and New Capability/New Parts Issue
- FY2001 Navy Study Addressing Causes of Component Cost Growth
- Need for Follow-On Analysis of Cost Growth Causation
Aging but Limited Cost Increases

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<th>CH-46E</th>
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<td><strong>Top Ten AVDLR Cost Drivers by NIIN</strong></td>
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<tr>
<th>T58-GE16 Engine</th>
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“Not Aging” but Significant Cost Increases (Capability Changes)

**E-2**

Top Ten AVDLR Cost Drivers by NIIN

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<tr>
<th>NIIN</th>
<th>Description</th>
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<tr>
<td>005872530</td>
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<td>002019809</td>
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<td>010110855</td>
<td>GIMBAL ASSEMBLY</td>
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<td>009280072</td>
<td>GYROSCOPE, DISPLACEMENT</td>
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<td>012743443</td>
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<td>013518722</td>
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<td>010488044</td>
<td>GEARBOX ASSEMBLY</td>
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**T58-GE16 Engine**

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<th>NIIN</th>
<th>Description</th>
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<tbody>
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<td>004347642</td>
<td>ROTOR, COMPRESSOR, AI</td>
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<td>010639544</td>
<td>CASE AND VANE ASSEMBLY</td>
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<tr>
<td>010491153</td>
<td>LINER, COMBUSTION CHAMBER</td>
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<td>008769689</td>
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<td>010765343</td>
<td>FUEL CONTROL, MAIN, T</td>
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<td>010877728</td>
<td>DIFFUSER, AIRCRAFT G</td>
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<tr>
<td>008303362</td>
<td>BRAKE, SHAFT, PROP</td>
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<tr>
<td>007581138</td>
<td>SEAL, LABYRINTH STATOR</td>
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<td>011932157</td>
<td>SUPPORT ASSEMBLY, TU</td>
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Average Age 1990-2001:

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<td>1992</td>
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<td>1997</td>
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<td>1998</td>
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<td>2000</td>
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<tr>
<td>2001</td>
<td>10.5</td>
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Root Causes for Cost Growth

**Aging System**
- Reaching Life Limits
- Increased Corrosion
- Increased Replacement Factor for Repair Parts
- Increased Beyond Economic Repair Items

**Maintenance Plan Change**
- 3 level to 2 level maintenance
- Discard to Repair
- Increased Depth of Maintenance
- Reduction in Life limits/Increased Frequency

**Obsolescence/Vendor Base/DMS**
- Reduced Sources/Competition for Parts and Repairs
- Rework vice Replacement of Items
- Premium Prices
- Cannibalization

**Logistics Shortfalls**
- Support Equipment
- Repair Parts
- Manpower
- Update Publications

**New/Replacement Parts**
- LECPs/OSIPS
- Attrition Changes with Higher Cost Materials

**Vendor Base Changes**
- Significant Changes in Vendor Sources

**Other**
- Areas Like FOD not Fitting other Categories

**Design Influences**
- Capability Growth
- Design “Mistakes”
- Inherent Design Limitation on R&M
Low Volume Component Repair
May Not Drive Higher Costs Currently But Limit Ability to Reduce Cost of Many Repairs

- 25% of the Items Repaired Show Up only Once per Year
- 75% of Items Repaired Show Up Less Than 12 Times per Year (<1/mo)
- 85% of Items Repaired Show Up Less Than 24 Times per Year (<2/mo)
- Over 3800 Unique (Different Item) Circuit Boards Repaired During Period FY1999-2000
**Impact of New Repairable New Items Entering Inventory**

**Demands for Repairable Items Over Time**

- **Old Items Departing Inventory**
- **New Items Entering Inventory**

**Costs for Repairable Items Over Time**

- **Total Repair Costs of New Items in Inventory**
  - Approximately 2.7 Times Repair cost of Old Items Departing from Inventory
  - By FY2001 – In Many Cases Represent Great Capability and Greater Complexity

- **Items Either Leaving or Entering Inventory Account for Approximately one/forth of Maintenance Repairable Actions Over Time**
AVDLR Cost Growth Drivers

Navy Aviation Analysis

350 AVDLRs – JAN 01

- Aging System: 51%
- Logistics Shortfall: 10%
- Obsolescence: 15%
- Maintenance Plan Change: 4%
- Design: 8%
- Vendor: 5%
- New Item: 5%
- Other: 2%

AVDLR Cost Growth Drivers
By Aircraft Type & Engines

ROOT CAUSES DIFFER SIGNIFICANTLY BY PROGRAM TYPE
AVDLR COST GROWTH DRIVERS
BY MAJOR SYSTEMS

NOTE: ENGINES CONSIDERED SEPARATELY (NOT SHOWN)  
CHART REFLECTS NUMBER OF ITEMS NOT $'S
Opportunities Exist To Attack Some of Aging and “Non-Aging” Causes of Cost Growth

- Need for Follow-On Cross Service Studies to Consistently Assess Dynamics of Cost Growth and Relationship to Aging
- Greater Knowledge of Cost Increase Causal Factors Will Allow Maintenance Community to More Effectively Adapt to User Requirements
- NAVAIR Aging Aircraft IPT has Already Used Better Understanding of Areas of Cost Growth to Define Key Focus Areas with Potential for Cost Reduction