



U.S. National Science Foundation

Hope is Not A Strategy!

Risk Management Revisions in the NextGen RIG

Alison Rockwell, NSF Research Infrastructure Advisor
Mark Warner, NSO Project Manager

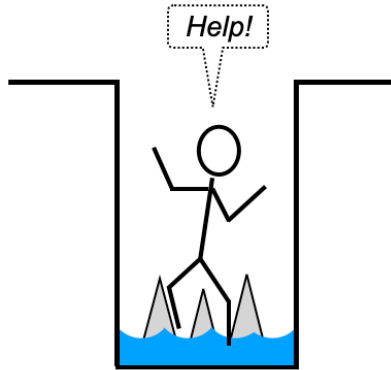
Mid-scale RI Image Credits:
Ohio State University, Cornell
University, Georgia Tech Research
Corporation, Florida State University,
Woods Hole Oceanographic
Institution, The University of Kentucky
Research Foundation, Arizona State
University, NSF I-Corps Northeast
Hub, the University of Arkansas,
Georgia Institute of Technology, the
University of Michigan, University of
California-San Diego, and the
University of Tennessee, Knoxville



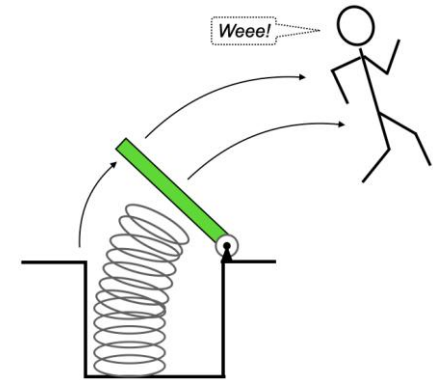
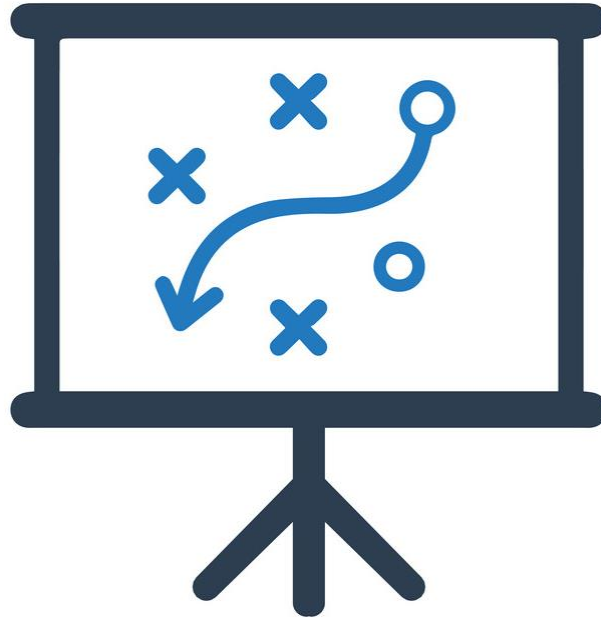
Hope is Not a Strategy!

Risk Management Revisions in the NextGen RIG

Strategic Risk Management Planning



Threats



Opportunities





Hope is Not a Strategy!

Risk Management Revisions in the NextGen RIG

Session Overview

- Why NSF is improving and revising risk management content the RIG.
- Review updates that are being made to the risk management guidance throughout the RIG.
- Interactive Q&A session.





Hope is Not a Strategy!

Risk Management Revisions in the NextGen RIG

Why?

- Current risk information is spread throughout the RIG.
- Clarify terms and definitions.
- Lack of clarity in the risk management process.
- Importance of creating a plan that is **tailored** and **scaled** for each specific RI, while **progressively elaborating** it throughout each life cycle stage.





Hope is Not a Strategy!

Risk Management Revisions in the NextGen RIG



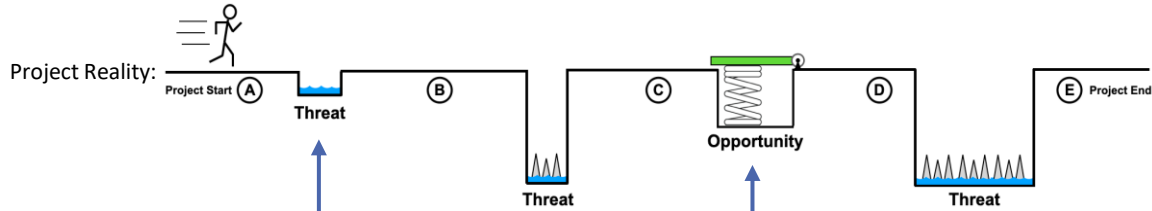
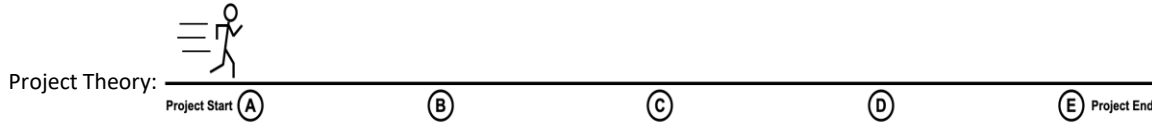
The solution

- ✓ *Risk Management* section streamlined and defines a clear 7-step process and 3 outputs.
- ✓ Clear guidance in *Project Execution Plan (PEP)* component on risk management.
- ✓ *Contingency Estimating and Management* in separate section.
- ✓ No new requirements, only enhanced guidance.



Project Theory vs Reality

RIG Revisions: Clarification of Terminology



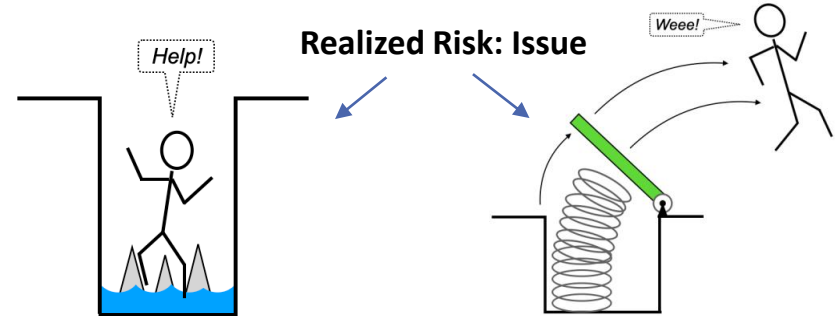
Threat:

A risk that, if it occurs, may have a negative impact on the RI effort.

Opportunity:

A risk that, if it occurs, may have a positive impact on the RI effort.

Widget Development Schedule							
ID#	Activity	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6
A	Gather Requirements & Perform Widget Trade Studies			Technical Roadblock			
B	Consolidate Requirements & Create Full Widget Design		Vendor Issue	Currency Rate Benefit			
C	Purchase Components & Fabricate Custom Widget Parts		X	Delayed			
D	Assemble Widget System In Lab & Test Against Requirements			Loss of Key			
E	Validate Performance & Deliver Widget to Customer			Personnel			New Task





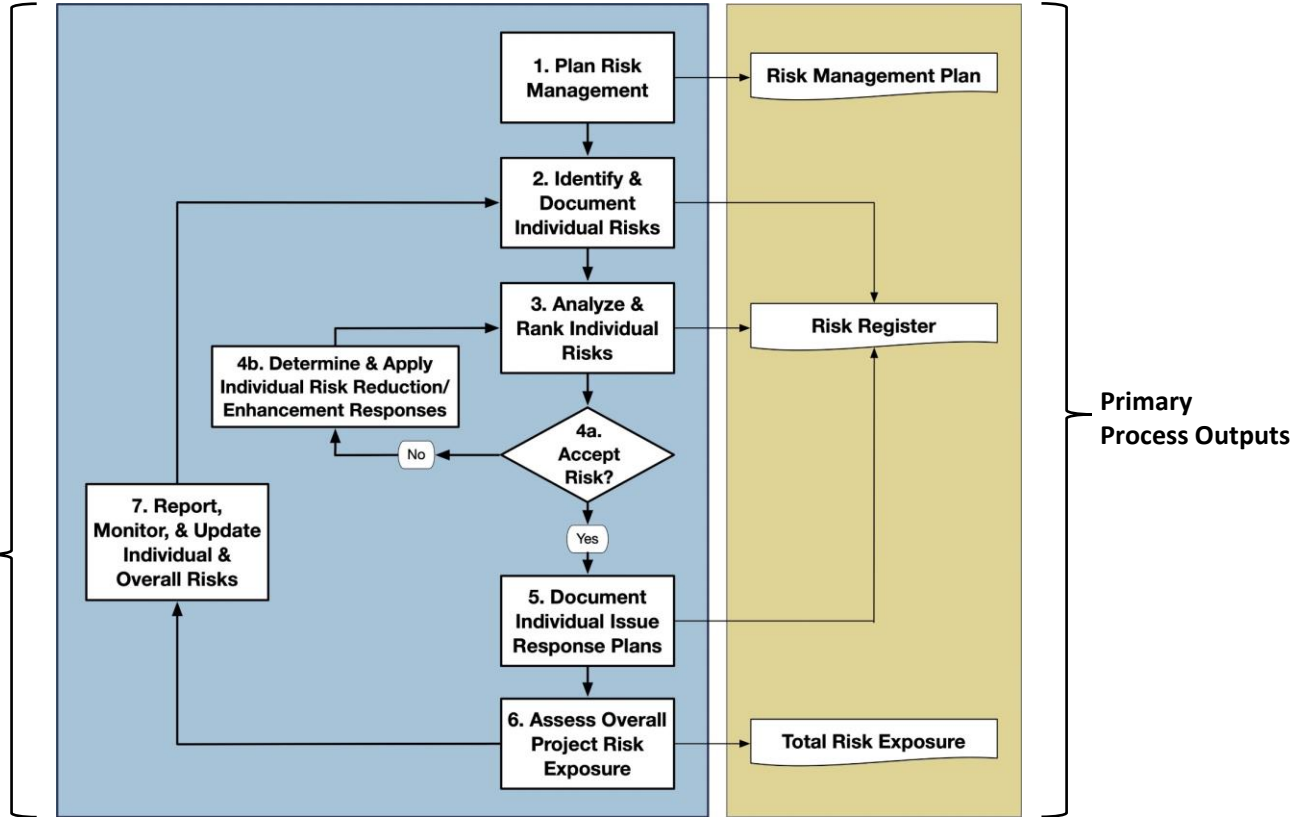
The Risk Management Process

RIG Revisions: Revised & Improved Risk Management Process



Current RIG Risk Management Process

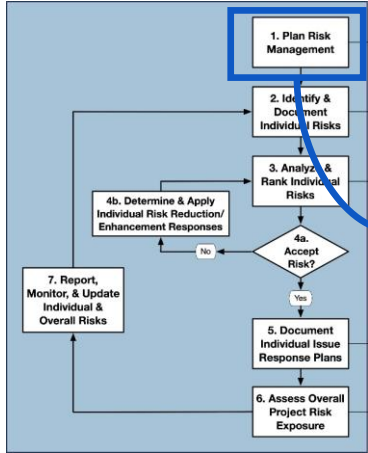
New/Revised 7-Step Risk Management Process





Risk Management Process – Step 1

RIG Revisions: Describe minimum required elements of an RMP



• What Is This Step?

- Create a documented & approved approach to identify, analyze, respond to, and communicate project risks.

• Why Is This Step Important?

- Risks are real and ever-present throughout RI lifecycle stages—*hope is not a viable strategy!*
- Ensures proactive, systematic, & comprehensive plan to address threats & opportunities that can impact project.
- Provides clear communication, understanding, and accountability – i.e., manages stakeholder expectations!
- Improves a project’s chances of success!

• How To Do This Step:

- Establish the overall goals, approaches, & tolerance (i.e., “appetite”) to risk.
- Establish risk management process/framework, tools, cadences for steps, document templates/formats, etc...
- Establish & assign risk management roles & responsibilities...

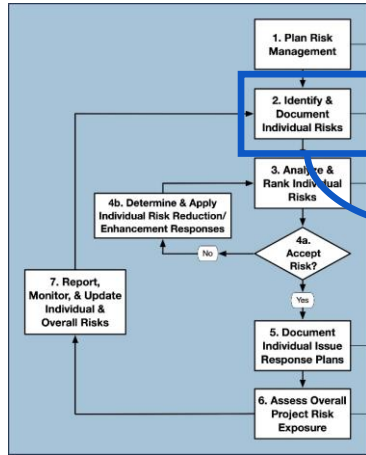
Tailor and Scale (T&S)

Risk Management Plan to the size, complexity, & characteristics of the RI Effort!



Risk Management Process – Step 2

RIG Revisions: Establish requirements & guidance for identification & documentation



- **What Is This Step?**
 - Systematically identify and capture all relevant threats and opportunities.
- **Why Is This Step Important?**
 - Failing to properly identify all relevant risks can result in significant unforeseen (and often avoidable) impacts to project success: scope, quality, schedule, budget, & stakeholder satisfaction/expectations.
- **How To Do This Step:**
 - Create a Risk Register to capture identified risks: Risk ID#, Title, WBS-element, Ownership, “If-Then” Statement, Trigger Date...
 - Systematically Identify Risks: by WBS, by Phase, by Type/Category...
 - State risk properly: e.g., ***“if bad weather occurs on launch day, then we will scrub/delay the launch, which will cause a slip in the critical path and add unbudgeted costs (e.g., de-fueling, re-transport of rocket...)”***

Risk Register Spreadsheet

Risk ID	Risk Title	WBS Element	Risk Owner	Risk Status	Risk Description Risk Statement	Trigger Date	Probability of Occurrence		Impact of Occurrence		Risk Exposure		Notes-Comments-History
							Qualitative	Quantitative (%)	Qualitative	Quantitative (\$)	Qualitative	Quantitative (\$)	
001	Adverse Weather Event on Day of Transport.	1.3.1	Mark	Open	There is a possibility of inclement weather delaying transport of the widget to the construction site. If this happens, then it would delay installation of the widget into the facility, which pushes the project end date out, costing time, money, and stakeholder frustration.	June 1	Moderately Likely	50%	Major	\$300,000	High	\$150,000	3/3/2021: We've reviewed this risk with Khalid, Sally, & Joe. We recognize we have no control over the probability of a weather event, and then impact is fixed by marching army costs. We also looked at accelerating the delivery, but the vendor assures us they can't finish before the scheduled FOB date in contract
002	Widget Failure During Test.	1.2.4	Stacey	Open	There is a high likelihood the state-of-art widget will fail the first time we test it. If this happens, then it could clog the downstream equipment, causing a shut-down of the entire system.	July 9	Very Likely	90%	Minor	\$10,000	Medium	\$9,000	4/4/2020: this isn't a very serious risk, as the widget test is not on the critical path, and we have a lot of schedule float. This will need to be dealt with if happens, so perhaps we can purchase a backup widget now so impact is minimized.
003	Union-Strike Stops Work.	1.5.5	Rex	Closed	There is a possibility the labor union will strike- if this happens, then it would shut-down construction site until the situation is resolved	Jan-15	Unlikely	10%	Major	\$300,000	Medium	\$30,000	10/4/2020- Union vote date is the trigger date- We will meet with union rep and offer bonus pay- 10/22/2020- We met with union and they expect low probability. 11/6/2021- Union voted not to strike- Risk can be re-ited.

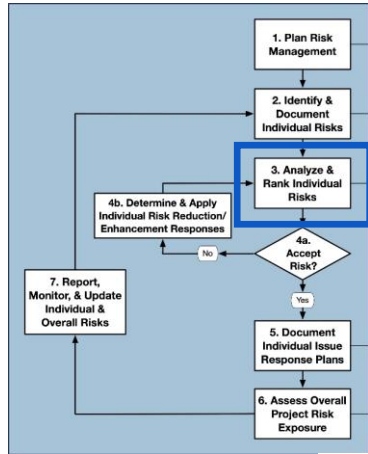
Risk Categories





Risk Management Process – Step 3

RIG Revisions: Clarify process for analyzing risks – qualitative and quantitative



• What Is This Step?

- Estimate the individual Risk Exposure (\$, Schedule); a/k/a the “importance” of each identified risk.

• Why Is This Step Important?

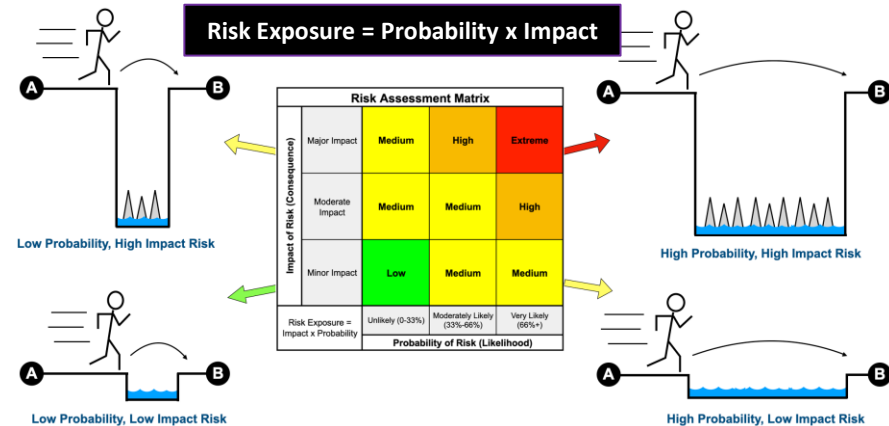
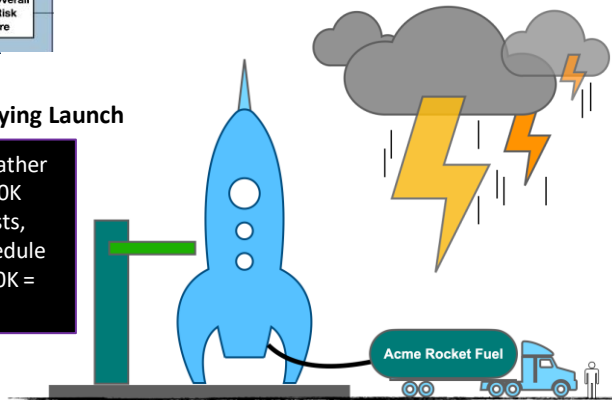
- Ranking helps focus limited resources on responding to most consequential/important risks.
- Helps establish & justify required project contingency.

• How To Do This Step:

- Estimate the likelihood (i.e., **probability** (%)) of the risk occurring.
- Estimate the consequence (i.e., **impact** (\$, schedule)) if the risk occurs.
- Calculate the resulting risk exposure: **Exposure = Probability x Impact**.

Risk Exposure of Storm Delaying Launch

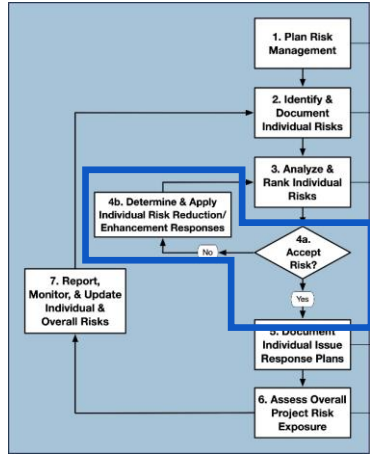
15% Chance of Bad Weather on Launch Day x \$500K Impact (defueling costs, transport, storage, schedule slippage) = 0.15 x \$500K = \$75,000.





Risk Management Process – Step 4

RIG Revisions: Describe process for responding to threats & opportunities



• What Is This Step?

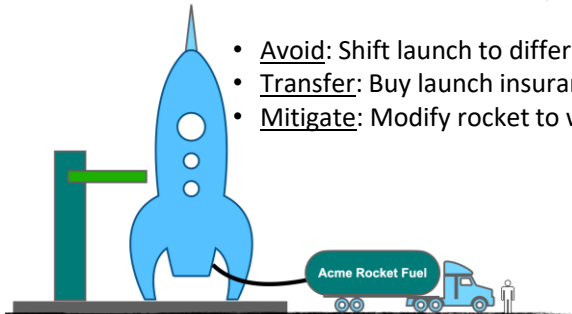
- Determine & apply risk reduction responses to lower the threat probability and/or impact.
- Determine & apply risk enhancement responses to increase the opportunity probability and/or impact.

• Why Is This Step Important?

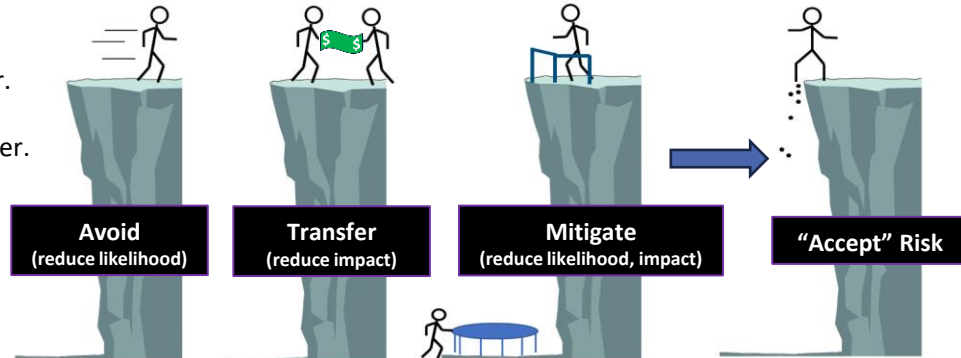
- Proactively addressing risks can greatly improve chances of project success
- Ignoring identified risks is akin to not identifying them at all....

• How To Do This Step:

- Develop/determine possible risk responses for each identified risk.
- Evaluate cost-versus-benefit of risk responses
- Apply as appropriate until risk can/should be “accepted.”



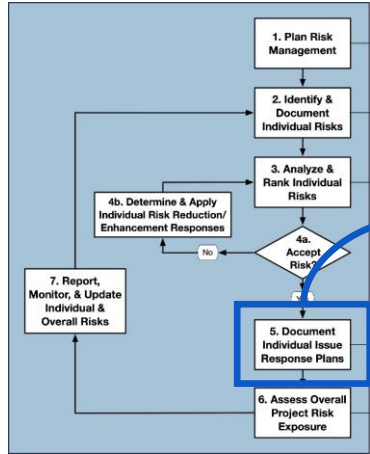
- Avoid: Shift launch to different/more-benign time of year.
- Transfer: Buy launch insurance.
- Mitigate: Modify rocket to withstand more severe weather.





Risk Management Process - Step 5

RIG Revisions: Added issue response step to the risk management process



• What Is This Step?

- Determine how the project will respond if the risk is realized.
- **Note:** Issue Responses \neq Risk Responses!
 - **Risk Response:** The Act of Modifying the Probability and/or Impact of a Possible Future Event.
 - **Issue Response:** What the Project Team Will Do if the Risk is Realized.

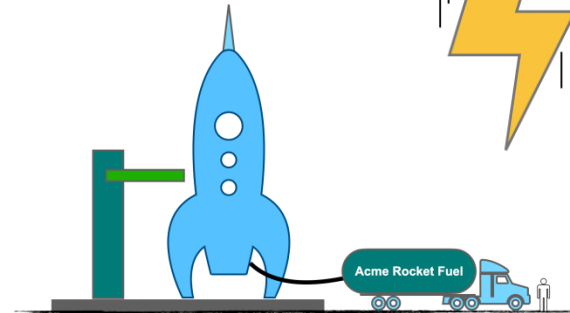
• Why Is This Step Important?

- Helps project team think through full risk event and inform other project elements.
 - *“Plans are useless, planning is essential.”*
- Helps estimate risk impacts (performance, cost, schedule).

• How To Do This Step:

- Brainstorm “what-if?” scenarios with team.
- Document plans; link from Risk Register; communicate to stakeholders.

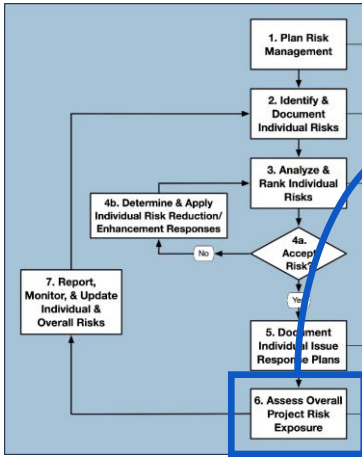
Issue Response Summary: *“If a storm arrives at the site on launch day, we will de-fuel the rocket, move it to a safe location, and transition its state from launch mode to temporary-storage mode. We will also need to move the team onto other work to keep them engaged while we wait for another launch opportunity, readjust the schedule, and release contingency monies to pay for these impacts.”*





Risk Management Process – Step 6

RIG Revisions: Clarified different allowable types of risk exposure calculations



- **What Is This Step?**
 - Estimate the overall/entire project’s risk exposure level as a whole.
- **Why Is This Step Important?**
 - Provides justification for and basis of required project contingency.
- **How To Do This Step:**
 - Select appropriate exposure estimation method and apply (i.e., tailor & scale approach).
 - If possible, double check results with a second, independent method.

Parametric: E.g., Risk Factor Analysis

Description of Area's Technical Type or Status	Technical Uncertainty Factor
No technical risk	0%
Existing, previously built design that uses commonly-available off-the-shelf hardware	1%
Minor modifications to an existing design that has been previously built	2%
Minor modifications to an existing design that has been previously built	2%
Minor modifications to an existing design that has been previously built	3%
Minor modifications to an existing design that has been previously built	4%
Minor modifications to an existing design that has been previously built	6%
Minor modifications to an existing design that has been previously built	8%
Minor modifications to an existing design that has been previously built	10%
Minor modifications to an existing design that has been previously built	15%

Description of Area's Cost Estimate Methodology	Cost Uncertainty Factor
No cost risk	0%
Firm-fixed price contract in place	1%
Off-the-shelf catalog item	1%
Vendor quote created from detailed SCW and/or Vendor quote from established drawings & specs	2%
Vendor quote from detailed drawings	2%
Vendor quote within 180 days, created from design sketches	3%
Professional estimator's estimate within past 180 days using established drawings, specs, designs	3%
Engineering judgement based on strong experience or record history or by Subject Matter Expert (SME)	4%
In-house estimate with minimal experience	6%
Cost plus contract in place	6%
Vendor quote that is 180-360 days old	7%
Vendor RCM estimate	8%
In-house estimate for item with minimal company experience or capability	8%
Vendor quote that is greater than 1 year old	8%
Non-cost estimate from an analogous program or project	10%
Engineering RCM Estimate	15%

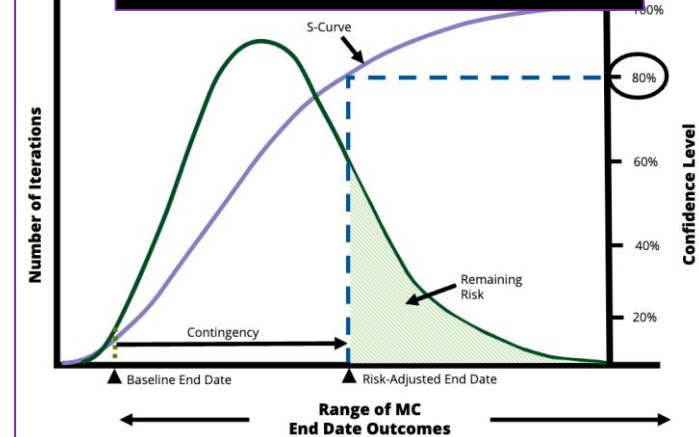
Description of Area's Schedule Estimate Methodology	Schedule Uncertainty Factor
No schedule risk	0%
No schedule impact on any other item or activity	2%
Slippage of this element would delay completion of another, non-critical path item (<120 days of float)	4%
Slippage of this element would delay completion of another, near-cp path item (<120 days of float)	6%
This item is on the project's critical path.	15%

Schedule Multiplier	Schedule Multiplier
1	1

Algorithmic: e.g., Sum Exposures From Risk Register

Risk ID	Risk Title	Risk Description	ESTIMATED Risk Probability	ESTIMATED Cost Impact	ESTIMATED Schedule Impact	Exposure (Probability x impact)	RISK Exposure (Probability x impact)
001	Weather Event	If a severe weather event disrupts transportation, then delivery will be delayed, resulting in schedule delay but no cost increase.	25%		4 weeks		1 week
002	Widget Failure	If the widget fails during testing, then a replacement will need to be found, resulting in cost and schedule increases.	10%	\$50,000	12 weeks	\$5,000	1.2 weeks
003	Gizmo Cost Estimate Uncertainty	Cost uncertainty estimated at 35% of baseline cost of \$128,000, due to design maturity at conceptual level.	15%	\$44,800		\$6,720	
Total Risk Exposure Sum =						\$11,720	2.2 weeks

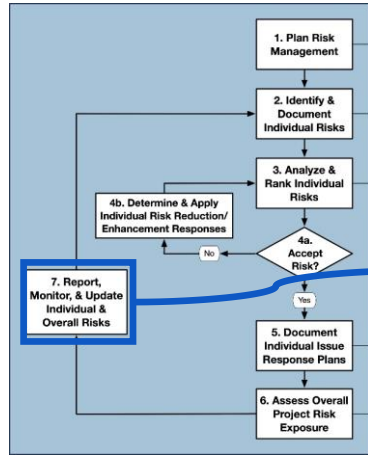
Probabilistic: e.g., Monte Carlo Simulations





Risk Management Process – Step 7

RIG Revisions: Reiterate importance of “Rinse & Repeat!”



• What Is This Step?

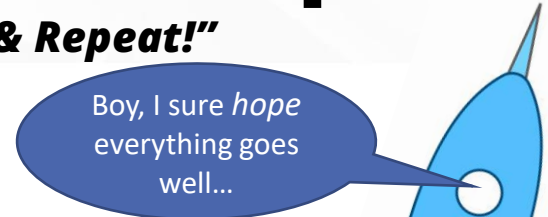
- Periodically report on risk status to stakeholders.
- Regularly monitor & update risks; e.g., identify new risks, update and/or retire existing risks as required

• Why Is This Step Important?

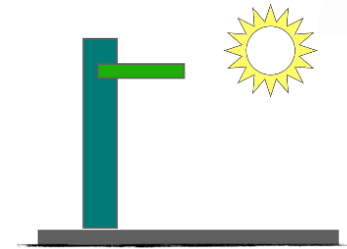
- Risks are ever-present and change with time.
- Staying on top of the risk situation is a critical aspect to ensuring project success.

• How To Do This Step:

- (Set up frequencies and formats of reporting.)
- Use a systematic approach to monitoring existing risks & identifying/analyzing/responding-to new risks.
- Rinse and repeat...



Boy, I sure *hope* everything goes well...





Hope is Not a Strategy!

Risk Management Revisions in the NextGen RIG



Summary

- Consolidating relevant material
- Clarifying and streamlining the *Risk Management* section
 - 7-step process
 - 3 outputs
- Enhancing guidance in the *Project Execution Plan (PEP)* on risk management.
- Separating *Contingency Estimating and Management* into own section.

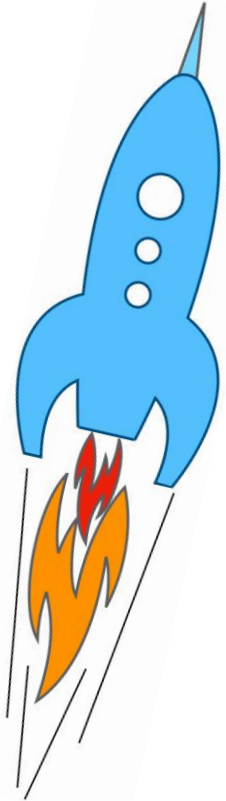


Note

- No new requirements, only enhanced guidance.
- Existing Risk Management Plans do not need to be updated; however, you are welcome to be progressively "improve" it.



Hope is Not a Strategy!



Questions?

arockwel@nsf.gov

