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TOR-2017-01692

Best Practices – Human Error Management Product Overview

May 4, 2017

Iwona A. Palusinski and Bonnie Valant-Spaight
Integrated Sensor Design and Analysis Department
Sensor Systems Subdivision

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Space and Missile Systems Center
Air Force Space Command
483 N. Aviation Blvd.
El Segundo, CA 90245-2808

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Acknowledgments

This document has been produced as a collaborative effort of the Mission Assurance Improvement Workshop. The forum was organized to enhance mission assurance processes and supporting disciplines through collaboration between industry and government across the U.S. Space Program community utilizing an issue-based approach. The process is to engage the appropriate subject matter experts to share best practices across the community in order to produce valuable mission assurance guidance documentation.

The document was created by multiple authors throughout the government and the aerospace industry. For their content contributions, the following contributing authors are acknowledged for making this collaborative effort possible:

Iwona A. Palusinski	The Aerospace Corporation
Bonnie Valant-Spaight	The Aerospace Corporation
Laurie Stupak	Ball Aerospace and Technologies Corporation
Alfredo Nunez	The Boeing Company
Thomas Pham	The Boeing Company
James Poirier	The Boeing Company
Tony Fernandez	Harris Corporation
Dave Hook	Harris Corporation
Regina Palmer	Lockheed Martin Corporation
Deborah Valley	MIT Lincoln Laboratory
Alisa Joseph	Northrop Grumman Mission Systems
William Burk	Raytheon Space and Airborne Systems
Mark Seay	SSL
Ramin Chowdhury	Missile Defense Agency

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Iwona A. Palusinski	The Aerospace Corporation
Bonnie Valant-Spaight	The Aerospace Corporation
Laurie Stupak	Ball Aerospace and Technologies Corporation

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Robert Pollard	Ball Aerospace and Technologies Corporation
Larry Tew	Center for Error Management
Kenneth Benner	The Aerospace Corporation
Matthew Binondo	The Aerospace Corporation
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Roland Duphily	The Aerospace Corporation
Alan Kruger	The Aerospace Corporation
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Eli Minson	Ball Aerospace and Technologies Corporation
Brian Reilly	DCMA

Best Practices – Human Error Management

Product Overview

Laurie Stupak, Ball Aerospace and Technologies Corporation
Iwona A. Palusinski, The Aerospace Corporation
Bonnie Valant-Spaight, The Aerospace Corporation

May 4, 2017

Agenda

- Motivation for product
- Product scope
- Product overview
  - *Best Practices*
  - *Examples*
- Team introductions

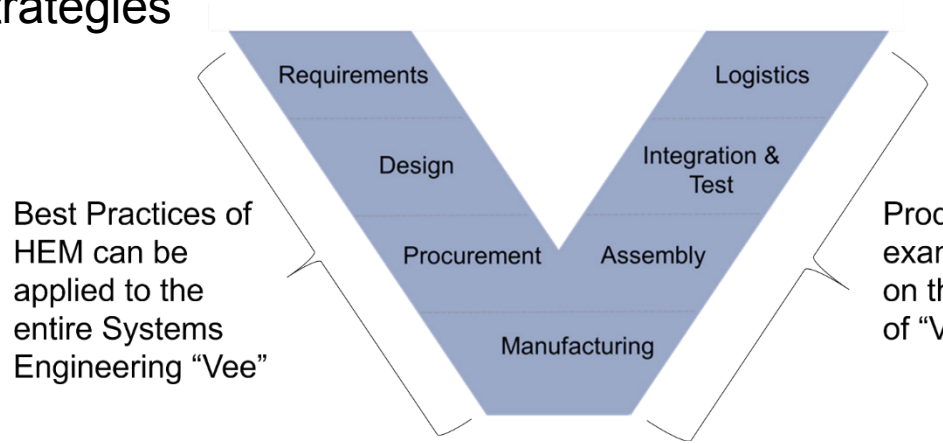
Human Error—"It" Happens

Why Human Error Management (HEM) Is Important

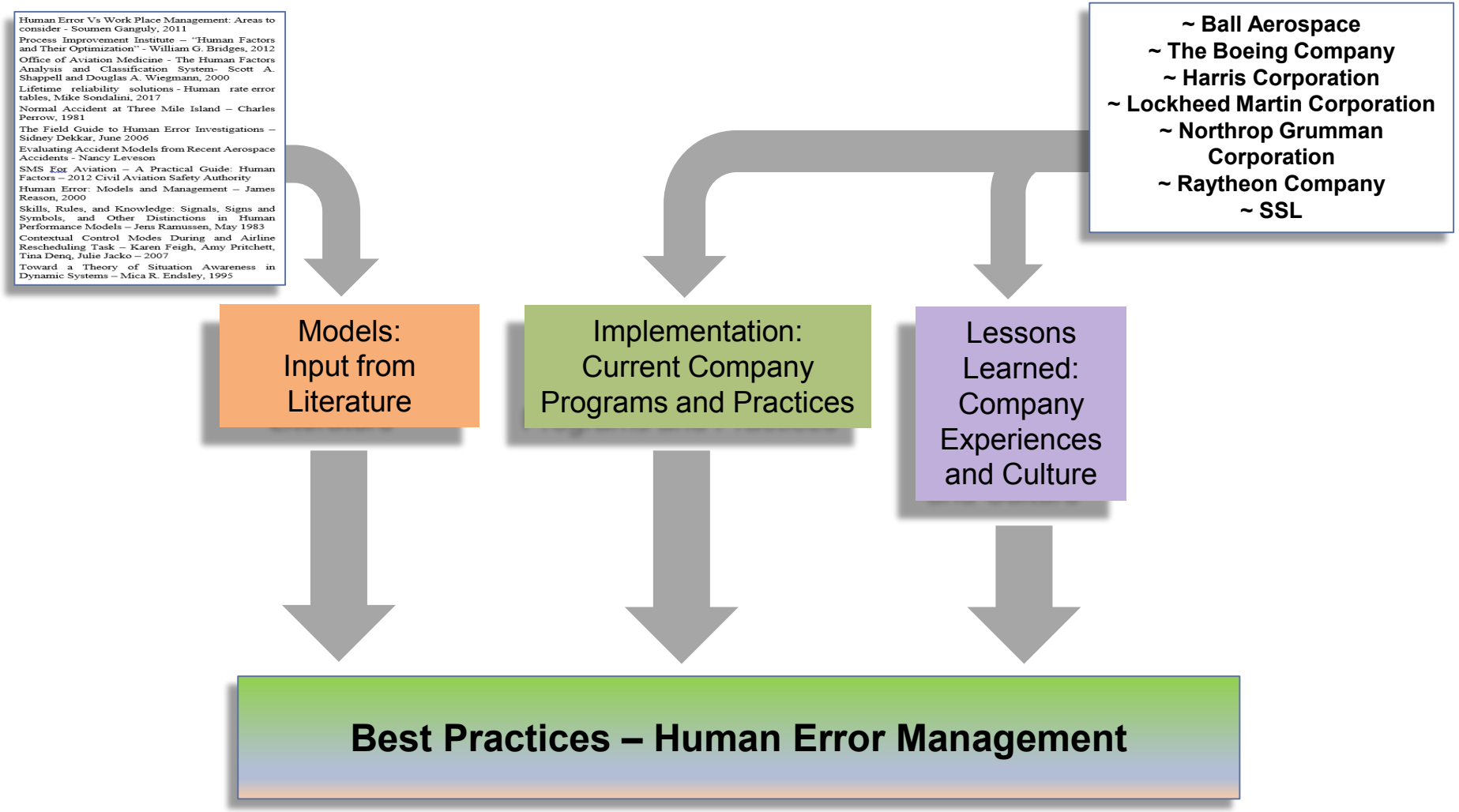
- Human contribution can be considered the most chaotic part of our processes
- Human error…"it" happens—and is accountable for over **50 percent** of errors in the aerospace industry
  - *These errors cost money, impact schedule, destroy hardware, and cost lives*
  - *These errors happen regardless of the measures in place to design them out, write the perfect procedure, or train all employees on how to do their tasks*
- Think about the last time you sat at your desk and wrote an email
- Think about the last time your company had an incident or failure due to human error
- Goals of the HEM Best Practices Product:
  - *Emphasize a PROACTIVE rather than reactive approach to managing human errors*
  - *Emphasize a CULTURE that is supported from the top down and which is based on more than just training*
  - *Define a uniform guideline with the objective of REDUCED human errors across the industry*

Product Scope

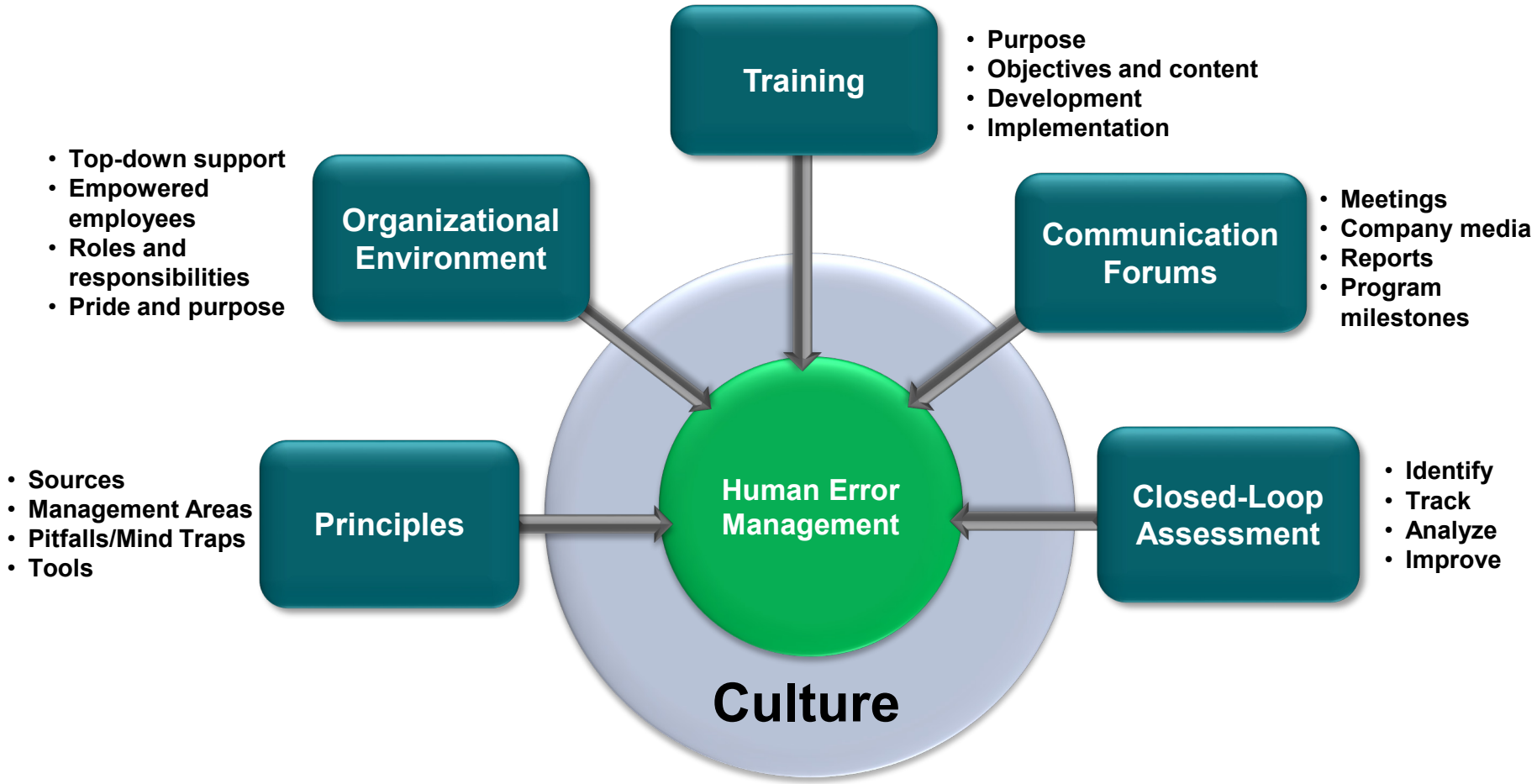
- Outlines Best Practices of human error management as a guideline to be considered for implementation at aerospace and subcontractor companies
  - *Product focuses on empowering the employees to MANAGE human error*
    - Human error will happen even with attempts to design it out
  - *Provides tools, models, and ideas to manage human error opportunities*
- Provides examples that focus on the right side of the Systems Engineering "Vee"
  - *Human errors and Best Practices apply through entire lifecycle*
- Presents a guide for companies to develop, improve, and/or strengthen their human error management strategies



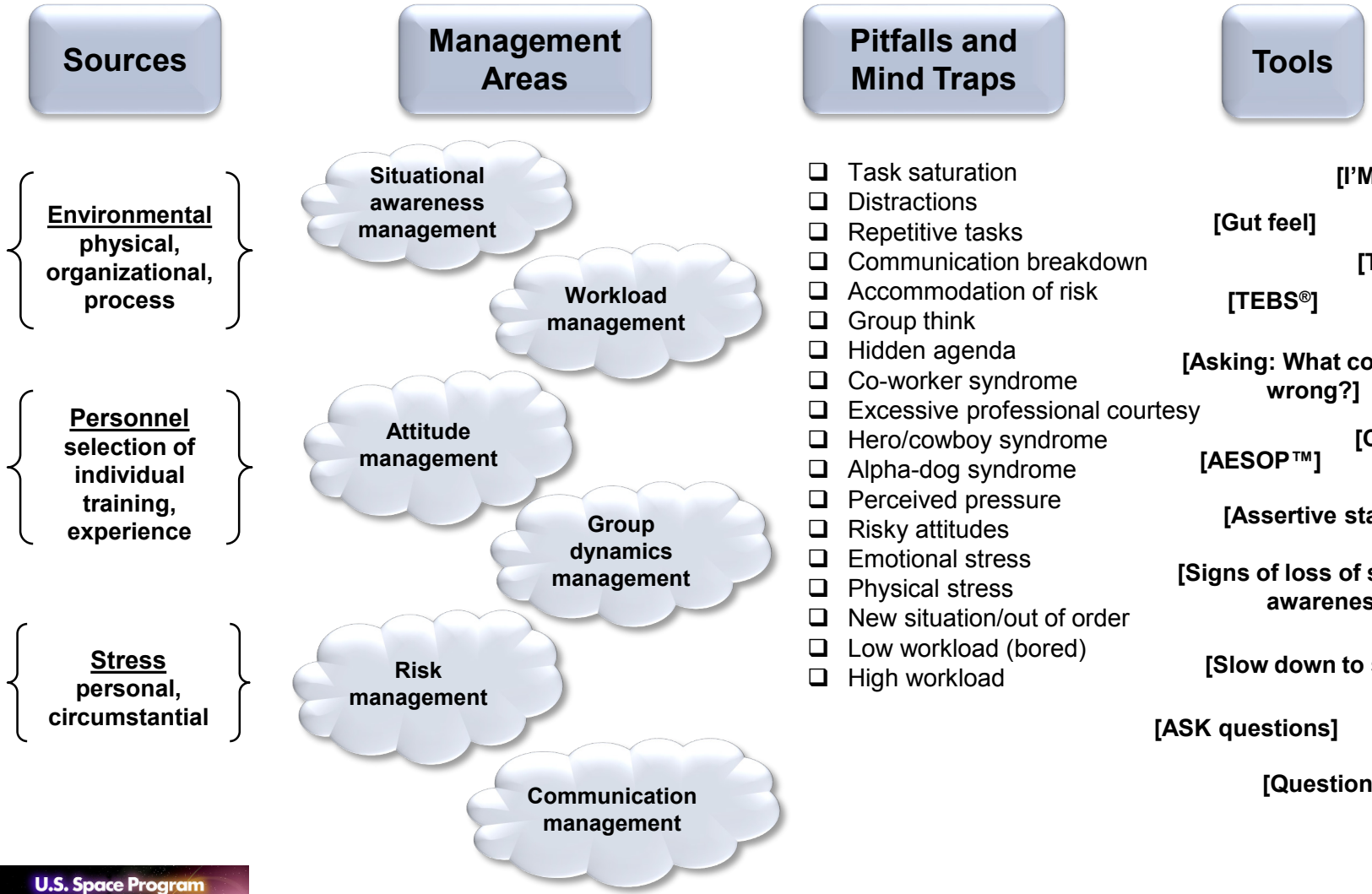
How Best Practices Were Developed



5 Best-Practice Elements of Successful HEM Programs

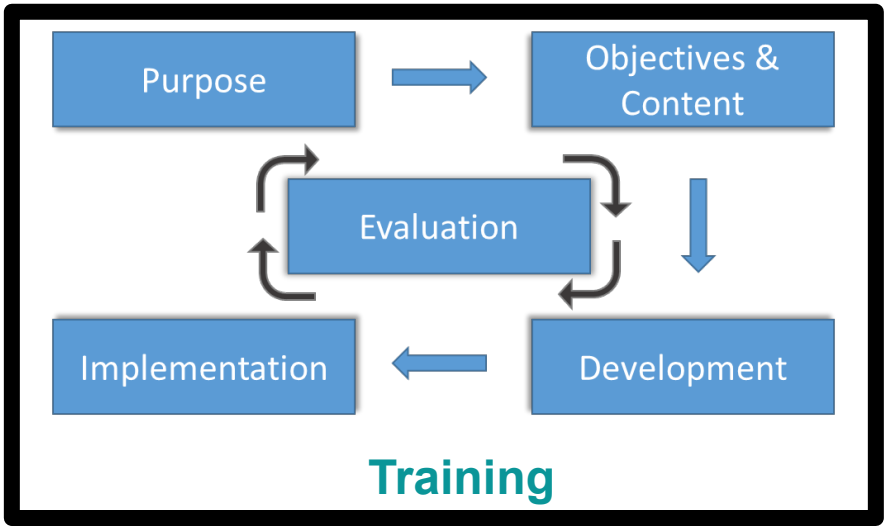


Best Practices: Principles

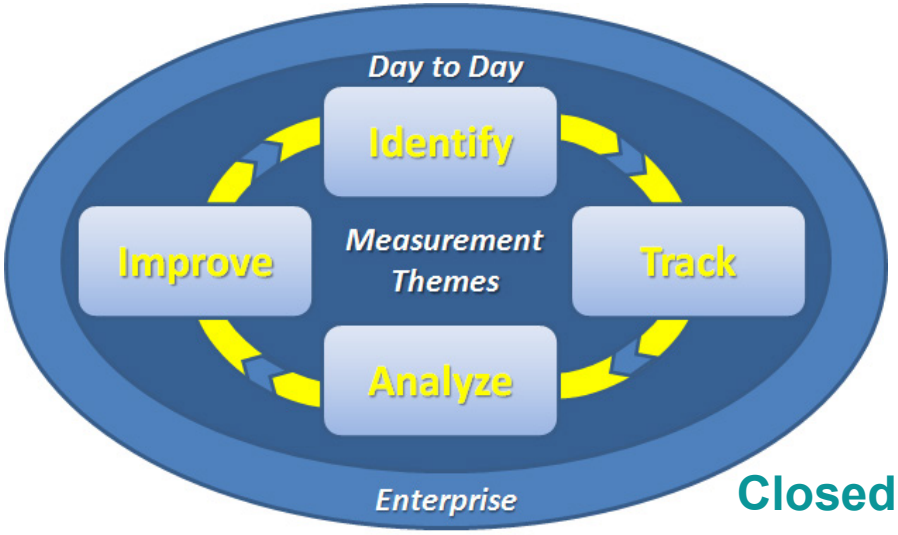


Best Practices Highlights

Communication



Training



Closed-loop Assessment

Human Error in the News

Incident: The wrong Best Picture winner was announced at the 89th Academy Awards® by Faye Dunaway and Warren Beatty. “La La Land” was announced when in fact “Moonlight” was the winner

Backstory:

Beatty was handed the envelope with the WRONG winner
- **Received the duplicate card from the previous award**
- **The outside envelope actually had the previous award name**
- **PwC employee responsible for envelopes had just tweeted picture of the previous winner, Emma Stone, minutes before**

Upon opening the envelope, Beatty hesitates to announce the winner.

"And the Academy Award..."

"...for best picture..."

Assuming Beatty is teasing the crowd, Dunaway jokingly pressures him.

"Come on,"

Still confused, Beatty shows the card to Dunaway who then ANNOUNCES the supposed winner.

“La La Land”

Human Error in the News

Incident: The wrong Best Picture winner was announced at the 89th Academy Awards® by Faye Dunaway and Warren Beatty. “La La Land” was announced when in fact “Moonlight” was the winner

Backstory:

Repetitive tasks?

Low workload —bored?

Distractions?

Beatty was handed the envelope with the WRONG winner

- **Received the duplicate card from the previous award**
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Upon opening the envelope, Beatty hesitates to announce the winner.

"And the Academy Award..."

Gut feel

"...for best picture..."

Assuming Beatty is teasing the crowd, Dunaway jokingly pressures him.

"Come on,"

Perceived pressure?

Still confused, Beatty shows the card to Dunaway who then ANNOUNCES the supposed winner.

“La La Land”

Hero syndrome?

Successful Best Practices Story

- **Situation:**
  - *Large, wide, and heavy piece of critical ground support equipment (GSE) was delivered on a truck bed that was too long to back into facility loading dock (vendor error)*
  - *Vendor insisted on attempting to maneuver truck to get into the building*
  - *After many two-point turn attempts to situate the truck perpendicular to the loading bay, not only did many trees need to be cut down, but the truck became stuck in the facility landscaping*
  - *Due to weight of GSE, the truck could not be moved until GSE was removed*
- **What now?**
  - *Vendor did not have equipment to remove GSE off of truck bed*
  - *Prime contractor had crane "inside" the building prepared to remove GSE once truck was inside*
- **New and unplanned task:**
  - *Critical GSE needs to be safely removed from the truck without damage to the hardware or building or risking the safety of personnel*

Courtesy of Ball Aerospace and Technologies Corporation

Successful Best Practices Story

Training
Employees on program team had been proactively trained in the principles of HEM

Culture
- Proactive training
- Openly discussed
- Successes and activities openly communicated to customer

Principles

Workload Management
New situation, excessive/high workload, emotional stress (frustrating situation), physical stress (long day, manual labor)

Group Dynamics
Group think, excessive professional courtesy, strength of an idea, hesitant to critique others
"TEBS® was used as a tool to manage life and safety," per RE who made a special effort to share how well the team did

Risk Management
Continuous critical thinking about what can go wrong, and appreciation of outcome

"Shout out to Bob and Sally for encouraging a stop-and-think approach when it came to next steps and human safety."

"Lots of ideas; we were careful to not take risks despite everyone involved"
~ Safety Engineer

Attitude Management
Hero syndrome, perceived pressure, risky attitudes, pressure/ get-it done, anti-authority, hero/ show-off syndrome

Situational Awareness
Distractions due to numerous observers, sudden loss of judgment, communication breakdown
Early on, RE requested barriers be put up and that only those needed remain

Communication
Communication barriers between prime and vendor, excessive professional courtesy
Pre-meeting for lift defining remove and replace was held per system safety engineer

"Even I got told to stop what I was doing."
~ Responsible Engineer (RE)

Best Practices | **Management Areas (Principles)** | **Tools (Principles)** | **Pitfalls/Mind Traps (Principles)**

Human Error Management Product Summary

- Outlines Best Practices of HEM
- Facilitates the learning of HEM Best Practices through use of examples
- Provides a guide for HEM evaluation and implementation

- Human error management is not simply about taking a training class or about the card we all wear on our employee badges, it IS also about culture:
  - *A culture that empowers, communicates, and supports all employees around HEM*
  - *A culture where employees recognize their fallibility, and supervisors and managers do not point fingers*
  - *A culture that incorporates all Best Practices into the company's processes and way of thinking*

Core Team Members

Company	Participant
The Aerospace Corporation	Iwona A. Palusinski Bonnie Valant-Spaight
Ball Aerospace and Technologies Corporation	Eli Minson Laurie Stupak
The Boeing Company	Alfredo Nunez Thomas Pham James Poirier
Harris Corporation	Tony Fernandez Dave Hook
Lockheed Martin Corporation	Regina Palmer
MIT Lincoln Laboratory	Deborah Valley
Northrop Grumman Mission Systems	Alisa Joseph
Raytheon Space and Airborne Systems	William Burk
SSL	Mark Seay
Missile Defense Agency	Ramin Chowdhury
DCMA	Brian Reilly

Co-leads
Steering Committee Champions

Team Members - SMEs

Company	Participant
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Approved Electronically by:

Jacqueline M. Wyrwitzke, PRINC DIRECTOR
MISSION ASSURANCE SUBDIVISION
SYSTEMS ENGINEERING DIVISION
OFFICE OF EVP

Todd M. Nygren, GENERAL MANAGER
SYSTEMS ENGINEERING DIVISION
ENGINEERING & TECHNOLOGY GROUP

Cognizant Program Manager Approval:

Arthur J. Dhallin, SYSTEMS DIRECTOR
ADVANCED PROGRAMS
ADVANCED SYSTEMS
OFFICE OF EVP

SY0200

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Aerospace Corporate Officer Approval:

Malina M. Hills, SR VP SPACE SYS
SPACE SYSTEMS GROUP

Content Concurrence Provided Electronically by:

Iwona A. Palusinski, DIRECTOR
INTEGRATED SENSOR DESIGN & ANALYSIS DEPT
SENSOR SYSTEMS SUBDIV
OFFICE OF EVP

SY0200

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Technical Peer Review Performed by:

Jacqueline M. Wyrwitzke, PRINC DIRECTOR
MISSION ASSURANCE SUBDIVISION
SYSTEMS ENGINEERING DIVISION
OFFICE OF EVP

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