



Integrated Risk Management

Aeronautical Systems Center.... the Birthplace, Home and Future of Aerospace

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Engineering

and

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Acquisition Cost

OSD Business Managers' Conference

13 & 14 June 2000

Defense Systems Management College

**Sponsored by the Under Secretary of Defense
for Acquisition, Technology, and Logistics**



Leadership Statement

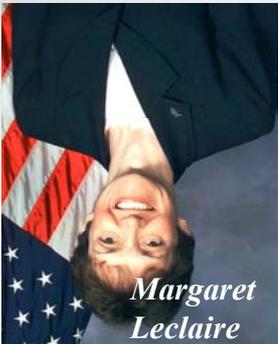
It has been our policy and strategy to develop and field affordable weapon systems that are responsive to the user's needs. Risk Management is a key component in this strategy and the Department of Defense's strategy for acquiring and sustaining mission-capable weapon systems. In support of this strategy our risk management process facilitates early identification of critical risk areas and supports establishment of realistic, executable technical, schedule and cost objectives.



Donna
Back



Jon
Ogg



Margaret
Leclaire



Pamela
Casey

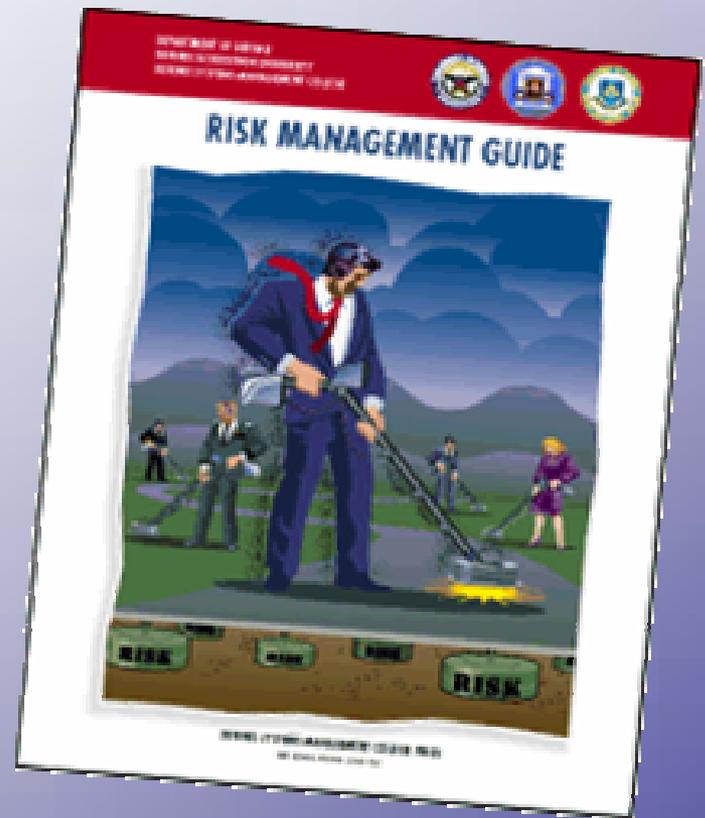
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Risk Management Guides



Risk Management Guide for DoD Acquisition, January 2000
Defense Systems Management College (DSMC) Press
www.dsmc.dsm.mil/pubs/gdbks/risk_management.htm (988KB)
AFMC Pamphlet 63-101, 9 July 1997 - OPR: HQ AFMC/ENP
<http://www.wpafb.af.mil/az/jacg/pbbe/pbbe.htm>

Note: Currently Only the May 1999 Version Is Available in Hard Copy.

Definitions

- Risk
 - The Possibility of Loss, Injury, Disadvantage, etc
 - A Measure of the Inability to Achieve Objectives
 - Two Components
 - *Probability of Occurrence*
 - *Consequence of Occurrence*
- Risk Management
 - Act or Practice of Controlling Risk
 - Identifying and Tracking Risk Drivers
 - Defining Risk Handling (Mitigation) Plans
 - Performing Periodic Risk Assessments
 - Facilitates Decision Making

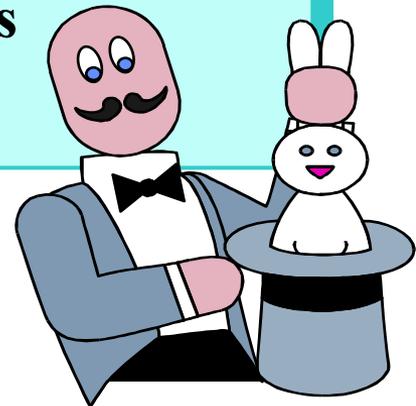
**All Risk Is About
the Future
All Facts Are in
the Past**

Four Common Risk Management Deficiencies:

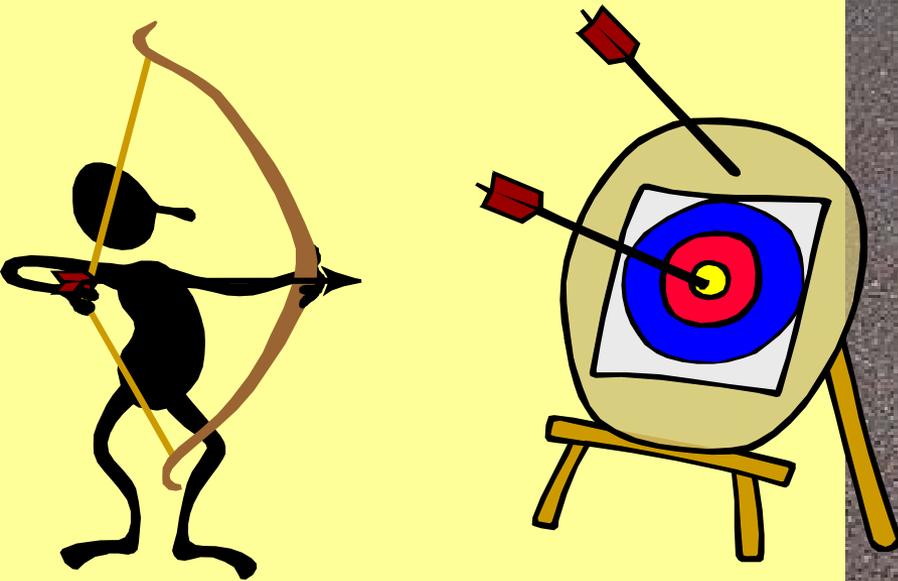
- The risk management process is weakly structured or ‘ad hoc’
- The risk assessment portion of the risk management process is often too subjective and not adequately documented
- The emphasis of the risk assessment process is generally on the uncertainty associated with a specific event occurring, with less attention given to the consequence of the event occurring.
- Program risk assessments and mitigation plans are often unlinked; and may be prepared on an as-needed basis

Defense Acquisition Management Magazine

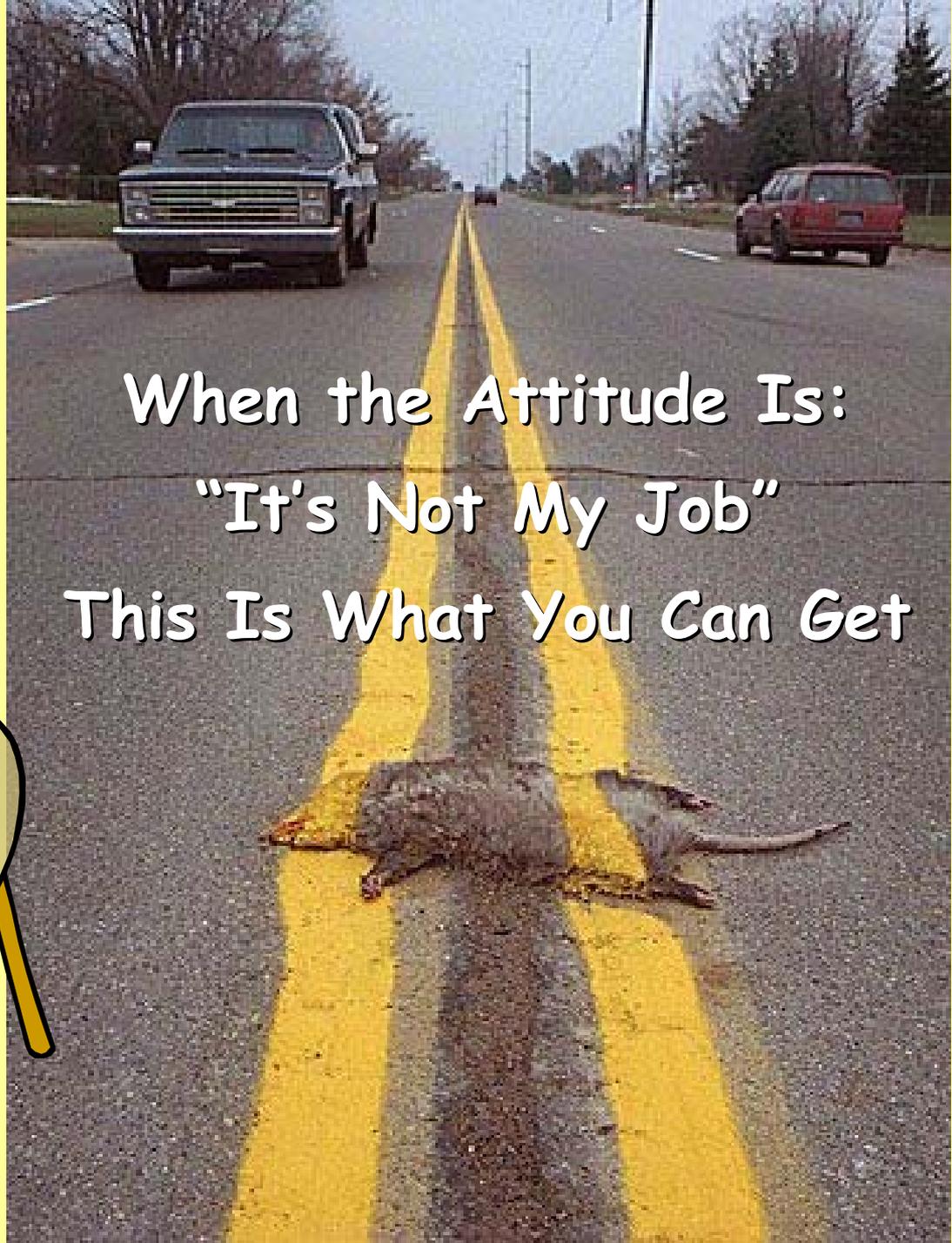
Jan-Feb 1996



Successful Programs
Have the Attitude:
"Risk Management
Is My Job"



When the Attitude Is:
"It's Not My Job"
This Is What You Can Get





Risk Management Structure

Based on DoD Risk Management Study

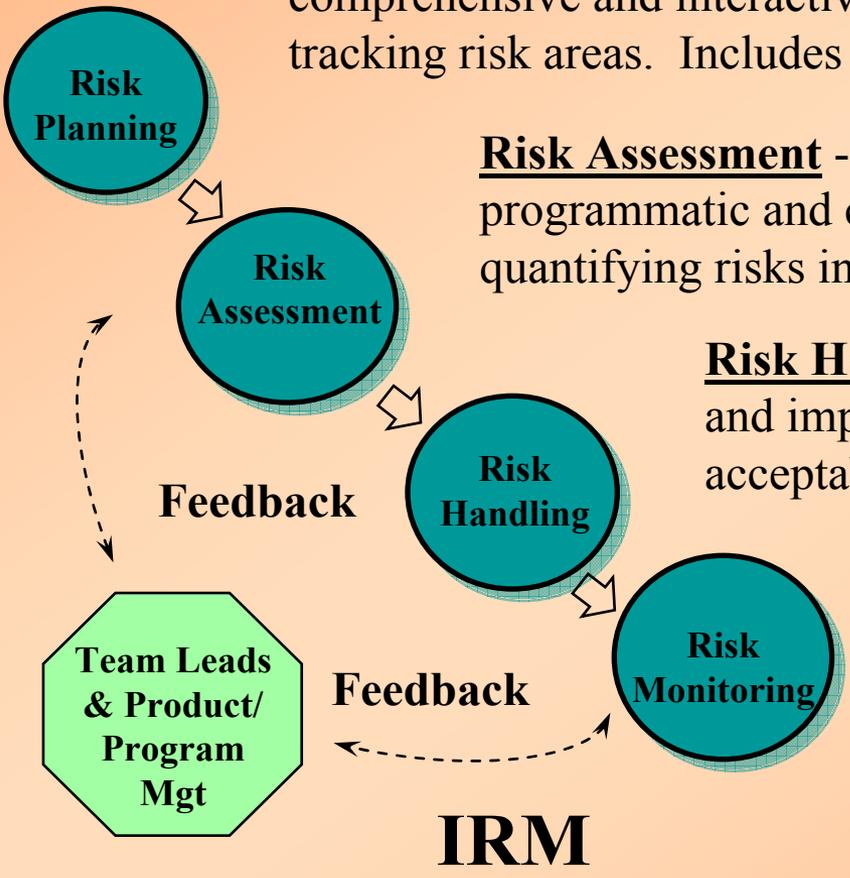
Aeronautical Systems Center...the Birthplace, Home and Future of Aerospace

Risk Planning - Process of developing and documenting a comprehensive and interactive method of identifying and tracking risk areas. Includes developing a risk management plan.

Risk Assessment - Process of identifying and analyzing programmatic and critical technical risks. Process includes quantifying risks in terms of performance, schedule and cost.

Risk Handling - Process that identifies, evaluates, selects, and implements risk handling options to set risk at acceptable levels.

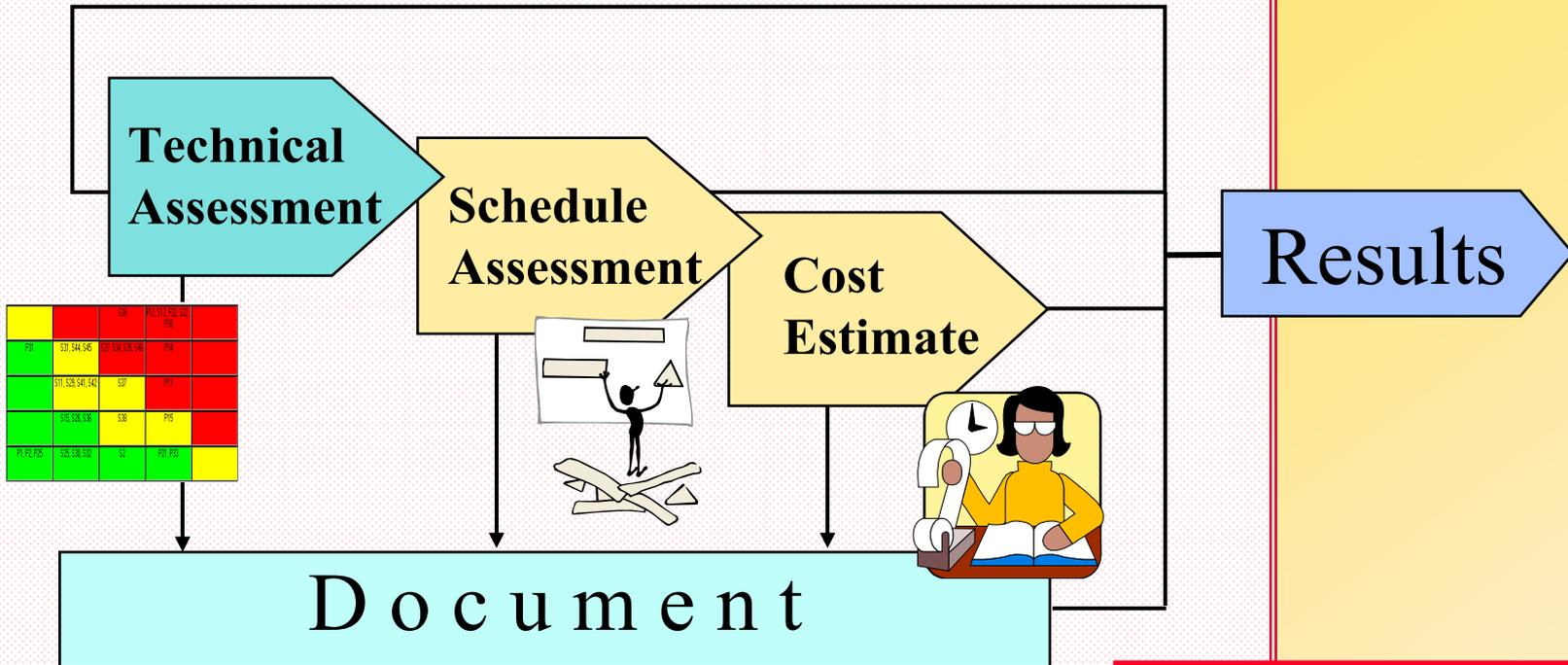
Risk Monitoring - Process that systematically tracks and evaluates the performance of risk handling actions against established metrics.



*PM: March-April 1998, page 48
Risk Management in the DoD*

Integrated Risk Assessment

Integrated Risk Assessment Process



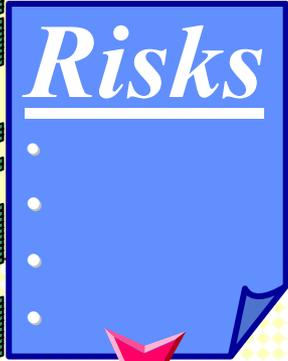
You need a process that keeps risks from getting out-of-control.

Technical Assessment (TA) Process



Probability/Consequence Screening (P/CS)

<http://www.afmc.wpafb.af.mil/HQ-AFMC/AQ/>

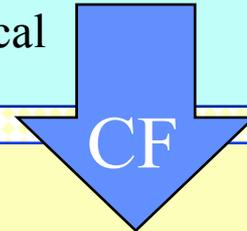


Probability of Risk With A Consequence In Terms of:

- Performance {P}
- Schedule {S}
- Cost {C}

CF = Consequence of Occurrence

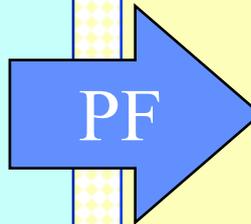
- Negligible
- Minor
- Moderate (Major)
- Serious
- Critical



Consequence of Occurrence

	Negligible	Minor	Major	Serious	Critical
5					
4					
3					
2					
1					

Probability of Occurrence



PF = Probability of Occurrence

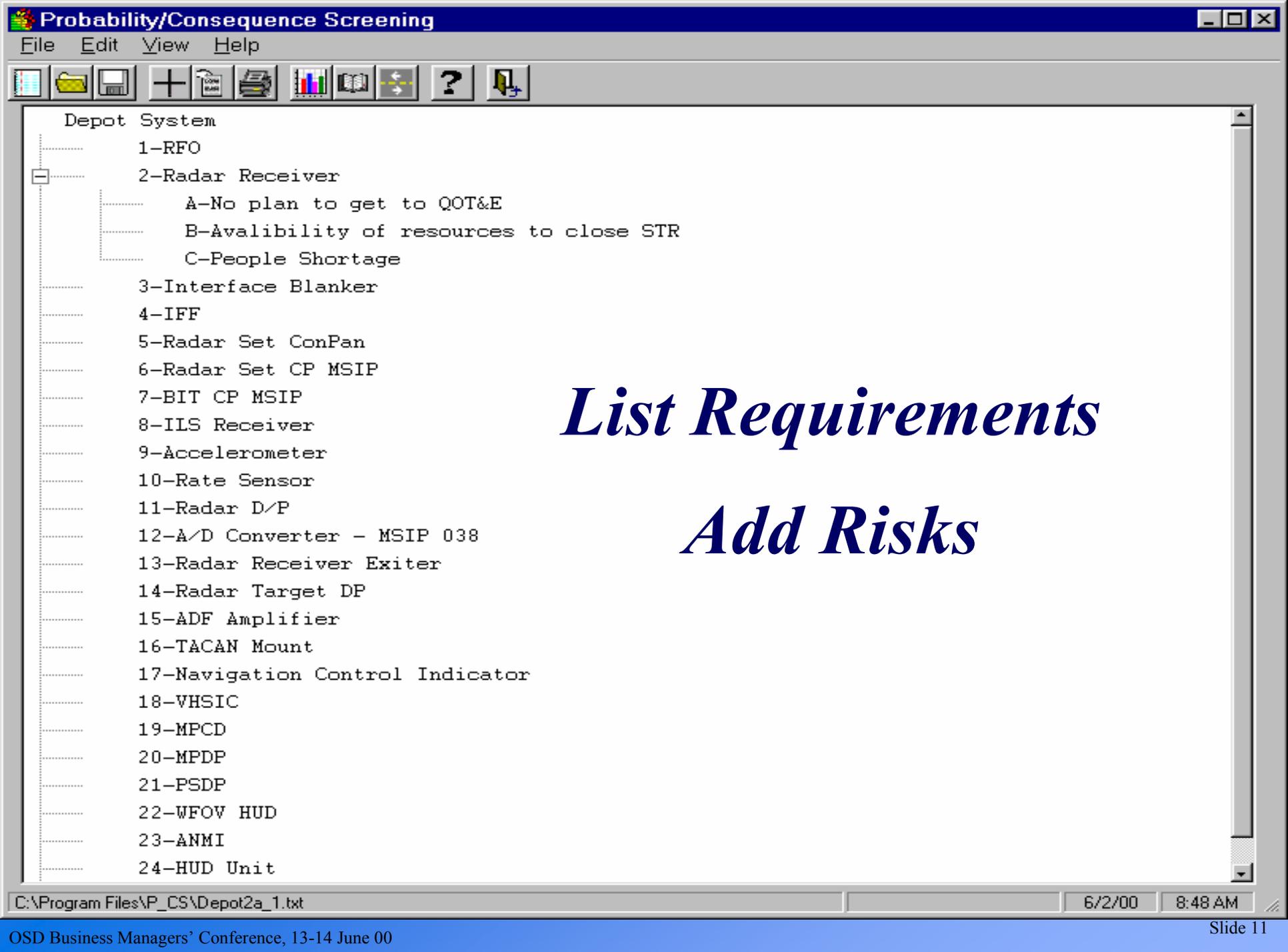
Five Levels:

- 1: 0 - 10% Not Likely
- 2: 11 - 40% Low Likelihood
- 3: 41 - 60% Likely
- 4: 61 - 90% Highly Likely
- 5: 91 - 100% Near Certainty

Note: Percentages for the Five Levels are Only A Guide

Risk Score Is Determined by Location in Consequence Screening Matrix

Consequence Screening Matrix



Depot System

- 1-RFO
- 2-Radar Receiver
 - A-No plan to get to QOT&E
 - B-Avalibility of resources to close STR
 - C-People Shortage
- 3-Interface Blanker
- 4-IFF
- 5-Radar Set ConPan
- 6-Radar Set CP MSIP
- 7-BIT CP MSIP
- 8-ILS Receiver
- 9-Accelerometer
- 10-Rate Sensor
- 11-Radar D/P
- 12-A/D Converter - MSIP 038
- 13-Radar Receiver Exiter
- 14-Radar Target DP
- 15-ADF Amplifier
- 16-TACAN Mount
- 17-Navigation Control Indicator
- 18-VHSIC
- 19-MPCD
- 20-MPDP
- 21-PSDP
- 22-WFOV HUD
- 23-ANMI
- 24-HUD Unit

List Requirements

Add Risks

Risk Assessment

Risk:

Owner:

Annotations

10 critical STRs need to be closed before plan can be written.

Flight assets shared with 2 other programs.

We're not #1 priority.

Performance: Test equipment interface not tested yet. 200MHz aircraft side of interface marginal at this speed, operates very well at 150MHz, but range test equipment requires at least 190MHz. More testing required to see if we can achieve 190MHz.

Schedule: Test range being shared with other programs. Limited test range availability during Thanksgiving and Christmas holidays. Time may be made up with weekend testing if funds can be found to pay test range personnel.

Cost: Delays in use of test range will add \$25k a week in range costs. Weekend personnel cost estimated to be about \$2k a day. This money is not available in current budget, but if this money

Probability of Occurrence

No Risk

Level 1: 0 - 10%

Level 2: 11 - 40%

Level 3: 41 - 60%

Level 4: 61 - 90%

Level 5: 91 - 100%

Consequence of Occurrence

Performance (Minor) | **Schedule (Moderate)** | **Cost (Minor)**

Negligible

Minor

Moderate

Serious

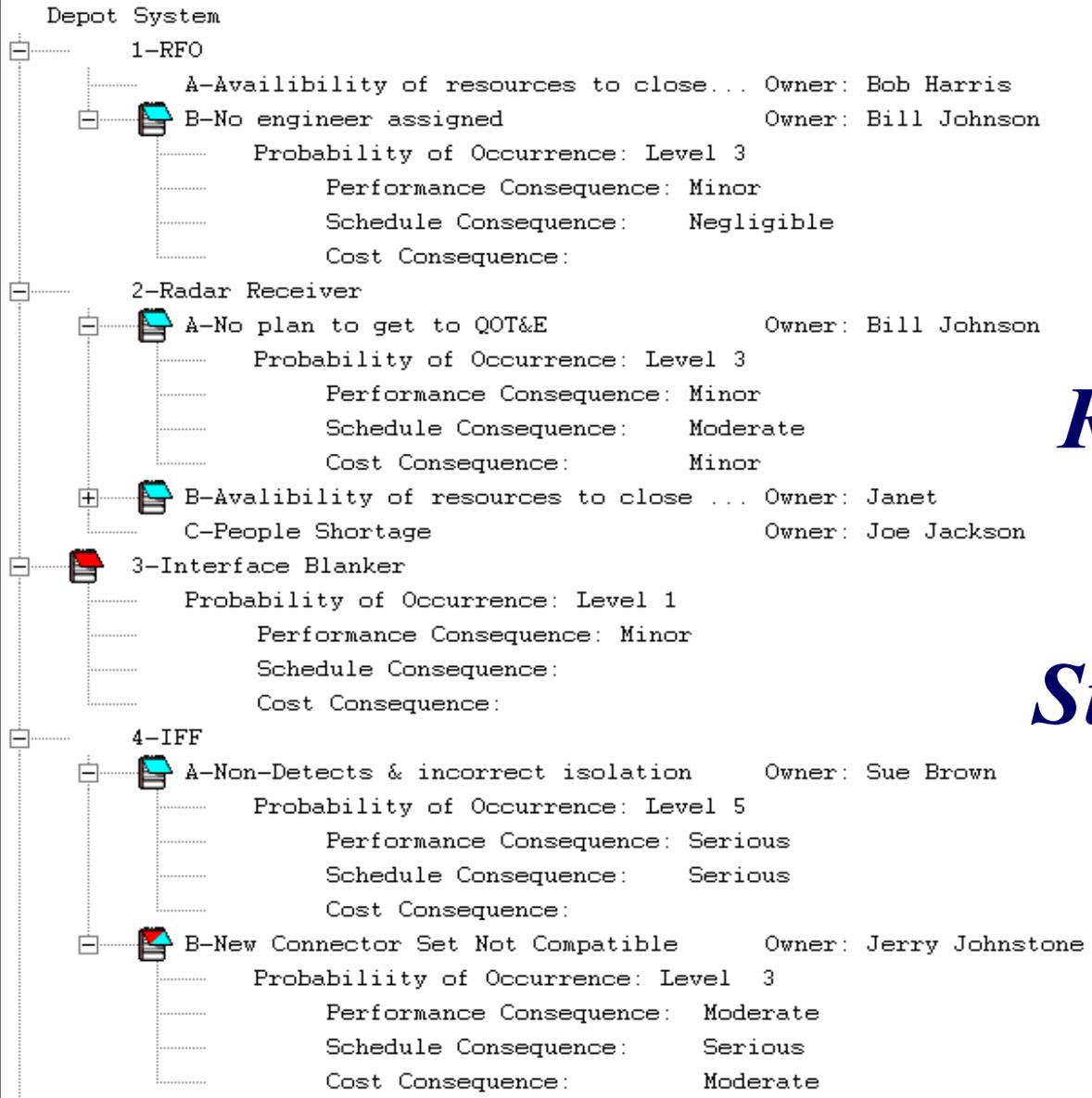
Critical

Buttons: OK, Cancel, ?

P/CS Quantify Risks



Assessment Page



Requirements

Risks

Summary Page

P/CS Risk Assessment

Depot System-Consequence Screening Matrix					
5/26/00					
	NEGLIGIBLE	MINOR	MODERATE	SERIOUS	CRITICAL
Level 5: 91 - 100%				P11A, S11A, P21A, S21A	
Level 4: 61 - 90%			S11B, S21B	P11B, P11D, S11D, P21B	
Level 3: 41 - 60%	S1B, P2B	P1B, P2A, C2A, S2B	S2A, P11C, P12A, S12A, S14A	P11G, S11G, P14A	
Level 2: 11 - 40%		S4, S11F, S12B, P24A, S24A, P24B, S24B	S11E, P11F, P12B	P11E	
Level 1: 0 - 10%		P3			

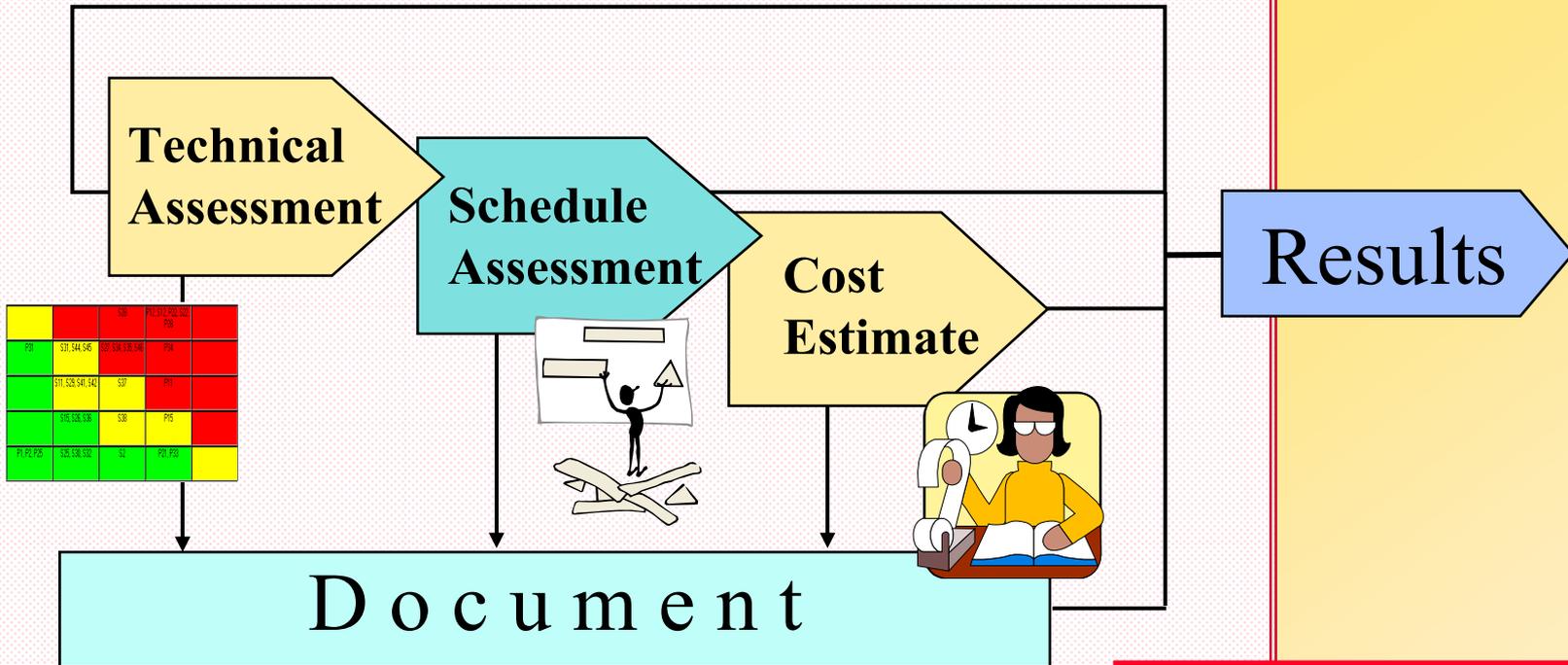
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Key

	Low Risk		Moderate Risk		High Risk
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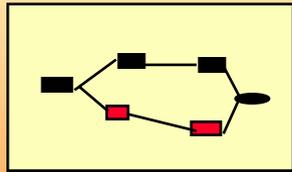
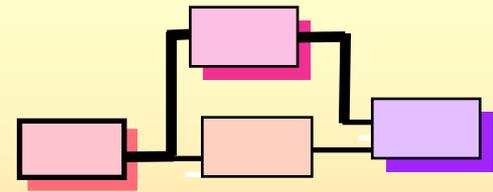
Integrated Risk Assessment

Integrated Risk Assessment Process

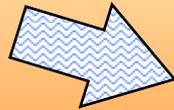


You need a process that keeps risks from getting out-of-control.

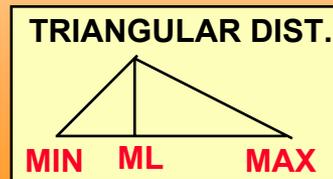
Schedule Assessment Process



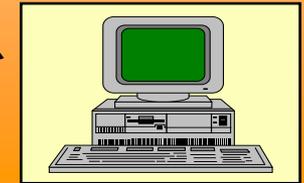
1. IPT Establishes Baseline Schedule



2. Understand TA Risk Areas

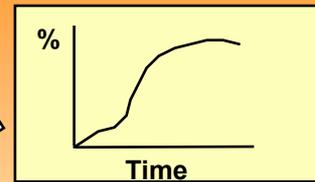


3. Evaluate Schedule Durations & Quantify Impact of Risk

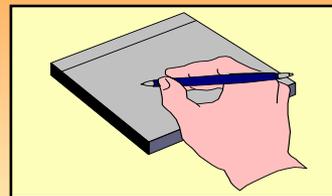


4. Run Schedule Simulation

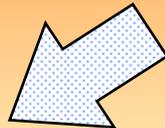
Tailor to Match Program



5. Analyze Results & Integrate Into Cost Estimate



6. Document & Present Results



SA RISK ACTION PLAN

ISSUE -- ACTION -- DATE

7. IPT Identifies Risk Mitigating Actions

Purpose:

- Identify/Quantify Impact of Risk Areas on the Program Schedule
- Support Cost Estimation

Risk Assessment

No plan to get to GOT&E

Owner: Bill Johnson

Annotations:

- 10 critical STRs need to be closed before plan can be written.
- Flight assets shared with 2 other programs. We're not #1 priority.

Performance: Test equipment interface not tested yet. 200MHz aircraft side of interface marginal at this speed, operates very well at 150MHz, but range test equipment requires at least 150MHz. More testing required to see if we can achieve 150MHz.

Schedule: Test range being shared with other programs. Limited test range availability during Thanksgiving and Christmas holidays. Time may be made up with weekend testing if funds can be found to pay test range personnel. Min 2 months, ML 3 months, Max 6 months.

Cost: Delays in use of test range will add \$25k a week in range costs. Weekend personnel cost estimated to be about \$2k a day. This money is not available in current budget, but if this money

Probability of Occurrence:

- No Risk
- Level 1: 0 - 10%
- Level 2: 11 - 40%
- Level 3: 41 - 60%
- Level 4: 61 - 90%
- Level 5: 91 - 100%

Consequence of Occurrence:

Performance (Minor): Negligible, Minor, Moderate, Serious, Critical

Schedule (Moderate): Negligible, Minor, Moderate, Serious, Critical

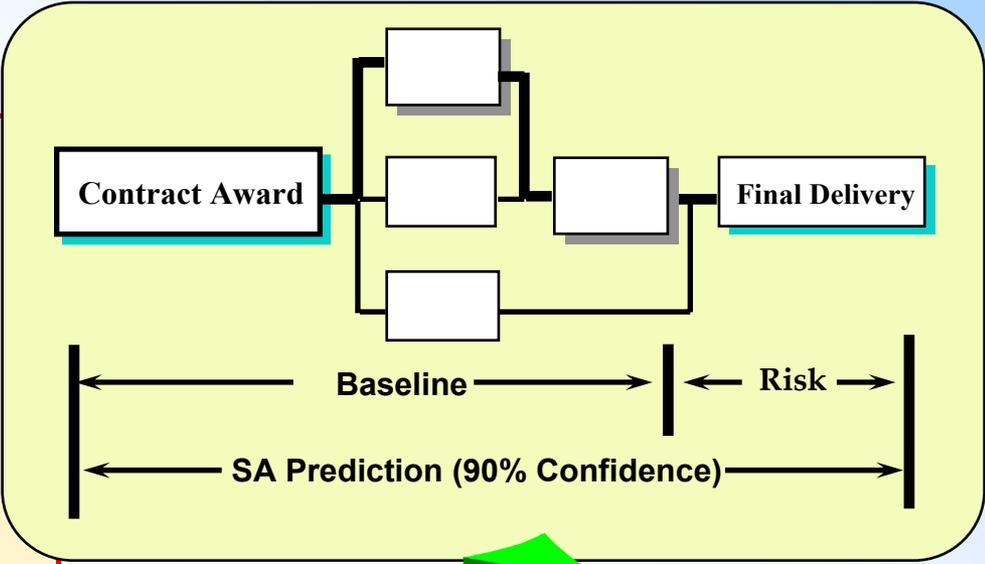
Cost (Minor): Negligible, Minor, Moderate, Serious, Critical

Quantify Risks

Risk Estimate

SRA Inputs for GPS Program

Min	Likely	Max	IMS	Proposed	Task#	Days	Task Name	Functional Area
90	91	109	44	90	90	Navigation Preliminary Design Complete	Software	Software
140	171	205	105	140	140	Navigation Detailed Design Complete	Software	Software
80	91	109	185	80	80	Common Nav software Coding Complete	Software	Software
110	135	162	186	110	110	Thruster Management Software Coding Complete	Software	Software
85	119	143	187	85	85	Geo Mapping Load Software Coding Complete	Software	Software
95	95	95	47	95	95	FLIR Prelim Design Complete	Software	Software
130	130	130	108	130	130	FLIR Detailed Design Complete	Software	Software
39	40	48	144	40	40	V-SIL Coding Complete	Software	Software
140	140	140	245	140	140	Communications Detailed Design Complete	Communications	Communications
100	100	100	246	100	100	Common Comm Software (1775 CDU page server) Coding Complete	Communications	Communications
140	140	140	247	140	140	Comm Sensor Control Software (ARC-700 Quick Tune) Coding Complete	Communications	Communications
14	15	18	264	15	15	Common Comm Software Interlock Testing Complete	Communications	Communications
14	15	18	324	15	15	Comm Sensor Control Software (ARC-700 Quick Tune) CSU Testing Complete	Communications	Communications
140	171	205	104	140	140	Communications Interlock Design Complete	Communications	Communications
60	68	82	181	60	60	Common Comm software (1553, NVM, CDU page server) coding complete	Communications	Communications
5	108	129	182	95	95	Baseline Tech Orders Updated	Logistics	Logistics
10	140	168	183	110	110	Initial Prototype Spares Provisioned	Logistics	Logistics
85	99	119	222	85	85	Prototype GFE Delivered	Logistics	Logistics



Date: 10/25/99 9:02:58 AM
Number of Samples: 500

Risk+[©] Output

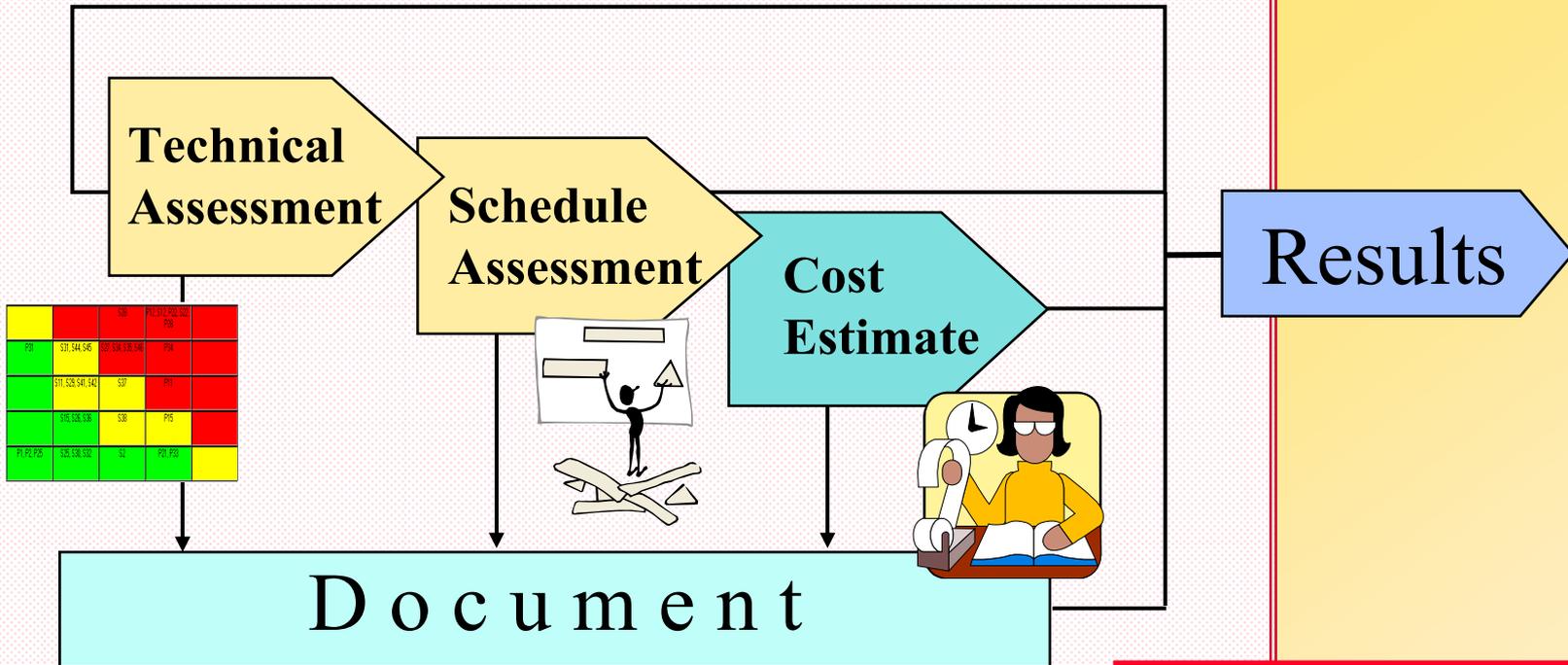
© ProjectGear, Inc.

Completion Probability Table

Prob	Date	Prob	Date
0.05	5/25/07	0.55	8/8/07
0.10	6/5/07	0.60	8/13/07
0.15	6/15/07	0.65	8/21/07
0.20	6/27/07	0.70	8/27/07
0.25	7/4/07	0.75	8/30/07
0.30	7/10/07	0.80	9/7/07
0.35	7/17/07	0.85	9/14/07
0.40	7/23/07	0.90	9/25/07
0.45	7/26/07	0.95	10/11/07
0.50	8/1/07	1.00	12/10/07

Integrated Risk Assessment

Integrated Risk Assessment Process



You need a process that keeps risks from getting out-of-control.



Cost Estimating Steps



- 1** Definition & Planning
- 2** Research, Collection & Analysis
- 3** Estimate Formulation
- 4** Formal Review/Presentation
- 5** Formal Documentation



Technical Assessment Results

Quantify Risks

Risk Assessment

Risk: No plan to get to QOT&E

Owner: Bill Johnson

Annotations

10 critical STRs need to be closed before plan can be written.

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We're not #1 priority.

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Cost: Delays in use of test range will add \$25k a week in range costs. Weekend personnel cost estimated to be about \$2k a day. This money is not available in current budget, but if this money

Probability of Occurrence

No Risk

Level 1: 0 - 10%

Level 2: 11 - 40%

Level 3: 41 - 60%

Level 4: 61 - 90%

Level 5: 91 - 100%

Consequence of Occurrence

Performance (Minor) Schedule (Moderate) Cost (Minor)

Negligible

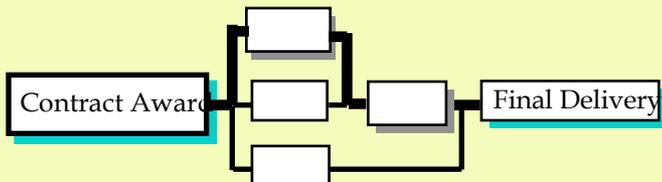
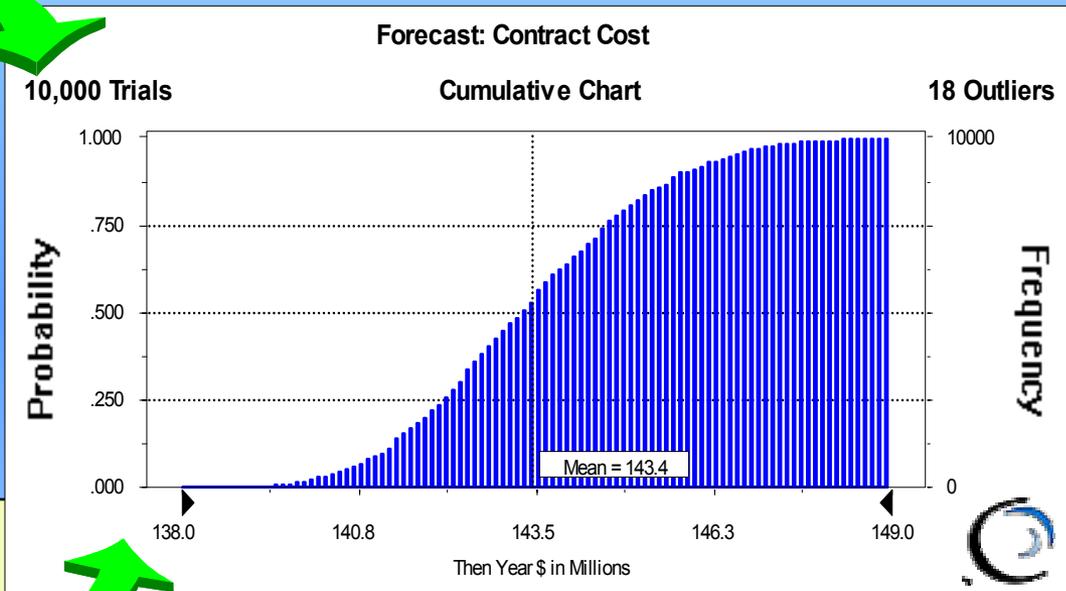
Minor

Moderate

Serious

Critical

Cost Sheet



Baseline

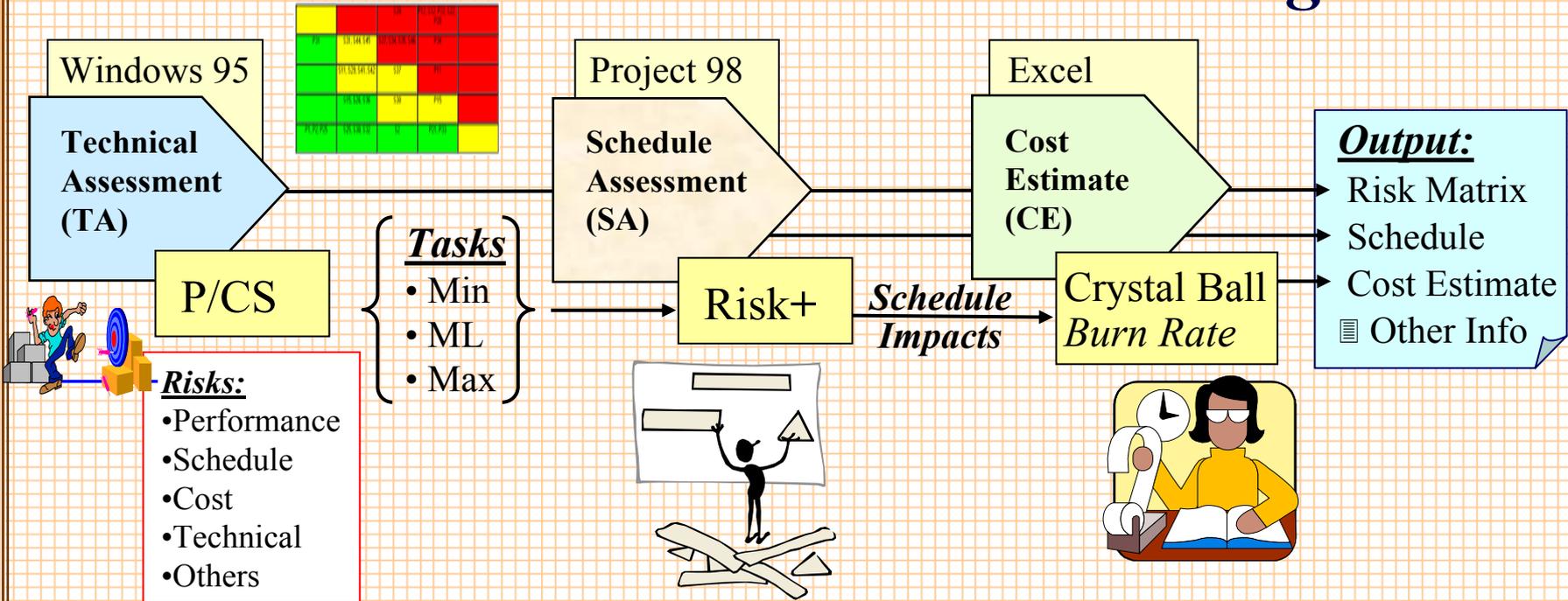
SA Prediction (90% Confidence)

Schedule Assessment Results

Crystal Ball Results®

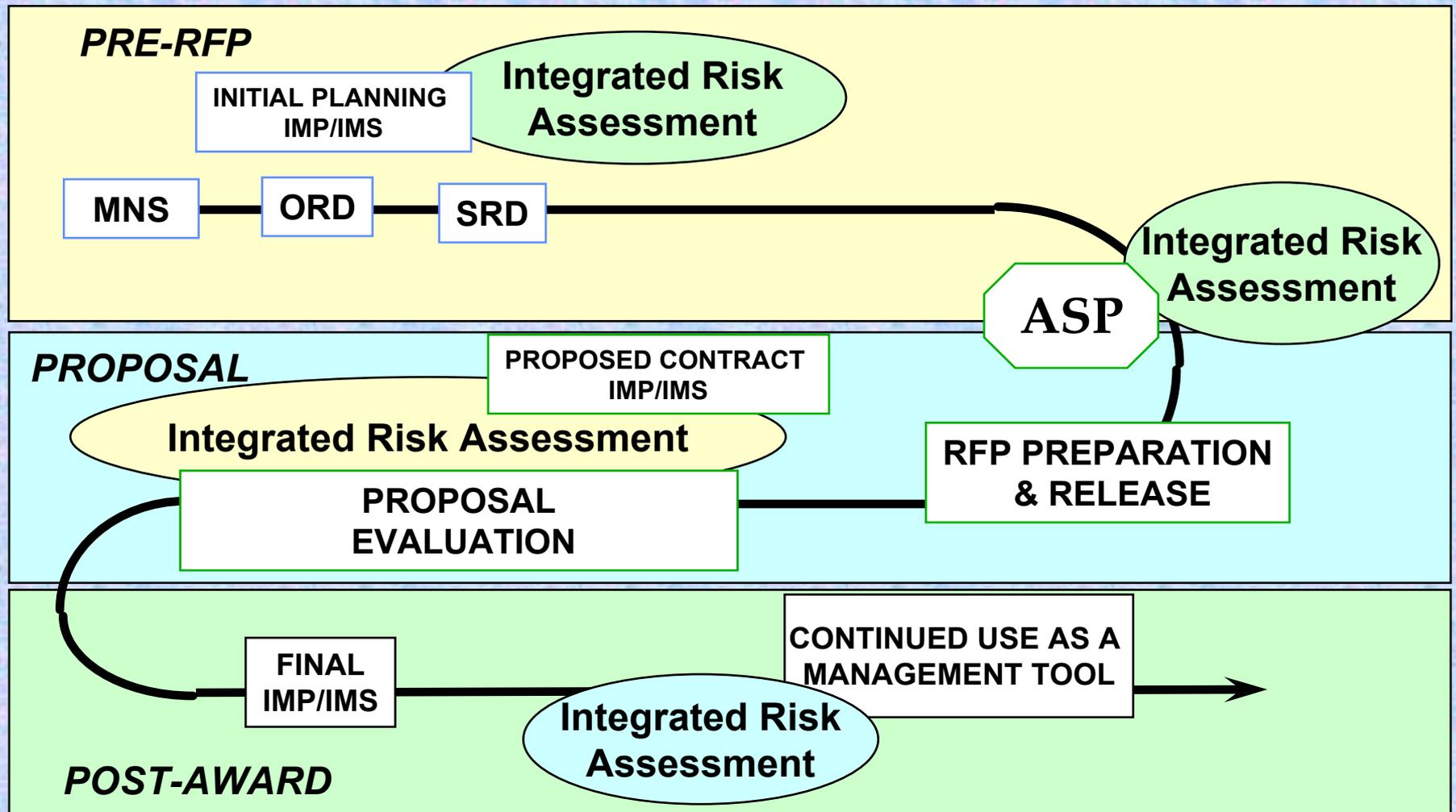
® Decisioneering, Inc.

A Facilitating Process



Integrated Risk Assessment (IRA)

Acquisition Timeline



Summary

Input

- Program Scope
- Schedule Constraints
- Cost Constraints
- Development Plan
- Needs
- Requirements

- Performance
- Technologies
- Schedule
- Budget
- Capability
- Feasibility



All Stakeholders:

- Government
- Industry
- Warfighters

IRM/ Process

Risk Planning

Who does it?
What do they do?
When do they do it?

Risk Assessment

Risk Handling

Sources of Risk:

- Internal
 - Technical
 - Schedule
 - Cost
- External
 - Personnel
 - Labor Actions
 - Supplier Viability
 - Regulations
 - Political Actions
 - etc

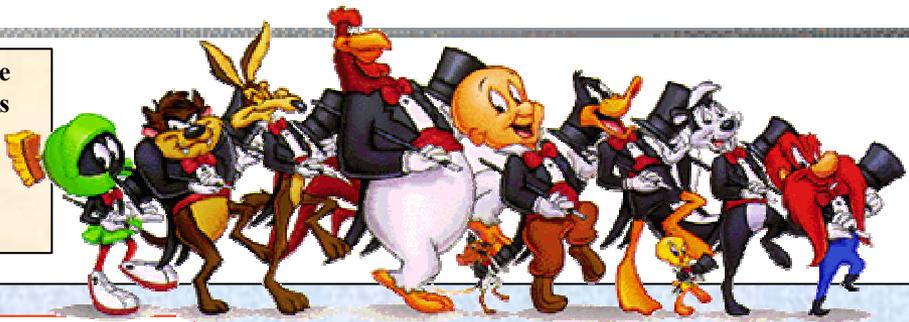
- Risk Avoidance
- Risk Control
- Risk Prevention
- Risk Assumption

Risk Monitoring

Summary

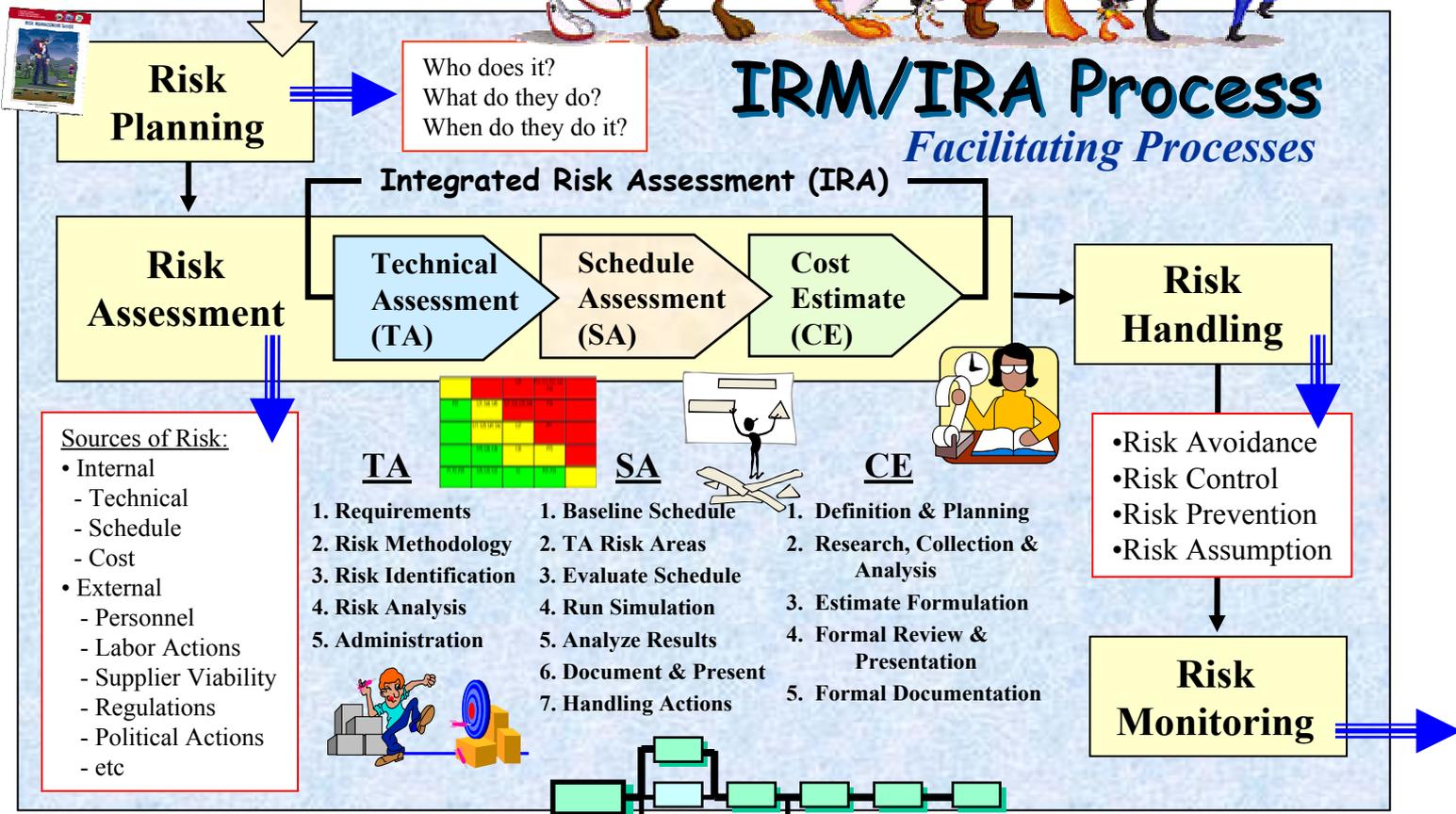
Input

- Program Scope
- Schedule Constraints
- Cost Constraints
- Development Plan
- Needs
- Requirements
- Performance
- Technologies
- Schedule
- Budget
- Capability
- Feasibility



All Stakeholders:

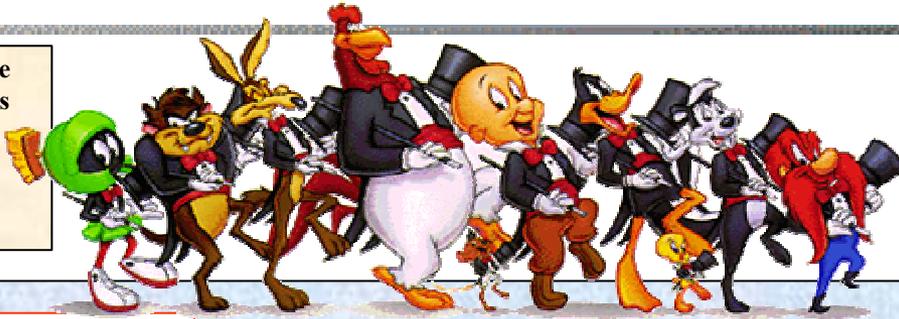
- Government
- Industry
- Warfighters



Summary

Input

- Program Scope
- Schedule Constraints
- Cost Constraints
- Development Plan
- Needs
- Requirements
- Performance
- Technologies
- Schedule
- Budget
- Capability
- Feasibility



All Stakeholders:

- Government
- Industry
- Warfighters

- Tools for Control
 - Handling Options
 - Clear Direction
- Better Able To:
- Deal With Unexpected Events
 - Deal With Unexpected Results
 - Reduce Level of Uncertainty
 - Maintain Executable Program



IRM/IRA Process

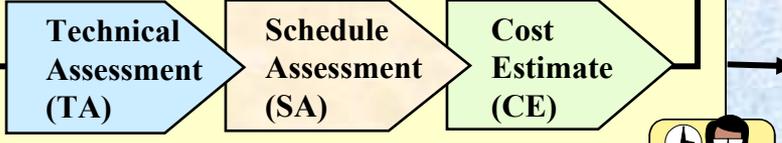
Facilitating Processes

Risk Planning

Who does it?
What do they do?
When do they do it?

Risk Assessment

Integrated Risk Assessment (IRA)



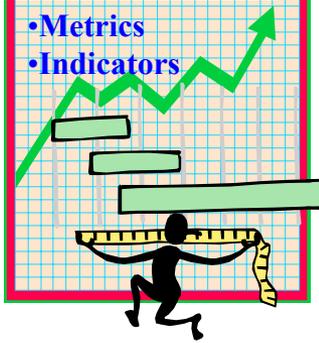
Risk Handling

- Risk Avoidance
- Risk Control
- Risk Prevention
- Risk Assumption

Risk Monitoring

Evaluate & Track Performance

Output

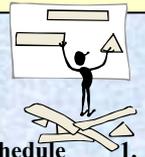


- Sources of Risk:
- Internal
 - Technical
 - Schedule
 - Cost
 - External
 - Personnel
 - Labor Actions
 - Supplier Viability
 - Regulations
 - Political Actions
 - etc

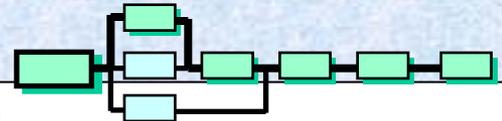
- TA**
1. Requirements
 2. Risk Methodology
 3. Risk Identification
 4. Risk Analysis
 5. Administration



- SA**
1. Baseline Schedule
 2. TA Risk Areas
 3. Evaluate Schedule
 4. Run Simulation
 5. Analyze Results
 6. Document & Present
 7. Handling Actions



- CE**
1. Definition & Planning
 2. Research, Collection & Analysis
 3. Estimate Formulation
 4. Formal Review & Presentation
 5. Formal Documentation



The Two Alternatives

The Alternative to Risk Management is
Crisis Management



Use IRA Results to Manage Program

However, There Is One Advantage of Not Doing Risk Management: **Failure** Comes As a Complete Surprise and Is Not Preceded by Long Periods of Worry, Stress, Problem Solving and Solution Searching.