



FAA System Engineering Council presents:

COTS Risk Mitigation Workshop

(Practical Methods for Effective COTS Acquisition and Life Cycle Support)

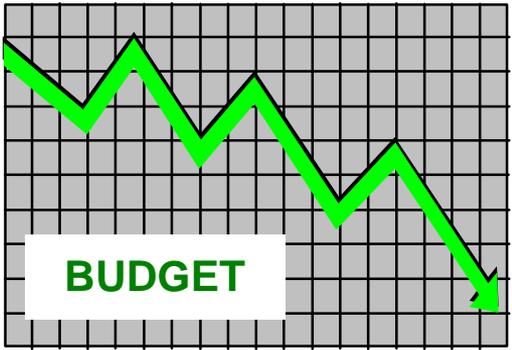
Gordon Shaffer
Version 3.1
June 21, 2002



A strange thing happened on the way to work one day...

ACQUISITION REFORM

MORE

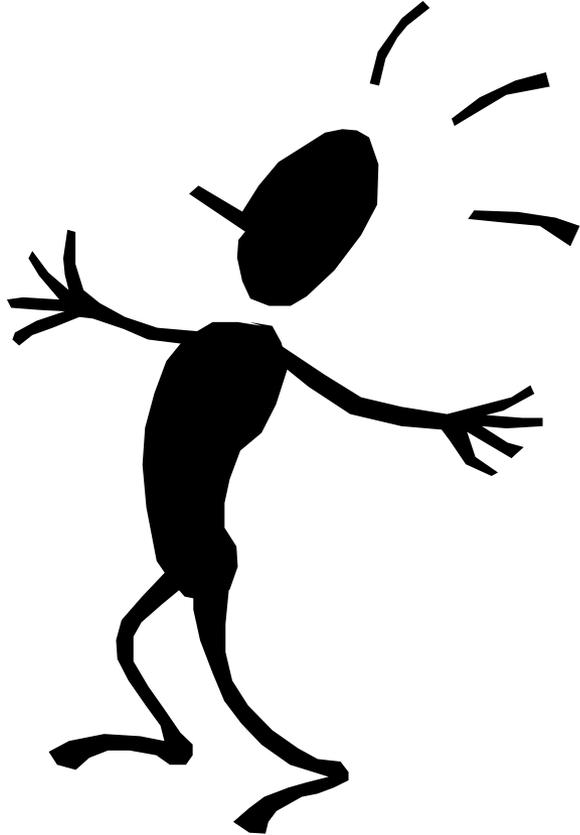


better

FAA AMS - 1996

cheaper

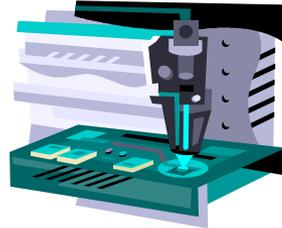
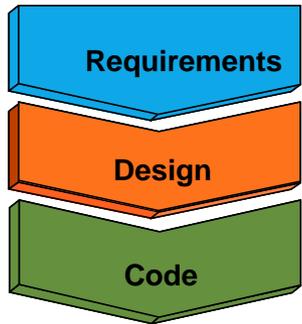
faster



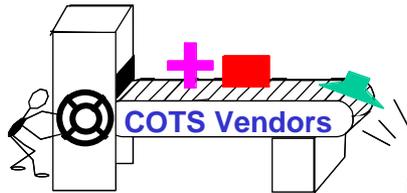
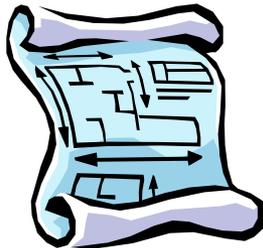
Just go do it!



Things became different!



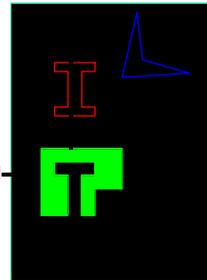
SLOC



???



???



Before

- emphasized development
- specified “how” and “what”

After

- emphasize interface integration
- specify “what,” not “how”



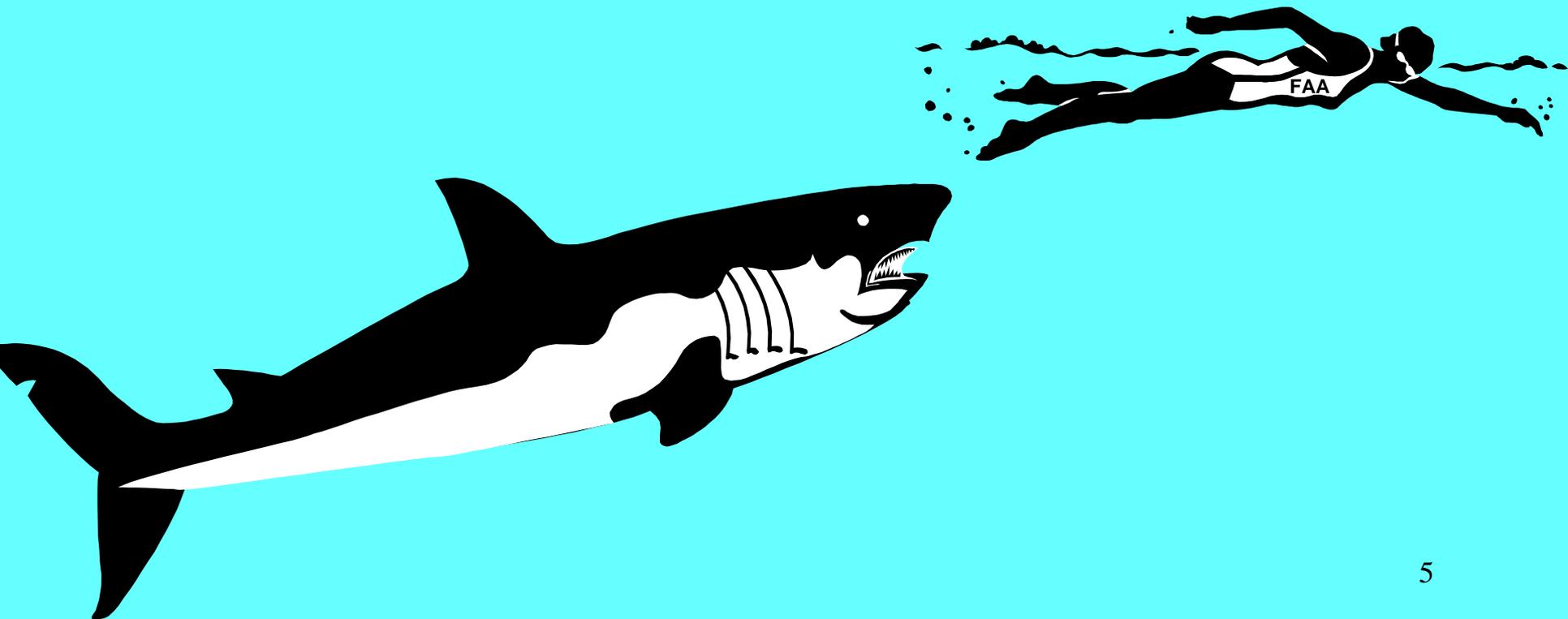
**I'm a busy person!!
I could be doing
productive work
right now!**



What is the problem we are trying to solve?



How To Float With The Commercial Market Without Getting Pulled Under

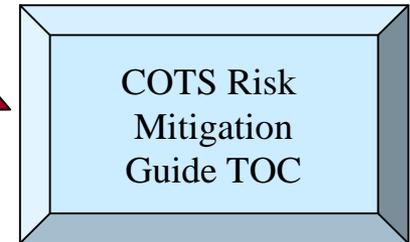
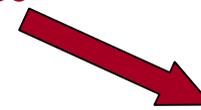




COTS Risk Mitigation Guide

- 1.1 - Introduction
- 1.2 - COTS Risk Factors
- 1.3 - COTS Risk Mitigation Strategies
- 1.4 - Applying COTS Risk Mitigation Strategies
- 1.5 - Summary
- Appendix A - References
- Appendix B - Understanding COTS Obsolescence and Technology Evolution Planning
- Appendix C - COTS Risk Mitigation Strategies and the Work Breakdown Structure
- Appendix D - COTS Obsolescence Data Analysis
- Appendix E - COTS Technical Performance Factors
- Appendix F - COTS Non-Technical Selection Factors

**Reference
button**





FAA COTS Risk Mitigation Guide Internet Access



Federal Aviation Administration (FAA) COTS Life Cycle Management

- COTS Risk Mitigation Guide
- COTS Risk Mitigation Workshop Courseware
- What's New?
- Related Links
- Comments?



Want to take the **MYSTERY (and Risk)** out of acquiring commercial-off-the-shelf (COTS) products and systems?

This webpage was developed by the FAA to provide government and non-government acquisition activities with a centralized and accessible body of COTS-related information designed to provide more effective management of COTS-based systems acquisition and life cycle support. Although this information is provided as a public service, acknowledgement of its source is requested.

Last updated 12.28.01

Learn how to achieve the benefits that COTS products can provide while limiting the impact of rapid COTS product obsolescence on your information management system [\[MORE\]](#)

[FAA Home](#) | [AUA Home](#)

FAA COTS Risk Mitigation Guide and courseware are downloadable



Module 1. Introduction



COTS Risk Mitigation Workshop

Training Objectives

- Train “practitioners”
 - how and when to apply COTS risk mitigation strategies
 - how to project COTS product obsolescence
 - how to minimize COTS product obsolescence impacts
- Train project leads/managers
 - how COTS risk mitigation strategies contribute to more informed decision-making
 - implement effective COTS planning, budgeting and life cycle support



Related Workshop Objectives

- Smart consumer - trust but verify
- Repeatable methodology
- Common language
- Market-oriented business practices



Workshop Agenda



1. Introduction
2. Training Context
3. Understanding COTS and COTS Risks
4. COTS Risk Mitigation
5. COTS Obsolescence Risk Analysis Exercise
6. Wrap Up

Schedule Day 1

8:00 - 9:50	Introduction
9:50 - 10:00	Break
10:00 - 11:20	Training Context
11:20 - 11:30	Break
11:30 - 12:30	Understanding COTS and COTS Risks
12:30 - 1:15	Lunch
1:15 - 2:50	Understanding COTS and COTS Risks (cont'd)
2:50 - 3:00	Break
3:00 - 4:30	COTS Risk Mitigation

Schedule Day 2

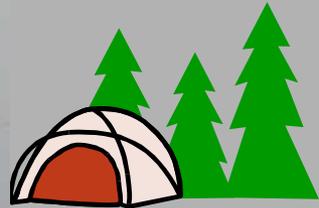
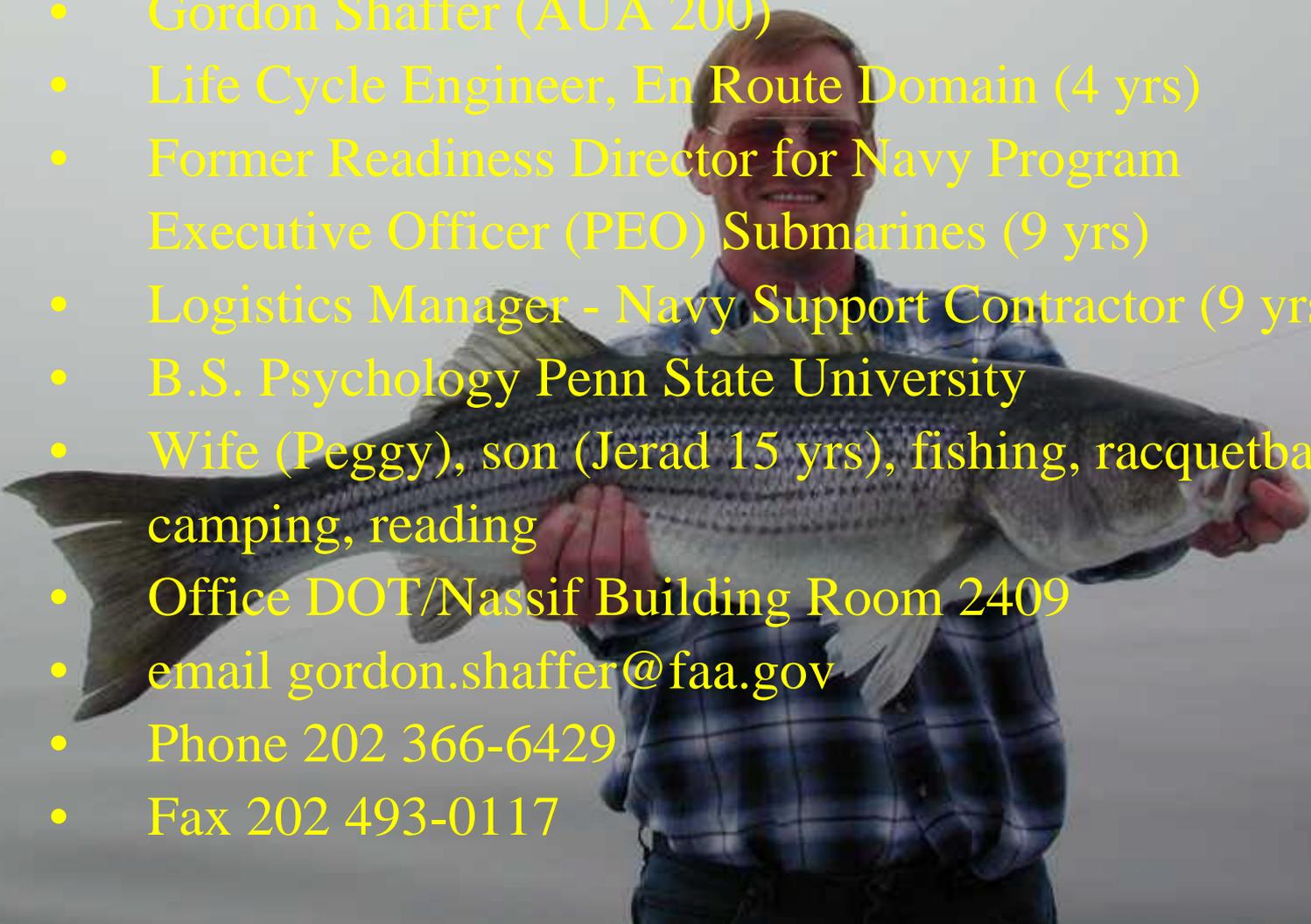
8:00 - 9:50	COTS Risk Mitigation (cont'd)
9:50 - 10:00	Break
10:00 - 11:45	COTS Obsolescence Risk Analysis Exercise
11:45 - 12:30	Lunch
12:30 - 4:00	COTS Obsolescence Risk Analysis Exercise
4:00 - 4:30	Wrap Up



COTS Risk Mitigation Workshop

About Your Instructor

- Gordon Shaffer (AUA 200)
- Life Cycle Engineer, En Route Domain (4 yrs)
- Former Readiness Director for Navy Program Executive Officer (PEO) Submarines (9 yrs)
- Logistics Manager - Navy Support Contractor (9 yrs)
- B.S. Psychology Penn State University
- Wife (Peggy), son (Jerad 15 yrs), fishing, racquetball, camping, reading
- Office DOT/Nassif Building Room 2409
- email gordon.shaffer@faa.gov
- Phone 202 366-6429
- Fax 202 493-0117





COTS Risk Mitigation Training

Student Introductions



- Name
- Organization
- Current work activities
- Experience in dealing with COTS
- *What you want out of the course*
- Items of interest
(optional)





What is COTS?



The FAA's Acquisition Management System (AMS) says...

“Commercial-off-the-shelf (COTS) is a *product or service* that has been developed for sale, lease or license to the *general public* and is currently available at a fair *market* value.”

COTS Risk
Mitigation
Guide 1.2

“COTS are just black boxes that keep on changing.” - Anon.



Survey: What Are the Positive Aspects of Using COTS Products?

Survey answers:

-
-
-
-
-
-



Survey: What Are the Negative Aspects of Using COTS Products?

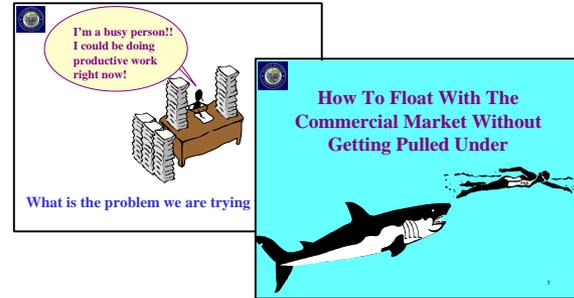
Survey answers:

-
-
-
-
-
-



Module 1 Review

1. What problem are we trying to solve?



2. FAA COTS Risk Mitigation Guide; Internet access



3. Training objectives; related objectives





Module 1 Review (cont'd)

4. Who we are, what we do and what we expect

COTS Risk Mitigation Workshop
About Your Instructor

- Gordon Shaffer (FAA 2017)
- Life Cycle Engineer, Air Route Branch, ATIS
- Program Manager, Director for New Program Executive Offices (NPEO) Subcontractors (2015)
- Lecturer, Emeritus, Army Support Computer
- B.S. Geography Penn State University
- Wife (Peggy), son (Jerald 15 yrs), fishing, ice camping, reading
- Office 1000 Newell Building Room 2409
- e-mail gshaffer@faa.gov
- Phone 202 366-6435
- Fax 202 493-0117

COTS Risk Mitigation Training
Student Introductions

- Name
- Organization
- Current work activities
- Experience in dealing with COTS
- What you want out of the course
- Items of interest (optional)

5. COTS definition; its positives & negatives

What is COTS?
The FAA's Acquisition Management System (AMS) says...

"Commercial-off-the-shelf (COTS) is a *product* that has been developed for sale, lease or license to the *public* and is currently available at a fair market price."

"COTS are just black boxes that keep on chugging."

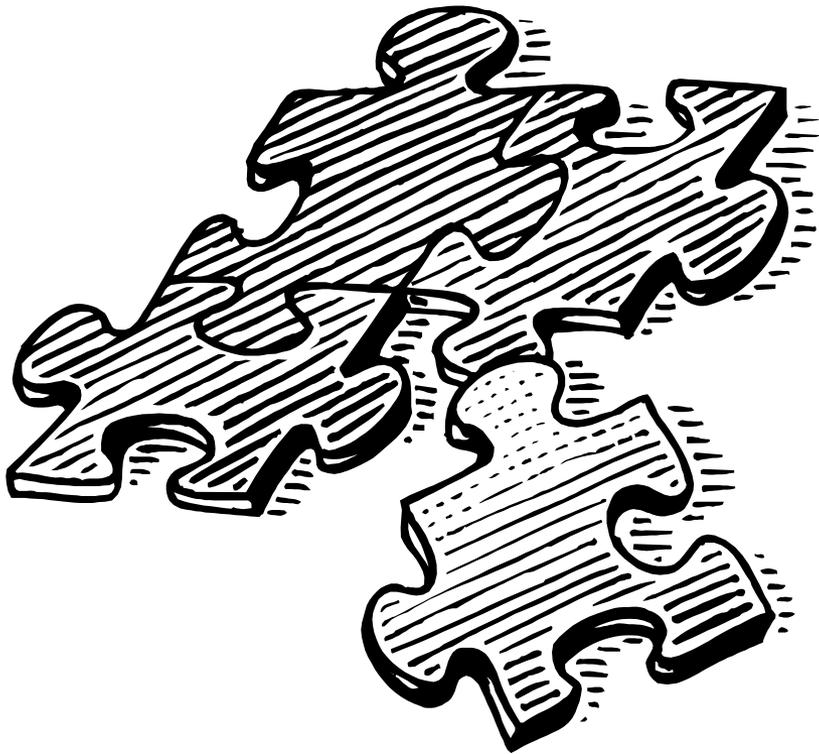
Survey: What Are the Negative Aspects of Using COTS Products?

Survey answers:

-
-
-
-
-
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**How does this workshop
fit in with my overall
training objectives?**



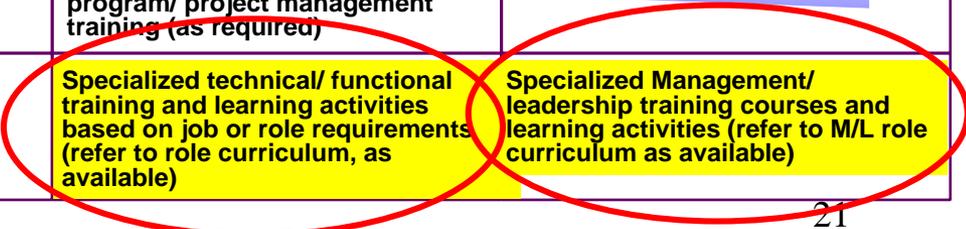


Module 2. Training Context



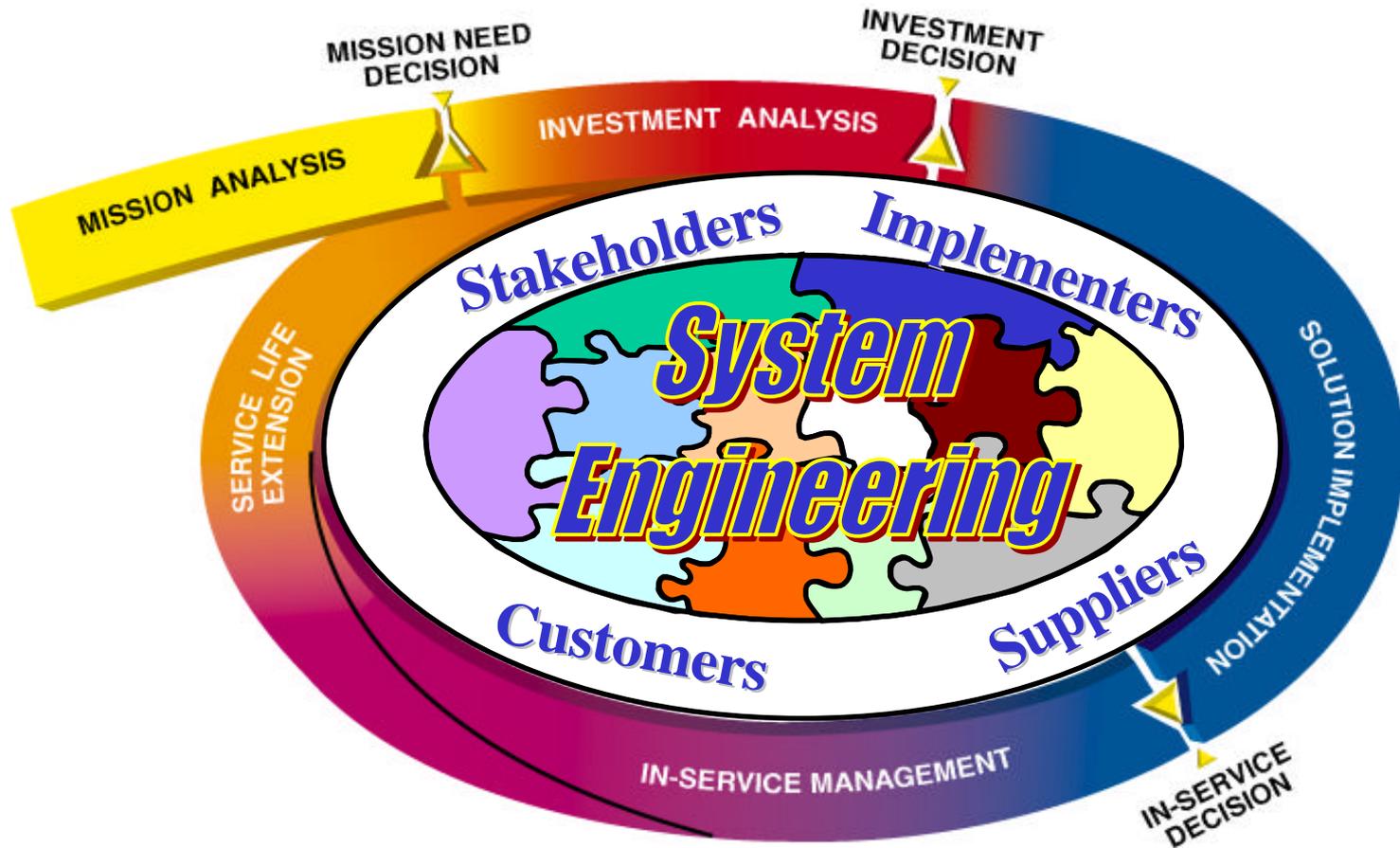
Integrated ARA Curriculum Framework

ESSENTIAL TOPIC AREAS (for all ARA employees)	ADMINISTRATIVE/ CLERICAL	TECHNICAL/ PROFESSIONAL	MANAGER/ LEADER
INTRODUCTION TO ARA	Core: Introduction to ARA		
ARA COMPETENCIES	Core: Critical Success Factors for the ARA Workforce		
PROCESS IMPROVEMENT	Follow-on: competency-specific training (as required)	Follow-on: competency-specific training (as required)	Follow-on: competency-specific training (as required)
FAA ACQUISITION MANAGEMENT SYSTEM	Core: FAMS		
SYSTEMS THINKING SYSTEM ENGINEERING	Core: Systems Thinking / System Engineering		
PROGRAM/ PROJECT MANAGEMENT	Core: Principles of Program / Project Management		
ROLE-SPECIFIC	Specialized clerical/ administrative training and learning activities	Specialized technical/ functional training and learning activities based on job or role requirements (refer to role curriculum, as available)	Specialized Management/ leadership training courses and learning activities (refer to M/L role curriculum as available)





FAA System Engineering



The objective is to provide balanced solutions to complex FAA system needs throughout all life cycle phases



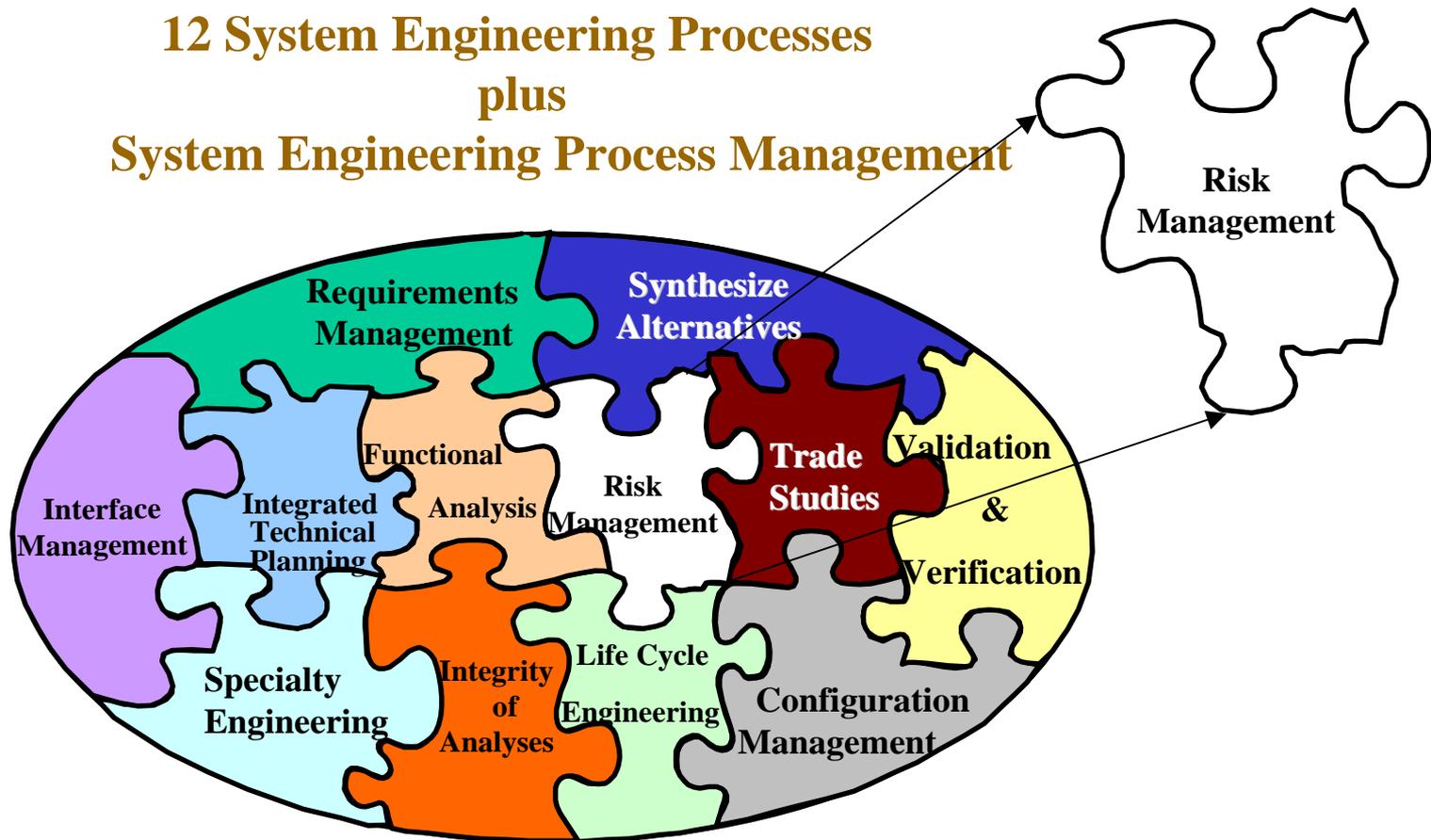
FAA System Engineering Council (SEC)

- SEC group lead - Mike Harrison (ASD100)
- Membership multi-disciplinary, multi-LOB systems engineers
- Chartered by the ARA Management Team (ARAMT), AIO and AF to establish standard system engineering practices across FAA
- SEC products and services include:
 - NAS System Engineering Management Plan (SEMP)
 - FAA System Engineering Manual (SEM)
 - system engineering training
 - program guidance resource



FAA System Engineering Processes

**12 System Engineering Processes
plus
System Engineering Process Management**



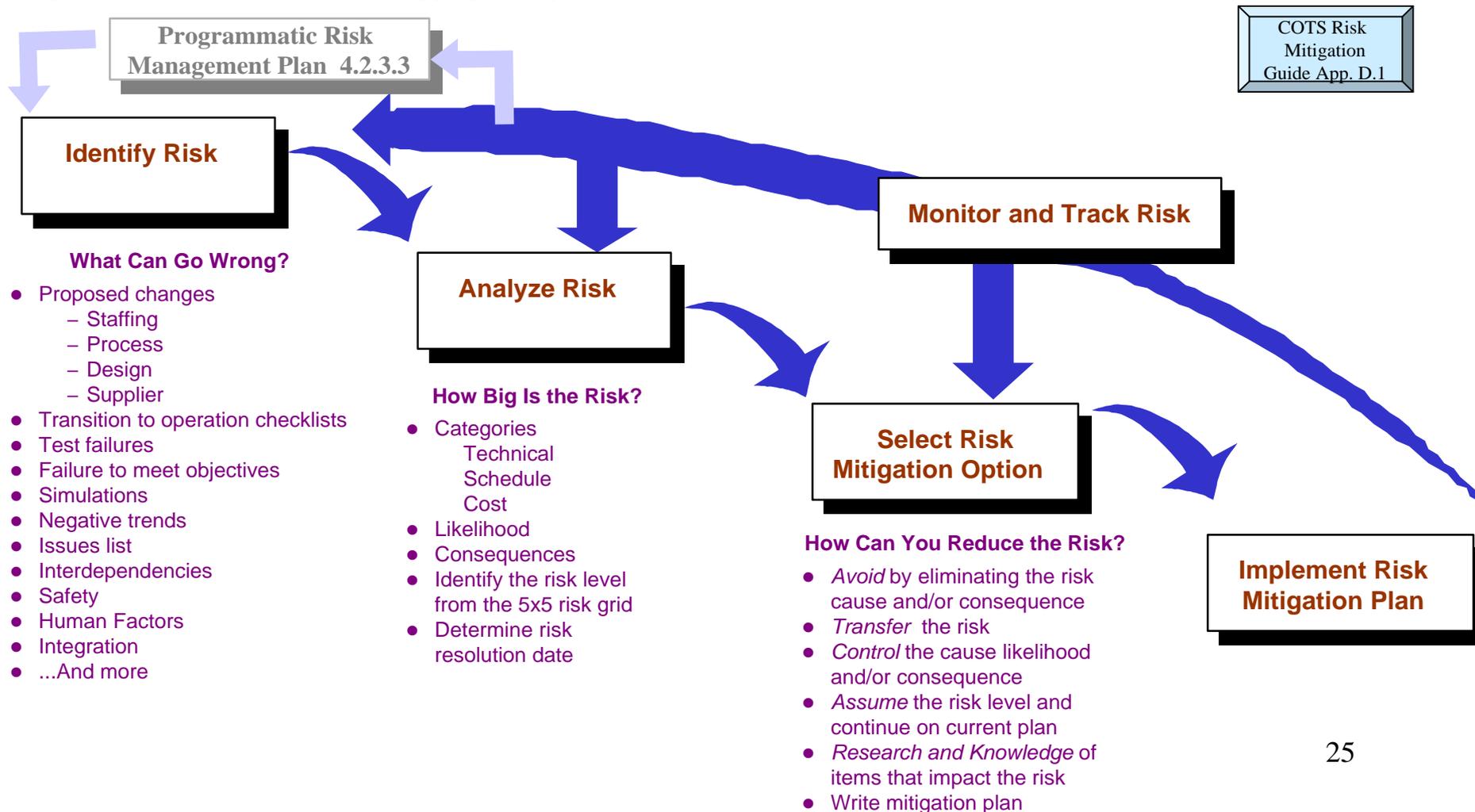
“A discipline that concentrates on the design and application of the whole (system) as distinct from the parts.” - Simon Ramo



FAA Programmatic Risk Management

Risk: A situation or circumstance which creates uncertainties about achieving program objectives.

Risk Management: An organized, systematic decision-support process that identifies risks, assesses or analyzes risks, and effectively mitigates or eliminates risks to achieving program objectives.





FAA Programmatic Risk Management

Risk Identification Flow

~~Managerial
Funding
Political~~

- Operability
- Producibility
- Supportability
- Human Factors
- Security
- Safety
- Performance
- **Acquisition Strategy**

Requirements

Cost

Schedule

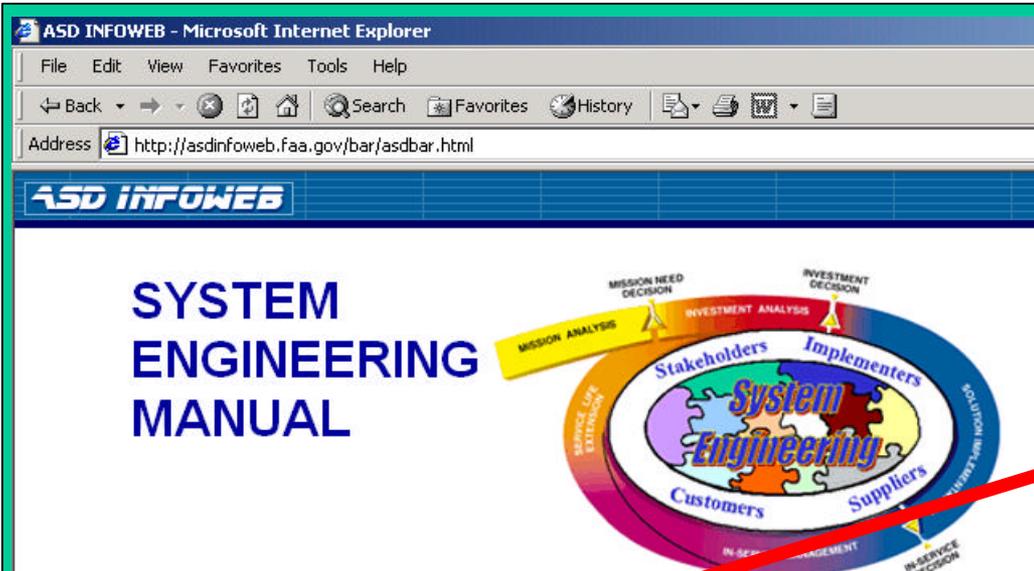
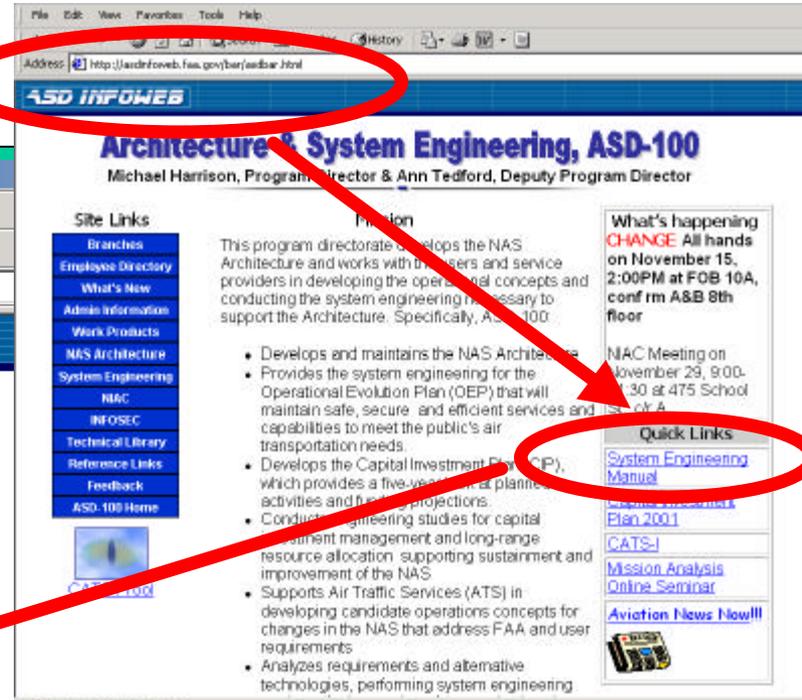
Technical

Programmatic Risks



Where to Find the SEM on the FAA Intranet

<http://asinfoweb.faa.gov/bar/asdbar.html>



System Engineering Manual Links

[Table of Contents](#) | [Reference Index](#) | [Milestone](#) | [Work Product](#)

Content Owner: [Scott VanBuren](#), 202-358-5326
Manual last updated on November 5, 2001

| [System Engineering Council \(SEC\)](#) | [System Engineering Manual \(SEM\)](#) | [System Engineering Management Plan \(SEMP\)](#)
| [Safety Risk Management](#) | [Other Links](#) | [System Engineering Homepage](#) | [ASD-100 Homepage](#)

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SEM Table of Contents

Sys Eng Mgmt Plan



Module 2 Review

1. ARA Curriculum Framework;
FAA System Engineering

Integrated ARA Curriculum Framework

GENERAL	ADMINISTRATIVE/ CLERICAL	TECHNICAL/ PROFESSIONAL	MANAGER/ LEADER
Occupation	Gen. Administrative ARA		
Job Description	Gen. Administrative Officer for ARA		
Job Responsibilities	Gen. Administrative Officer for ARA		
Position			
Supervisor			
Reporting			
Education			
Experience			
Skills			
Knowledge			
Attitudes			
Personnel			
Equipment			
Materials			
Tools			
Other			

FAA System Engineering

"A discipline that concentrates on the design and application of the whole (system) as distinct from the parts." - Simon Ramo

2. FAA System Engineering Council;
system engineering processes

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 - program guidance resource

FAA System Engineering Processes

The objective is to provide balanced solutions to complex FAA system needs throughout all life cycle phases

3. Programmatic Risk Management;
COTS acquisition strategy risks

FAA Programmatic Risk Management

Risk Management - An organized, systematic decision support process that identifies, classifies, assesses or analyzes risks, and develops strategies to minimize or avoid them.

Programmatic Risks

- Operability
- Productivity
- Supportability
- Human Factors
- Security
- Safety
- Reliability
- Acquisition Strategy

Other risks include: Mission Risk, Analysis Risk, Supportability, Security, Safety, Reliability, Acquisition Strategy, and Programmatic Risks.



Module 3. Understanding COTS and COTS Risks

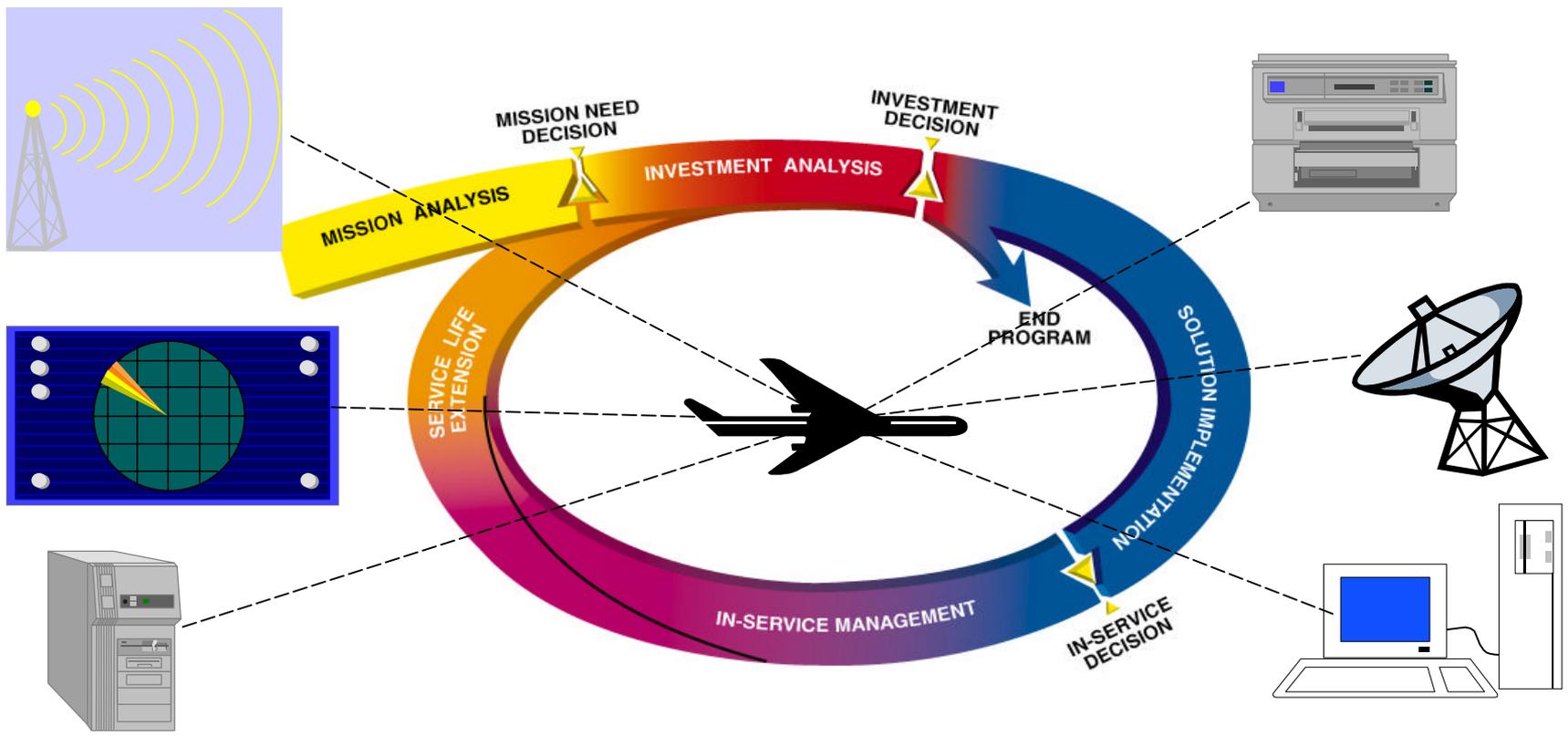


**Why can't we go
back to custom-
designed systems?**





COTS is the Preferred AMS Solution



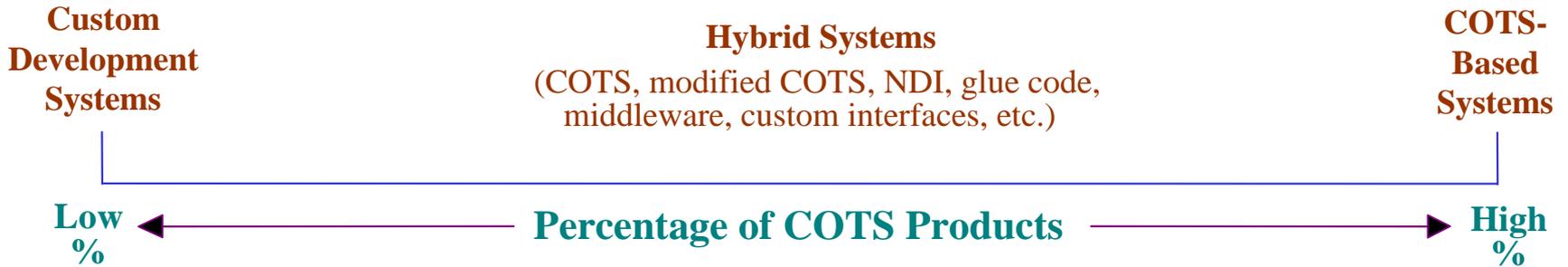
COTS solutions have already changed the composition of the NAS architecture. COTS product use is a reality we need to recognize and accommodate.



COTS Product Use Can No Longer Be Avoided

COTS Risk Mitigation Guide 1.2

Acquisition Strategy Continuum



COTS risk mitigation applies to all acquisition strategies to some degree.



COTS Risk Mitigation

Workshop Terms

COTS Risk
Mitigation
Guide App. G

- **Programmatic risk** - a situation or circumstance which creates uncertainties about achieving program objectives
- **Mitigation** - “to make less severe” (Webster’s Collegiate Dictionary)
- **F³** - the form (i.e., physical layout), fit (i.e., size) and function (i.e., capability) parameters of a product
- **F²** - when only two of the three F³ characteristics are the same between products
- **Non-developmental item (NDI)** - an item that has been previously *developed for use by federal, state, local, or a foreign government* and for which no further development is required (AMS Appendix C)



Terms (cont'd)

- **Sustainment** - “those activities associated with keeping fielded products operational and maintained.” (AMS Appendix C)
- **Supportability** - “the degree to which product design and planned logistics resources meet product use requirements.” (AMS Appendix C)
- **Technology evolution planning** - the collection and analysis of COTS product market research information to identify the risks and mitigation measures for projected product obsolescence issues.
- **Integrated change planning/integrated change package** - the logical and optimal combination of product obsolescence support options, efficiency improvements and functional enhancements.



Terms (cont'd)

- **Compatibility testing** - the determination of a product's ability to substitute for another similar product without a major difference in form, fit or function (F³) parameters.
- **Compliance testing** - the determination of a product's ability to comply with specified performance characteristics
- **Conformance testing** - the determination of a product's ability to conform to specified standards
- **OEM** - original equipment manufacturer for a hardware or software product



Terms (cont'd)

- **Inter-operability** - a product's ability to operate with other products without modification
- **Life cycle** - “a generic term relating to the entire period of conception, definition, build, distribution, operation and disposal of a product.” (AMS Appendix C)
- **COTS-based acquisition** - the planning, procuring, integration, testing, fielding and support of a system or change to a fielded system that contains COTS products.

Other terms will be defined during the
course of the workshop



Does COTS Affect My Job?





COTS Affects All Information Technology Users

School



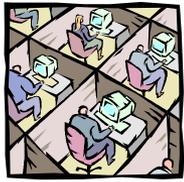
Home



Administration



Science



Workplace



Medicine



Industry



Military



Personal

This workshop will focus on how COTS affects FAA automated system life cycle phases and supporting functional areas.



COTS Product Benefits

- Avoid custom development risks
- Rapid infusion of current technology and tools
- Use of world-wide standards
- Reduce development costs
- Broad market/vendor base
- Industry/market supported skill sets

COTS Risk
Mitigation
Guide 1.2

However...there is no such thing as a “risk-free” lunch!



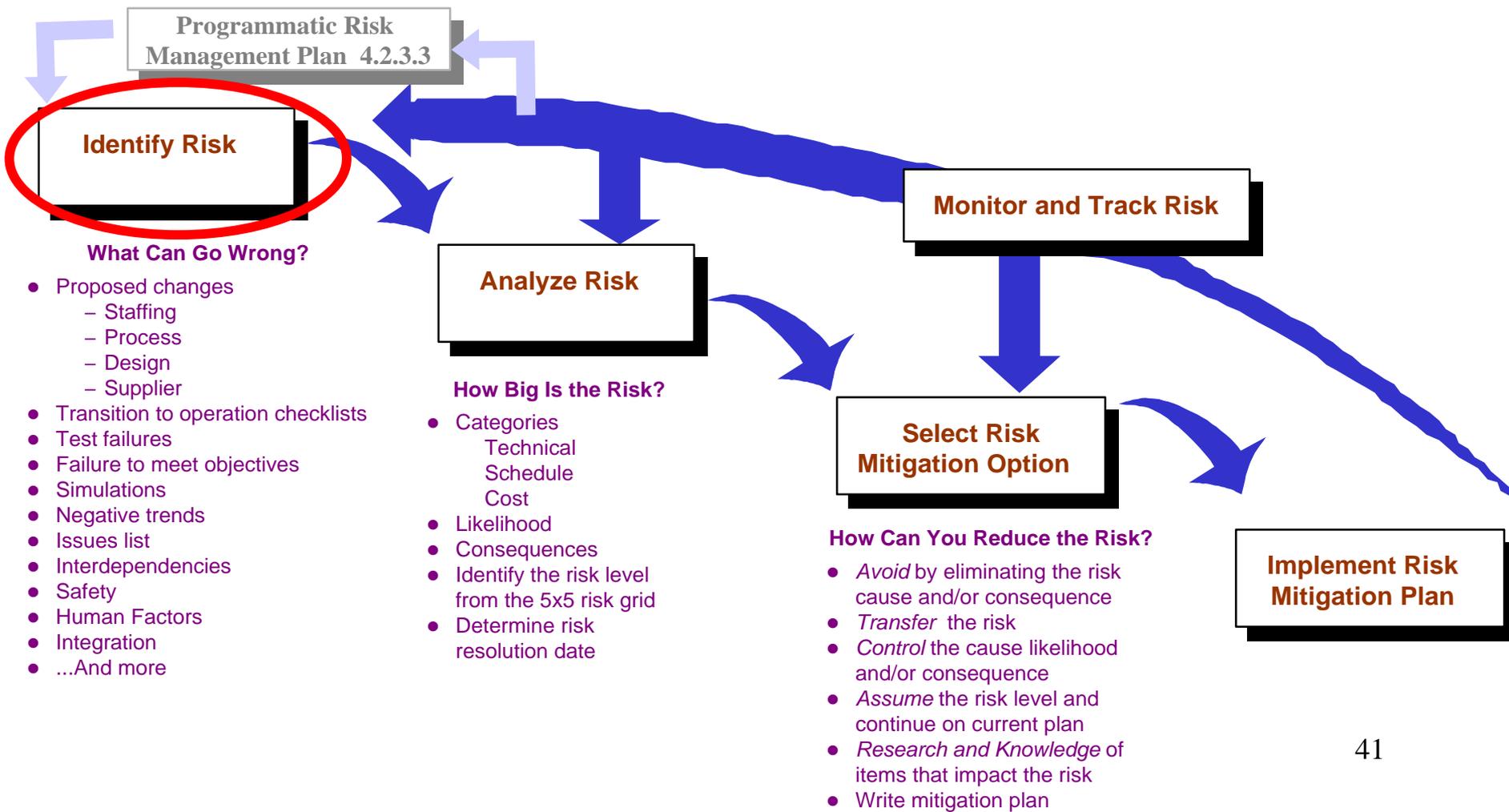
**So what's risky
about COTS?**



FAA Programmatic Risk Management

Risk: A situation or circumstance which creates uncertainties about achieving program objectives.

Risk Management: An organized, systematic decision-support process that identifies risks, assesses or analyzes risks, and effectively mitigates or eliminates risks to achieving program objectives.





Identifying COTS Risks

COTS Risk
Mitigation
Guide 1.3

- **Known**

- loss of design control
- industry/government “lessons-learned”
- COTS Risk Mitigation Guide Appendix A – References

- **Unknown**

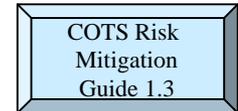
- obsolescence
- rapid technology evolution
- market behavior

COTS risks are the same for any degree of COTS product use



Understanding Known COTS Risks

1. **Rapid and asynchronous changes**
2. Different obsolescence impacts
3. **Proprietary data**
4. Higher life cycle costs
5. Multiple configurations
6. Different quality practices
7. **“As is” configuration**
8. Commercial standards
9. Time-limited manufacturer support
10. **Information security susceptibility**



When acquiring COTS products, we need to understand, identify and plan for the risks



COTS Software Risks

COTS Risk
Mitigation
Guide 1.3.11

- Diminishing software support skills over time
- COTS software compatibility with underlying hardware platform
- Complexity of COTS software interfaces (e.g. operating system) with other COTS software products/applications, middleware, glue code, custom/legacy interfaces
- Modifying system functionality without unknowingly exceeding a COTS software product tolerance
- Introducing system “unknown unknowns” with untested products (e.g. unused code, timing differences, firmware changes etc.)
- Licensing options and costs
- Sole source dependency for critical software components and data rights availability
- Information security



COTS Risk Factor No. 1

Rapid and asynchronous changes

- Underlying technology advancements
- Competition for market share
- Product types and release cycles



COTS Risk
Mitigation
Guide 1.3.1

Budget planning uncertainties = cost risk
Obsolescence uncertainties = technical risk

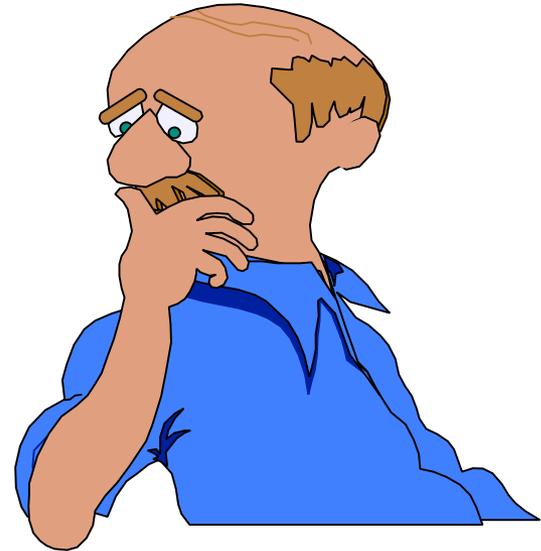


COTS Risk Factor No. 2

COTS Risk
Mitigation
Guide 1.3.2

Different obsolescence impacts

- Common misconception - When a COTS product goes end of life (EOL) or end of service (EOS) something needs to be done right now!
- Four classes of product obsolescence impacts to a system



Budget planning uncertainties = cost risk
Product support uncertainties = technical risk



System Obsolescence Impacts

NO IMPACT

- * sufficient spares versus reliability
- * OEM sells rights to third party
- * no action required

LOW IMPACT

- * F³ compatible OEM or other vendor sources
- * no conjunctive changes to interfacing products
- * testing and documentation updates only

MEDIUM IMPACT

- * only F² compatible products available
- * changes to interfacing hw/sw products
- * use product obsolescence support options

HIGH IMPACT

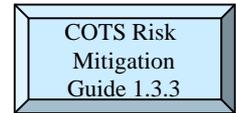
- * market support almost non-existent
- * new technology/products incompatibility
- * use product obsolescence support options

It is not a foregone conclusion that all EOL and EOS situations require an immediate response.

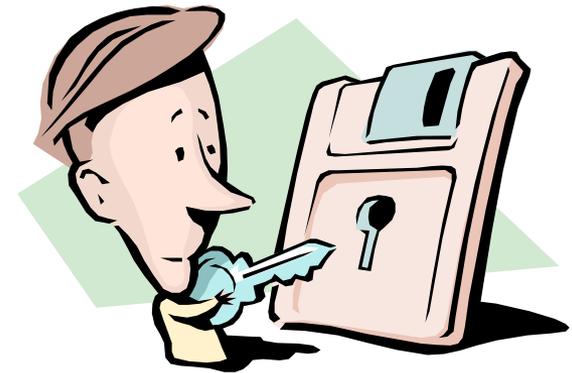


COTS Risk Factor No. 3

Proprietary data



- Competitive control of research/manufacturing processes
 - source code, circuit designs, schematics, drawings, patents, unique features
- Available data at the “black box” (gozinta/gozouta) level
 - commercial style technical documentation/training
 - promotes post-sale product support
 - testing and maintenance differences

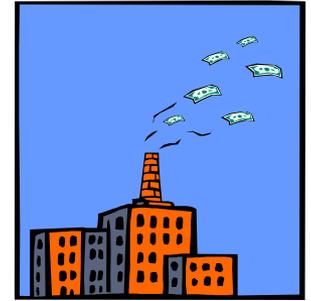


Design control uncertainties = technical risk



COTS Risk Factor No. 4

Higher life cycle costs



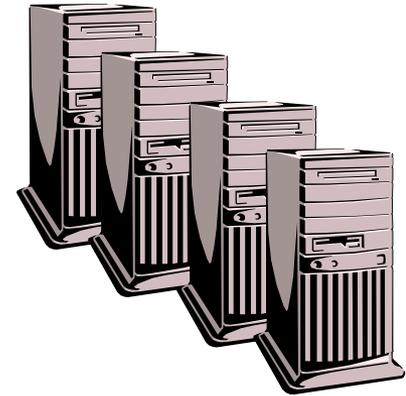
- “Faster, better, cheaper” sales pitch for COTS
- Higher costs without early risk mitigation planning
- Prevents added ownership costs due to:
 - poor configuration management
 - insufficient test capability
 - modification of COTS products
 - lack of obsolescence planning
 - user acceptance issues
 - inadequate product selection criteria

Budget planning uncertainties = cost risk



COTS Risk Factor No. 5

Multiple configurations



- COTS product OEMs are also subject to technology evolution/obsolescence
 - piece parts/components
 - subassemblies
- Production lots can be functionally equivalent
 - contain different versions of piece parts, sub-assemblies, firmware/software
 - can occur without notice
- COTS-based systems increase likelihood of configuration differences
 - system complexity, quantities and deployment time

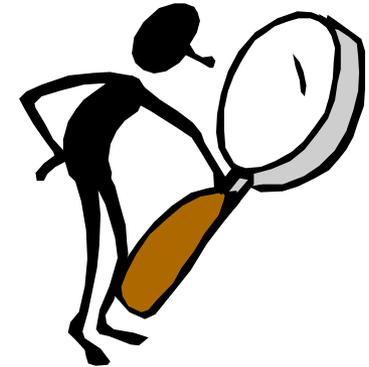
COTS Risk Mitigation Guide 1.3.5

Test and evaluation uncertainties = schedule risk
Product support uncertainties = technical risk

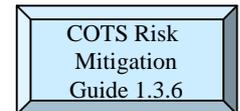


COTS Risk Factor No. 6

Different quality practices



- Not all COTS products are created equal
- Functionally equivalent products can have significant differences driven by:
 1. components used
 2. quality assurance practices
 3. manufacturing processes
 4. labor force skills
 5. market share
 6. product support
 7. upward/downward compatibility
 8. corporate longevity
- “Caveat emptor” (buyer beware)...a smart consumer looks beyond the price



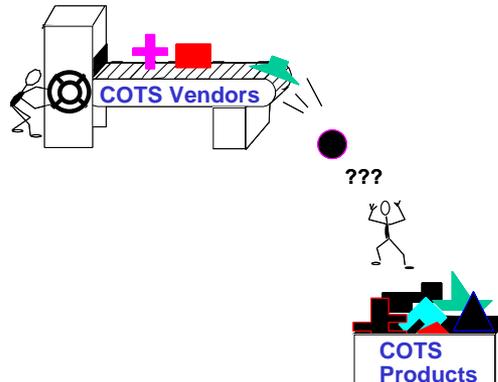
Procurement uncertainties = schedule risk
Product support uncertainties = cost & technical risk



COTS Risk Factor No. 7

“As is” configuration

- Information technology requirements and solutions are driven by the commercial market (i.e., consumers) and evolving technologies
 - pre-determined form, fit and function (F³)
 - WYSIWYG
 - may not meet unique government requirements



COTS Risk
Mitigation
Guide 1.3.7

Requirements uncertainties = technical risk
User acceptance uncertainties = schedule risk



COTS Risk Factor No. 8

Commercial standards

- Commercial standards (e.g., ISO, IEEE, ANSI)
 - world-wide coordination of mfrs., engineering groups (e.g., INCOSE), corps. etc.
 - high level requirements on core capabilities and processes
 - flexibility to add distinguishing features
- Open system standards are developed to:
 - standardize product interface types (e.g., RS232, SCSI, SQL)
 - stabilize networking protocols (e.g., TCP/IP, SNMP)
 - expand availability of product choices in various technology sectors
- Commercial standards evolve rapidly and can conflict



Design control uncertainties = technical risk



COTS Risk Factor No. 9

Time-limited manufacturer support

- New product releases create older generations of products
 - upward/downward compatibility maintains customer base
- Manufacturer decides spares/repair/technical support timeframe
 - two to three generations of hardware and software
 - third party support
- “Just-in-time” inventory management
 - rapid release cycles
 - near term orders/demand
 - avoids excess product/repair part inventories
 - warehousing costs

COTS Risk
Mitigation
Guide 1.3.9



Product support uncertainties = technical risk

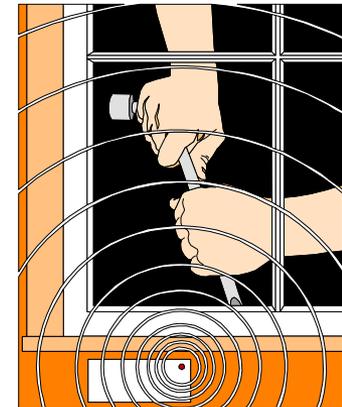


COTS Risk Factor No. 10

Information security susceptibility

COTS Risk
Mitigation
Guide 1.3.10

- Inter-operability enhances available product selection
 - common interface protocols
- Open system standards are open to all
 - world-wide applicability
 - internet
 - network engineers/administrators



System access uncertainties = technical risk



Module 3 Review

1. Preferred AMS solution; cannot totally avoid COTS

COTS is the Preferred AMS Solution

COTS Product Use Can No Longer Be Avoided

Acquisition Strategy Continuum

“Pure” Custom Development Systems Hybrid Systems (COTS, modified COTS, NDI, glue code, middleware, custom interfaces, etc.) “Pure” COTS-Based Systems

Low % ← Percentage of COTS Products → High %

The Government can no longer afford to develop system components that are readily available on the market (processors, displays, disk drives, application software etc.). Therefore, COTS risk mitigation applies to all acquisition strategies to some degree.

30

2. COTS definition; related terminology

What is COTS?

The FAA's Acquisition Management System (AMS) says...

“Commercial-off-the-shelf (COTS) is a system or system component that has been developed for sale, lease or license to the public and is currently available at a fair and reasonable price.”

“COTS are just black boxes that keep...

COTS Risk Mitigation Workshop Terms

- **Programmatic risk** - a situation or circumstance which creates uncertainties about achieving program objectives
- **Mitigation** - “to make less severe” (Webster’s Collegiate Dictionary)
- **F³** - the form (i.e., physical layout), fit (i.e., size) and function (i.e., capability) parameters of a product
- **F²** - when only two of the three F³ characteristics are the same between products
- **Non-developmental item (NDI)** - an item that has been previously developed for use by federal, state, local, or a foreign government and for which no further development is required (AMS Appendix C)

32



Module 3 Review (cont'd)

3. COTS effects on the acquisition phases and supporting practices

Does COTS Affect My Job?

COTS Affects All Information Technology Users

This workshop will focus on how COTS affects FAA automated system life cycle phases and supporting functional areas.

4. COTS benefits; understanding the known risks

COTS Product Benefits

- Avoid custom development risks
- Rapid infusion of current technology
- Use of world-wide standards
- Reduce development costs
- Broad market/vendor base
- Industry/market support

However...there is no such thing as a free lunch

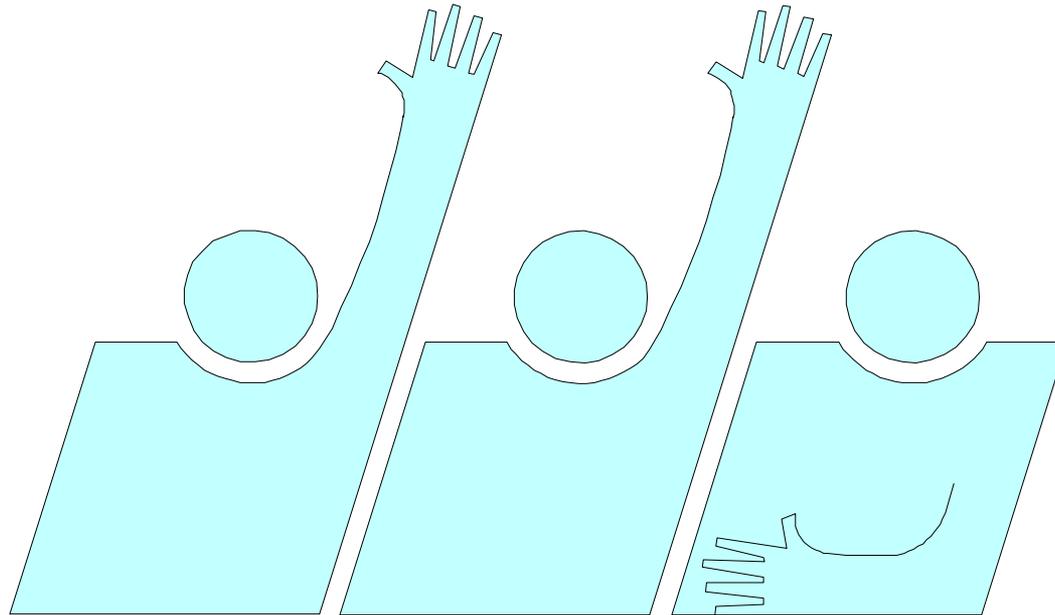
Understanding Known COTS Risks

1. Rapid and asynchronous changes
2. Different obsolescence impacts
3. Proprietary data
4. Higher life cycle costs
5. Multiple configurations
6. Different quality practices
7. "As is" configuration
8. Commercial standards
9. Time-limited manufacturer support
10. Information security susceptibility

When acquiring COTS products, we need to understand, identify and plan for the risks



Risk Refresher



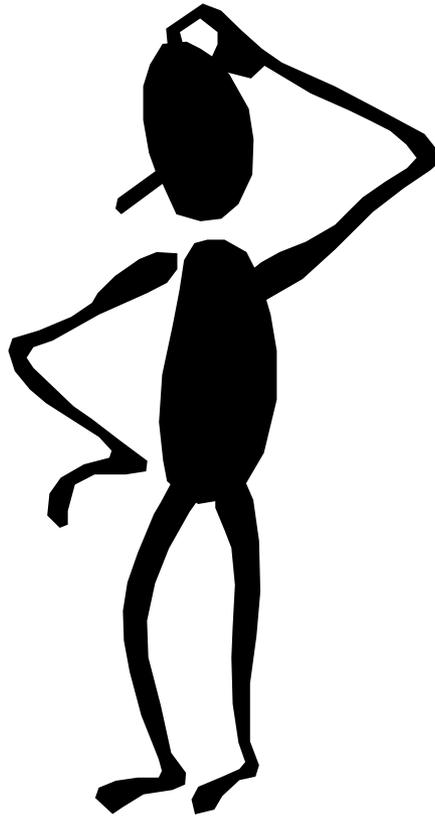
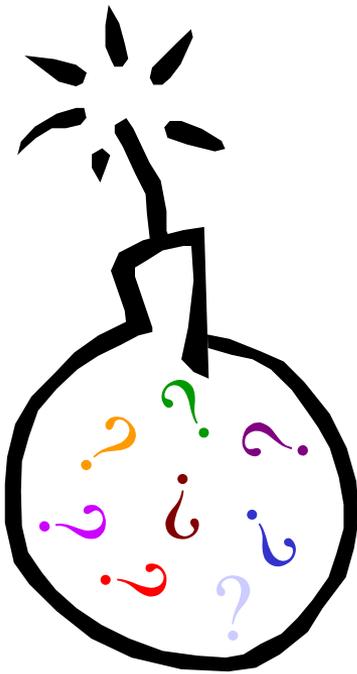
Can the class name the 10 known COTS risk factors (without help)?



Module 4. COTS Risk Mitigation (controlling the known risks)



**OK...so what strategies
are needed to manage
COTS risks??**

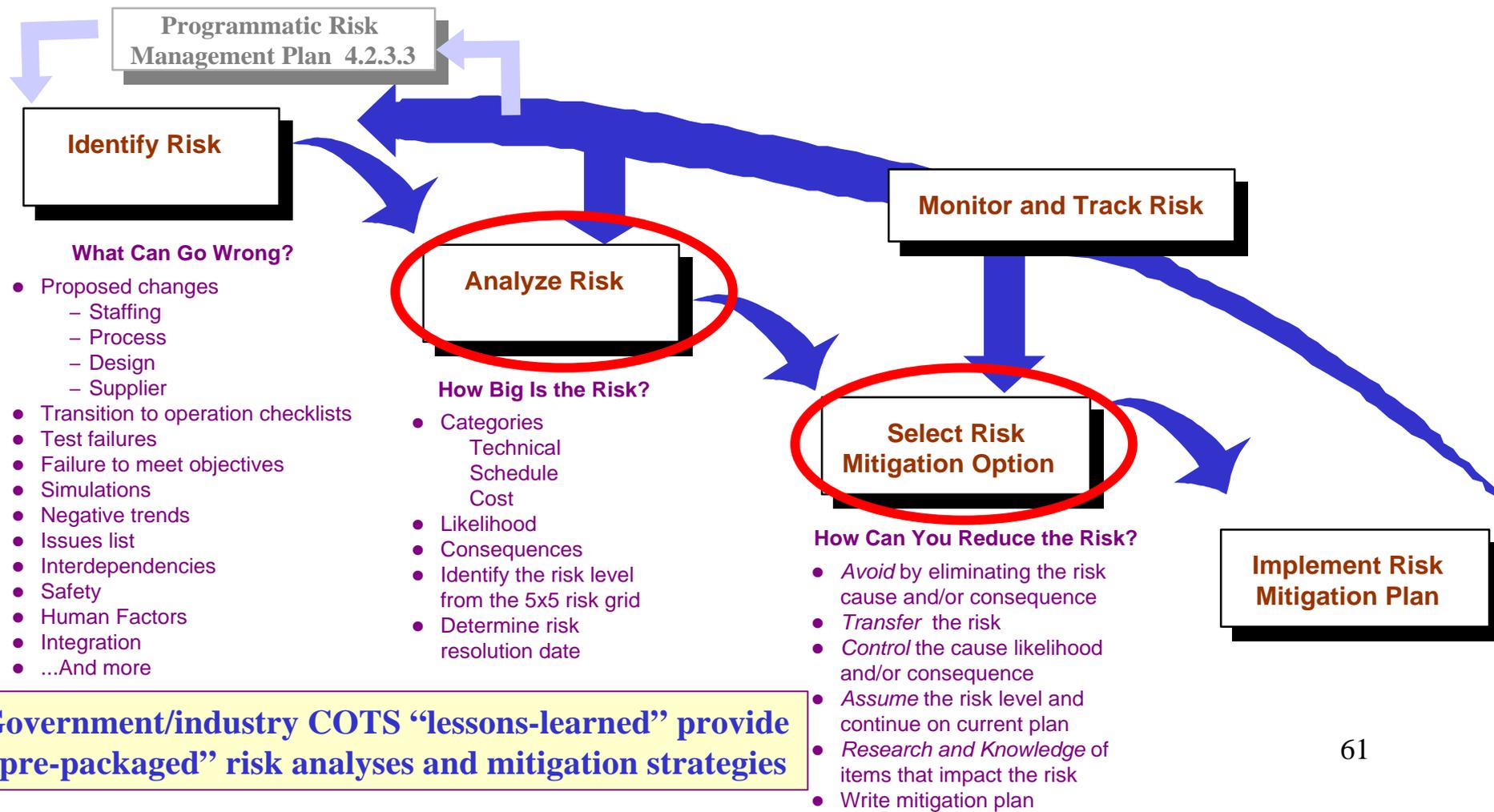




FAA Programmatic Risk Management

Risk: A situation or circumstance which creates uncertainties about achieving program objectives.

Risk Management: An organized, systematic decision-support process that identifies risks, assesses or analyzes risks, and effectively mitigates or eliminates risks to achieving program objectives.



Government/industry COTS “lessons-learned” provide “pre-packaged” risk analyses and mitigation strategies



**How do these COTS
risk mitigation strategies
link with the AMS?**





COTS Risk Mitigation Strategies & Benefits

COTS Risk Mitigation Guide 1.4

Number	COTS Mitigation Strategies	Application Benefits	Risk Factors Addressed
1	Involve COTS-knowledgeable individuals in all analytical processes	Facilitates the application of COTS risk mitigation strategies and informed decision-making	#1-6 and #8-10
2	Involve users early and throughout the program life cycle to identify and resolve COTS-related constraints	Reduces chances of surfacing user acceptance issues late in system development and deployment	#1, #3, #4, #6, #7 and #10
3	Perform continuous COTS product market research	Allows product team to project and plan for changes in technology, product configurations and obsolescence-related issues	#1, #2, #4, #5 and #7-10
4	Integrate market research results with field data and new requirements	Optimizes and prioritizes cost, schedule and performance factors between obsolescence-driven system changes and system upgrades	#3, #4, #9 and #10
5	Develop and maintain flexible performance requirements suited to the use of COTS products	Allows for the appropriate level of specified function description and the inclusion of COTS technical performance factors	#7-8 and #10
6	Institute and maintain ongoing COTS product testing capability	Allows project to assess new COTS products/technologies for specification compliance, form/fit/function compatibility and standards conformance	#1-5, #7, #8 and #10



COTS Risk Mitigation Strategies & Benefits

(cont'd)

Number	COTS Mitigation Strategies	Application Benefits	Risk Factors Addressed
7	Develop and maintain non-technical COTS selection factors	Addresses important manufacturer/product selection factors (e.g. quality) not contained in performance/functional specifications	#1 and #3-10
8	Use COTS-sensitive analytical and budget processes	Allows analyses, trade studies, plans and budgets to reflect unique market-driven COTS characteristics and obsolescence projections	#1-10
9	Integrate COTS-based technology evolution planning information within the Integrated Program Plan (IPP)	Provides centralized planning that captures system evolution strategy, obsolescence projections and risk mitigation decisions	#1-10
10	Emphasize strong and COTS-relevant configuration management practices	Reduces the possibility of untested COTS product changes affecting system performance and supports multiple system configurations	#1, #2, #4, #5
11	Use a COTS-experienced systems integration agent	Facilitates acquisition, development, deployment and support activities with proven COTS-capable personnel and services	#1-10
12	Leverage the commercial infrastructure wherever feasible	Prevents costly duplication of already existing COTS product support infrastructure	#4 and #9
13	Avoid modification of COTS products when possible	Prevents loss of product support by the manufacturer and increased life cycle costs	#3 and #7

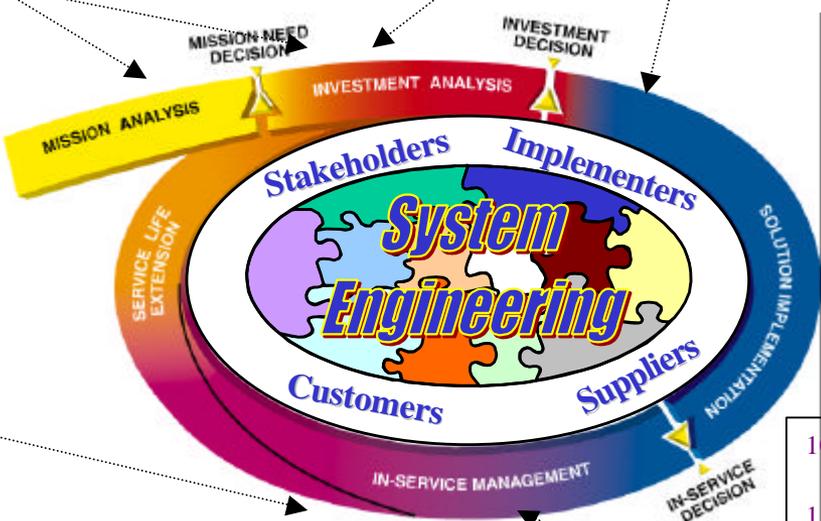


COTS Risk Mitigation Strategies and the AMS

1. Involve COTS-knowledgeable individuals in all analytical processes
2. Involve users early and throughout the program life cycle to identify and resolve COTS-related constraints
3. Perform continuous COTS product market research
4. Integrate market research results with field data and new requirements
5. Develop and maintain flexible performance requirements suited to the use of COTS products
6. Institute and maintain ongoing COTS product testing capability

7. Develop and maintain non-technical COTS selection factors
8. Use COTS-sensitive analytical and budget processes
9. Integrate technology evolution planning within the Integrated Program Plan (IPP)

COTS Risk Mitigation Guide 1.5



10. Emphasize strong and COTS-relevant configuration management practices
11. Establish a COTS-experienced systems integration agent
12. Leverage the commercial infrastructure wherever feasible
13. Avoid modification of COTS when possible

Inter-related COTS risk mitigation strategies are integrated into early program planning and applied throughout a system's life cycle



Risk Mitigation Strategy Structure

What?

Risk mitigation title describes the activity

Why?

How this benefits the practitioner and management

What COTS risk factors are addressed

When?

Applicable AMS phase(s)

How?

Tools, examples, templates, procedures, etc.

If this strategy is ignored?

Consequences

Primary risk impact if strategy is ignored

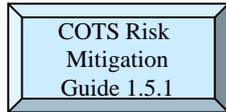


Risk Mitigation Strategy No. 1

Involve COTS-knowledgeable individuals in all analytical processes

• Why?

- COTS knowledge supports informed decision-making
- Plan COTS management strategies for new acquisitions
- Understand COTS product obsolescence
- Address COTS risk factors 1-6 and 8-10



• When?

- Mission Analysis (needs analysis, risk analysis)
- Investment Analysis (strategy, requirements, trade studies, early concept demonstrations, surveys, cost estimation, life cycle cost, source selection)
- Solution Implementation (design analysis, test, trade studies)
- In-Service Management (supportability, engineering changes, disposal)





Risk Mitigation Strategy No. 1 (cont'd)

Involve COTS-knowledgeable individuals in all analytical processes

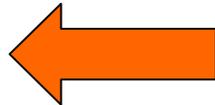
- How?

- Borrow 'em

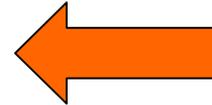
- Steal 'em

- Buy 'em

- Train 'em



- Work Breakdown Structure (WBS)



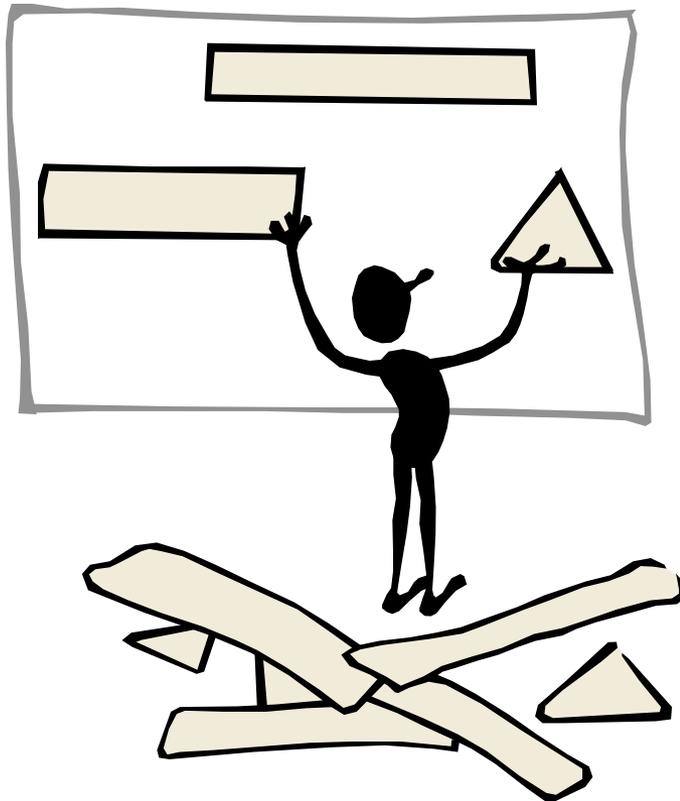
- If this strategy is ignored?

- Inability to successfully identify and mitigate COTS risks

Primary risk = cost

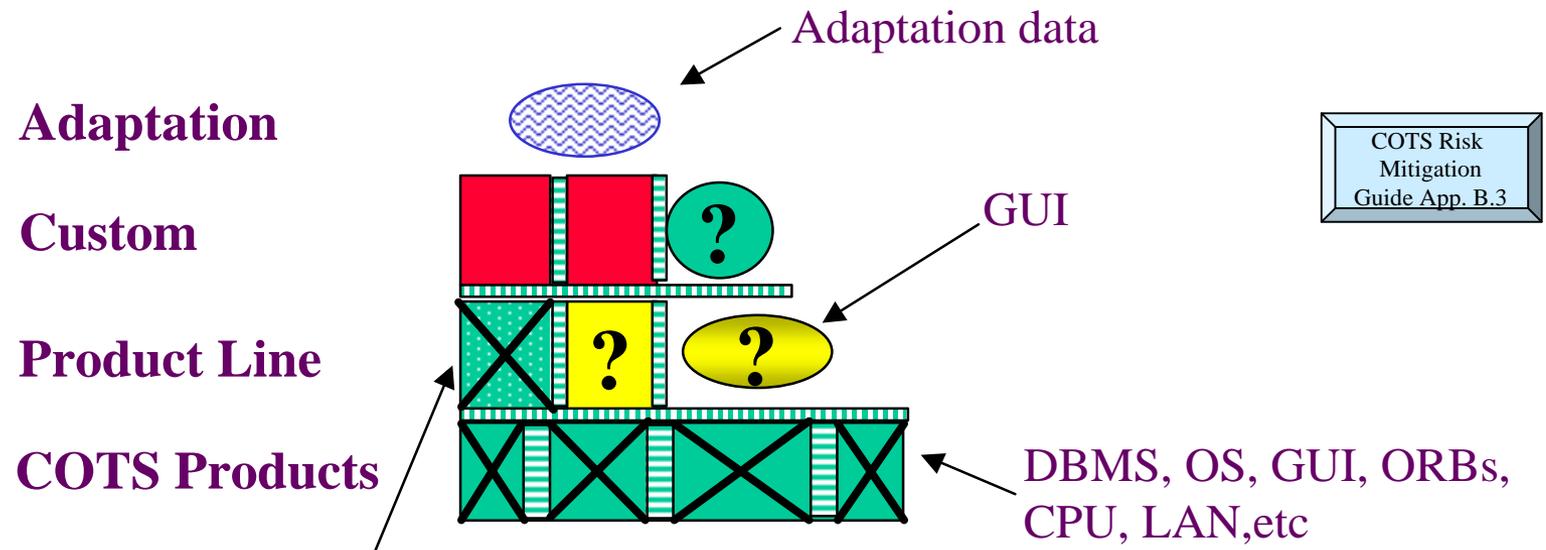


How do we plan early for obsolescence?





Understanding the System Architecture



Support

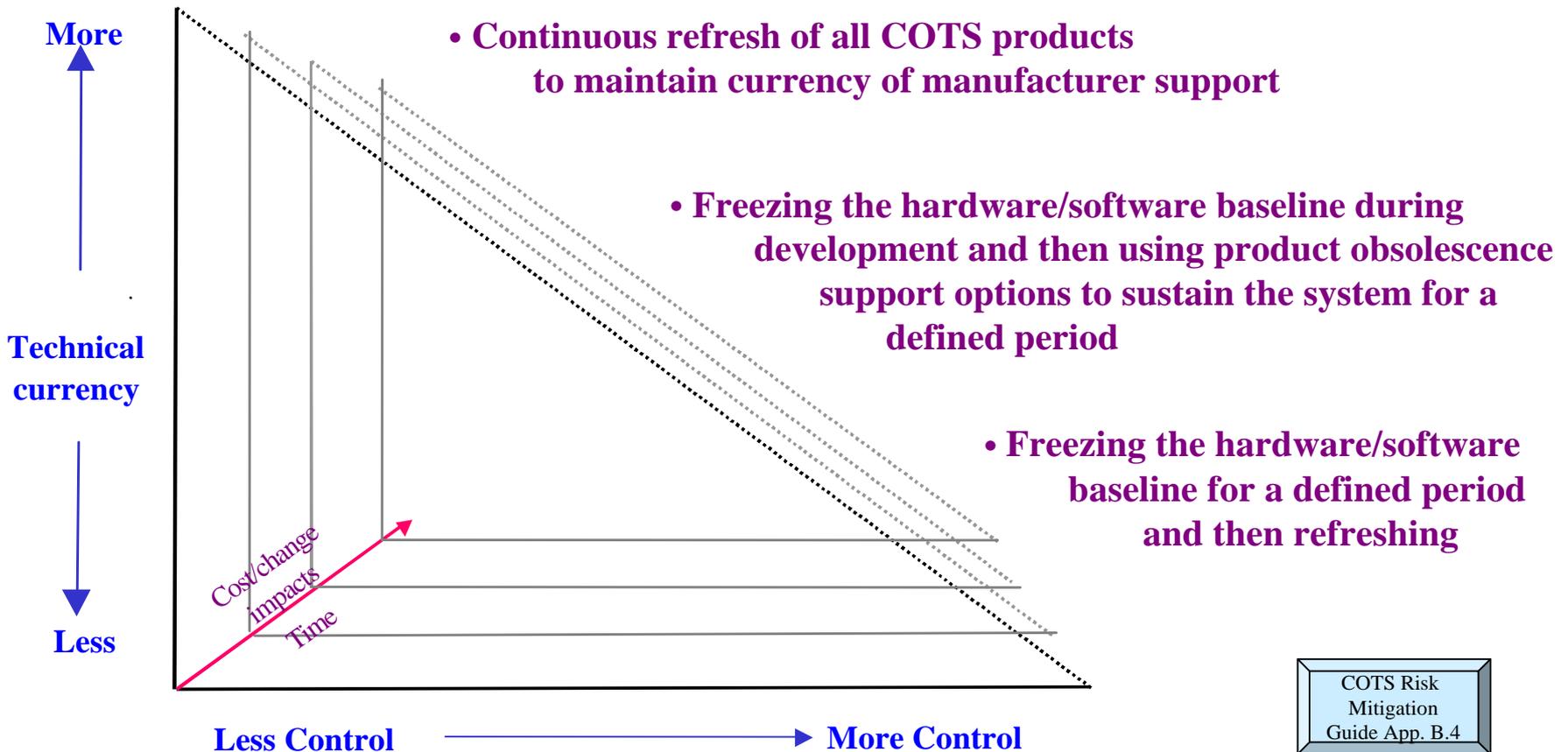
X - Not FAA responsibility
 ? - TBD - FAA or vendor

- New application
- Contractor product line component
- Changed contractor product line component
- Glue
- NDI Component
- Generated code

System support planning becomes easier when the constituent product categories are known



Developing An Effective Strategy



A flexible balance among baseline control, technical currency and change timing factors must be established

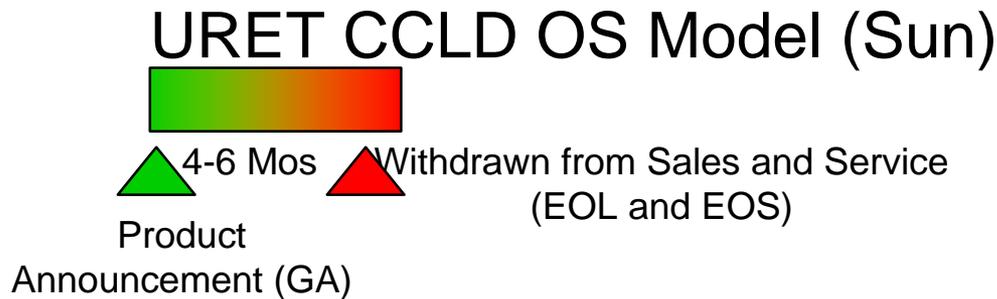
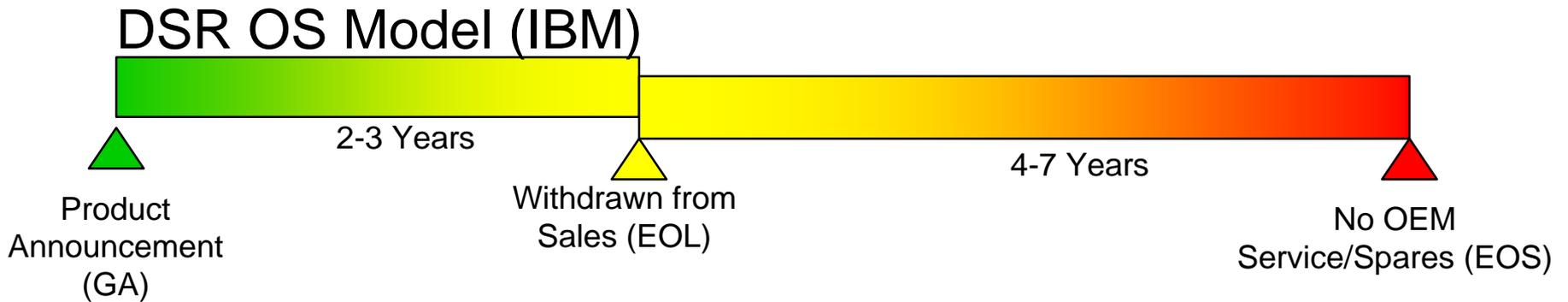


URET CCLD vs. DSR Product Lifecycles

GA: Product Generally Available for public purchase.

EOL: Product no longer being actively marketed and sold.

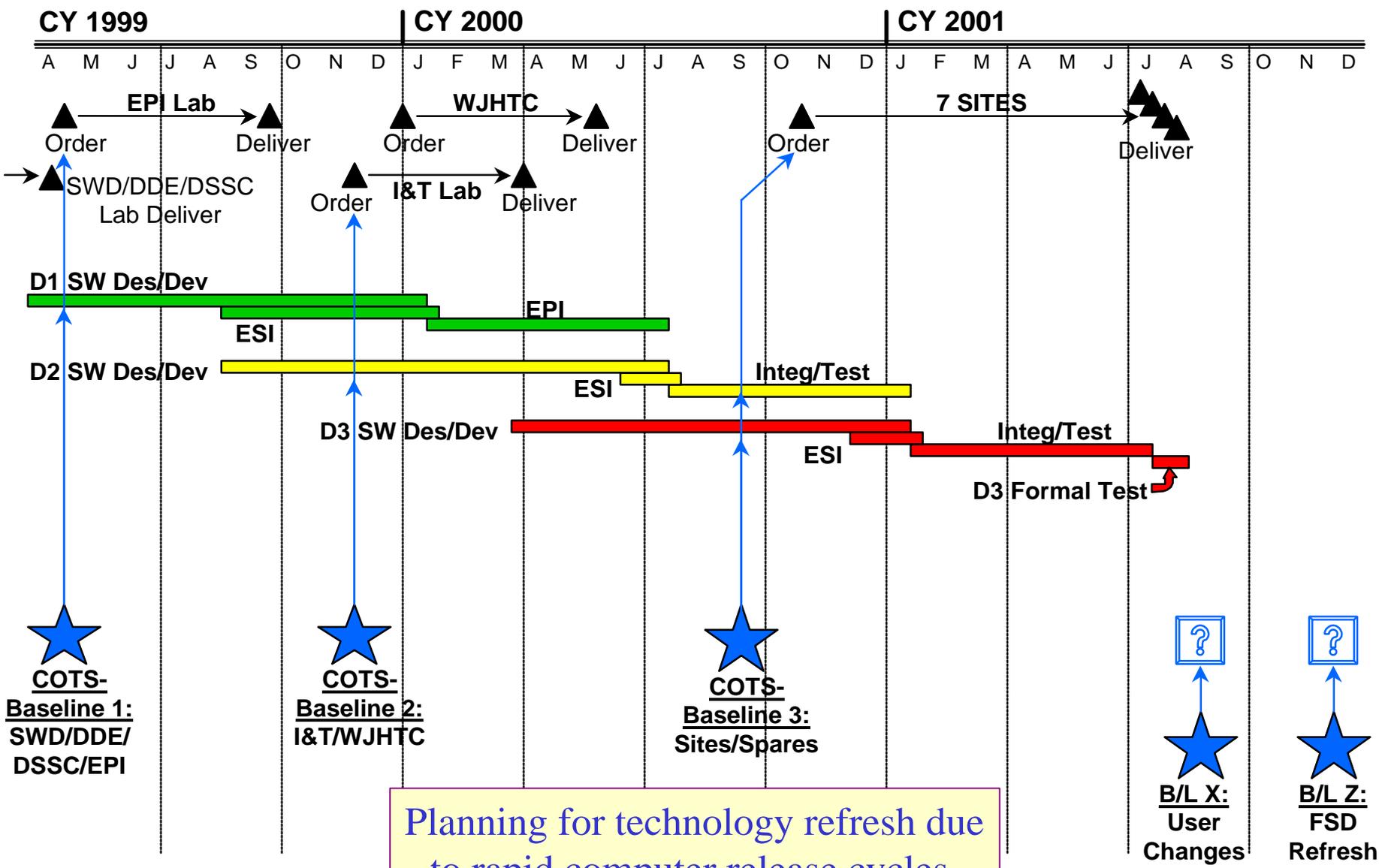
EOS: Product no longer being serviced, and/or spares no longer available from OEM.



Early recognition of product release cycles and configuration management impacts is key to obsolescence management strategy



Recommended Approach (URET CCLD)



Planning for technology refresh due to rapid computer release cycles.

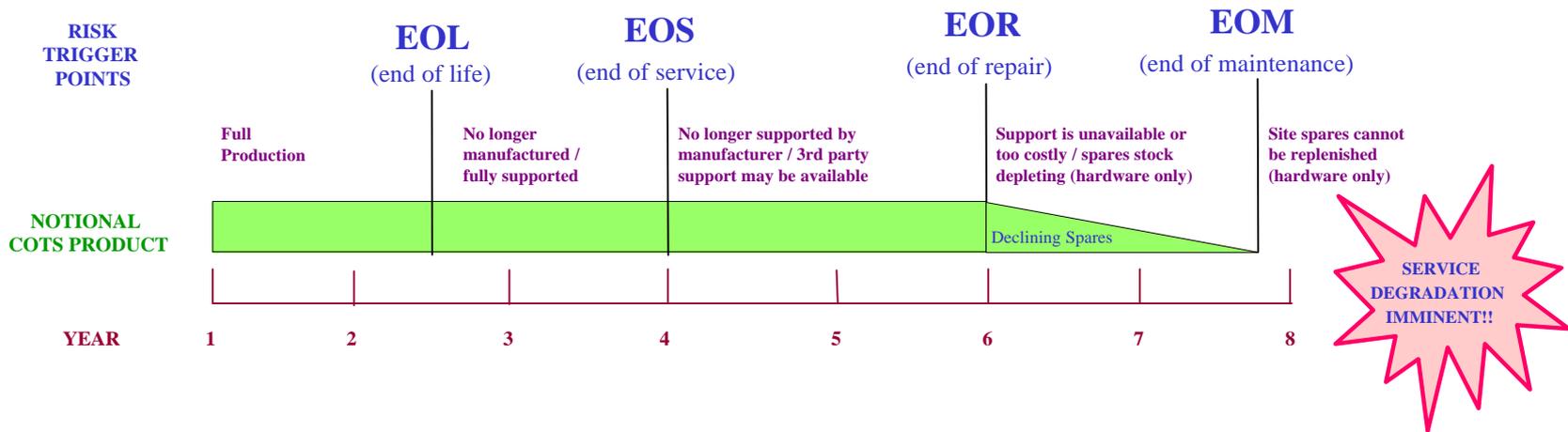


Understanding the Obsolescence Progression

COTS Risk Mitigation Guide App. B.1

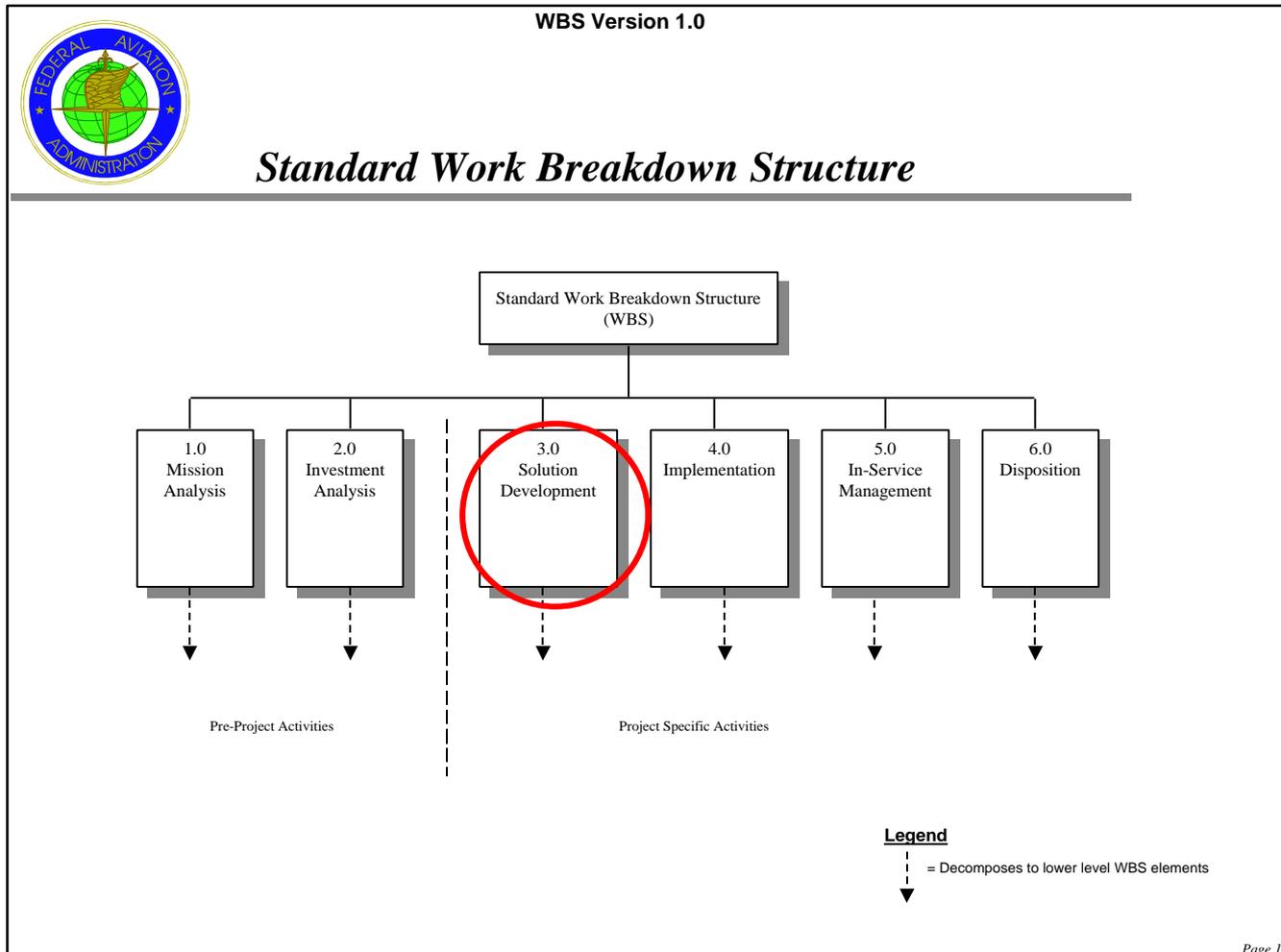
Obsolete - “No longer useful.” (Webster)

Obsolescence - “The process of becoming obsolete.” (Webster)



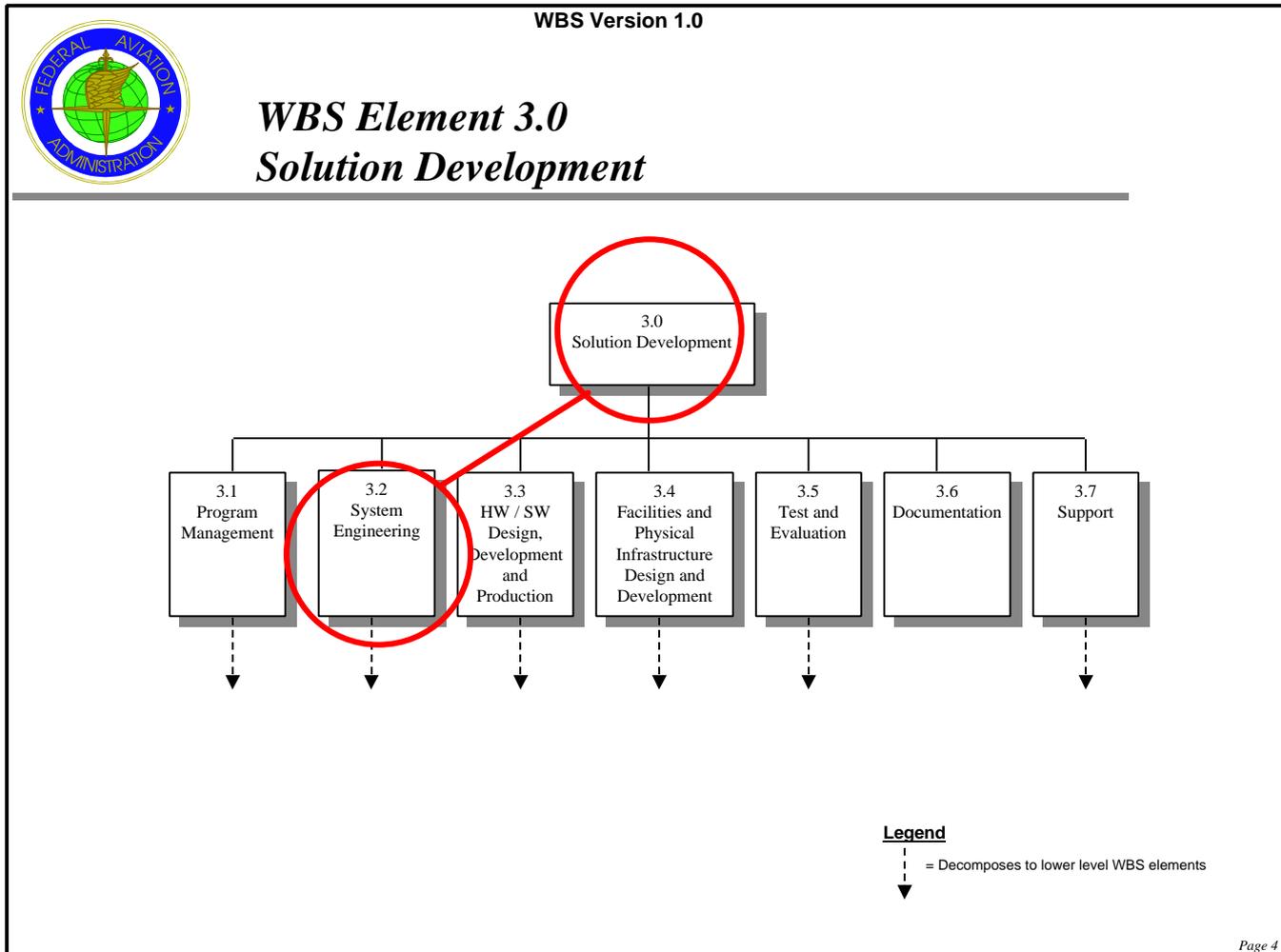
Obsolescence is a diminishing level of product support over time. Each trigger point begs the question “How does this impact my system?”.

Resource Planning for Market Research Activities During Solution Implementation



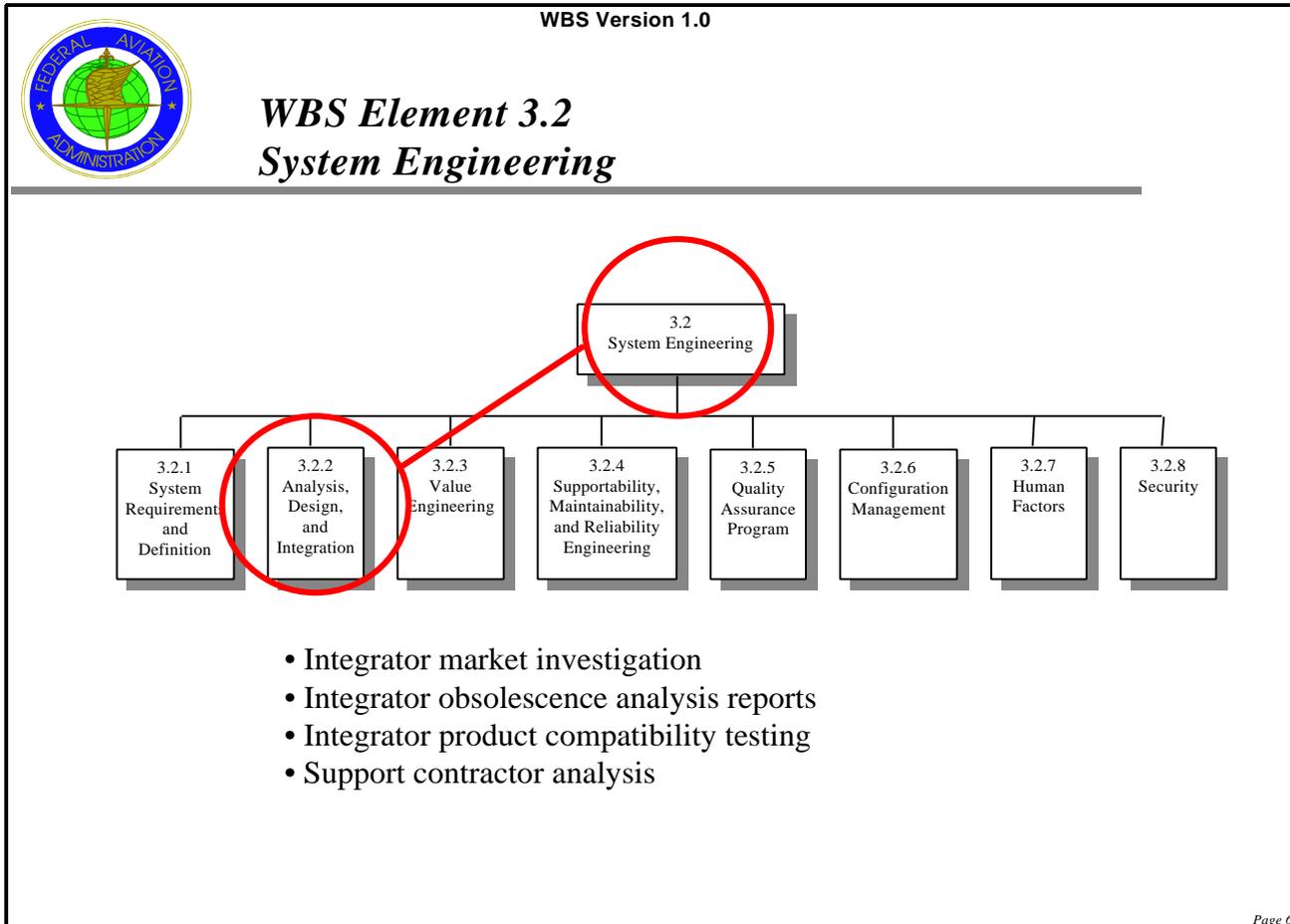
Standard FAA WBS maps to the AMS life cycle phases

WBS Allows Programming of Resources to Specific Activity Areas



Ensures that COTS-specific risk mitigation resources (e.g., market research) are programmed

Market Research Activities During Solution Implementation Would Fall Under 3.2.2



WBS templates are available in the AMS FAST toolset,
WBS activities mapped out in COTS Guide App. C



Risk Mitigation Strategy No. 2

Involve users early and throughout the program life cycle to identify and resolve COTS-related constraints

• Why?

- Provide operations and maintenance perspectives
- Train on COTS characteristics/risks/mitigations
- Become familiar with candidate COTS solutions
- Establish requirements priorities / adapt field procedures
- Identify and resolve suitability issues
- Address COTS risk factors 1, 3, 4, 6, 7 and 10



COTS Risk
Mitigation
Guide 1.5.2

• When?

- Mission Analysis (needs analysis, risk analysis)
- Investment Analysis (requirements, trade studies, early concept demonstrations, surveys, cost estimation, life cycle cost, source selection)
- Solution Implementation (design analysis, acceptance testing, trade studies)
- In-Service Management (supportability, engineering changes, disposal)



Risk Mitigation Strategy No. 2 (cont'd)

Involve users early and throughout the program life cycle to identify and resolve COTS-related constraints

- **How?**

- Memorandum of understanding (MOU)
- Roles and responsibilities (rotation, empowerment, responsibility, accountability, authority, participation etc.)
- AMS FAST under TOOLSETS/Union Guidance

- **If this strategy is ignored?**

- Unexpected user acceptance issues

Primary risk = schedule



Risk Mitigation Strategy No. 3

Perform continuous COTS product market research

COTS Risk
Mitigation
Guide 1.5.3

- Why?

- Understand if current/future technology will meet needs
- Identify/compare products to meet functional requirements
- Establish a forward-look horizon on obsolescence impacts
- Become a smart consumer
- Address COTS risk factors 1, 2, 4, 5 and 7-10



- When?

- Mission analysis (technology trend analysis, obsolescence of fielded systems)
- Investment Analysis (prototyping, beta testing, SIRs, contract requirements)
- Solution Implementation (product selection, support planning, obs. analysis)
- In-Service Management (obsolescence analysis, engineering changes)



Risk Mitigation Strategy No. 3 (cont'd)

Perform continuous COTS product market research

- **How?**

- Surveillance (emerging technologies, market conditions, products)
- Investigation (product testing, obsolescence information, analysis)
- Internet, trade shows, publications, consultants, integrator, support contractors, SIRs, visits to manufacturers, demonstrations, beta testing, prototyping, compatibility testing, obsolescence surveys

- **If this strategy is ignored?**

- Poor product selection and the inability to predict obsolescence risk triggers

Primary risk = technical



What Market Research Information Information is Needed?

Line Item #	System Integrator Part #	Item Description	OEM	Item Type	Qty Per System	End of Life Date	End of Service Date	H/W Interface	S/W Interface	Average Failure Rate (per year)	Failure Rate (last 12 months)	Failure Trend	Total Depot Spares	Ready For Issue Spares

Line Item #	Site Spares	OEM Next Generation Product F ³ Compatibility	Alt. F ³ Products Available?	Alt. F ² Products Available?	T&E Time	Procurement/ Production Lead Time	System Availability Impact	Workaround	Notes/Additional Information

COTS Risk Mitigation Guide App. D.2

Standardized product obsolescence information needs to be collected periodically to forecast and monitor potential supportability risks

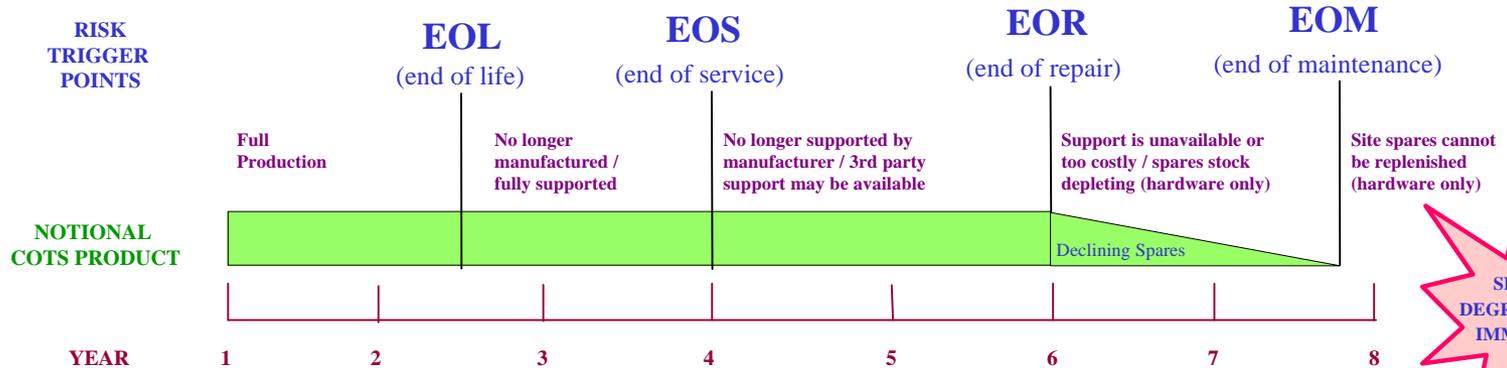


**So, I just keep
doing tech refreshes
to my system right?**



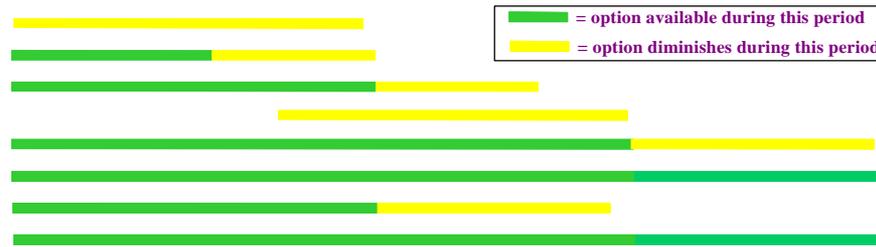
Technology Refresh is Only One of Several Options

COTS Product Obsolescence Progression



Product Obsolescence Support Options

- 1 – No action required
- 2 – Lifetime Buy (any source)
- 3 – Extended Maintenance/Warranty
- 4 – Third party Maintenance
- 5 – Technology Refresh
- 6 – Redesign/Integrated Change
- 7 – Purchase Data Rights
- 8 – Reclamation/Salvage



COTS Risk Mitigation Guide App. B.5

The earlier an obsolescence situation is identified, the greater the number of available support options.



COTS Product Obsolescence

Support Options

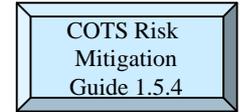
COTS Risk Mitigation Guide App. B.5

Option	Definition
No Action Required	When a product’s reliability and/or the availability of replacement assets (i.e., depot spares, OEM, third party) allows for continued product support regardless of obsolescence phase.
Lifetime Buy (from any source)	The acquisition (e.g., purchase, trade) of sufficient replacement products, components or repair items from any source to meet a projected failure/demand rate or a defined point in time.
Extended Maintenance or Warranty	The purchase of technical and/or repair support from the original equipment manufacturer (OEM) or third party source that extends product support beyond the original timeframe.
Third Party Maintenance	The establishment of a technical and/or repair support capability by a vendor other than the OEM that is qualified to provide that support.
Technology Refreshment (aka Tech Refresh)	“The periodic replacement of COTS products using the same kind of products (e.g., processors, displays, computer O/S, commercially-available software) within the larger system to assure continued supportability of the system through an indefinite service life.” (AMS 11/98). Periodicity is based on when the COTS product is no longer supportable. System performance baseline remains unchanged.
Redesign/Integrated Change	When product obsolescence must be addressed by a system design change (e.g. incompatible products, new technology) or when replacement of obsolete products is integrated with a larger system upgrade or pre-planned product improvement (P ³ I).
Purchase Data Rights	An arrangement made between a product user and an OEM to secure the proprietary data rights (e.g., drawings, software, documentation) for a product to assume organic (internal) or third party support for that product.
Reclamation/Salvage	Also referred to as cannibalization, this is typically a last resort support option whereby pieces of a discarded product are reclaimed and re-assembled to create a functional product.



Risk Mitigation Strategy No. 4

Integrate market research results with field data and new requirements



- **Why?**

- Ensure obsolescence projections are part of program planning
- Establish engineering change priorities and risks
- Identify schedule/technical relationships of all system changes
- Address COTS risk factors 3, 4, 9 and 10



- **When?**

- Mission Analysis (needs analysis, technology trend assessment)
- Investment Analysis (APB, IPP, requirements document, contract requirements)
- Solution Implementation (IPP, system change prioritization, budget)
- In-Service Management (IPP, system change prioritization, budget)



Risk Mitigation Strategy No. 4 (cont'd)

Integrate market research results with field data and new requirements

- **How?**

- Market research results (technology, products, obsolescence)
- Field data (RM&A trends, logistics/support/suitability issues, feedback, innovation/efficiency opportunities)
- New requirements (functionality enhancements, interface changes, budget constraints, political priorities)
- Plot projected changes on timeline and analyze relationships

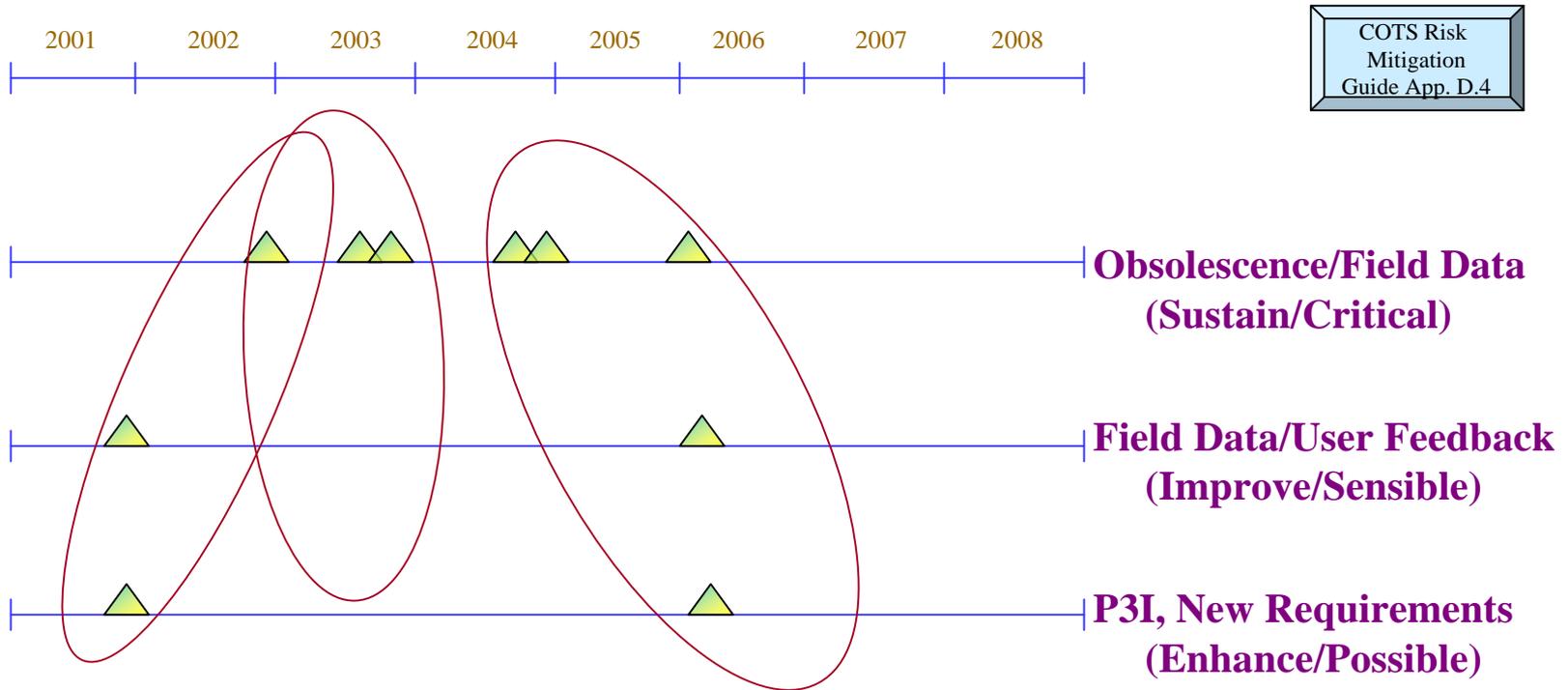
- **If this strategy is ignored?**

- More frequent and sub-optimized design changes

Primary risk = cost



Integrating System Change Information



COTS Risk Mitigation Guide App. D.4

Projected system changes are grouped into like categories and plotted on a time-line to align technical and schedule relationships for integrated change planning



Risk Mitigation Strategy No. 5

Develop and maintain flexible performance requirements suited to the use of COTS products

COTS Risk
Mitigation
Guide 1.5.5

- Why?

- Reconcile COTS (“as is”) characteristic with requirements
- Avoid over-specification (black box)
- Establish requirements priorities
- Include COTS-unique technical factors
- Address COTS risk factors 4, 5 and 9



- When?

- Investment Analysis (iRD, RD, system functional specification, trade studies)
- Solution Implementation (lower level specs, selection criteria, trade studies)
- In-Service Management (engineering changes)



Risk Mitigation Strategy No. 5 (cont'd)

Develop and maintain flexible performance requirements suited to the use of COTS products

- **How?**

- Functional requirements (what versus how, AMS guidance and SEM)
- Separate the “must haves” from the “nice to haves”
- Identify range of acceptable performance values
- Establish and adhere to the maintenance concept
- Include COTS-unique technical factors (open system, scalability, portability, modularity, compatibility, unused code, infosec, etc.- Guide App. E)

- **If this strategy is ignored?**

- Incompatible products, product modification or development

Primary risk = technical



Product Technical Compliance Worksheet*

EXAMPLE

EXAMPLE

Set Product						
Category	Requirement	Required?	Status	Prod 1	Prod 2	
ATM Backbone	ATM standards supported (see comments)	Yes	Active	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
ATM Backbone	ATM Switches-ATM Forum V3.1 or later	Yes	Active	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
ATM Backbone	Sonet Line Drivers OCS-XXX	Yes	Active	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
General	TCP/IP protocol suite	No	Active	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
General	Based on ATM backbone using SONET	Yes	Active	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
General	Classical IP allows direct connections	Yes	Active	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
General	Conventional and Classical models of IP	Yes	Active	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
General	SVC and PVC support	Yes	Active	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
General	VIBRRT and ABR implemented	Yes	Active	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
IP Internetwork	Name Server	No	Active	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
IP Internetwork	Routing	No	Active	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
IP Internetwork	TCP/IP suite (see comments)	No	Active	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
IP Internetwork	File Transfer FTP,TFTP	Yes	Active	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
IP Internetwork	Network Management SNMPv2	Yes	Active	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Time Synchroniz	NTP (Interim),ATM/SONET Based (future)	No	Active	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		S		Total Number of Requirements Met:		14 11
Total Mandatory:		C		%age of Total Requirements Met:		93.3% 73.3%
10		O		Number of Mandatory Requirements Met:		9 10
Total Optional:		R		%age of Mandatory Requirements Met:		90.0% 100.0%
5		E		Number of Optional Requirements Met:		5 1
		S		%age of Optional Requirements Met:		100.0% 20.0%

* Courtesy of Lockheed Martin Federal Systems



Risk Mitigation Strategy No. 6

Institute and maintain ongoing COTS product testing capability

COTS Risk
Mitigation
Guide 1.5.6

- **Why?**

- Supports market research activity (investigation)
- Test COTS product compliance, conformance & compatibility
- Drive out “unknown unknowns”
- Support prototyping, beta testing, demonstrations, 2nd level eng.
- Address COTS risk factors 1-5, 7, 8 and 10

- **When?**

- Mission Analysis (early operational concept demonstrations)
- Investment Analysis (beta testing, prototyping, demonstrations)
- Solution Implementation (development testing, acceptance testing)
- In-Service Management (product compatibility, engineering changes)





Risk Mitigation Strategy No. 6 (cont'd)

Institute and maintain ongoing COTS product testing capability

- **How?**

- Dedicated developmental/re-configurable test bed(s)
- Different levels of testing (e.g., disk drive vs. router, initial vs. regression)
- Organic, contractor support or combination
- Strong configuration management emphasis

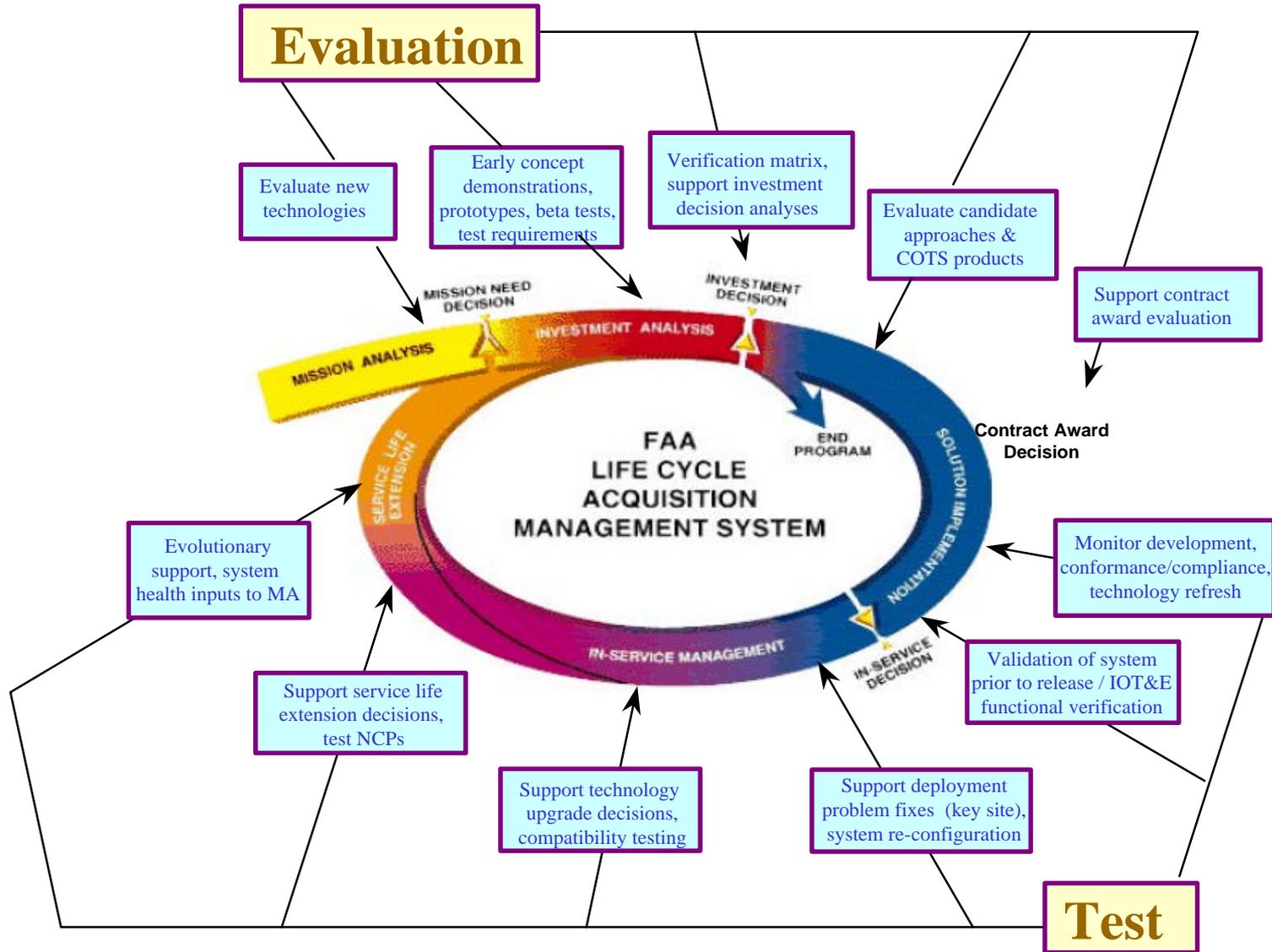
- **If this strategy is ignored?**

- Inability to characterize COTS product performance, avoid obsolescence impacts & manage multiple system configurations

Primary risk = technical



COTS T&E in the System Life Cycle





Risk Mitigation Strategy No. 7

Develop and maintain non-technical COTS selection factors

COTS Risk
Mitigation
Guide 1.5.7

- **Why?**

- To assess along with functional performance requirements
- Avoid dead-end technologies / trailing edge product maturity
- Discriminate/optimize among similar products
- Support smart consumerism
- Address COTS risk factors 1 and 3-10

- **When?**

- Investment Analysis (contract requirements)
- Solution Implementation (product selection)
- In-Service Management (engineering changes)





Non-Technical COTS Selection Factors

- Product maturity
- Manufacturer stability
- Manufacturer flexibility
- Upward/downward compatibility
- Market share
- Reputation
- Business projections
- Quality practices
- Sole source
- Total cost of ownership
- Warranty
- Licensing

Functionally equivalent COTS products need to be discriminated using non-technical selection factors



Risk Mitigation Strategy No. 7 (cont'd)

Develop and maintain non-technical COTS selection factors

- **How?**

- Identify & weight critical product factors from App. F (e.g., product maturity, manufacturer stability/flexibility, compatibility history, market share, reputation, business projections, quality practices, sole source status, total cost of ownership, product modification, warranty)
- Formalize and use for initial integrator product selection and life cycle product replacement

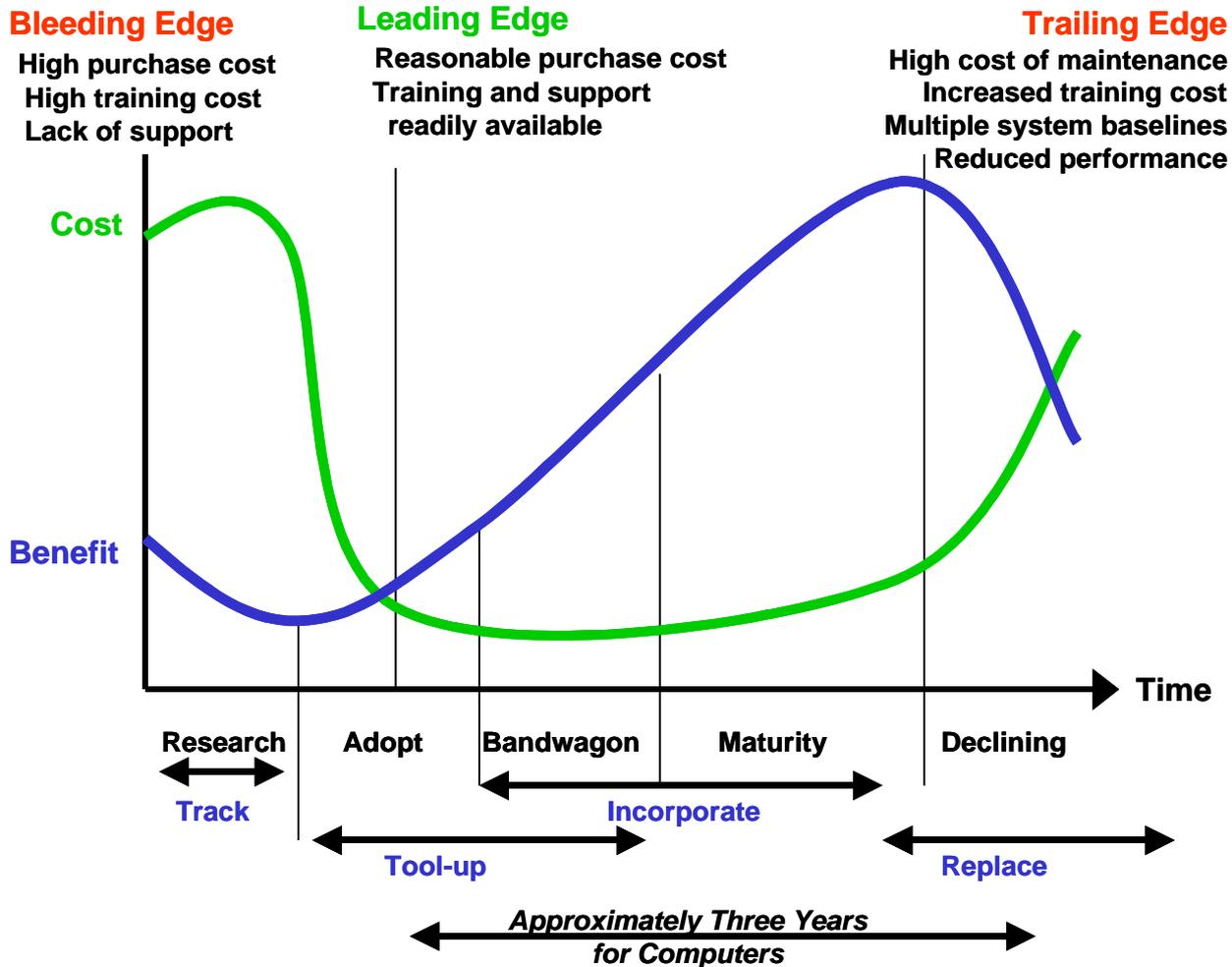
- **If this strategy is ignored?**

- System COTS products with undesirable/unknown characteristics

Primary risk = technical



Technical Maturity Factor



COTS non-technical selection factors can be just as important as performance requirements



Sample COTS Non-Technical Criteria Format

Expert Choice: C:\ECWIN\\$\$\$

File Edit Assessment Synthesis Sensitivity-Graphs Utilities Help

To Find the Best COTS Alternative

Local=1.0 Global=1.0
Level=0 Node=0

To Find the Best COTS Alternative

GOAL (1.000)

Complec (0.263)	Cnfig_Mn (0.047)	Instaltn (0.025)	LCC (0.255)	Flexibty (0.020)	Ext_Fact (0.022)	Doc/Data (0.085)	RMA (0.183)	Training (0.099)
Technical	CM_Proc	Inst/Mnt	Design	Migratn	Prev_Bus	Document	Availbty	ReqdTrng
Available	Chg Ctrl	PostInst	Infstrc	Plan	Supp_Rel	Data Rts	Reliabty	VendAvbl
Support	Rev Ctrl		Estimate	Criteria	Technical	Notify	Mainfbty	VendTrng
MOD_COTS	Chg Notf		Credible	Procedur	SuppHelp	Upgrades		VendSppt
Ruggdztm	S/W CM		O&S	EOL	Users			Effectiv
Quality			Maturity		Colabrtm			
Safety			Op Sys		Cust_Inf			
			DataRite					

GET Engi Visicom SabTech



Risk Mitigation Strategy No. 8

Use COTS-sensitive analytical and budget processes

- Why?

- Incorporate COTS risk mitigation activities
- Reflect continuous system evolution
- Project/prioritize obsolescence-induced supportability issues
- Accommodate unanticipated “pop-ups”
- Address COTS risk factors 1-10

COTS Risk Mitigation Guide 1.5.8



- When?

- Mission Analysis (needs analysis, risk analysis, initial estimates)
- Investment Analysis (requirements, trade studies, early concept demonstrations, surveys, cost estimation, life cycle cost (LCC), source selection)
- Solution Implementation (LCC, design analysis, test results, trade studies)
- In-Service Management (obsolescence analysis, engineering changes)



Risk Mitigation Strategy No. 8 (cont'd)

Use COTS-sensitive analytical and budget processes

- How?

- COTS-sensitive cost models in their infancy (Price, COCOTS, CAST™)
- Forces “roll your own” adaptation of processes/tools to reflect unique COTS characteristics (e.g., obsolescence and tech refresh cycles, mitigation activities, selection criteria, risk analysis, contract requirements, system configurations, system architecture breakdown, economic service life estimates)
- Stay alert for tools and processes that can be standardized

- If this strategy is ignored?

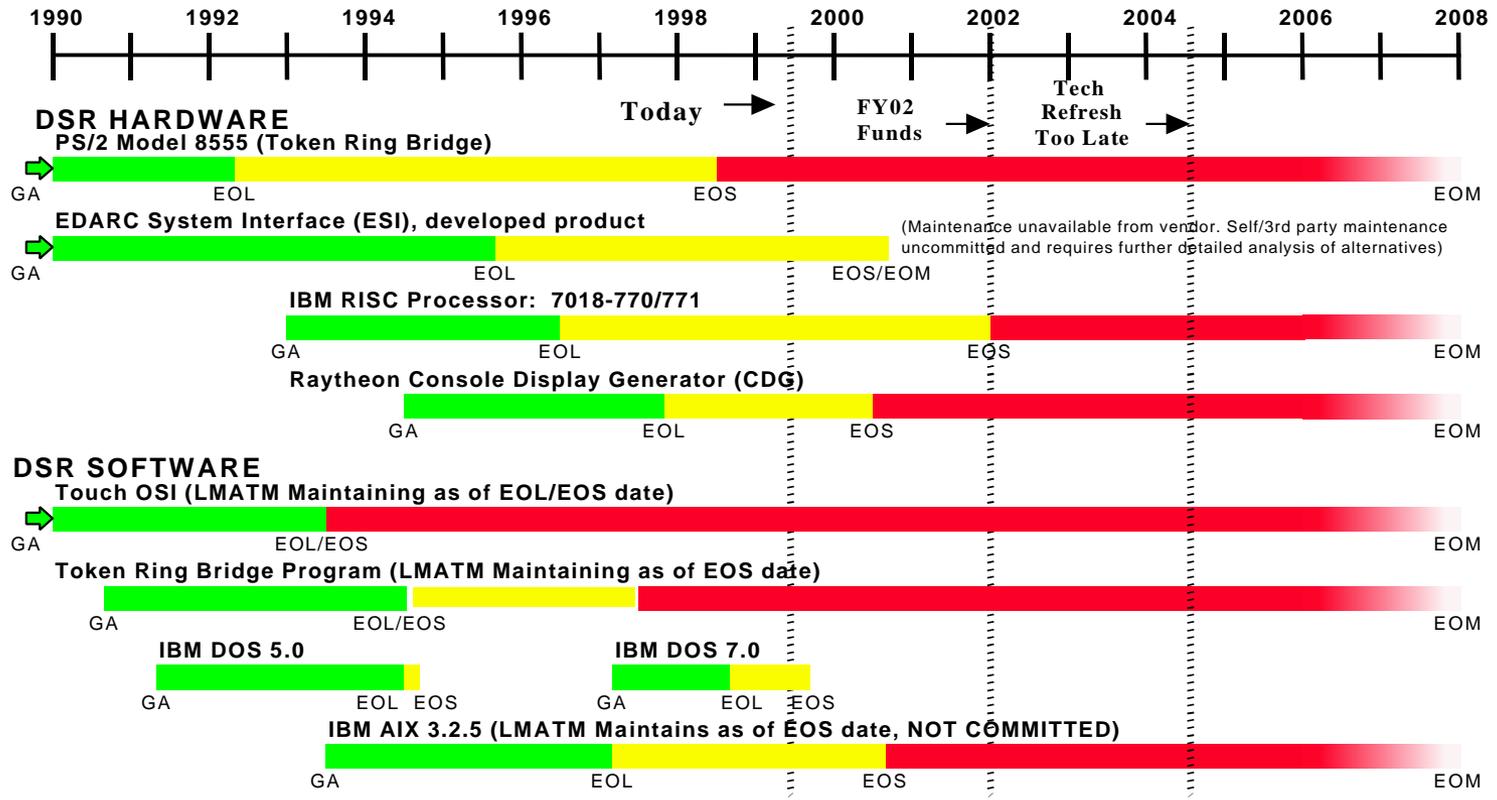
- Inability to make informed program decisions

Primary risk = cost



Technology Evolution Planning Horizon

Key Product Supportability Analysis



End of Life (EOL) - product is no longer being manufactured
 End of Support (EOS) - product manufacturer no longer provides product service or spares support
 End of Maintenance (EOM) -product is not maintainable (technically or cost effectively) by third party

SAMPLE

SAMPLE

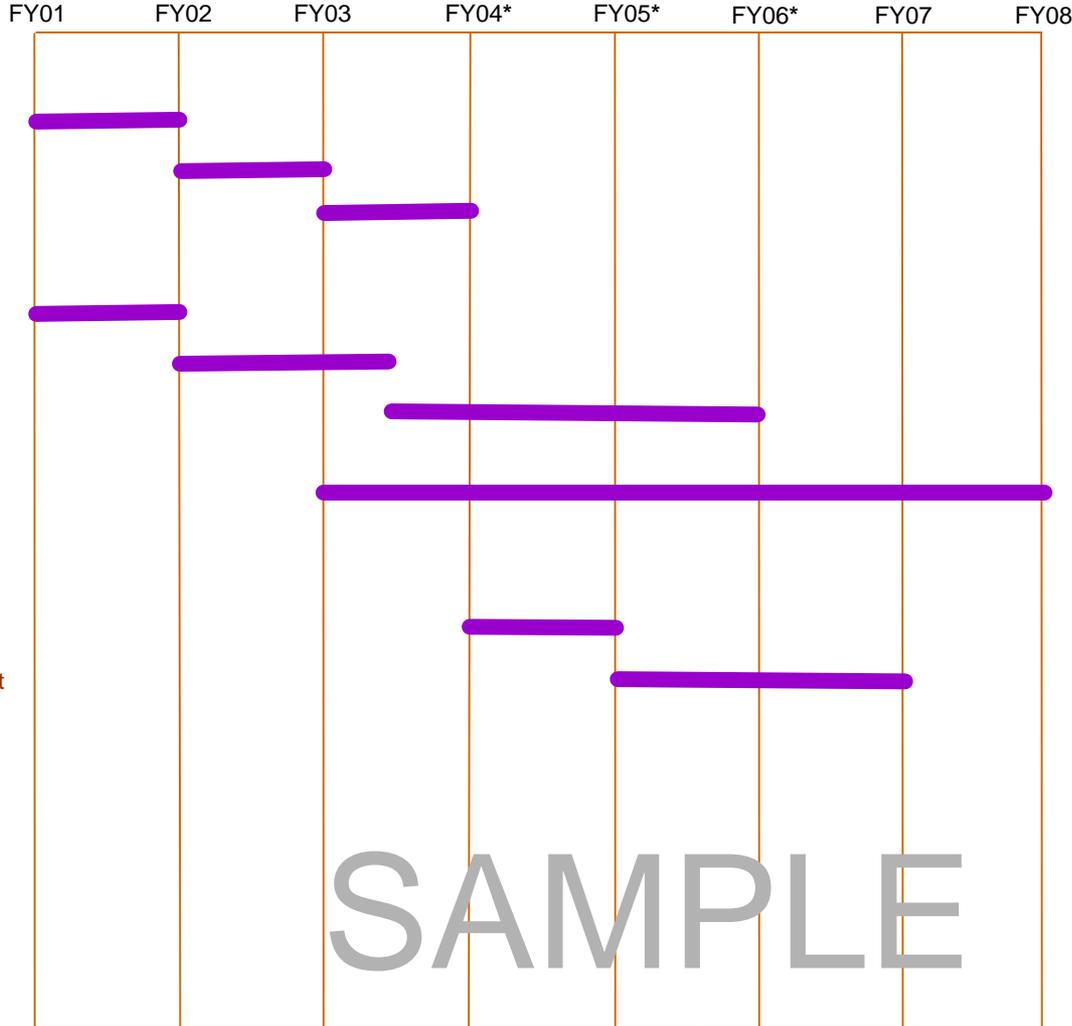
Continued deferral of critical technology refresh/sustainment activities will “bow wave” funding requirements too late to avoid operational impacts.



Sample Risk Mitigation Planning

Activity

Rationale



ESI LRUs are end of life (no longer manufactured) by Raytheon and contain many obsolete components. Raytheon maintenance year to year until parts no longer available. Interfacing RCM card (EDARC) also high risk EOL LRU.

R-side mod replaces obsolete operating system (OS). Replaces CDG which is EOL with limited spare assets.

Replaces obsolete data storage devices with the addition of HOCSR Phase 3/4 storage and support assets (common functional domain)

D-side mod replaces obsolete RISC6000 processors and 15" monitors. Completes OS replacement.

Requirements have not yet been defined.

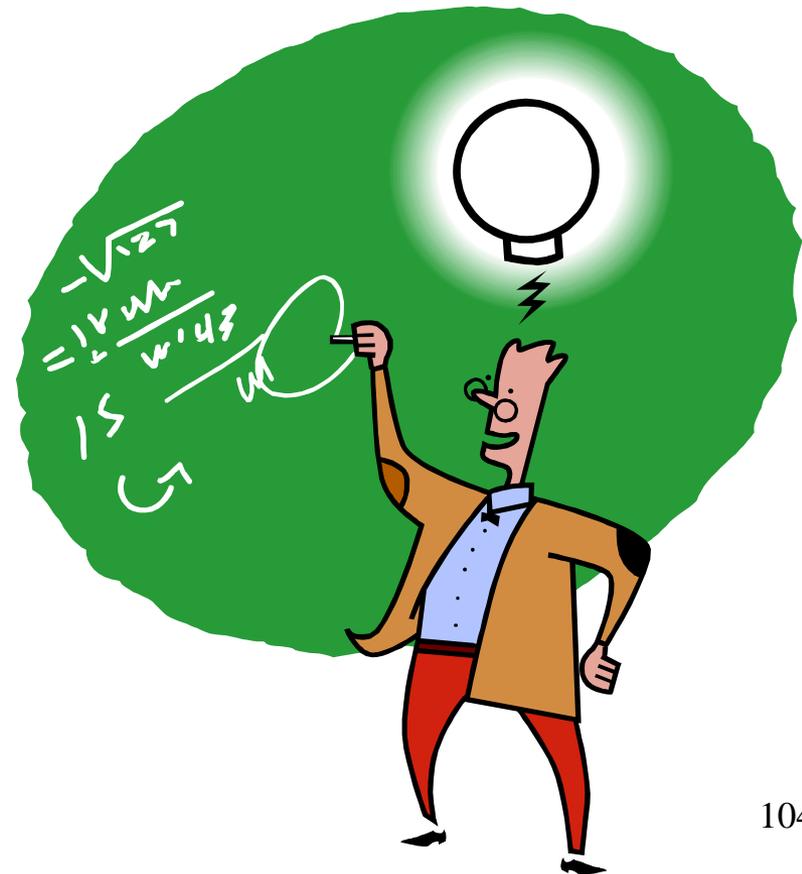
Assets available for short term choke point needs. Funding required beginning (FY02) for follow on choke point support

SAMPLE

* Indicates recent FY03 budget reduction allocations for FY04 through FY06



How should our budget process adapt?

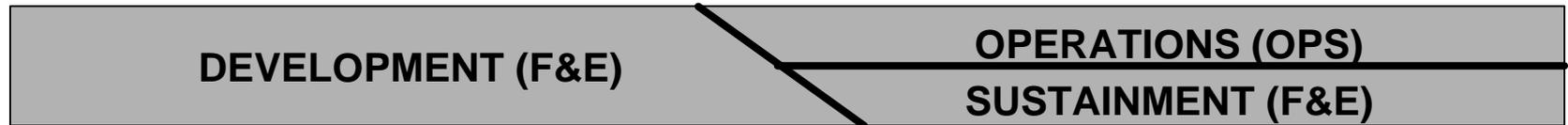




COTS Systems Evolve Indefinitely!



Current Budget Model



COTS-Oriented Sustainment Model

- Alternate Parts Matrix
- Life Cycle Cost Analyses
- Compatibility Testing
- NCP Test, Integration, Validation
- Technical Support
- Training updates/conducts
- Market Research/Tech Forecast
- Product Evaluation/Prototyping
- Test Bed Facilities/Support
- Integrated Change Development
- Configuration Management
- Obsolescence analysis

The *continuous* changes within COTS-based systems demand a corresponding stream of developmental F&E funding coordinated with operations funding



What is the Proverbial “Bottom Line”?

The acquiring activity must be able to provide accurate and detailed technical information to budget personnel and decision-makers to answer the following question:

“What happens if we don’t fund this requirement?”

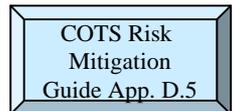
COTS Risk
Mitigation
Guide App. D.5

This question must be answered in clear terms of *operational* consequences



Operational Consequences

- **Loss of ground to air communications**
- **Loss of ground to ground communications**
- **Loss of back-up capability**
- **Operational availability (A_o) degraded**
- **Flight safety**
- **Loss of radar or sector coverage**
- **Security**
- **Passenger/airline impacts (e.g. delays, \$\$, efficiency)**
- **Lack of certification**



Budget justifications for system sustainment must be supported by the best possible data, good analysis and the consequences/risks of non-funding



Common Sense

“If given a choice, you don’t have a choice: you have to go with sustainment. Like at home, if the roof is leaking, the plumbing needs overhauling, and the house needs to be rewired, you don’t want to hear talk about how nice it would be to have a new deck overlooking the woods in the back.”

- Gerald Lavey AOA Highlights 6 Jan 00



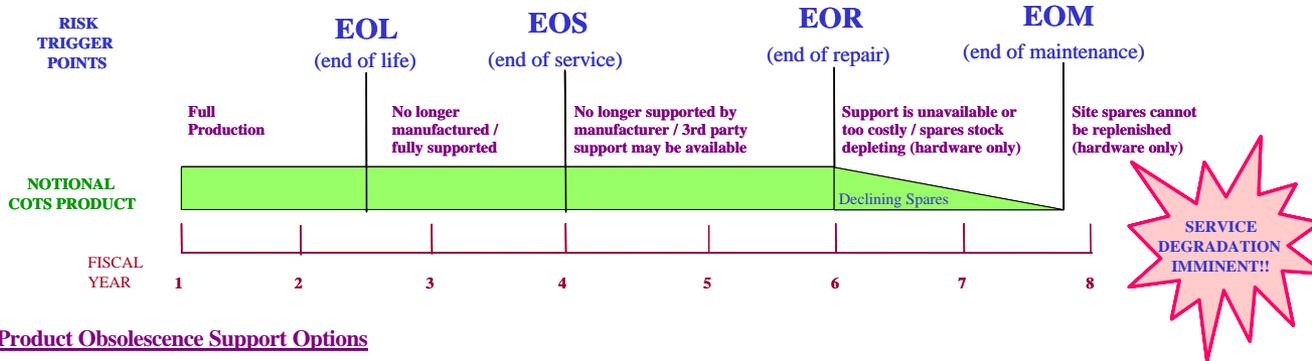
**How do we make
sure the funding is
scheduled correctly?**



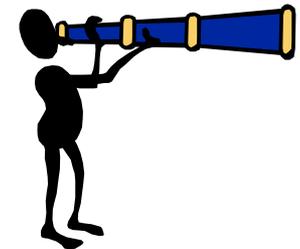


Technology Evolution Planning Lead-time

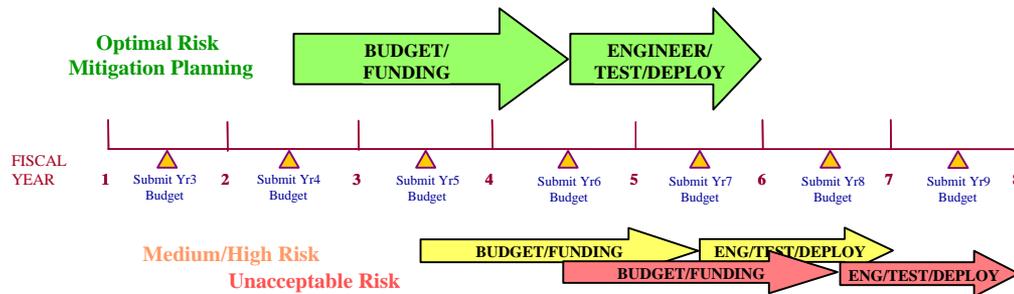
COTS Product Obsolescence Progression



Product Obsolescence Support Options



Technology Evolution Planning Lead-time



Timely mitigation of product obsolescence issues must include engineering and budget lead-times



Risk Mitigation Strategy No. 9

Integrate COTS-based technology evolution planning within the Integrated Program Plan (IPP)

COTS Risk
Mitigation
Guide 1.5.9

- Why?

- Ensure obsolescence is not treated as a separate issue
- Prioritize sustainment needs against other program needs
- Serve as life cycle repository of program decisions and rationale

- When?

- Investment Analysis (IPP, APB, contract requirements, budget)
- Solution Implementation (IPP updates, budget, program metrics)
- In-Service Management (IPP updates, engineering changes)





Risk Mitigation Strategy No. 9 (cont'd)

Integrate COTS-based technology evolution planning within the Integrated Program Plan (IPP)

- How?

- Document COTS-specific information (risk management strategy, obsolescence planning/refresh cycles, mitigation activities, engineering change decisions and rationale, supporting budget baseline etc.)
- IPP template allows flexibility for incorporation of this information (AMS FAST Toolset under Guidance)
- Emphasize IPP use and maintenance over system life cycle

- If this strategy is ignored?

- Loss of integrated, proactive planning and program continuity

Primary risk = cost



Integrated Program Plan (IPP) Inputs

1 BACKGROUND (Revised 07/2001)

1.1 Mission Need

1.2 Status (Revised 07/2001)

2 OVERVIEW (Revised 07/2001)

2.1 Program Scope (Revised 07/2001)

2.2 Products

3 INTEGRATED PROGRAM FUNDING (Revised 07/2001)

4 INTEGRATED PROGRAM SCHEDULE (Revised 07/2001)

5 PERFORMANCE (Revised 07/2001)

5.1 Core Work Activities

5.2 Program Management Work Activities (Revised 07/2001)

5.3 Procurement Work Activities (Revised 07/2001)

6 BENEFITS (Revised 07/2001)

7 PHYSICAL INTEGRATION (Revised 07/2001)

8 FUNCTIONAL INTEGRATION (Revised 07/2001)

9 HUMAN INTEGRATION (Revised 04/1999)

10 SECURITY (Revised 07/2001)

11 IN-SERVICE SUPPORT

12 TEST AND EVALUATION (Revised 07/2001)

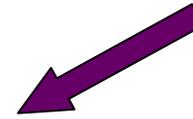
13 IMPLEMENTATION AND TRANSITION (Revised 07/2001)

14 QUALITY ASSURANCE (Revised 07/2001)

15 CONFIGURATION MANAGEMENT

16 IN-SERVICE MANAGEMENT (Revised 07/2001)

sustainment funding,
risk mitigation activities



technology refresh cycles



risk management



compatibility testing



system evolution



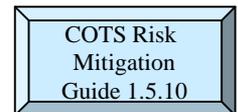
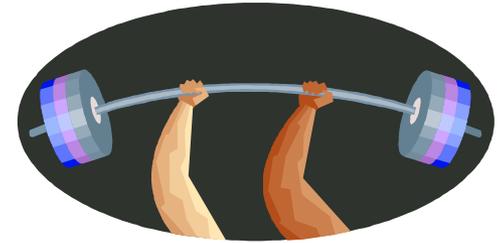


Risk Mitigation Strategy No. 10

Emphasize strong and COTS-relevant configuration management practices

- Why?

- More frequent engineering change activity
- More possible configurations
- Lack of detailed design information
- Different product numbering conventions
- Ensure no untested COTS products enter the NAS
- Address COTS risk factors 1, 2, 4 and 5



- When?

- Investment Analysis (requirements document, APB, IPP, contract)
- Solution Implementation (specs, contract, test baselines, product baselines)
- In-Service Management (engineering changes)



Risk Mitigation Strategy No. 10 (cont'd)

Emphasize strong and COTS-relevant configuration management practices

- **How?**

- CM practices remain the same (CM planning, configuration item selection, change management, auditing, status accounting)
- CM system at the lowest replaceable unit level
- Document system at source control level
- Ensure tightest possible link with testing activities
- Establish serial number control

- **If this strategy is ignored?**

- Introduction of “unknown unknowns” into the NAS

Primary risk = technical



Risk Mitigation Strategy No. 11

Use a COTS-experienced systems integration agent

COTS Risk
Mitigation
Guide 1.5.11

- Why?

- COTS integration can be complex (legacy interfaces, multiple vendors & manufacturers, “as is” COTS products, understanding technologies)
- Commercial standards ~~≠~~ “plug and play”
- Improve chance of program success
- Address COTS risk factors 1-10



- When?

- Investment Analysis (source selection)
- Solution Implementation (development, integration, test, deployment)
- In-Service Management (2nd level engineering, support, engineering changes)



Risk Mitigation Strategy No. 11 (cont'd)

Use a COTS-experienced systems integration agent

- **How?**

- Develop source selection screening questionnaire on integrator COTS management practices (see example)
- Incorporate COTS-specific contract requirements and deliverables (see example)

- **If this strategy is ignored?**

- Longer learning curves, ineffective integration, program delays, cost overruns and poor system support

Primary risk = schedule



Assessing a System Integrator's COTS Management Experience

- Overall experience / success for delivering COTS-based systems
- Complexity of the systems delivered
- Market research capability
- Bias towards particular COTS product lines
- Effective manufacturer relationships / vendor network
- Management and staff experience
- Life cycle cost and support orientation
- Preference for modifying COTS
- Process for selecting COTS products
- Obsolescence management / technology refresh processes



COTS-Specific Contract Requirements and Deliverables

- No COTS modifications without trade off and formal approval
- Incorporation of the COTS non-technical selection factors into the design analysis process
- Incorporation of COTS technical factors into the specification
- Best commercial practices (BCP) deliverables/products
- Continuous market research
- Dedicated COTS product test capability
- Integrate COTS risk mitigation strategies with programmatic risk management
- Periodic COTS product obsolescence projections and working groups
- Technology evolution planning data / supportability analyses
- Use of COTS-adapted life cycle modeling and trade off tools
- Incentives to optimize design decisions based on total ownership costs
- Provisions for contractor provided technical, maintenance and logistics support



Risk Mitigation Strategy No. 12

Leverage the commercial infrastructure wherever feasible

COTS Risk
Mitigation
Guide 1.5.12

- **Why?**

- COTS product support infrastructure already established to support the commercial consumer base
- Avoid unnecessary and costly duplication of services
- Address COTS risk factors 4 and 9

- **When?**

- Investment Analysis (contract development)
- Solution Implementation (deliverables, support planning)
- In-Service Management (technical support, logistics support)





Risk Mitigation Strategy No. 12 (cont'd)

Leverage the commercial infrastructure wherever feasible

- **How?**

- OEM technical, repair and spares support
- Warranty - Leasing - Overnight shipping - Internet
- Quantity discounts - Third party support - After market
- Negotiated licensing - Commercial documentation/training
- Assess inherently governmental responsibility (A-76) conflicts

- **If this strategy is ignored?**

- Additional program and life cycle costs

Primary risk = cost



Risk Mitigation Strategy No. 13

Avoid the modification of COTS products when possible

COTS Risk
Mitigation
Guide 1.5.13

- Why?

- Cost-effective COTS product support is based on “as is” configuration (warranty, repairs, parts, training, documentation)
- Avoid more expensive unique product life cycle support costs
- Address COTS risk factors 3 and 7

- When?

- Investment Analysis (source selection, contract requirements)
- Solution Implementation (product selection, requirements flexibility, trades)
- In-Service Management (engineering changes)





Risk Mitigation Strategy No. 13 (cont'd)

Avoid modification of COTS when possible

- **How?**

- Do not change physical design, documentation, software, parts
- Examine the “must have” priority of the requirement
- Make COTS modification a contractual exception
- Understand life cycle cost implications of product ownership
- Ruggedization of COTS product within external casing
- OEM incorporates change into commercial version

- **If this strategy is ignored?**

- Increased program life cycle costs and supportability issues

Primary risk = cost



COTS Risk Mitigation/Technology Evolution Planning Flow

INTEGRATED PROGRAM PLANNING
 select acquisition/system evolution strategy;
 integrate/prioritize technology evolution
 planning inputs; **document** decisions;
 develop/refine annual budget submits

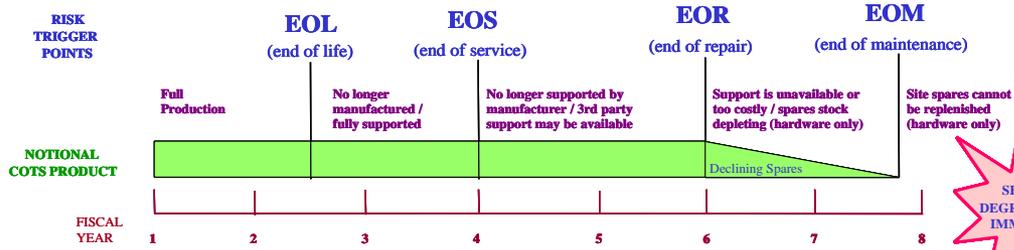
INTEGRATED PROGRAM PLAN (IPP) EXECUTION
 implement system engineering &
 programmatic risk management
 throughout system life cycle



COTS RISK MITIGATION
 tailor to COTS acquisition strategy



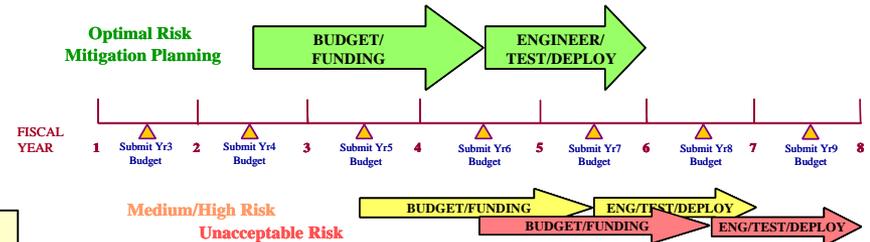
COTS Product Obsolescence Progression



Product Obsolescence Support Options



Technology Evolution Planning Lead-time



MARKET INVESTIGATION
 collect product obsolescence
 status information

DATA ANALYSIS
 determine system supportability
 impacts; **identify** viable
 obsolescence support options

SOLUTION LEAD-TIME
 establish lead-time for support
 options; **estimate** costs; **assess**
 funding timing criticality;
develop technical rationale

TECHNOLOGY EVOLUTION PLANNING INPUTS
 choose obsolescence support
 options; **develop/refine**
 sustainment requirements

COTS Risk Mitigation Guide App. B.6



Module 4 Review

1. Implementing strategies within AMS; “what, why, when, how” structure

COTS Risk Mitigation Strategies and the AMS

1. Develop and maintain non-technical COTS selection factors
2. Use COTS to narrow analytical and budget processes
3. Involve COTS knowledgeable individuals in all analytical processes
4. Involve users early and throughout the program life cycle to identify and resolve COTS-related concerns
5. Perform continuous COTS product market research
6. Integrate market research results with field data and user requirements
7. Develop and maintain baseline performance requirements suited to the use of COTS products
8. Institute and maintain ongoing COTS product testing capability

Inter-related COTS risk mitigation strategies are integrated into early program planning and applied throughout a system's life cycle.

Risk Mitigation Strategy Structure

What?
Risk mitigation title describes the activity

Why?
How this benefits the practitioner and management
What COTS risk factors are addressed

When?
Applicable AMS phase(s)

How?
Tools, examples, templates, procedures, etc.

If this strategy is ignored?
Consequences

Primary risk impact if strategy is ignored

2. Developing a strategy; work breakdown structure

Developing An Effective Strategy

A flexible balance among base currency and change timing factors

Market Research Activities During Solution Implementation Would Fall Under 3.2.2

WBS Element 3.2 System Engineering

- Integrate market investigation
- Integrate obsolescence analysis reports
- Integrate product compatibility testing
- Support contractor analysis

WBS templates are available in the AMS FAST toolset, WBS activities mapped out in COTS Guide App. C



Module 4 Review (cont'd)

3. Obsolescence progression;
alternate support options

Understanding the Obsolescence Progression

Obsolete - "No longer useful." (Webster)
Obsolescence - "The process of becoming obsolete." (Webster)

Obsolescence is a diminishing level of performance. Each trigger point begs the question "How do we support this?"

Technology Evolution Planning Lead-time

Timely mitigation of product obsolescence issues must include engineering and budget lead-times

4. Market research information;
integration with field data and
new requirements

What Market Research Information Information is Needed?

Line Item #	System/Engineer Part #	Date Description	OCM	Item Type	Qty Per System	End of Life Date	End of Service Date	EOS Reference	SW Reference	Average Failure Rate (per 1000 hours)	Failure Mode Description	Failure Effect	End User Impact	Repair Time/Parts

Line Item #	Item System	OCM/Item Classification	OCM/Item Compatibility	OCM/Item Product Availability	OCM/Item Product Availability	EOS	End of Service Date	End of Support Date	End of Life Date

Standardized product obsolescence information periodically to forecast and monitor product obsolescence

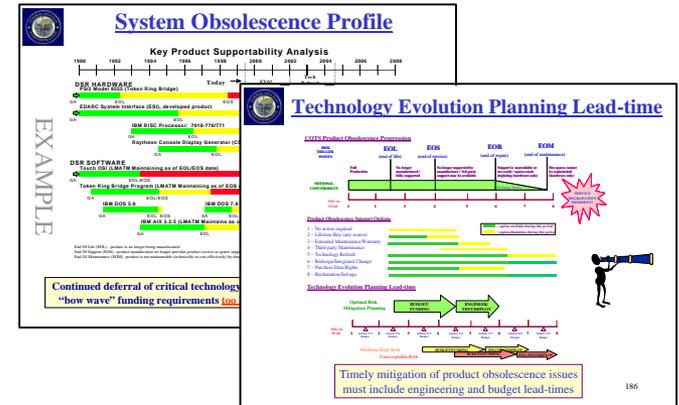
Integrating System Change Information

Projected system changes are grouped into like categories and plotted on a time-line to align technical and schedule relationships for integrated change planning

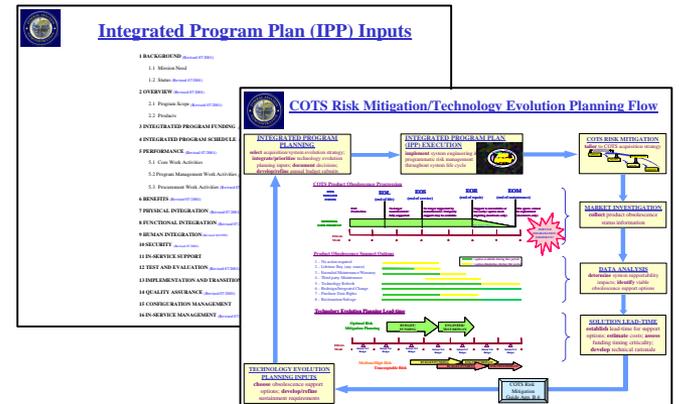


Module 4 Review (cont'd)

5. System obsolescence profile; technology evolution planning lead-time



6. Integrated Program Plan (IPP) inputs; technology evolution planning process flow





Can a Legacy System with COTS Still Benefit from COTS Risk Mitigation?

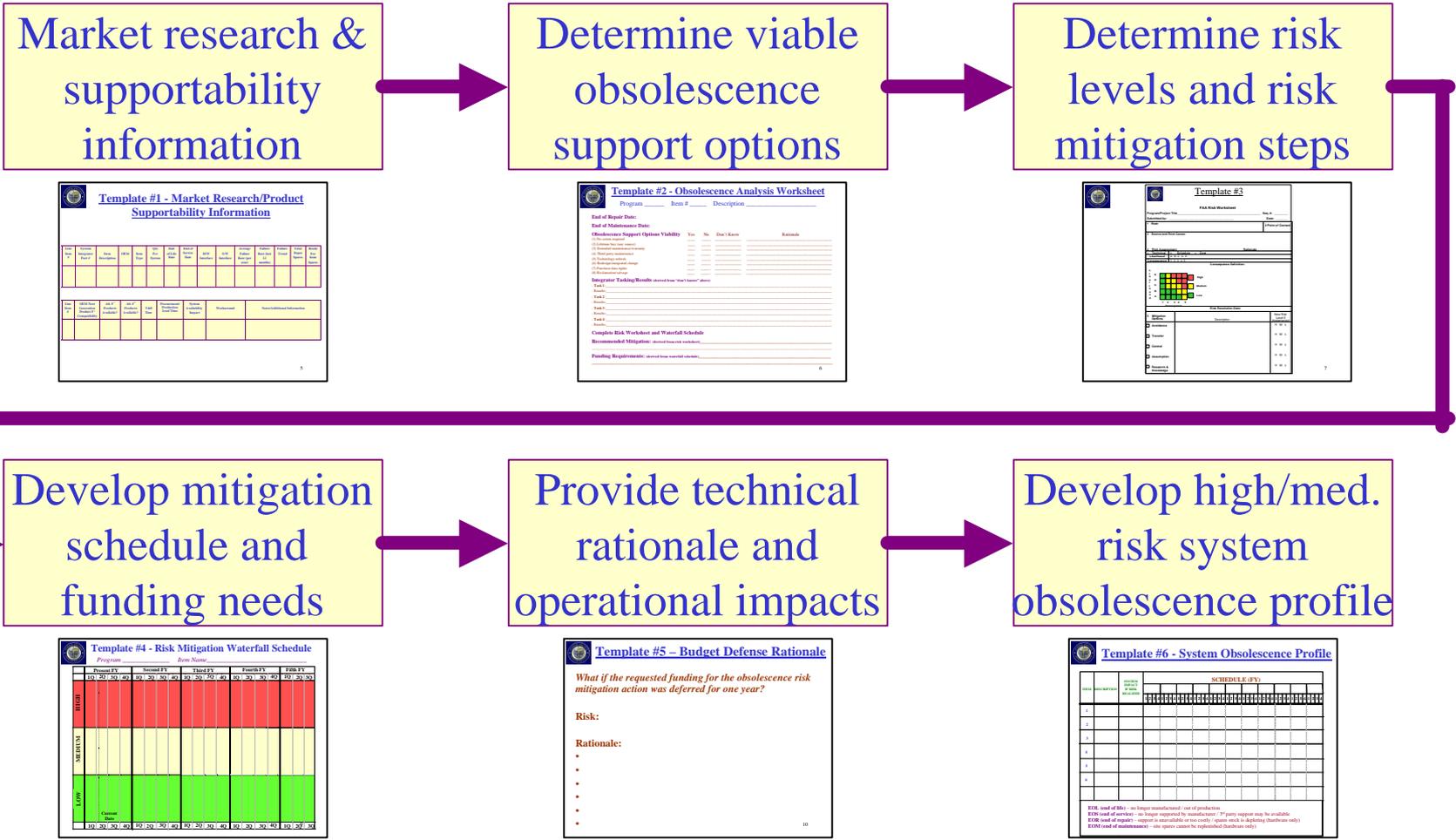
	No	Yes	Some
1. Involve COTS-knowledgeable individuals in all analytical processes.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Involve users early and throughout the program life cycle to identify and resolve COTS-related issues.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Perform continuous COTS product market research (i.e., technology trends, product applicability and obsolescence status).....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Integrate market research results with field data and new requirements.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Develop and maintain flexible performance requirements suited to the use of COTS products.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Institute and maintain ongoing COTS product testing capability.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Develop and maintain non-technical COTS selection factors.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Use COTS-sensitive analytical and budget processes.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Integrate COTS-based technology evolution planning with overall Integrated Program Plan (IPP).....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. Emphasize strong and COTS-relevant configuration management practices.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. Use a COTS-experienced systems integration agent.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12. Leverage the commercial infrastructure wherever feasible.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13. Avoid the modification of COTS products when possible.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



**Module 5. COTS Obsolescence Risk
Analysis Exercise**
(controlling the unknown risks)



COTS Obsolescence Risk Analysis Flow



Use of standard obsolescence analysis templates can help to mitigate COTS obsolescence risks



Obsolescence Risk Analysis Exercise

Objectives

COTS Risk
Mitigation
Guide App. D.1

1. Learning what market research information is needed and defining the information elements
2. Projecting end of repair (EOR) and end of maintenance (EOM) dates for COTS products
3. Analyzing and selecting viable risk mitigation/product obsolescence support options and determining their impact to the system
4. Assigning product obsolescence risk levels and recommending mitigation actions using programmatic risk management templates
5. Developing and communicating credible budget defense rationale
6. Integrating COTS product information into a system obsolescence risk profile

Know what information to ask for, how to understand it, how to mitigate the risks and communicate to management



Remember...

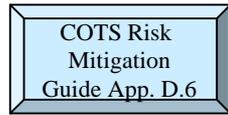


risk is in the eye of the beholder



Obsolescence Risk Analysis Exercise

AIS Program Situation Summary



You are supporting the Automated Information System (AIS) project. It is a hybrid system comprised of both custom and COTS products. It has been fielded at 20 sites for about three years and *does not have any COTS risk mitigation* strategies in place.

The contractor has recently indicated that one of its COTS product suppliers just went out of business. Concerned about the other COTS products, your system engineering group has *tasked the contractor* to deliver a *market research report* for all the COTS products in the AIS and you have just received it.

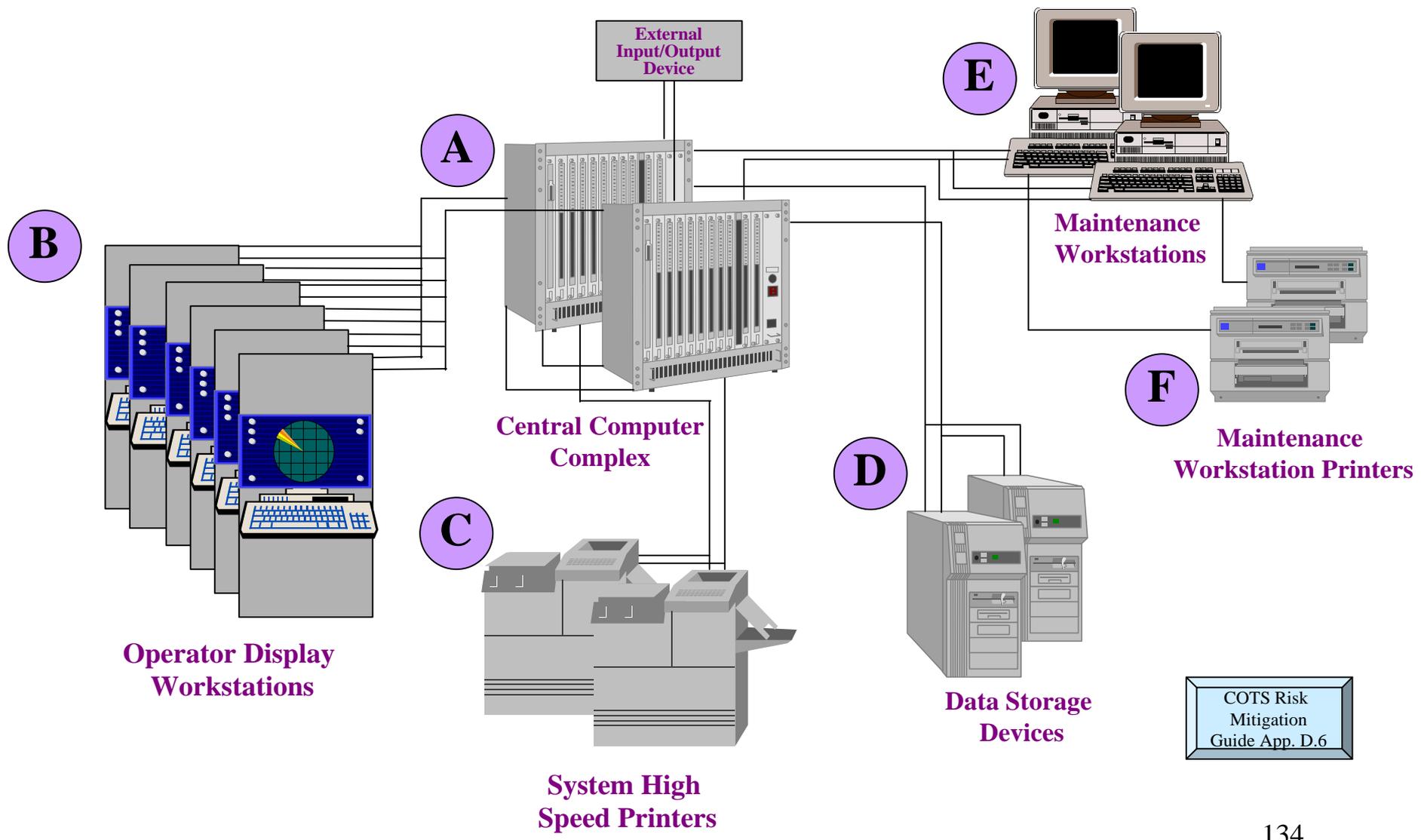
The contractor has summarized the *top 6 COTS product risks* that appear to need attention due to near term end of service dates they have obtained from the product manufacturers and suppliers.

The program's budget does not have any provisions for technology refresh or obsolescence-induced supportability problems. It indicates that an external system interface change requires an *upgrade of the Central Computer Complex* hardware and operating system software. It is scheduled for initial key site deployment *four years from now* with one year planned for development, test and integration.



AUTOMATED INFORMATION SYSTEM

Architecture Diagram (notional)



COTS Risk Mitigation Guide App. D.6



Market Research Information Element Definitions

Information Block Title	Description
Line Item #	Item identification sequence number assigned by the report originator
Integrator Part #	System integration agent's unique part number assignment
Item Description	Commonly used nomenclature for the item
OEM	Original equipment manufacturer that produced the item
Item Type	Type of product I.e., COTS, modified COTS or custom made
Quantity Per System	Total quantity of items contained in each system
End of Life Date	When the manufacturer no longer produces this item
End of Service Date	When the manufacturer no longer provides repair, replacement or technical support
H/W Interface	Identifies the hardware components that interface with this item
S/W Interface	Identifies the software components that interface with this item
Average Failure Rate (Per Year)	The average number of actual failures per year of this item. If the system is newly fielded, mean time between failure projections may be used until actual failure data is collected
Failure Rate (Last 12 months)	The actual number of failures that have occurred over the past 12 months



Market Research Information Element Definitions

(cont'd)

Failure Trend	Identifies whether or not a failure trend exists (upward, downward or none) by measuring failure data against an agreed upon threshold and includes module repairability success %
Total Depot Spares	The total number of spare assets for this item including those in the repair pipeline but not including site spares
Ready For Issue Spares	The number of immediately usable spares that are available for replenishment of site spares
Site Spares	The number of total spares available at all operational sites
OEM Next Generation Product F ³ Compatibility	Whether or not the next generation product by the OEM is form, fit and function (F ³) compatible with the currently used product
Alternate F ³ Products Available?	Whether or not there are other products on the market from different manufacturers that are form, fit and function (F ³) compatible
Alternate F ² Products Available?	Whether or not there are other products from the OEM or from other manufacturers that come close to meeting full form, fit and function (F ³) requirements
T&E Time	The amount of time the integrator estimates it will take to acquire the product (or develop a change kit) and the time to test and evaluate the product (or fix) in a system context
Procurement/Production Lead Time	The length of time it will take to acquire and initially deploy production quantities of the change kit
System Availability Impact	Describes the operational consequence(s) of continued failures of this item
Workaround	Identifies temporary methods of addressing continued failures of this item
Notes/Additional Information	Additional related information



AIS Operator Display Monitor (ODM)

Market Research Information

COTS Risk Mitigation Guide App. D.6.1

Line Item #	System Integrator Part #	Item Description	OEM	Item Type	Qty Per System	End of Life Date	End of Service Date	H/W Interface	S/W Interface	Average Failure Rate (per year)	Failure Rate (last 12 months)	Failure Trend	Total Depot Spares	Ready For Issue Spares
6	1000-6	Operator Display Monitor (ODM)	Suny Inc.	COTS	6	24 months ago	6 months from present	B	B	6	10	up	20	20

Line Item #	Site Spares	OEM Next Generation Product F ³ Compatibility	Alt. F ³ Products Available?	Alt. F ² Products Available?	T&E Time	Procurement/ Production Lead Time	System Availability Impact	Workaround	Notes/Additional Information
6	40	not F ³ compatible	none	yes	4 months	12 months	loss of workstation	re-assignment of operator sectors to remaining display workstations (one workstation max.)	current monitor is a sealed unit and not repairable; new OEM monitor is 21" vice current 20"; sole source manufacturer



FAA Risk Worksheet

Program/Project Title AIS Seq. #: _____
 Submitted by: _____ Date: _____

1 Risk: Operator Display Monitor (ODM) will be non-supportable in 6 months. **2 Point of Contact**

3 Source and Root Cause: ODM manufacturer (Suny Inc.) has declared end of service date of 6 months from present. Their next generation monitor is 21”and does not meet the specified requirements nor will it fit in the cabinet without a major redesign.

4	Risk Assessment	Rationale
<input checked="" type="radio"/>	Technical	Lack of product support will eventually affect system performance
<input type="radio"/>	Schedule	Cannot mitigate risk but different approach might
<input type="radio"/>	Cost	Unacceptable system performance but alternatives available.

<p>Likelihood</p> <table border="1" style="width: 100%; text-align: center; border-collapse: collapse;"> <tr><td>E</td><td style="background-color: #00FF00;"> </td><td style="background-color: #FFFF00;"> </td><td style="background-color: #FF0000;"> </td><td style="background-color: #FF0000;"> </td><td style="background-color: #FF0000;"> </td></tr> <tr><td>D</td><td style="background-color: #00FF00;"> </td><td style="background-color: #FFFF00;"> </td><td style="background-color: #FFFF00;"> </td><td style="background-color: #FF0000;"> </td><td style="background-color: #FF0000;"> </td></tr> <tr><td>C</td><td style="background-color: #00FF00;"> </td><td style="background-color: #FFFF00;"> </td><td style="background-color: #FFFF00;"> </td><td style="background-color: #FF0000;"> </td><td style="background-color: #FF0000;"> </td></tr> <tr><td>B</td><td style="background-color: #00FF00;"> </td><td style="background-color: #00FF00;"> </td><td style="background-color: #00FF00;"> </td><td style="background-color: #FFFF00;"> </td><td style="background-color: #FFFF00;"> </td></tr> <tr><td>A</td><td style="background-color: #00FF00;"> </td><td style="background-color: #00FF00;"> </td><td style="background-color: #00FF00;"> </td><td style="background-color: #00FF00;"> </td><td style="background-color: #00FF00;"> </td></tr> <tr><td></td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr> </table> <p style="text-align: center;">Consequence</p>	E						D						C						B						A							1	2	3	4	5	<p>Consequence Definition:</p> <ul style="list-style-type: none"> Finite spares asset supply Initial system degradation due to loss of workstations Lowered system availability System mission failure Unacceptable flight safety risks due to loss of sector management capability.
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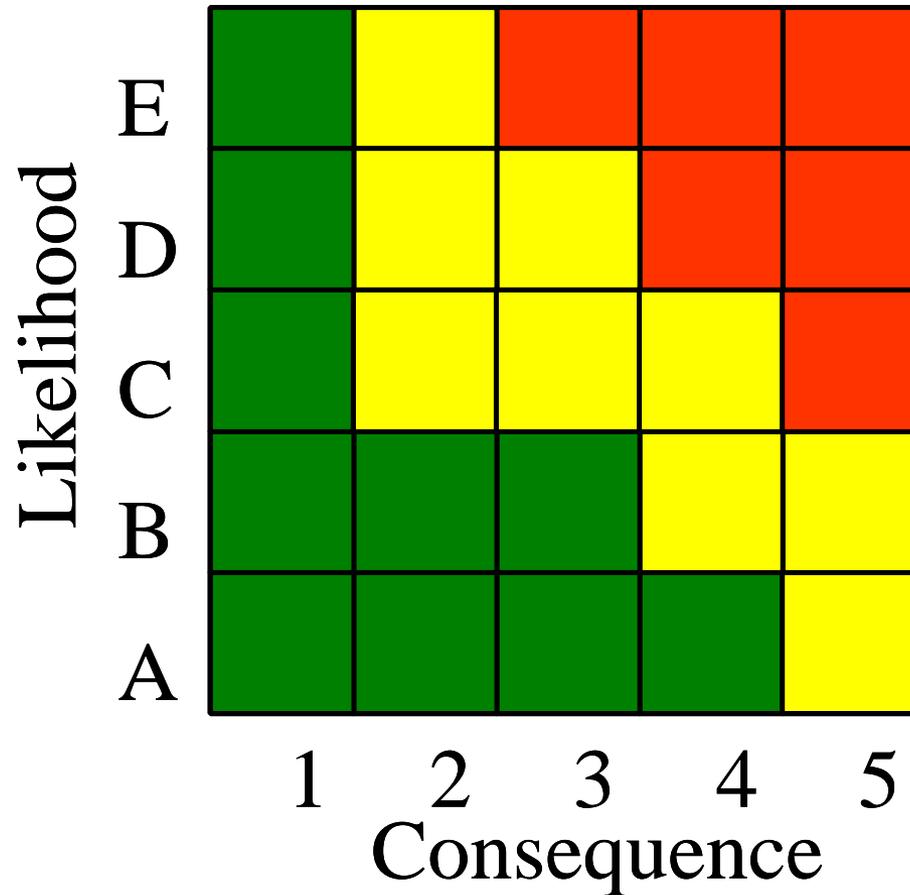
Risk Resolution Date: NLT 30 months from present to avoid EOM

5	Mitigation Options	Description	New Risk Level if Implemented
<input type="checkbox"/>	Avoidance	1. Procure remaining available spare ODMs to buy time for prototype testing and redesign activities.	H (M) L
<input type="checkbox"/>	Transfer	2. Procure 20” flat panel prototype, redesign the cabinet as required and perform system tests to determine suitability.	H (M) L
<input type="checkbox"/>	Control	3. Procure flat panel production units and develop ODM replacement kits.	H (M) L
<input type="checkbox"/>	Assumption	4. Begin waterfall replacement of ODMs at sites.	H M (L)
<input type="checkbox"/>	Research & Knowledge		H M L

COTS Risk Mitigation Guide App. D.6.3



Communicating Risk



Use of a risk grid simplifies and standardizes the communication of program uncertainties



FAA Programmatic Risk

Likelihood Definitions

COTS Risk
Mitigation
Guide App. D.6.3

What is the likelihood the risk will happen?

Level		Existing Approach and Processes
E	Near Certainty	...cannot mitigate this type of risk; NO known processes or alternatives are available.
D	Highly Likely	...cannot mitigate this risk, but a different approach might.
C	Likely	...may mitigate this risk, but alternative approaches will be required.
B	Low Likelihood	...have usually mitigated this type of risk with minimal oversight in similar cases.
A	Not Likely	...will effectively avoid or mitigate this risk based on standard practices.

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Guide App. D.7.3



FAA Technical Consequence Definitions

Given the risk is realized, what would be the magnitude of the impact?

Level	Technical	Schedule	Cost
1	Minimal Impact	Minimal Impact	Minimal Impact
2	Minor performance shortfall, same approach retained	Additional tasks required, able to meet key dates	Development or acquisition cost increase $\leq 1\%$
3	Moderate performance shortfall, ...alternatives available	Minor schedule slip, will miss need date without workaround	Development or acquisition Cost increase $> 1\% \ \& \ \leq 5\%$
4	Unacceptable performance but alternatives available	Program critical path impact but workaround available	Development or acquisition cost increase $> 5\% \ \& \ \leq 10\%$
5	Unacceptable performance and NO alternatives exist	No known way to achieve program milestones	Development or acquisition cost increase $> 10\%$

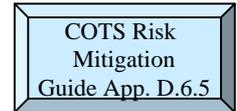
COTS Risk Mitigation Guide App. D.6.3



Budget Defense Rationale

What if the requested funding for the obsolescence risk mitigation action in year three was deferred for one year?

Risk: ODM will be unsupportable in 6 months



Rationale:

- Failures are accelerating (up 66% from average)
- Extended EOM based on linear failure projection only
- Cannot avoid EOM situation (4th quarter fourth year)
- Will result in loss of operator workstations
- Mission performance at risk (i.e.; sector loss, flight safety etc.)



What if...

COTS Risk
Mitigation
Guide App. D.6.5

Funding for flat panel development in third year were deferred for one year?

Budget Defense Rationale

- Failures are accelerating (up 66% from average)
- Extended EOM based on linear failure projection only
- Cannot avoid EOM situation (4th quarter fourth year)
 - Will result in loss of operator workstations
- Mission performance at risk (i.e.; sector loss, flight safety etc.)



Exercise Instruction Sheet

Using the same method & reference materials as the AIS ODM sample exercise and the package of materials provided for each table:

- 1. Read the market research information for your table's assigned AIS line item and remember to include the flat panel mitigation action as part of the scenario**
- 2. Fill out the 8.5" by 11" obsolescence analysis worksheets individually or by group discussion to arrive at an agreed upon information set**

(NOTE: The instructor will be available to answer questions about the scenario, the market information and the analysis process)

- 3. Fill out the 8.5" by 11" FAA risk worksheets individually or by group discussion to arrive at an agreed upon information set**

(NOTE: After identifying proposed Contractor Tasks from the "don't know" responses to the options, ask the instructor to review and provide contractor responses)

- 4. Plot out risk mitigation activities on either the near term or long term risk mitigation waterfall schedule individually or by group discussion**
- 5. Fill out the 8.5" by 11" budget defense rationale sheets individually or by group discussion**
- 6. Transfer the results of the table's analysis onto the large worksheets for class report out and discussion (allow 2 hours for analysis and .5 hours per table for report out)**



Market Research / Product Supportability Information

AIS Line Item #1 – PC Model 2001 Maintenance Workstation CPU

Line Item #	System Integrator Part #	Item Description	OEM	Item Type	Qty Per System	End of Life Date	End of Service Date	H/W Interface	S/W Interface	Average Failure Rate (per year)	Failure Rate (last 12 months)	Failure Trend	Total Depot Spares	Ready For Issue Spares
1	1000-1	PC Model 2001 Maintenance Workstation CPU	Dill Inc.	COTS	2	18 months ago	4 months from present	A	A	6	6	none	4	4

Line Item #	Site Spares	OEM Next Generation Product F ³ Compatibility	Alt. F ⁵ Products Available?	Alt. F ² Products Available?	T&E Time	Procurement/ Production Lead Time	System Availability Impact	Workaround	Notes/Additional Information
1	20	no	yes	yes	1 month	1 month	loss of one of two = degraded capability loss of two of two = loss of diagnostics and certification	none	OEM is changing product line. OEM has no excess inventory. OEM is only product source.



Market Research / Product Supportability Information

AIS Line Item #2 – Data Storage Device Disk Drive

Line Item #	System Integrator Part #	Item Description	OEM	Item Type	Qty Per System	End of Life Date	End of Service Date	H/W Interface	S/W Interface	Average Failure Rate (per year)	Failure Rate (last 12 months)	Failure Trend	Total Depot Spares	Ready For Issue Spares
2	1000-2	Data Storage Device Disk Drive	Tam-dum	COTS	2	12 months ago	6 months from present	A	A	2	4	up	8	8

Line Item #	Site Spares	OEM Next Generation Product F ³ Compatibility	Alt. F ⁵ Products Available?	Alt. F ² Products Available?	T&E Time	Procurement/ Production Lead Time	System Availability Impact	Workaround	Notes/Additional Information
2	20	new DSD not compatible with existing operating system	no	no	2 months	4 months	loss of one of two = loss of redundancy loss of two of two = no data retrieval capability	none	sole source manufacturer



Market Research / Product Supportability Information

AIS Line Item #3 – ODW Graphics Engine

Line Item #	System Integrator Part #	Item Description	OEM	Item Type	Qty Per System	End of Life Date	End of Service Date	H/W Interface	S/W Interface	Average Failure Rate (per year)	Failure Rate (last 12 months)	Failure Trend	Total Depot Spares	Ready For Issue Spares
3	1000-3	ODW Graphics Engine	Uni-view Inc.	COTS	6	present	3 months from present	B	B	4	5	none	10	10

Line Item #	Site Spares	OEM Next Generation Product F ³ Compatibility	Alt. F ⁵ Products Available?	Alt. F ² Products Available?	T&E Time	Procurement/ Production Lead Time	System Availability Impact	Workaround	Notes/Additional Information
3	20	none	no	yes	6 months	2 months	loss of workstation	re-assignment of operator tasks to remaining workstations	manufacturer just announced bankruptcy; existing engine incompatible with flat panel change for line item #6



Market Research / Product Supportability Information

AIS Line Item #4 – High Speed Printer Print Head

Line Item #	System Integrator Part #	Item Description	OEM	Item Type	Qty Per System	End of Life Date	End of Service Date	H/W Interface	S/W Interface	Average Failure Rate (per year)	Failure Rate (last 12 months)	Failure Trend	Total Depot Spares	Ready For Issue Spares
4	1000-4	High Speed Printer Print Head	Omni-Print	COTS	2	12 months ago	8 months from present	C	C	20	40	up	70	43

Line Item #	Site Spares	OEM Next Generation Product F ³ Compatibility	Alt. F ⁵ Products Available?	Alt. F ² Products Available?	T&E Time	Procurement/ Production Lead Time	System Availability Impact	Workaround	Notes/Additional Information
4	20	Only complete printer is F ³ compatible	no	yes	1 month	2 months	loss of one of one = loss of redundancy loss of two of two = no print capability	use maintenance workstation printers but at much slower speed	



Market Research / Product Supportability Information

AIS Line Item #5 – Central Computer Complex Operating System

Line Item #	System Integrator Part #	Item Description	OEM	Item Type	Qty Per System	End of Life Date	End of Service Date	H/W Interface	S/W Interface	Average Failure Rate (per year)	Failure Rate (last 12 months)	Failure Trend	Total Depot Spares	Ready For Issue Spares
5	1000-5	CCC Operating System	Tandem	COTS	2	36 months ago	8 months from present	B-F	B-F	n/a	n/a	n/a	n/a	n/a

Line Item #	Site Spares	OEM Next Generation Product F ³ Compatibility	Alt. F ⁵ Products Available?	Alt. F ² Products Available?	T&E Time	Procurement/ Production Lead Time	System Availability Impact	Workaround	Notes/Additional Information
5	n/a	none	none	yes	n/a	n/a	loss of system operations	none	sole source OEM is raising software license costs 10X at the EOS date



System Obsolescence Risk Profile

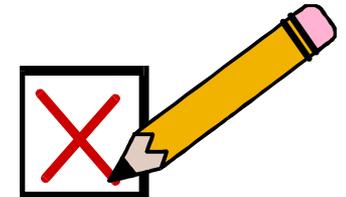
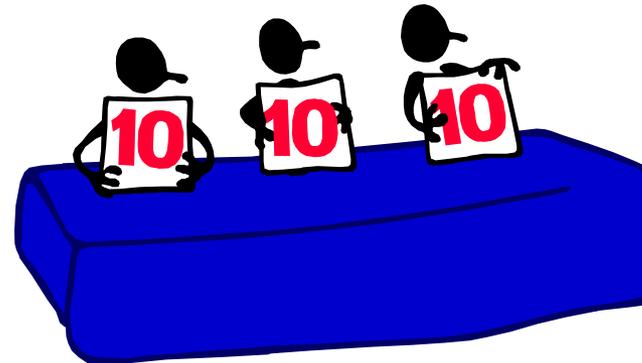
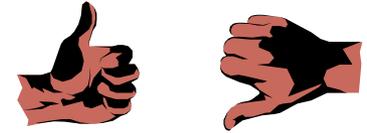


Module 6. Wrap Up



Wrap Up Elements

- Training objectives review
- Documentation access
- Parking lot review
- Student objectives
- Workshop summary
- Critique sheet





Module 5 Review - Objectives

- ✓ 1. Learn what market research information is needed and the definition of the information elements;
- ✓ 2. Project end of repair (EOR) and end of maintenance (EOM) dates for COTS products;
- ✓ 3. Integrate COTS product information into a system obsolescence risk profile;
- ✓ 4. Analyze and select viable risk mitigation/product obsolescence support options and determine their impact to the system;
- ✓ 5. Identify product obsolescence risk issues and mitigation actions using programmatic risk management templates;
- ✓ 6. Develop and communicate credible budget defense rationale; and
- ✓ 7. Integrate COTS product information into a system obsolescence risk profile.

Know what information to ask for, how to understand it,
how to mitigate the risks and communicate to management



COTS Risk Mitigation Workshop



Training Objectives



- Train “practitioners”
 - how and when to apply COTS risk mitigation strategies
 - how to project COTS product obsolescence
 - how to minimize COTS product obsolescence impacts
- Train project leads/managers
 - how COTS risk mitigation strategies contribute to more informed decision-making
 - implement effective COTS planning, budgeting and life cycle support



COTS Risk Mitigation Summary

- COTS-based systems are real and are here to stay



MUST ACCEPT THIS

- COTS products have unique characteristics (+ and -) & risks



MUST UNDERSTAND THEM

- Rapid obsolescence of COTS products is a primary concern



MUST HAVE A FLEXIBLE STRATEGY

- Mitigation strategies exist to help manage COTS risks



MUST APPLY THEM

- Mitigation strategies are inter-related and generate technology evolution planning information



MUST BE CONTINUOUS AND INTEGRATED

The *strategic* implementation of COTS risk mitigation activities provides the *tactical* information needed for more effective COTS acquisition and life cycle support



Benefits to the FAA



- Toolkit to standardize repeatable process
 - COTS risk mitigation implementation checklist
 - COTS obsolescence risk analysis procedure and templates
 - Supporting guidance and courseware
- Nucleus of COTS-oriented FAA personnel
- Market-oriented business standard for the future

Better information **Better knowledge**
Better decisions **Better systems**



Making this work...



- Question business practices
- Apply the strategies and tools
- Educate and inform
- Call for guidance

