Risk, Issues and Lessons Learned: Maximizing Risk Management in the DoD Ground Domain

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Lisa Graf - TARDEC Systems Engineering

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Standard Form 298 (Rev. 8-98) Prescribed by ANSI Std Z39-18
Why do Risk Management?

“There is only one reason for risk management:
To assure the program decision-makers learn about and
deal with important risks before they turn into issues”.
- Carnegie Mellon University “Risk Management Overview for TACOM”

Benefits of Risk Management include:
• Risk is a proactive approach - preventing problems before they occur. Issue management is a reactive approach – fixing issues that exist.
• Understanding your risks and putting measures in place to prevent issues – doing it right the first time.
• Minimize or prevent cost overruns, schedule delays, and performance problems
• Product and design quality are improved.
• Maximizing usage of resources.
• Promoting teamwork and system engineering.
• Communication to stakeholders and decision makers.
Current State of Risk Management

• Failure Mode and Effects Analysis (FMEAs) may or may not be required by contract and access to them and use of them may be limited.

• Risks are tracked in a database or spreadsheet.

• Issues are tracked in a database or spreadsheet.

• There is no acknowledged Army wide way to capture lessons learned effectively.

There is no traceability or linkage from FMEAs, to risks, issues or lessoned learned.
Why Is an Integrated Risk Approach So Important?

Taking an integrated approach to risk management is a way to:

• Shorten design time
• Avoid program mistakes
• Prevent cost overruns
• Avert schedule delays
• Maximize usage of resources.
• Deliver a higher quality system to the warfighter
• Do it right the first time!
Integrated Risk Management

FMEA
Failure Mode and
Effects Analysis

Fields from FMEA
software pre-populate
Risk Info sheet.

Risk Mitigation from
Risk Recon trace back
and populate FMEA,
new RPN numbers.

Risk Recon

An issue’s corrective action
plan or path forward will
likely have new associated
risks, which can be
entered and traced back to
original risk in Risk Recon.

When a risk becomes
an issue, user can
create an issue in the
database and track the
corrective action plan.

Issue Database

Tie all systems
together and have one
searchable lessons
learned database.

Lessons Learned
Integrated Risk Management

**FMEA**

*Failure Mode and Effects Analysis*

- Fields from FMEA software pre-populate Risk Info sheet.

**Risk Recon**

- Risk Mitigation from Risk Recon trace back and populate FMEA, new RPN numbers.
- An issue’s corrective action plan or path forward will likely have new associated risks, which can be entered and traced back to original risk in Risk Recon.

- When a risk becomes an issue, user can create an issue in the database and track the corrective action plan.

**Issue Database**

- Tie all systems together and have one searchable lessons learned database.

**Lessons Learned**
Why risk management starts with a FMEA…

• Failure mode and effect analysis (FMEA) is an analysis of all potential failure modes within a system.

• A FMEA can be performed on a system, subsystem, or the components of a system/subsystem.

• FMEA is used as a foundation for root cause analysis of design/process/system failures.

• FMEA are best conducted using a cross functional group of subject matter experts (SMEs).

• FMEAs should be required for systems or subsystems via the contract. They should be readily accessible and usable by the government.
Types of FMEAs

• **Design FMEA (DFMEA)**: Identifies how a product can fail to do what it was designed to do or why it does things it should not do.

• **Process FMEA (PFMEA)**: Identifies the possibilities of incorrectly manufacturing or assembling a product.

• **Program FMEA**: Identifies potential failure modes in a non-technical process (business systems, procurement processes, hiring practices – any process not describing a product or the manufacturing, assembly or integration of that product).

• **Applicable Standards**:
  - SAE J-1739: Automotive Industry
  - SAE ARP-5580: Aerospace Recommended Practice
How do you create a FMEA?

• Start with a known program element:
  • Bill of Materials (BOM)
  • Work Breakdown Structure (WBS)
  • Parameter Diagram (P-Diagram)
  • Process Workflow
**Bill of Materials**

<table>
<thead>
<tr>
<th>Components</th>
<th>Material</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0 Writing System</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.1 BIC Clic Stic Pen</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.1.1 Housing Assembly</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.1.1.1 Plug Assembly</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.1.1.1.1 Clip</td>
<td>ABS/PP</td>
<td>1</td>
</tr>
<tr>
<td>1.1.1.1.2 Plunger Cap</td>
<td>ABS/PP</td>
<td>1</td>
</tr>
<tr>
<td>1.1.1.1.2.1 Plunger Cap</td>
<td>ABS/PP</td>
<td>1</td>
</tr>
<tr>
<td>1.1.1.1.2.2 Female Plunger</td>
<td>ABS/PP</td>
<td>1</td>
</tr>
<tr>
<td>1.1.1.1.2.3 Male Plunger</td>
<td>ABS/PP</td>
<td>1</td>
</tr>
<tr>
<td>1.1.1.2 Nib</td>
<td>ABS/PP</td>
<td>1</td>
</tr>
<tr>
<td>1.1.1.3 Barrel</td>
<td>ABS/PP</td>
<td>1</td>
</tr>
<tr>
<td>1.1.1.4 Spring</td>
<td>Steel</td>
<td>1</td>
</tr>
<tr>
<td>1.1.2 Ink Assembly</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.1.2.1 Tube</td>
<td>ABS/PP</td>
<td>1</td>
</tr>
<tr>
<td>1.1.2.1.1 Blue Ink</td>
<td>Ink</td>
<td>.1 grams</td>
</tr>
<tr>
<td>1.1.2.2 Metal Tip</td>
<td>Brass</td>
<td>1</td>
</tr>
<tr>
<td>1.1.2.3 Ball</td>
<td>Tungsten Carbide</td>
<td>1</td>
</tr>
</tbody>
</table>
WBS for a Retractable Pen

Writing System 1.0

BIC Clic Stic Pen 1.1

System Engineering / Project Management 1.2

System Test & Evaluation 1.3

Training 1.4

Housing Assembly 1.1.1

Barrel 1.1.3

Spring 1.1.4

Nib 1.1.2

Plunger Assembly 1.1.1.2

Plunger Cap 1.1.1.2.1

Female Plunger 1.1.1.2.2

Male Plunger 1.1.1.2.3

Clip 1.1.1.1

Plug Assembly 1.1.1.1

Ink Assembly 1.1.2

Tube 1.1.2.1

Metal Tip 1.1.2.2

Ball 1.1.2.3

Blue Ink 1.1.2.1.1

Equipment 1.4.1
### Parameter (P) Diagram

<table>
<thead>
<tr>
<th>NOISE 1: Piece to Piece</th>
<th>NOISE 2: Change Over Time</th>
<th>NOISE 3: Customer Usage</th>
<th>NOISE 4: External Environment</th>
<th>NOISE 5: System Interaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimensional (interference with tip)</td>
<td>Ink running low</td>
<td>Too much pressure on the ball point</td>
<td>Humidity (corrosion of point)</td>
<td>Writing surface (not enough friction)</td>
</tr>
<tr>
<td>Material discrepancies</td>
<td>Ink drying out</td>
<td>Not enough pressure on the ball point</td>
<td>Drying of ink around point</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Unintended usage (pushing buttons, etc.)</td>
<td>Viscosity of ink (too thick/runny)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>INPUT SIGNAL</th>
<th>SUB-SYSTEM</th>
<th>IDEAL FUNCTION</th>
<th>ERROR STATES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ink flows from tube</td>
<td>Ball Point</td>
<td>Ink transmits to paper</td>
<td>No ink transmits to paper</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Ink leaks out unintentionally</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CONTROL FACTORS</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Amount of ink flowing</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Use proven, thorough approaches to describe all the elements of the process. Work Breakdown Structures and Process Maps are popular tools for this purpose.

**Process Flow Diagram**

Output
Hot dog ready for bun placement

1. Remove hot dog from grill
   Inputs
   • Grill (hot)
   • Hot dog (cooked)
   • Tongs (min 10 inch length)

Output
Completed hot dog sub-assy

2. Place hot dog in bun
   Inputs
   • Bun (fresh)
   • Hot dog (still hot)
   • Tongs (min 10 inch length)

Output
Hot dog ready to eat

3. Add condiments
   Inputs
   • Ketchup (Heinz)
   • Mustard (yellow)
   • Onions (chopped)
   • Chili (no beans)
   • Hot dog sub-assy
How does the FMEA work?

Execute the analysis and discover the potential failures and effects, their causes, and ultimately what to do about it.

<table>
<thead>
<tr>
<th>Item or step from WBS, Process Map, or other</th>
<th>Process step function / requirements</th>
<th>Potential Failure Mode</th>
<th>Potential Failure</th>
<th>Potential Causes / Mechanisms of Failure</th>
<th>Occurrence</th>
<th>Current Process Controls Prevention</th>
<th>Current Process Controls Detection</th>
<th>Effect</th>
<th>R.P.M.</th>
<th>Recommended Actions</th>
<th>Responsibility &amp; Target Completion Date</th>
<th>Action Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Remove hot dog from grill</td>
<td>Hot dog is not “ready”</td>
<td>Delay: customer hungry</td>
<td>Grill is not hot</td>
<td>1</td>
<td>None</td>
<td>Temperature gauge on grill</td>
<td>1</td>
<td>7</td>
<td></td>
<td>G. Ratyczak One week prior to BBQ</td>
<td>Shopping list and RSVP list kept together, updated as guests call in</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Hot dog is not hot enough (not cooked)</td>
<td>4</td>
<td>None</td>
<td>Use grill marks to indicate fully cooked status</td>
<td>2</td>
<td>56</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Hot dog is overcooked (burned)</td>
<td>6</td>
<td>None</td>
<td>Use grill marks to indicate fully cooked status</td>
<td>2</td>
<td>84</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Hot dog is not present</td>
<td>Major delay: Customer hungry, angry</td>
<td>Insufficient hot dog supplies, ran out</td>
<td>Educated guess on needs</td>
<td>None</td>
<td>10</td>
<td>630</td>
<td>Match hot dog count to guest list and update shopping list</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Hot dog not in bun</td>
<td>Delay: Re-Work or get new hot dog</td>
<td>Operator error, misaligned bun</td>
<td>Handiway coordination</td>
<td>None</td>
<td>2</td>
<td>14</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Hot dog incorrectly positioned in bun</td>
<td>Customer will have difficulty eating, or may have to adjust hot dog manually</td>
<td>Operator error, poor placement</td>
<td>Handiway coordination</td>
<td>None</td>
<td>2</td>
<td>20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Place hot dog in bun</td>
<td>Hot dog not in bun</td>
<td>Delay: Re-Work or get new hot dog</td>
<td>Operator error, misaligned bun</td>
<td>1</td>
<td>Handiway coordination</td>
<td>None</td>
<td>2</td>
<td>14</td>
<td></td>
<td></td>
<td></td>
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<td>Operator error, poor placement</td>
<td>Handiway coordination</td>
<td>None</td>
<td>2</td>
<td>20</td>
<td></td>
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</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Hot dog does not meet end of line requirements (condiments missing)</td>
<td>Minor delay: more work needed</td>
<td>Favorite condiment not available (not present)</td>
<td>None</td>
<td>None</td>
<td>10</td>
<td>150</td>
<td>Use list while shopping to minimize mistakes/missing items</td>
<td>G. Ratyczak Two days prior to BBQ</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
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<td>Minor delay: more work needed</td>
<td>Favorite condiment not available (not present)</td>
<td>None</td>
<td>None</td>
<td>10</td>
<td>150</td>
<td>Use list while shopping to minimize mistakes/missing items</td>
<td>G. Ratyczak Two days prior to BBQ</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Hot dog does not meet end of line requirements (condiments missing)</td>
<td>Minor delay: Scrap hot dog, start over</td>
<td>Wrong condiment added to hot dog</td>
<td>None</td>
<td>None</td>
<td>10</td>
<td>810</td>
<td>Do not apply condiments until customer is present</td>
<td>G. Ratyczak Day of BBQ</td>
</tr>
</tbody>
</table>

Unclassified
How does the FMEA work?

9 x 9 x 10 = 810 !!!

The analysis says this failure, along with its severe effect, is not only likely to happen, but we currently have no way to deal with it!
I can’t address every failure – only the most important ones. Where do I draw the line? How do I decide where to focus resources?
How do you know if the FMEA is Done Properly?

- Is every failure possibility you can think of included in the FMEA?

- Is every component or part or process step included in the FMEA?

- Is every subsystem and its interaction to the larger system accounted for in the FMEA?

- Are the effects of the integration of this component or subsystem to the larger whole (vehicle level, system level, SoS level, etc.) taken into account?
How Can a FMEA Help My Program?

• A DFMEA provides robustness of design.

• A PFMEA provides robustness of process.

• A FMEA reused from a previous program reduces the design time for the system.

• Potential failure modes are identified early in the program and can be dealt with up front, rather than detected later.

• FMEAs can be used to determine the root cause of system or part failures, once fielded!!!
### Root Cause Analysis

**System:** A/C Condenser Fan System  
**Subsystem:** A/C Condenser Fan  
**Component:**  
**Model Year / Vehicle(s):**  
**Core Team:**  
**Support:**

<table>
<thead>
<tr>
<th>Item</th>
<th>Potential Failure Mode</th>
<th>Potential Effects of Failure</th>
<th>Severity</th>
<th>Potential Causes / Mechanisms of Failure</th>
<th>Occurrence</th>
<th>Current Controls</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Complete loss of airflow</td>
<td>8</td>
<td>[1.1.1] Loss of source current / voltage - Blown fuse - Broken wire</td>
<td>4</td>
<td>Yuma - Test vehicle</td>
</tr>
<tr>
<td>[1]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Partial loss of airflow</td>
<td>3</td>
<td>[1.1.2] Over-voltage / Transients</td>
<td></td>
<td>FW 3 - Electrical Requirements and characterization</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>FW 4 - Body Fan Requirement validation</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Yuma - Test vehicle</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>New Yuma - Test vehicle</td>
</tr>
<tr>
<td>[1.1.3]</td>
<td>Control circuit malfunction</td>
<td></td>
<td>5</td>
<td></td>
<td></td>
<td>FW 3 - Electrical Requirements and characterization</td>
</tr>
<tr>
<td>[1.1.4]</td>
<td>Mechanical impedance/obstruction that either slows or stops the rotation of the impeller (internal/external contamination)</td>
<td></td>
<td>6</td>
<td></td>
<td></td>
<td>DTL 1 - Hot Clean</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>DTL 2 - Hot + Dust</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>DTL 3 - Hot + Imbalance</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>DTL 4 - Hot + Dust + Read lead / Resonance</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>FW 5 - Fan imbalance cycling</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>FW 2 - Dust</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Yuma - Test vehicle</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>New Yuma - Test vehicle</td>
</tr>
</tbody>
</table>

**Acquisition Excellence**
Benefits of FMEAs

• Prevent major risks, reduce failures, minimize cost and reduce development time - Do it right the first time.

• FMEA prioritizes the actions that should be taken to reduce risk. It also highlights where further actions would result in further risk reduction.

• FMEA is an important tool of reliability and maintainability analysis. Reliability increases when risk is mitigated.

• Aids in root cause analysis, failure investigation, and finding corrective actions.

• FMEA Provides a repository for lessons learned, best practices, and sharing of technical knowledge which can be used in other programs.
Integrated Risk Management

FMEA
Failure Mode and Effects Analysis

Risk Mitigation from Risk Recon trace back and populate FMEA, new RPN numbers.

Risk Recon

An issue’s corrective action plan or path forward will likely have new associated risks, which can be entered and traced back to original risk in Risk Recon.

When a risk becomes an issue, user can create an issue in the database and track the corrective action plan.

Issue Database

Tie all systems together and have one searchable lessons learned database.

Lessons Learned

Fields from FMEA software pre-populate Risk Info sheet.

Unclassified
What is a Risk?

• A risk is a potential failure mode that is likely to occur in the future.

• Usually characterized in terms of impact on a program’s cost, schedule and performance.

• Rated in terms of:
  • Likelihood – Probability of occurrence
  • Consequence – Impact to the program is the risk becomes an issue.

• Usually states as an “IF this happens THEN this MAY happen…”
DoD Risk Management

RISK DOCUMENTATION

What project/program requires Risk Management?
- Identify baseline for cost, schedule and performance for the project/program.
- Create Risk Management Plan for the project/program.
- Assign roles and responsibilities for the project/program.
- Complete risk training for the project/program’s Risk IPT.

What can go wrong?
- Study WBS, SOW, IMP/IMS, EVM.
- Lessons learned.
- Review IPTs’ areas of responsibility.
- Ask “why” multiple times.

What will you do about it?
- Eliminate the root cause.
- Control the root cause or consequence.
- Transfer the risk.
- Assume the level of risk.

How is the planned risk mitigation being implemented?
- Determine planning what budget & requirements needed.
- Provide a coordination vehicle with management, etc.
- Document changes.

How are things going?
- Communicate risks.
- Monitor risks plans.
- Review status through event driven technical reviews and a risk review board.
- Review watch risks.

How big is the risk?
- Consider likelihood of root cause occurrence.
- Identify consequences in (Cost, Schedule, and Performance).

This is a iterative process for new risks.
# Risk Mitigation Approaches

<table>
<thead>
<tr>
<th>Method</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Avoid:</strong></td>
<td>Develop a strategy to avert the likelihood and/or consequence by selecting a different approach or not pursuing the option at all. Consider this technique when multiple design or programmatic options are available (sometimes “eliminate”).</td>
</tr>
<tr>
<td><strong>Transfer:</strong></td>
<td>Develop a strategy to place the risk with the party most able to do something about it.</td>
</tr>
<tr>
<td><strong>Assume:</strong></td>
<td>Accept consequences of the risk, with frequent monitoring to determine if the risk actually occurs, and that the impact is as predicted (and is tolerable) if it does. Also known as accept.</td>
</tr>
<tr>
<td><strong>Control:</strong></td>
<td>Develop a strategy to lower the risk by reducing its likelihood, consequence, or both components with tasks in the IMS. This approach is sometimes referred to as handle or mitigate.</td>
</tr>
<tr>
<td><strong>Watch:</strong></td>
<td>Monitor and periodically re-evaluate the risk for change.</td>
</tr>
</tbody>
</table>
**Consequence Guidance**

(Available in Risk Recon under “Help” and “Tip Sheet”)

---

**Consequence Table**

<table>
<thead>
<tr>
<th>Rating/Description</th>
<th>Performance</th>
<th>Cost</th>
<th>Schedule</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 (Catastrophic) - Jeopardizes an exit criterion of current acquisition phase</td>
<td>Unacceptable; No viable alternatives exist</td>
<td>Program budget impacted by 10% or more; Program success jeopardized</td>
<td>Key events or milestones delayed by more than one month</td>
</tr>
<tr>
<td>4 (Critical) - Potentially fails Key Performance Parameter (KPP)</td>
<td>Unacceptable; Significant changes required</td>
<td>Program budget impacted by 5%-10%. Significant portion of program management reserves must be used to implement workarounds</td>
<td>Critical path activities 2 weeks late; Workarounds would not meet milestones; Program success in doubt</td>
</tr>
<tr>
<td>3 (Moderate)</td>
<td>Below goal; Moderate changes required; Alternatives would provide acceptable system performance; Limited impact on program success</td>
<td>Budget impacted by 1%-5%; Limited impact on program success; Does not require significant use of program cost and/or schedule reserves</td>
<td>Non-critical path activities one month late; Workarounds would avoid impact on critical path. Limited impact on program success</td>
</tr>
<tr>
<td>2 (Marginal)</td>
<td>Below goal but within acceptable limits; No changes required; Acceptable alternatives exist; Minor impact on program success</td>
<td>Budget impacted by 1% or less; Minor impact on program success; Minor commitment of program management reserves (schedule, cost) used for workarounds</td>
<td>Non-critical path activities late; Workarounds would avoid impact on key and non-key milestones; Minor impact on program success; Development schedule goals exceeded by 1%-5%</td>
</tr>
<tr>
<td>1 (Negligible)</td>
<td>Requires minor performance trades within the threshold - objective range; No impact on program success</td>
<td>Budget not dependent on the issue; No impact on program success, Cost increase can be managed within program plan</td>
<td>Schedule not dependent on issue; No impact on program success; Schedule adjustments managed within program plan</td>
</tr>
</tbody>
</table>

---

**Terms and Definitions**

**Risk**
A measure of future uncertainties in achieving program performance goals and objectives within defined cost, schedule and performance constraints. Risk addresses the potential variation in the planned approach and suspected outcome.

**Issue**
An event that has already occurred or has 100% likelihood of occurring.

**Likelihood**
Probability that the risk will occur (based on ratings 1-5).

**Consequence**
Effect or impact on the program if risk becomes an issue (based on ratings 1-5).

---

“Knowing our risks provides opportunities to manage and improve our chances of success.”

— Roger Vanscoy
Likelihood Guidance
(Available in Risk Recon under “Help” and “Tip Sheet”)

Risk Recon Website:
https://peoportalap.tacom.army.mil/riskmgmt
POCs: Lisa.Graf@us.army.mil
         George.Wiklund@us.army.mil

Risk Information Sheet

Description of Risk Condition
State the risk in one clear and concise sentence, creating an “IF...THEN...MAY” statement or a brief description.

Context

Consequence
What are the impacts to the program in terms of Cost, Schedule, Performance or Other if this risk becomes an issue.

Mitigation Plan
This is the detailed mitigation plan - what will be done to mitigate the risk. List steps with due dates, owners and impact to the risk.

CloseOut Rationale
List the agreed upon details for closing this risk - who agreed to close it at what meeting, date and for what reasons.

Likelihood - Probability Levels and Indicators

5 (Near Certainty) - Assume & anticipate occurrence (>90%) Approach and processes cannot mitigate risk; Immature technology; System very complex
4 (Highly Likely) - Very high chance of occurrence (>65% to 90%) Approach and processes not well documented; Technology available but not validated
3 (Moderate) - Significant chance of occurrence (>40% to 65%) Approach and processes are partially documented; Un-validated technology has been shown to be feasible by analogy, test, or analysis
2 (Low Likelihood) - Occurrence possible but less than likely (10% to 40%) Current approach and processes understood & documented; most technology has been validated
1 (Not Likely) - Occurrence is possible but very unlikely (<10%) Approach and processes are well understood and documented

UNCLASSIFIED: Dist A. Approved for public release. #20815
What is Risk Recon?

Risk Recon is a risk management tool jointly developed by Program Executive Office (PEO) Ground Combat Systems (GCS) and the Tank Automotive Research, Development and Engineering Center (TARDEC) for risk management.

The tool provides an easily accessible database for PEO, PMs and organizations to store and share information in one centralized location. This provides greater opportunity for lessons learned.

For more information go to https://peoportalap.tacom.army.mil/riskmgmt and click on the Help Menu to email the Risk Recon help desk to get more information on how to get your program set-up to use this free tool.
### Risk Recon - Detailed Risk Report (FOUO)

#### HBCT Test Org / HBCT Test PMO / HBCT Training / HBCT Training / test three

<table>
<thead>
<tr>
<th>Status</th>
<th>Con/Lik</th>
<th>Impact</th>
<th>Risk Title</th>
<th>Description of Risk Condition</th>
<th>Context</th>
<th>Consequence if Realized</th>
<th>Mitigation - Rational for Choosing that Mitigation Plan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>4/4</td>
<td>C/S/P</td>
<td>Hitting a deer</td>
<td>IF a driver hits a deer THEN their new car MAY be damaged.</td>
<td>Ths is a potential of hitting a deer.</td>
<td>Damage to a car.</td>
<td>1. Add additional fog lamps to vehicle by Jan. 1, 2010</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2. Add anti-deer sound emitting devise to vehicle</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3. Avoid roads at night and counter daylight risk with anti-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>deer sound emitting devise to vehicle</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Mitigation Plans include:</td>
</tr>
<tr>
<td>Baseline</td>
<td>4/2</td>
<td>C/S/P</td>
<td>Training Example - Loss of Power in Thunderstorms</td>
<td>If there is a thunderstorm with high winds and lightning strikes occur, then loss of power to homes make occur and people may be without power.</td>
<td>If a thunderstorm occurs and high winds in excess of 60 mph occur (WHAT), then power lines may come down due to high winds (HOW) and loss of power may occur.</td>
<td>If power is lost in a storm then homes will not have power. This can lead to loss of food in the refrigerator (COST), alarm clocks that don’t work and people may be Mitigation Plans include:</td>
<td></td>
</tr>
</tbody>
</table>

- Risks can also be exported into an Excel spreadsheet.
- This allows for easy sorting, searching and customization for reports.
- User can also customize and save their own excel formats for download for the next time a report is run.
- Risks for a particular folder or a total program team can be depicted with risk matrix summaries or pie charts.
- Historical comparisons between dates can also be done.
The “Risk Information Sheet” contains the majority of the information for the risk including the description of the risk, context, consequences and mitigation.

- It can be exported into an Acrobat .pdf file, Excel, CSV, etc.
Risk Recon Reports
Waterfall Chart/Burn Down Chart

Risk Waterfall Report (FOUO)

**Risk ID:** 1665

**Risk:** Systems Engineering (SE) Workshop

**Description of Risk Condition:** If we do not properly plan for the SE Workshop, then we may not market our SE services effectively.

<table>
<thead>
<tr>
<th>Mitigation Steps</th>
<th>Due Date</th>
<th>Status</th>
<th>New L</th>
<th>New C</th>
<th>Step Owner</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4/1/2011</td>
<td>Complete</td>
<td>5</td>
<td>5</td>
<td>L. Graf</td>
</tr>
<tr>
<td>2</td>
<td>4/29/2011</td>
<td>Complete</td>
<td>4</td>
<td>4</td>
<td>C. Crawford</td>
</tr>
<tr>
<td>3</td>
<td>4/29/2011</td>
<td>Complete</td>
<td>4</td>
<td>4</td>
<td>D. Whithurst</td>
</tr>
<tr>
<td>4</td>
<td>6/15/2011</td>
<td>In Progress</td>
<td>3</td>
<td>3</td>
<td>C. Crawford</td>
</tr>
<tr>
<td>5</td>
<td>7/1/2011</td>
<td>In Progress</td>
<td>3</td>
<td>3</td>
<td>M. Russo</td>
</tr>
<tr>
<td>6</td>
<td>8/1/2011</td>
<td>Not Started</td>
<td>3</td>
<td>3</td>
<td>M. Russo</td>
</tr>
<tr>
<td>7</td>
<td>8/2/2011</td>
<td>Not Started</td>
<td>2</td>
<td>2</td>
<td>SE Group</td>
</tr>
<tr>
<td>8</td>
<td>9/2/2011</td>
<td>Not Started</td>
<td>2</td>
<td>2</td>
<td>SE Group</td>
</tr>
</tbody>
</table>

Waterfall Chart - Simplified (Mitigation Steps and RiskWeight)
What happens when a risk becomes an issue?

Issue Management is a natural progression of risk management as risks that are not successfully mitigated become issues.

It is important to determine a way to formally manage program risks in order to focus efforts on top issues, communicate those issues to decision makers and stakeholders in a timely fashion, and create corrective action plan paths forward to resolve them.

The Issue Recon Database is tied to Risk Recon and allows for seamless traceability of risks, mitigation plans, issues and corrective action plans.

This allows the organizations using it to prioritize their work and resources for both risk and issues.
Integrated Risk Management

FMEA
Failure Mode and Effects Analysis

Fields from FMEA software pre-populate Risk Info sheet.

Risk Mitigation from Risk Recon trace back and populate FMEA, new RPN numbers.

Risk Recon

An issue’s corrective action plan or path forward will likely have new associated risks, which can be entered and traced back to original risk in Risk Recon.

When a risk becomes an issue, user can create an issue in the database and track the corrective action plan.

Issue Database

Tie all systems together and have one searchable lessons learned database.

Lessons Learned
What is an Issue?

• An issue is something that has already happened or will certainly happen.

• Risks, when mitigation is unsuccessful, become issues after an event has occurred such as testing has failed, the schedule has slipped, etc.

• Usually characterized in terms of impact on a program’s cost, schedule and performance.

• Rated in terms of:
  • Severity: Impact on the program
  • Priority: How quickly the issues has to be addressed and resolved.
Issue Management Benefits Using a Linked Approach with FMEA and Risk

• Linking Issue Management to Risk and FMEA takes on more of a proactive approach to identifying and addressing programmatic concerns.

• Quickly resolving issues early in the program reduces cost, schedule delays and performance problems.

• Linking processes and databases enhances the ability to revisit failure modes and the actions taken to address them.

• Confirmation of the effectiveness of the corrective action after implementation is tracked and documented.
Issue Management

Issue Management Process

Project Level Administration

Issue Administration

1. Identify program/project for issue management.
2. Allocate resources.
3. Create Issue Management Plan including process, roles and responsibilities.
5. Create a project in Issue Record to enter issues.

Issue Assessment

6. Enter issue into Issue Record.
7. Submit issue to 1st Level Approver for review.
8. Approve issue? Y
10. Approve issue? Y
11. Review corrective action required?
12. Corrective action required? Y
13. Corrective action required? Y
15. Issue Owner

Single Issue Workflow

Corrective Action

16. Create corrective action plan.
17. Submit corrective action plan to 1st Level Approver for review.
18. Approve corrective action?
19. Corrective action approved? Y
20. Corrective action approved? Y
21. Close issue?

Issue Monitoring

19. Corrective action effective?
20. Corrective action effective?
21. Close issue?
For the Issue Status, the IPT has proposed the following status options, listed in the shown dropdown.
Issue Info Sheet (cont):

For the Functional Group pull down, a free form text field (that would appear only if at least one functional group box is checked) is requested to permit decomposition. For example, logistics could break down into spares, transportation, sustainment, convoys, etc. Others may include depots, FOBs, HHQ, AMC, ASA(ALT), ATOs, TTPs, etc.
### Issue Rating:

![Image of the issue rating page](image)

#### Changes must be Saved first before navigating off this web page

<table>
<thead>
<tr>
<th>Issue Analysis (Click bar to expand/contract)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Issue ID:</strong></td>
</tr>
<tr>
<td><strong>User Defined Issue ID:</strong></td>
</tr>
<tr>
<td><strong>Issue Title:</strong></td>
</tr>
<tr>
<td><strong>Status:</strong></td>
</tr>
<tr>
<td><strong>Urgent:</strong></td>
</tr>
<tr>
<td><strong>Date Initiated:</strong></td>
</tr>
<tr>
<td><strong>Last Saved On Date:</strong></td>
</tr>
<tr>
<td><strong>Estimated Closure Date:</strong></td>
</tr>
<tr>
<td><strong>Date Closed:</strong></td>
</tr>
<tr>
<td><strong>Functional Groups:</strong></td>
</tr>
<tr>
<td><strong>Issue Owner:</strong></td>
</tr>
<tr>
<td><strong>Priority:</strong></td>
</tr>
</tbody>
</table>

Ideally, the Priority pull-down menu would shade red/yellow/green based on the rating. The IPT still needs to determine if more dimensions are required.
### Issue Impacts:

#### Cost:
- Sustainment
- Contract Revision
- MIPR Required
- RFI Required
- Operations
- Validation
- Spares
- TD/EMD
- Labor/Overtime
- WD Required
- Training
- Capital

#### Schedule:
- Acceptance Testing
- Analysis
- Procurement
- Development (TD/EMD)
- Deployment
- Redlined
- Characterization
- FRP Decision
- Contracting

#### Affects the Critical Path:
- KPP/KSA
- Comms
- Maintainability
- Transportability
- Mobility
- DOTL/PF
- Consumption
- Force Protection
- Op Effectiveness
- Lethality
- Power
- Survivability
- Network/C4I
- Reliability

---

**Nested check boxes to show further granularity to describe impacts. “Nested” means optional check boxes only appear when the main impact (Cost/Schedule/Performance) is checked.**
Corrective Action Tab:

This is a tab with more fields to define complex corrective actions vs. a simple issue resolution.

This screen will allow the user to check the type of corrective action plan they want to enter. Numerous corrective actions plans can be entered for each method.
**Integrated Risk Management**

**FMEA**
*Failure Mode and Effects Analysis*

Fields from FMEA software pre-populate Risk Info sheet.

Risk Mitigation from Risk Recon trace back and populate FMEA, new RPN numbers.

**Risk Recon**

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When a risk becomes an issue, user can create an issue in the database and track the corrective action plan.

**Issue Database**

Tie all systems together and have one searchable lessons learned database.

**Lessons Learned**
Lessons Learned

• Provides the organization with effective feedback and useful information for future programs.

• Document program-specific issues that may be relevant to technical and logistical support after full rate production.

• Increase warfighter satisfaction and provide the warfighter with useful program information as the program moves into the operations and sustainment phase.
Lessons Learned Documentation

• Program feedback such as field failures, process changes, design changes (ECP), fed back into the FMEA → The FMEA is a lessons learned starting point for new programs.

• Search functions enabled in Risk and Issues databases for keywords, programs, dates, etc. to quickly determine past risks and applicability to future programs.

• Free form input from subject matter experts into database at any time to capture best practices, failures on any programs, design considerations, etc.

• Integration with the TARDEC Advanced Systems Engineering Lab (ASEL) SE Suite of tools which includes the ability to search on all program information in the database including requirements, data, etc.
Summary

• By linking FMEA, Risk and Issue processes and database tools, potential and actual failure modes will be more effectively addressed and managed from identification through lessons learned.

• Collaboration throughout organizations within the Department of the Army will be facilitated by implementing a common architecture and approach for handling failure modes.
Resources


- Risk Management Integrated Approach:
  - George Wiklund – 586-282-9725 – george.c.wiklund.civ@mail.mil
  - Lisa Graf – 586-306-2572 - lisa.j.graf2.civ@mail.mil

- Risk Recon:
  - To set up training on how to use Risk Recon, or to get your program set up to use the tool, contact:
    - Becky Addis - 586-214-2582 – rebecca.l.addis.civ@mail.mil
    - Risk Recon Help Desk - usarmy.detroit.peo-gcs.mbx.risk-recon-helpdesk@mail.mil

- Issue Management IPT:
  - To join the Issues Management IPT or to use the Issues Management tool starting March 2012, contact:
    - Dawn Packard – 586-282-8827 – dawn.m.packard2.civ@mail.mil

- FMEA Training:
  - Kadry Rizk – 586-282-5403 - kadry.w.rizk.civ@mail.mil
  - Gregor Rataczak – 586-282-4618 - gregor.a.rataczak.civ@mail.mil
Special Thanks to...

The Risk Recon IPT Member

The TARDEC Issues IPT Members

The TARDEC FMEA IPT Members

For their contribution, input and hard work that made this briefing possible.