Reduction in Total Ownership Cost: Balancing Availability, Capability, and Costs (AWACS and R-TOC)

Captain David L. Peeler, Jr.

Abstract

The Airborne Warning And Control Systems[1] (AWACS) Systems Program Office (SPO) has been actively pursuing cost reduction and aircraft availability activities since 1994. The original conception of such activities was dubbed "Extend Sentry."[2] This program was made up of a combination of projects focused on solving, producing, and fielding fixes to chronic problems and maintenance and supply deficiencies on the AWACS. The goal was to extend the AWACS service life into the next century. The current Reduction in Total Ownership Cost (R-TOC) effort complements the AWACS' SPD's efforts to transform the Extend Sentry program into a continuous Reliability, Maintainability, and Availability (RM&A) process systemic to the AWACS program *in toto*.

AWACS was selected as a pilot program for both R-TOC and Section 912/816.[3] The R-TOC designation was a logical outgrowth of the Extend Sentry program. The AWACS SPO had been intuitively pursuing cost reduction activities prior to the conception of the OSD R-TOC initiative. Extend Sentry was composed of approximately 150 projects designed to either improve aircraft availability or reduce maintenance hours. Some of these efforts had the added advantage of reducing the ownership costs of the platform. To date 52 Extend Sentry projects have been funded and/or completed. Several of the projects that resulted in cost savings were identified to SAF/AQF – the Air Force R-TOC office – as "prior year 'R-TOC'[4] activities."

For the formal R-TOC pilot submission AWACS has proposed 18 initiatives for future cost savings. These initiatives were identified through the program's legacy Extend Sentry and current, top priority RM&A projects. Cost estimates for these projects were established at the piece-part level. Each estimate was stated as a delta to the current cost the item being recommended for replacement under the auspices of R-TOC.[5]

The necessity for development (3600), procurement (3010), and O&M/O&S (3400) funding varied depending on the proposed R-TOC program. Some required no development, some needed no additional infusion of

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[1] The E-3 Airborne Warning and Control System (AWACS) is an airborne/ maritime Command, Control, and Communications (C^3) capable aircraft that is integrated into a Boeing 707 airframe. Its mission includes target detection and identification, communications to tactical forces located either on the ground, sea, or in the air, and control of friendly forces. To accomplish this C^3 mission, the E-3 carries powerful airborne surveillance and identification radar, display and computer processing and communications subsystems as well as other mission support systems.

[2] The AWACS platform is known as the E-3 Sentry. Thus the term Extend Sentry was coined to connote the extension of the platforms mission life.

[3] Refers to the Defense Authorization Acts of 1998 and 1999 respectively. The language in Sections 912 and 816 have been interpreted to address process change and barrier removal in an attempt to improve program manager oversight of life cycle management and sustainment.

[4] Although R-TOC is a relatively new designator, AWACS identified to SAF/AQF several of the previous projects the platform had accomplished to reduce the platforms total ownership – operating – cost.

[5] Only projects that actually forecast the reduction of costs are included in the R-TOC recommendations. AWACS is also pursuing projects that increase mission performance – through reduced aborts, etc. – and/or reduce the maintenance hours required.

procurement funding, while other require both. In addition to development and procurement estimates, O&S estimates to identify cost increases and reductions across the years of economic mission life were required. Any of the Cost Analysis Improvement Group (CAIG) elements could be impacted. Most of the 18 proposed R-TOC projects addressed costs for Depot Level Reparables (DLR), the Reparable Support Division (RSD) breakout of CAIG element 2 :Unit Level Consumption. However, other CAIG elements are impacted by the AWACS proposal, including mission personnel and contractor support.

Although the R-TOC effort primarily focuses on the reduction of a platform's operating costs, its Section 912/816 complement, does much the same for the acquisition and procurement aspects of the program. As mentioned above, the AWACS program was also selected as a Section 912/816 pilot. In this capacity, the program identified various ways to remove acquisition reform and operational execution barriers from the platform. These barriers increase the cost of managing and operating the platform. Coupled with R-TOC, these pilot ideas form the essence of reducing the costs of acquiring and operating the E-3 AWACS platform throughout its mission life.

Captain David L. Peeler, Jr.
Chief, AWACS Architecture,
Engineering, & C^2 Cost

BIOGRAPHY

UNITED STATES AIR FORCE

JOB DESCRIPTION: Capt David L. Peeler, Jr. leads multi-functional teams in the development of cost estimates for $1.5B Airborne Warning and Control System (AWACS) enhancements in support of the ACC Modernization Investment Planning (MIP) Process. He prepares and documents all levels of cost estimates used for life cycle decisions impacting the $8 billion multinational AWACS program, analyzes contractor cost data, works with Budget Analysts to provide in-depth financial management for two Integrated Product Teams. Leader of AWACS' $54B Total Ownership Cost (TOC) Effort supporting OSD, SAF/AQ, ACC, and Air Force's TOC efforts. Provides "surge" leadership for cross- functional Process Action Teams to resolve critical accounting and finance issues for the ESC Comptroller.

BACKGROUND: David was born and raised in Cherokee County South Carolina, where he graduated from Blacksburg High School. Following college and prior to commissioning he work as a manager in several private sector concerns. Capt. Peeler was commissioned through OTS in 1992 and was assigned to Malmstrom AFB Montana were he served as Chief, Financial Services until 1995. He was selected to attend the Air Force Institute of Technology at Wright-Patterson AFB Ohio. In 1996 he was assigned to the Electronic System Center's Financial Management Staff at Hanscom AFB Massachusetts. Reassignment to the AWACS SPO came in 1997 and he is currently Chief, AWACS Architecture, Engineering, & C2 Cost. He has earned designation by the Society of Cost Estimating and Analysis as a Certified Cost Estimator/Analyst and is also a Certified Acquisition Professional, Financial Management–Level II.

EDUCATION:

1. 1988: Bachelor of Arts degree in Political Science from Berea College in Berea, Kentucky.
2. 1990: Bachelor of Science degree with double majors in Mathematics and Economics from Troy State University in Troy, Alabama.
3. 1996 Master of Science degree in Cost Analysis from the Air Force Institute of Technology.

ASSIGNMENTS:

1. Dec 92 – May 95: Malmstrom AFB Montana; 43rd Air Refueling Wing
   - Financial Services Officer — 43rd Comptroller Squadron
   - Chief, Financial Services — 43rd Comptroller Squadron/341st Missile Wing

2. May 95 – Sep 96: Wright-Patterson AFB Ohio; Air Force Institute of Technology (AFIT)
   - Graduate Student, Cost Analysis; Logistics School

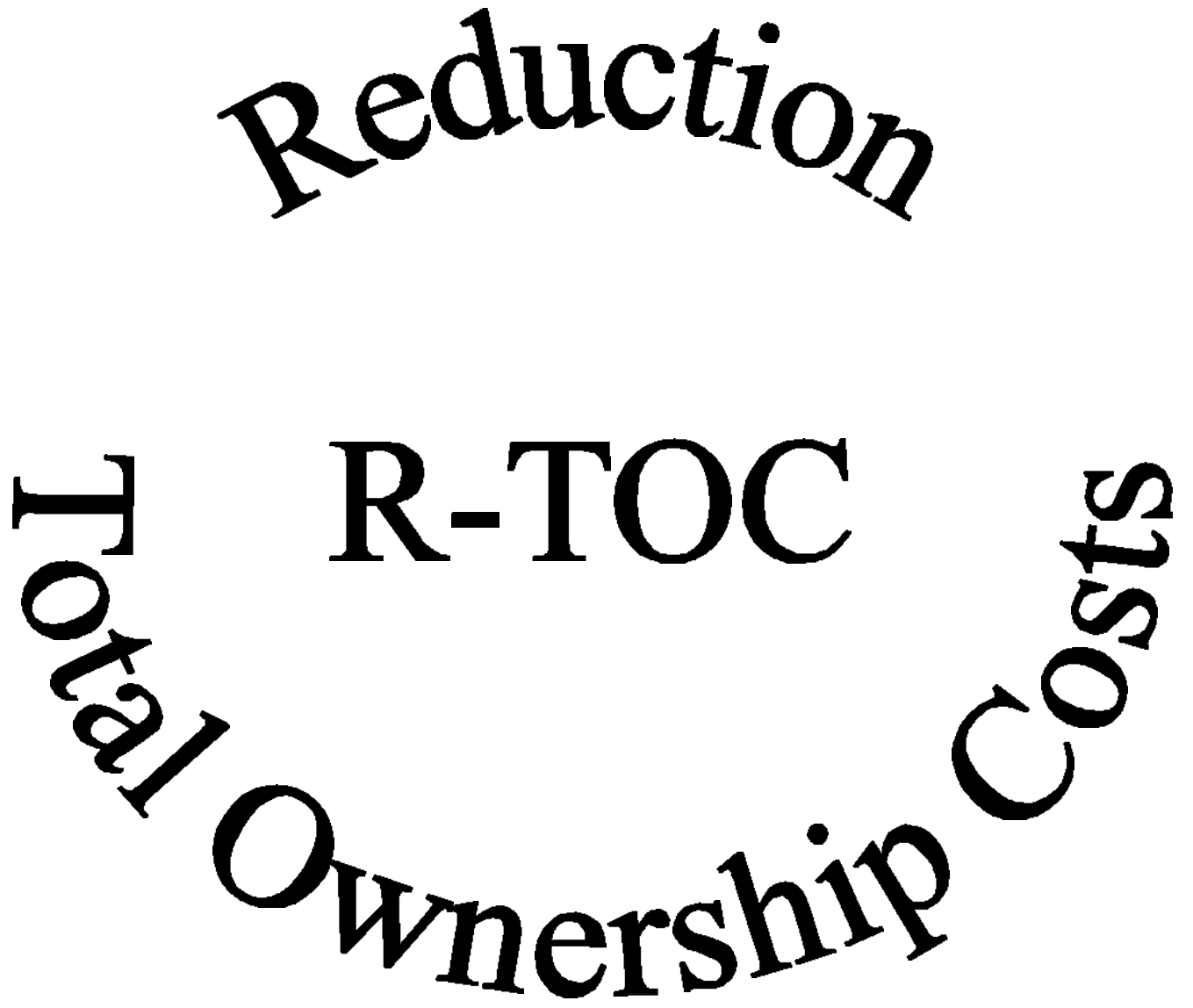
3. Sep 96 – May 99: Hanscom AFB Massachusetts; Electronic Systems Center
   - Weapon Systems Cost Analyst — Product Center Financial Mgmt Staff
   - AWACS Weapon System Analyst — AWACS SPO
   - Chief, AWACS Architecture, Engineering, & C2 Cost — AWACS SPO

MAJOR AWARDS AND DECORATIONS:

National Defense Medal
HQ AFSPC's Financial Services Officer of the Year, FY94
AF Commendation Medal
AF Achievement Medal
HQ AFMC's Acquisition Costing Military of the Year, FY98
Air Force's Acquisition Costing Military of the Year (Runner-up), FY98

EFFECTIVE DATES OF PROMOTION:

Second Lieutenant	18 Nov 92
First Lieutenant	18 Nov 94
Captain	18 Nov 96

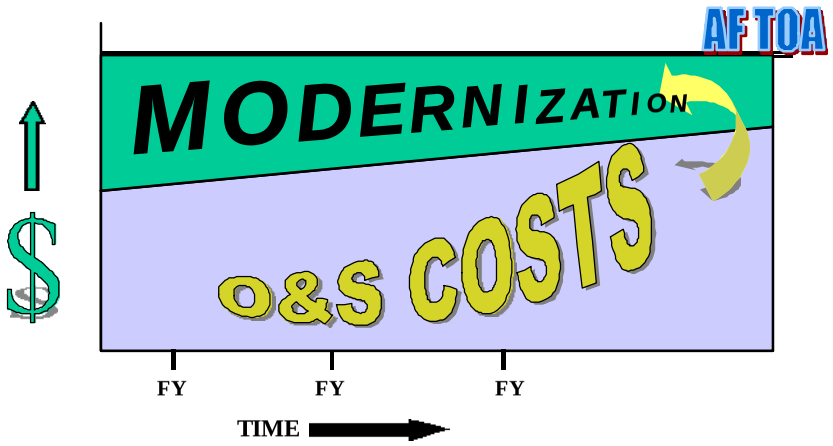


Capt David Peeler

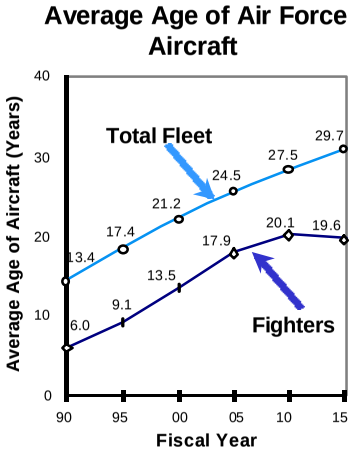
Preview

- Why R-TOC
- TOC and Section 912/816 Definition
- Ideas, Goals, and Impact on AWACS Top-line
- Funding, Cost Drivers, and Operationalization
- AWACS Initiatives
- Actions To Date and What's Next
- Challenges Ahead

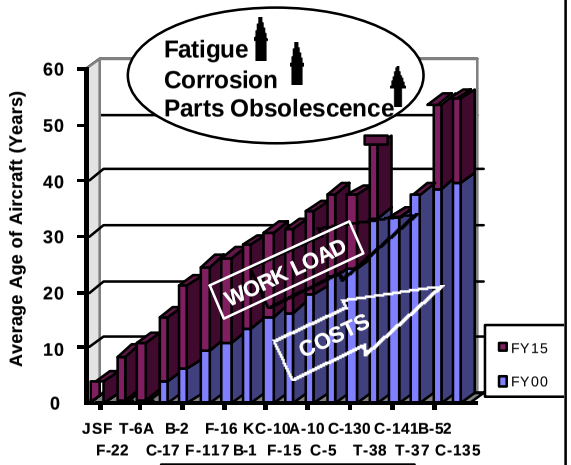
BACKGROUND



The Aging Force

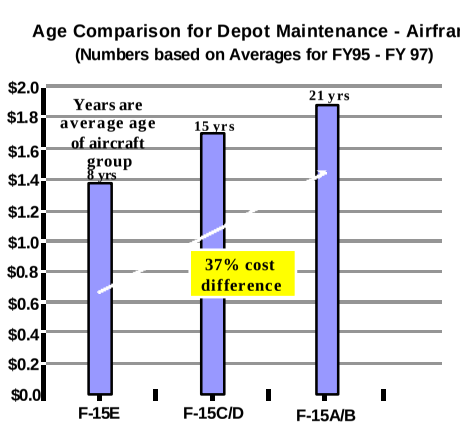


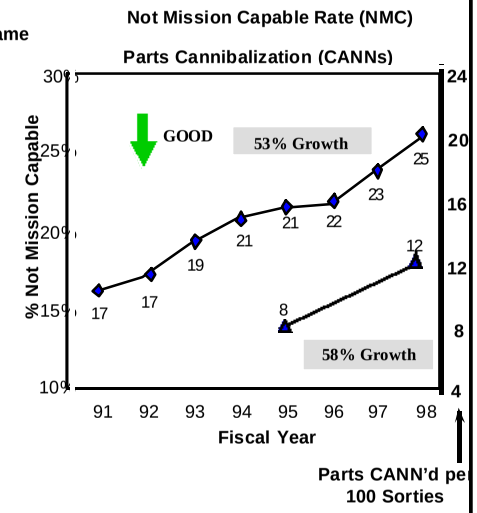
Year 2000 = 20 years old
Year 2015 = 30 years old



Modernization:
Buy New; Improve Old

Aging Cost and Workload





OSD AND AF OBJECTIVES

OSD PROGRAM

AGGRESSIVE REDUCTIONS
≈ 20% ANNUALLY/
WEAPON SYSTEM O&S

REVOLUTION IN MILITARY AFFAIRS

eAF
Global Engagement +

REVOLUTION IN BUSINESS AFFAIRS

Acquisition Reform
Better, Faster, Cheaper

HOW DO WE GET THERE FROM HERE?

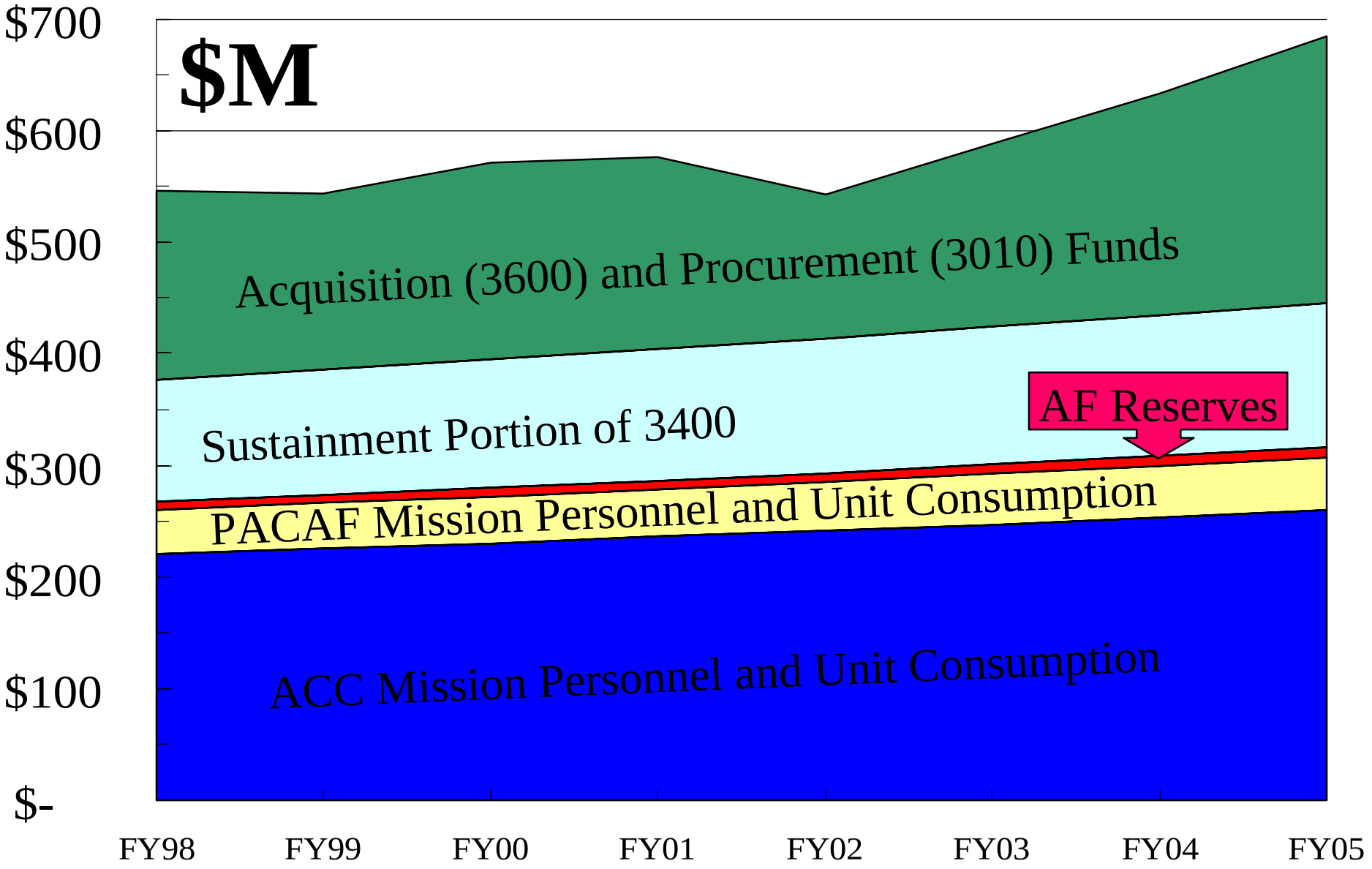
O&S REDUCTION GOALS
1% PER YR AFTER
INFLATION (APPG

AF PROGRAM

Definition

- TOC is comprised of the costs to *research*, *develop*, *acquire*, *own*, *operate* and *dispose* of defense systems, other equipment, real property, costs to recruit, retain, separate, and otherwise support military and civilian personnel, and all other costs of business operations of the DoD.
- **Section 912(c)** Pilot Program intent is to test increased program manager oversight of appropriate product support functions.
  - Streamline/improve acquisition and operational processes

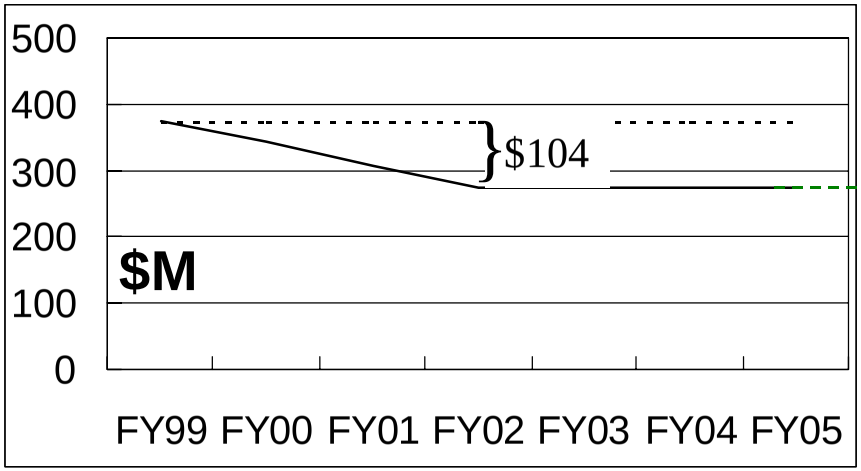
AWACS Budgets -- Top-level View



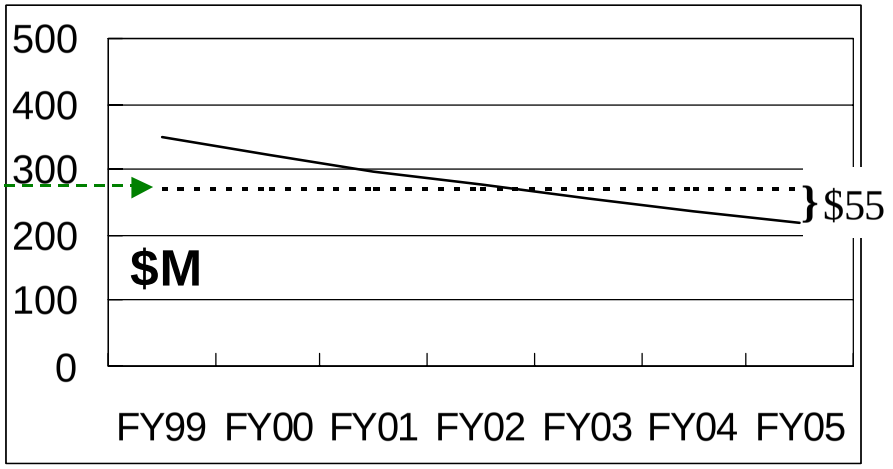
AWACS Top-line

- Reduce our Cost of Doing Business
  - Both ACC and DoD Goals
  - ACC: 30% by FY02 and DoD 10% per year thru FY05
- DoD Goals translate to reduced TOA

ACC Strategic Goal
AWACS O&S Top-line



DoD R-TOC Reductions
AWACS O&S Top-line



AWACS Comb Chart

$546	Airborne Warning And Control System				$	% of category	% of AWACS		$	% of category	% of AWACS
TOTAL OWNERSHIP COST				Extend Sentry (other)	$0	0.0%	0.0%				
	RDT&E	$49	8.9%	Extend Sentry (C&D -- Step 1)	$18	36.5%	3.3%				
				CMD	$13	26.2%	2.3%				
				Block 30/35	$0	0.0%	0.0%				
				Weapon System Architecture	$1	2.0%	0.2%				
				Integration Labs/Filght Test	$11	23.0%	2.1%				
				TS-3 PDM	$3	6.1%	0.5%				
				Home/Operations	$3	6.1%	0.5%				
	PROCUREMENT	$121	22.1%	Extend Sentry (other)	$8	6.7%	1.5%				
				Extend Sentry (C&D -- Step 1)	$26	21.3%	4.7%				
				Block 30/35	$18	14.7%	3.3%				
				GINS	$1	0.6%	0.1%				
				11411D	$1	1.2%	0.3%				
				RSIP	$63	52.2%	11.5%				
				Home/Operations	$4	3.4%	0.8%				
	O&S	$377	68.9%	MISSION PERSONNEL	$203	54.0%	37.2%	OPERATIONS	$80	39.5%	14.7%
								MAINTENANCE	$103	50.6%	18.8%
								OTHER MISSION PERSONNEL	$20	9.9%	3.7%
								POL/ENERGY CONSUMPTION	$41	33.4%	7.5%
				UNIT LEVEL CONSUMPTION	$123	32.7%	22.6%	CONSUMABLE MATERIAL/REPAIR PARTS	$11	8.7%	2.0%
								DEPOT LEVEL REPARABLES	$48	38.8%	8.8%
								TRAINING MUNITIONS/EXPENDABLE STORES	$0	0.0%	0.0%
								OTHER	$24	19.1%	4.3%
				DEPOT MAINTENANCE	$32	8.5%	5.9%	OVERHAUL/REWORK	$32	100.0%	5.9%
								OTHER	$0	0.0%	0.0%
								INTERIM CONTRACTOR SUPPORT	$0	0.0%	0.0%
				CONTRACTOR SUPPORT	$3	0.7%	0.5%	CONTRACTOR LOGISTICS SUPPORT	$2	81.5%	0.4%
								OTHER	$1	18.5%	0.1%
								SUPPORT EQUIPMENT REPLACEMENT	$1	9.3%	0.3%
								MOD KIT PROCUREMENT INSTALL	$0	0.0%	0.0%
				SUSTAINING SUPPORT	$15	4.0%	2.8%	OTHER RECURRING INVESTMENT	$1	7.9%	0.2%
								SUSTAINING ENGINEERING SUPPORT	$8	53.0%	1.5%
								SOFTWARE MAINTENANCE SUPPORT	$5	29.8%	0.8%
								SIMULATOR OPERATIONS	$0	0.0%	0.0%
								OTHER	$0	0.0%	0.0%
				INDIRECT SUPPORT	$0	0.1%	0.0%	PERSONNEL SUPPORT	$0	0.0%	0.0%
								INSTALLATION SUPPORT	$0	100.0%	0.0%

$M FY98

Comb Chart (continued)

	$	% of category	% of AWACS
OPERATIONS	$80	39.5%	14.7%
MAINTENANCE	$103	50.6%	18.8%
OTHER MISSION PERSONNEL	$20	9.9%	3.7%
POL/ENERGY CONSUMPTION	$41	33.4%	7.5%
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SIMULATOR OPERATIONS	$0	0.0%	0.0%
OTHER	$0	0.0%	0.0%
PERSONNEL SUPPORT	$0	0.0%	0.0%
INSTALLATION SUPPORT	$0	100.0%	0.0%

Reflects actual costs of sub-optimal crews
Average of 24 Crews in 1998

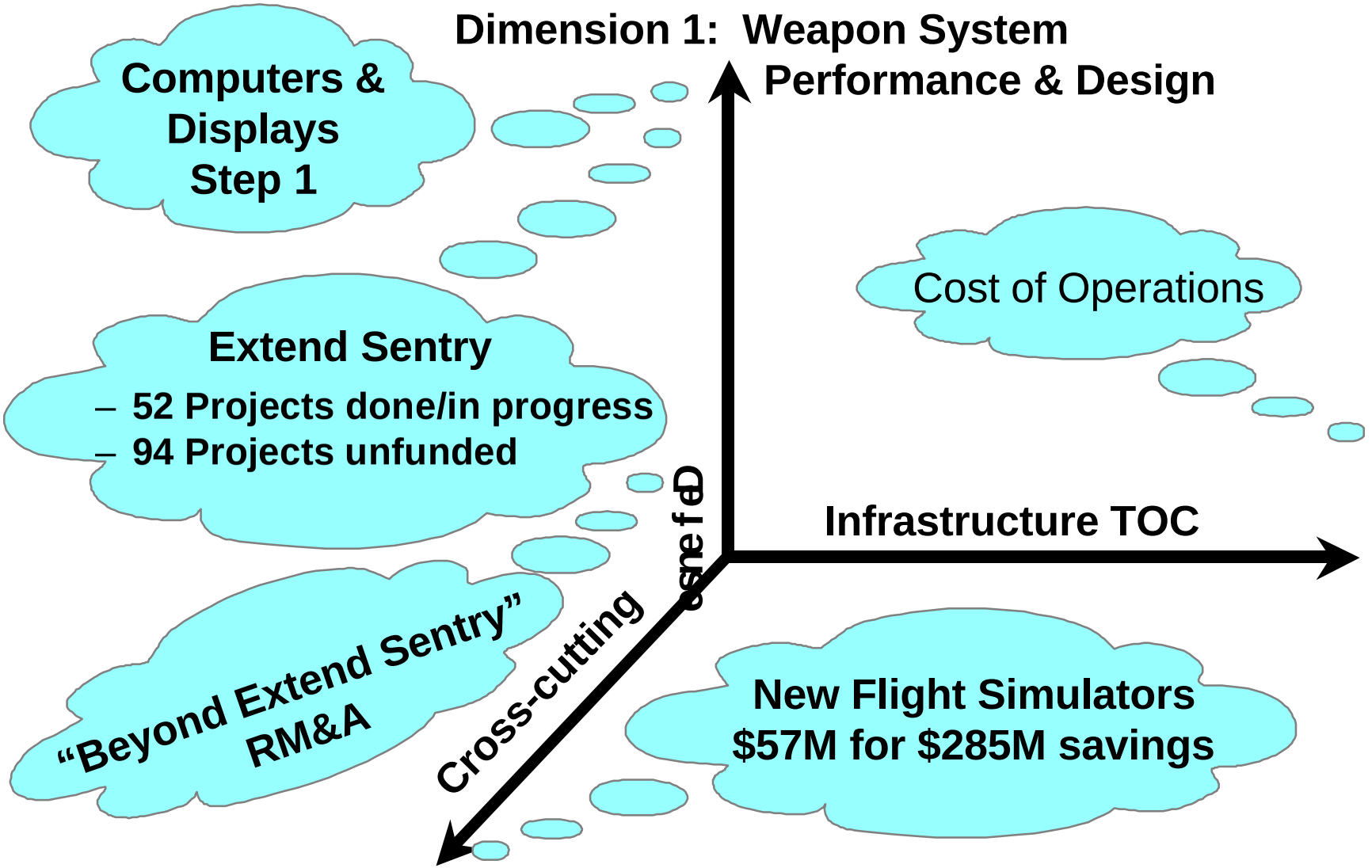
FY1998
AVPOL = $32 M

Questions as to exactly what “other” indicates.

Poking at these for more insight

Questions in this area

AWACS TOC Concepts



Operations Focus

Financial Focus

TOC Construct

Total Ownership (Operation) Cost

Derive Operational ROI
&
Measures of Merit

Synthesize

Shift Budget Management
to
Cost Management

Link Operational Value to Business Case

Team Establishment

Capt Peeler	Maj Howe
Janice Real	Lt Col Bunting
Lt Col Tyler	Mr. John Portz
Maj Weigan	Maj Clampitt
Maj Wert	Lt Col Martin

Area POCs for pulling together information.
Efforts will vary and encompass entire E-3.

Timeline

7-9 Dec -- AF R-TOC Strategic Roadmap Build [D1]
31 Dec -- Determining and evaluating TOC proposals[D2]
26 Feb -- Definite Operational Metrics (clear meaning)[D2, D3]
27 Mar -- Isolation of all Drivers (operational & cost)[D3]
16 Apr -- Parallel/Integrated TOC Database (OPS & FM)[D4]
30 Jun -- Link Operational Value to Business Case[D4]
Deploy through TOC case influence of MIP/POM Process.[D5]

Building/Expanding Upon AWACS TOC Successes

Section 912 Initiatives
Business Reforms

Management Action #1: Improve Program Funding Stability Special Dispensation Required

Management Action #2: Improve and Automate Cost Reporting and Increase Funding Visibility

Management Action #3: Improve Cooperative Decision Making between Stakeholders on Efficient/Effective Resource Application

Management Action #4: Increase PM Input, Involvement and Influence in Modernization Planning and Prioritization (MPP) Process

Management Action #5: Allow PM to Optimize Program Funding by Matching to Execution Schedules

Section 912 Initiatives
Business Reforms (Cont.)

Management Action #6: Provide PM with Greater Influence Over Source of Repair Assignment Process (SORAP). CAIG element 5.

Management Action #7: Empower the PM to Enter into TSPR contracts with the Warfighter for His Weapon System

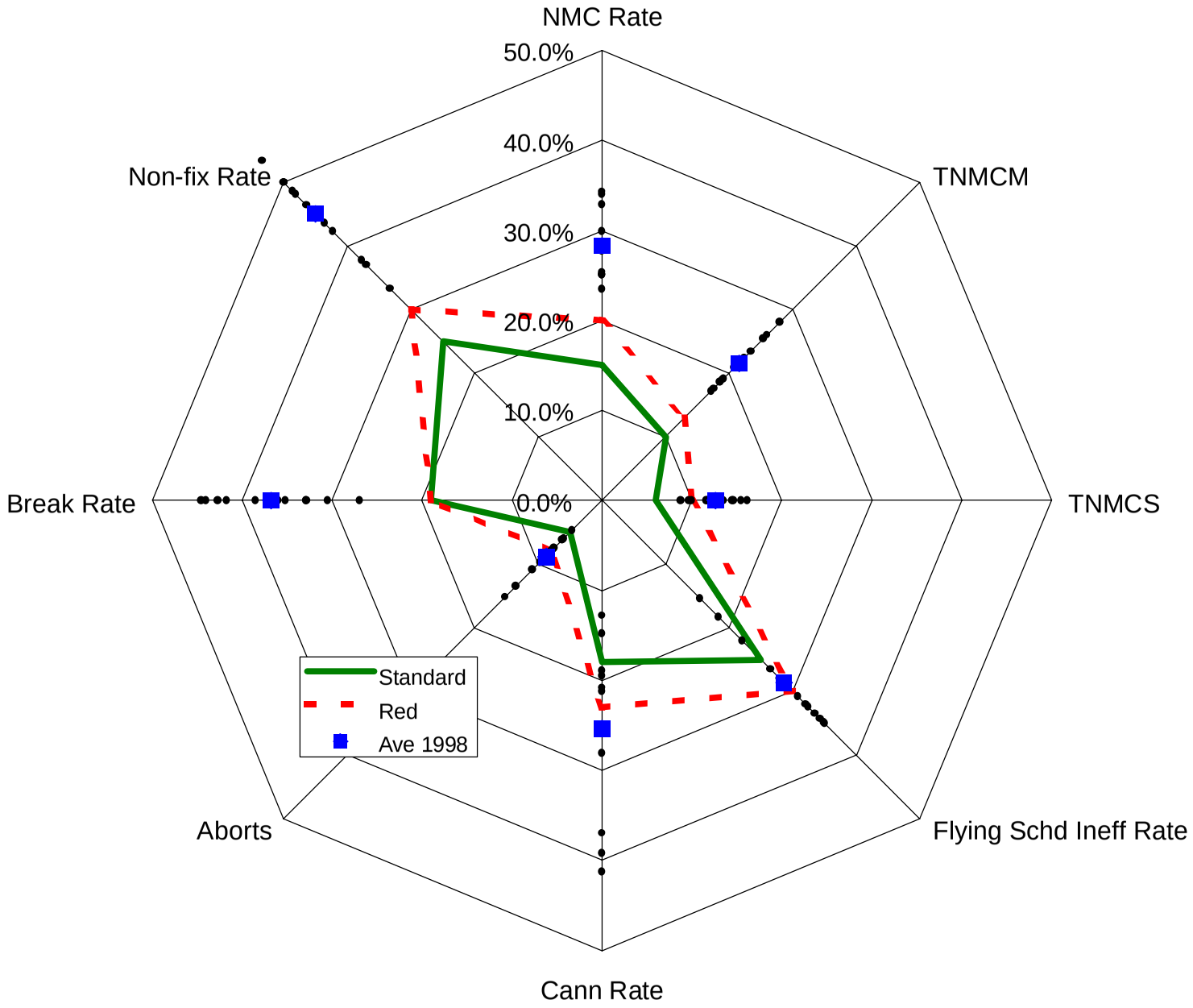
Management Action #8: Establish Policy and Procedures to Allow Re-Investment of Savings

Management Action #9: Education and Reporting

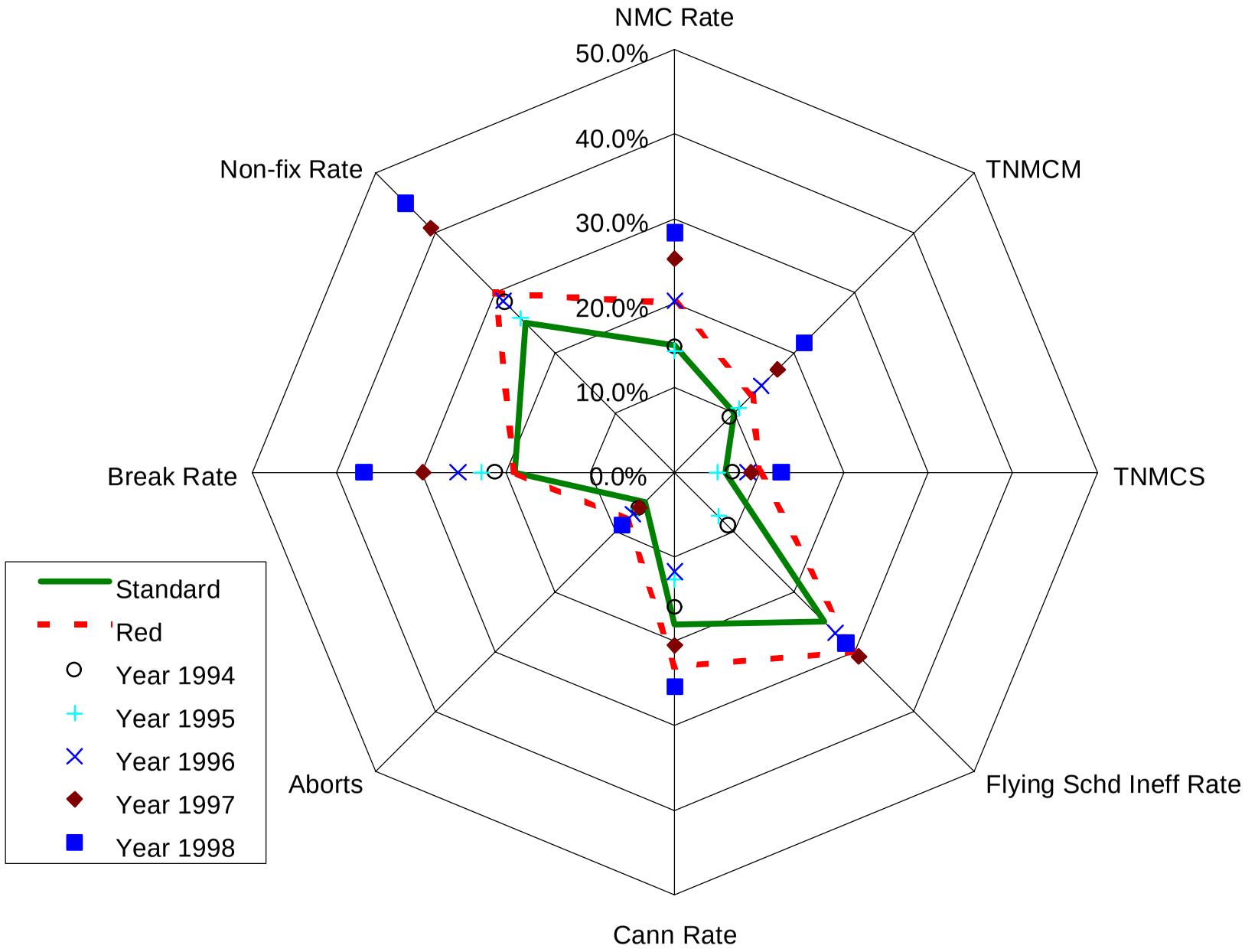
Potential R-TOC Candidates

Proposer	Program / Initiatives		
	Completed	**Initiatives**	**Intuition**
Funded	Digital Techincal Orders HF Radio Replacement Leading Edge Skins Bleed Air Valve Step Start Resistor Six Port Wave Guide Switch Pin Diodes SS Redundant Control Board Hard Disk System (HDS)Line Line Printers	Mission Computing – Step 1 RSIP Line Printer Replacement Flat Panel Displays (CLADS) Magnesium Parts Replacement	
Top Priority R-TOC Candidates		JTIDS DLI (Links 16 & 11) Flight Sim (Replace TC-18 and current sim) Cockpit Avionics Mod → Navigator positions Solid State IFF Transmitter Maintenance Free Battery Solid State RF Driver Solid State HVPS New STALO Klystron Hybrid Wideband Floating Deck Pulsar	Expeditionary AWACS – Step 2 Re-engine Trunion Web Pressure Regulating Shut-off ADS Switches Mission Crew To Ground Universal reciever Synchronizer Phase Shift Control Unit Phase Shift Drive Unit
Canidates Pending Analysis		Dehumidification Re-engineered Supply Support Process DMT Distributed Mission Training Centers Establish SPO as Paying Station Training Proficiency Changes Arc 169 HPA COMBS COTS RDP Pacific Sierra Reasearch	Cross-platform Unity Airframe: International harmonization; Common widebody for C^2 mission Mission Crew (Harmonize w/GTACS, ROAC/SOAC and IADS) Contract maintenance Flight-line / Depot MX and Management Program Oversight Increase use of COTS Open Architecture (DII COE) Downsize the SPO Operational Approach Incregase useof HiFi sim/remote control/com Examine rgmts:: Alaskan Det/SOUTHCOM

AWACS 1998 Radar Chart



AWACS KPP Averages 1994-1998



Actions to Date

- Made an R-TOC Pilot
- Attended Oct and Dec AF R-TOC Sessions
- Leveraging Extend Sentry Projects with Cost Associations
- Submitted R-TOC Initiatives List and Identified Current and Completed Projects to SAF/AQF (1 Feb 99)

Upcoming Actions

- Implementation Plan
  - Completely Flesh-out Initiatives List (15 Mar)
    - Full cost estimate for each
  - Process & Structure included
- Link Operational KPPs to Cost / Business case
  - Identify Ops / CONOPS changes that save funds
- Include Initiatives in POM
- Track R-TOC Initiatives Against Program Baseline

Review

- Why R-TOC
- TOC and Section 912/816 Definition
- Ideas, Goals, and Impact on AWACS Top-line
- Funding, Cost Drivers, and Operationalization
- AWACS Initiatives
- Actions To Date and What's Next
- Challenges Ahead

Challenges Ahead

- How to dollarize operational metrics
  - TNMCM, TNMCS, Aborts, Canns, Break Rate, etc.
- How to quantify availability in dollar terms
- Effective ways to collect, analyze and report data on R-TOC/RM&A projects
  - Amalgamate & translate to cost of ownership
- Include Initiatives in POM

Back-up Charts

Definition

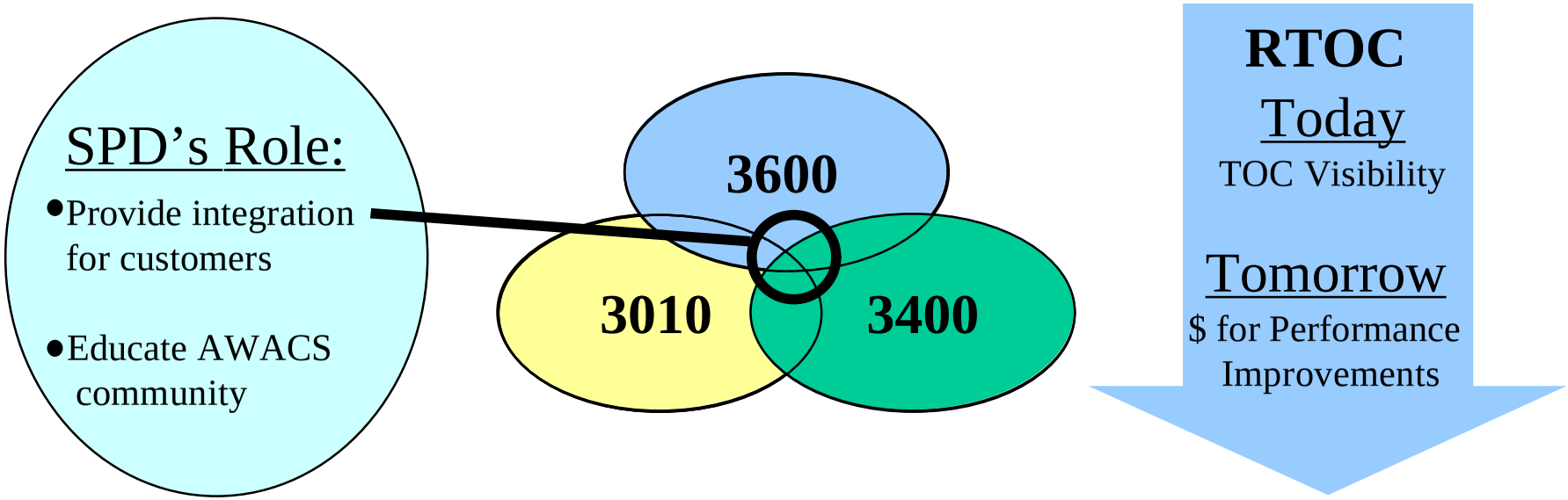
- TOC is comprised of the costs to *research*, *develop*, *acquire*, *own*, *operate* and *dispose* of defense systems, other equipment, real property, costs to recruit, retain, separate, and otherwise support military and civilian personnel, and all other costs of business operations of the DoD.
- Identify AWACS' TOC (subset of AF TOC)
  - ACC Strategic Goal: 30% Reduction in Cost of Operations by the end of 2002
  - DoD R-TOC: 10% per year O&S reduction through FY05
  - More importantly… meeting platform requirements within continued funding limitations

R-TOC Pilots -- Air force

- B-1
- C-5
- C/KC-135
- F-16
- F-117
- C-17
- **AWACS**
- JSTARS
- ISC2
- SBIRS

The Army and Navy each also have 10 pilot programs

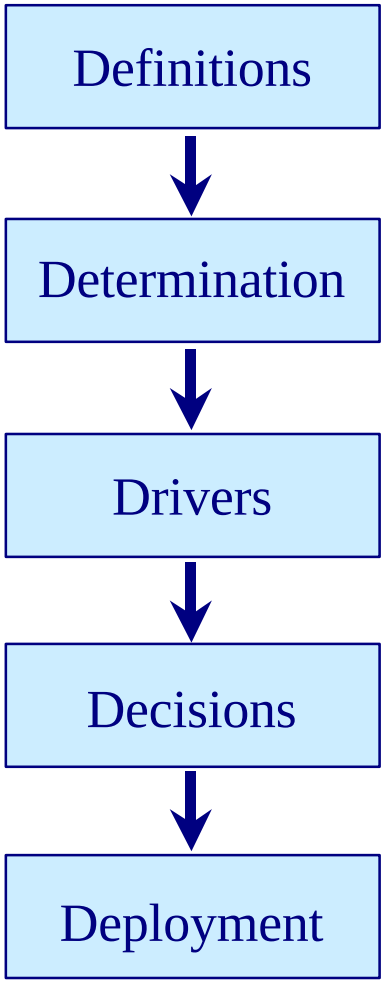
3400 Summit (VTC):
11 March 99



Objective:
Provide visibility and integration of budget requirements for the Warfighter

Slide POC: LT Joshua McClure, 478-1066

AF R-TOC
OVERARCHING METHODOLOGY



- What does Total Ownership Cost Mean?
- What Cost Elements are Required?

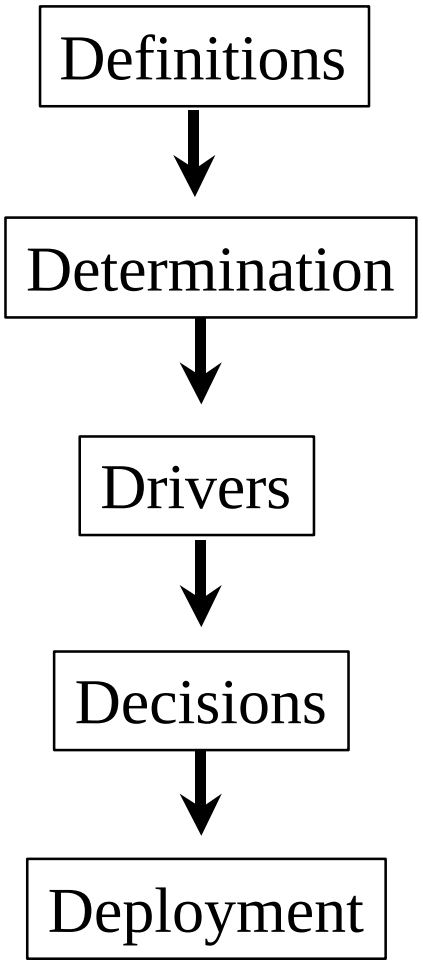
- By Program/Product
- Compute Cost Elements
- Fill in TOC Matrix

- Isolate High Drivers/Causes
- Product/Program Orientation

- Options to Reduce TOC
- Impacts of Candidates
- Select It, Do It!!

- Getting TOC in the Field
- Communication, Education and Training
- Tools, Feedback and Incentives

R-TOC's 5D Methodology



Defining attributable and allocable program costs
ACTD, R&D, Acquisition, Production, & Operation

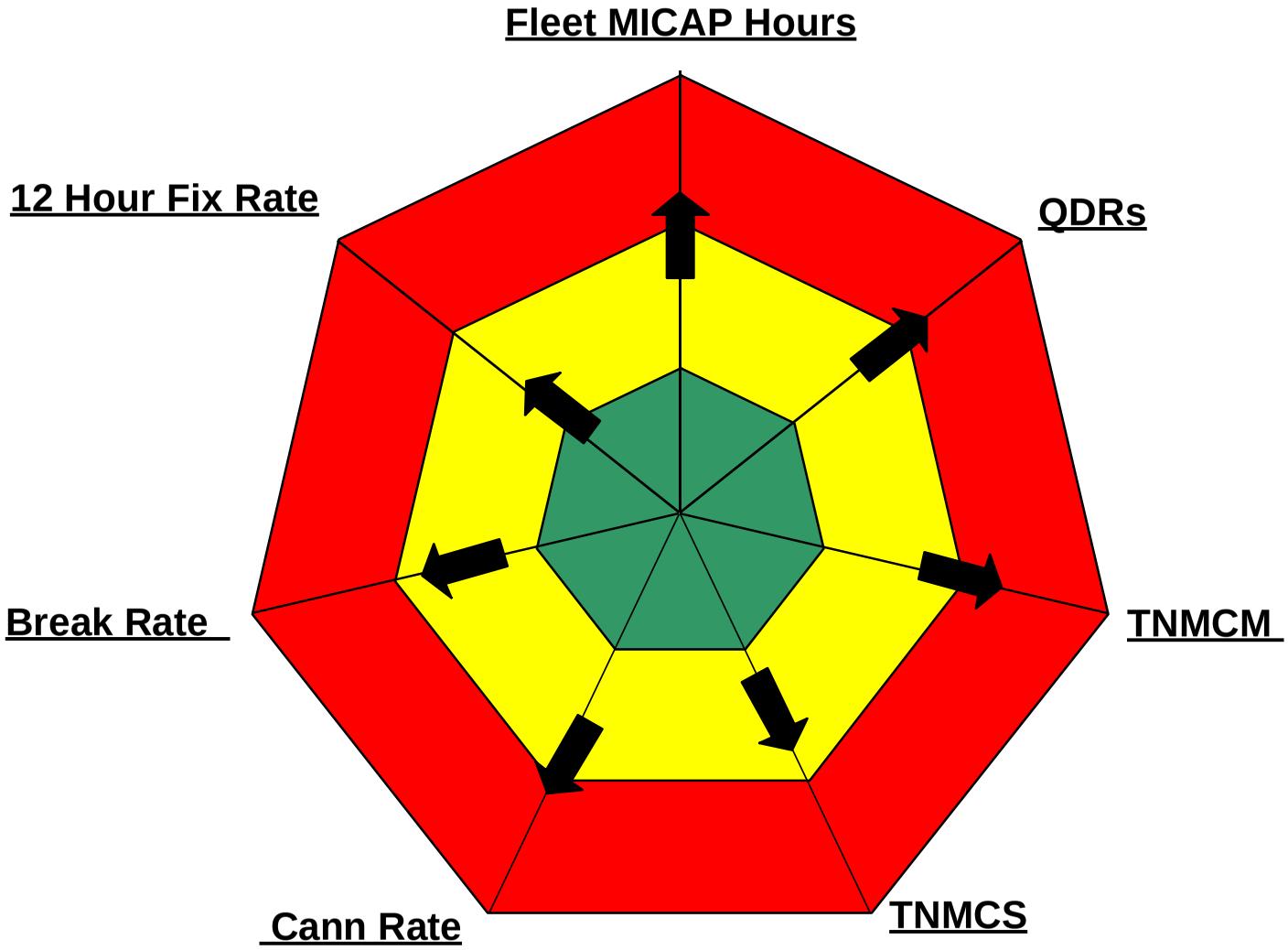
Platform TOC view. Assigning costs to elements.
Drilling down into expense breakout ("comb" chart)

Mission personnel -- 35%
Production contract costs -- 21%
Unit Level Consumption -- 19%

RM&A (Extend Sentry): A/C availability; $ reduction
ADAPT Restructure and AIL/ADL Consolidation
Evaluating Lab/Sim capability and capacity (Lab IPT)

Funded Extend Sentry Programs
Digital Tos

EXAMPLE Spider Diagram



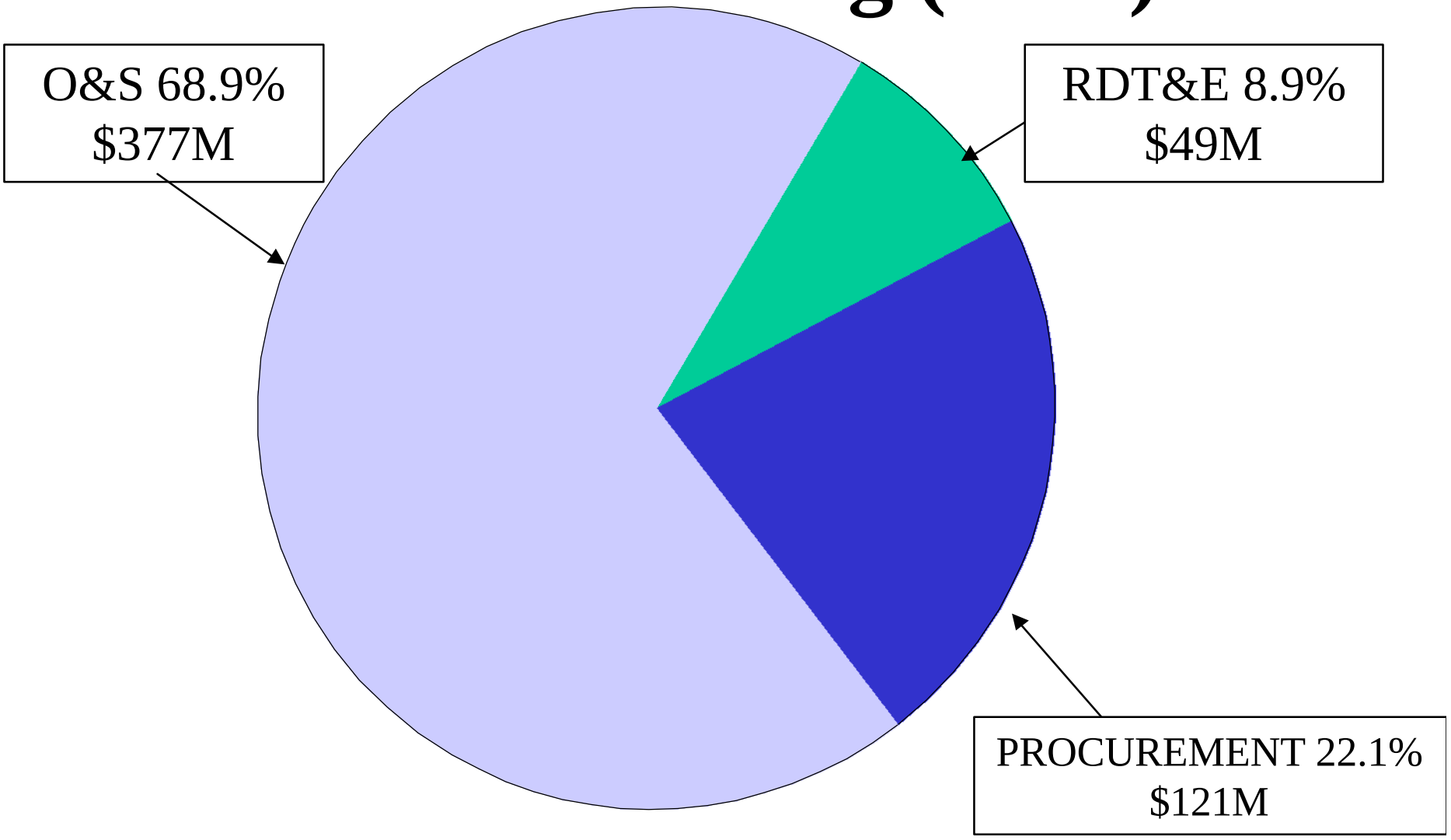
SPO Cost Reduction Initiatives

Addressing the $3M (.6% of AWACS $)

- Acquisition Reform / Business Practices
  Pushing historically SPO activities to the Contractor
- Activity Based Costing (ABC)

Preconceived Notions	*Data Supports*
Excess unfunded work	Lower than Expected
High cost to "what-ifs"	$1,300 per drill
Reviews (all levels & types)	Higher than expected
Information to customers	Higher than expected
Support of the US customer	Higher than Expected
	AW share relative to LAK

AWACS Funding (1998)



Why target O&S? That's where the money is!

AWACS R-TOC Potential

Proposer	Program / Initiatives		
	Implemention	**Initiatives**	**Intuition**
SPO/ALC	Mission Computing – Step 1 RSIP Digital Techincal Orders Line Printers HF Radio Replacement Leading Edge Skins Magnesium Parts Replacement Hard Disk System (HDS) Bleed Air Valve Step Start Resistor Six Port Wave Guide Switch Pin Diodes SS Redundant Control Board	IFF Solid State Transmitter BRAT Flat Panel Displays (CLADS) Maintenance Free Battery Solid State RF Driver Solid State HVPS New STALO COMBS Line Printer Replacement Solid State VCO Arc 169 HPA Re-engine Dehumidification	Expeditionary AWACS – Step 2 Trunion Web Pressure Regulating Shut-off ADS Switches Klystron Hybrid Wideband TADIL A Link 11 Mission Crew To Ground Universal reciever Synchronizer Phase Shift Control Unit Phase Shift Drive Unit
ACC/DR AC2ISRC		JTIDS DLI (Link 16) Flight Sim (Replace TC-18 and current sim) GATM → Navigator positions DMT Distributed Mission Training Centers	Cross-platform Unity Airframe: International harmonization; Common widebody for C^2 mission Front Seat (Glass Cockpit) Mission Crew (Harmonize w/GTACS, ROAC/SOAC and IADS Contract maintenance Flight-line / Depot MX and Management Program Oversight Increase use of COTS Open Architecture (DII COE) Downsize the SPO Funding Stream Full fund programs, not FY funding Operational Approach Increqase useof HiFI sim/remote control/com Examine rqmts:: Alaskan Det/SOUTHCOM
552 ACW	Mission Computing – Step 1 RSIP Digital Techincal Orders Line Printers CLADS	New Flight Simulators JTIDS DLI Link 16 Training Proficiency Changes	Included w/AC2ISRC inputs above.

Team Approach

- Success depends on active cooperation and participation of all AWACS stake-holders
- Submit your ideas and/or initiatives
  - Processes, procedures, modifications, parts replacements
  - Your cost reduction ideas can be R-TOC candidates
- R-TOC impacts us all, across the entire platform
- Need active participation when called upon for aid in information gathering and analysis of KPP cost

R-TOC is a TEAM Effort