



EXAMPLES AND INSIGHTS ON TRAINING HUMAN FACTORS FOR AS13100

Human Factors Subject Matter Interest Group

7th Feb 2024



AESQ – Aerospace Engine Supplier Quality Strategy Group

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INTRODUCTION

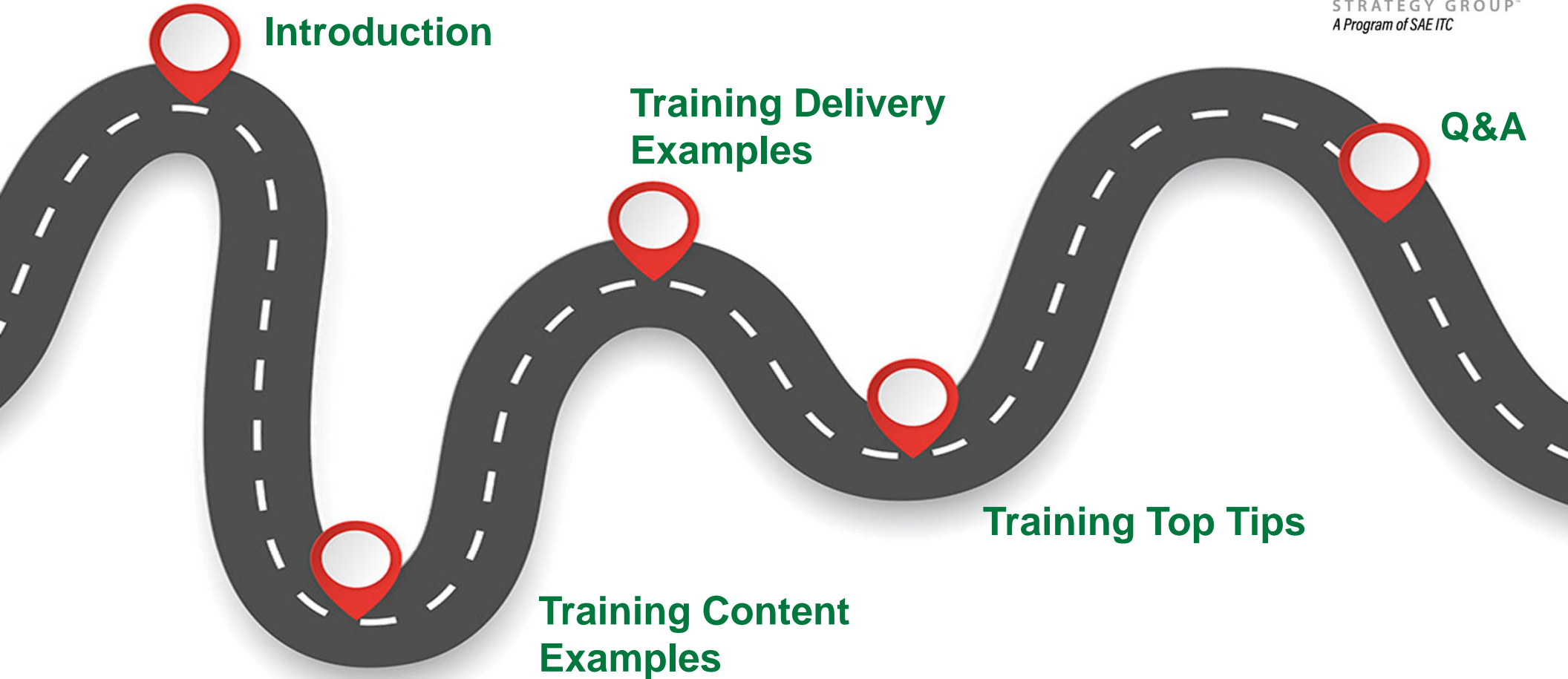


Chris Craig
Senior Operations Quality Manager
Rolls-Royce plc

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Agenda



Human Factors Subject Matter Interest Group

The RM13010 Human Factors Subject Matter Interest Group has the mission to assist in the development of knowledge and understanding in the AESQ supply base to apply & use Human Factors as a means to mitigate process risks and achieve the goal of Zero Defects.



Current Membership

Organization	Representative
Rolls-Royce	Chris Craig – Team Leader
GE Aerospace	Bethany Ryan – Deputy Team Leader
P&W	Nick Watling
Safran Aircraft Engines	Romain Brivois
Airbus	Ludovic Chevet
PCC	Dan Carroll
MTU	Beata Tarczon
Collins	Nicole Karlen
GKN Aerospace Engines	Håkan Björkålv
GKN Aerospace Engines	Taina Olsson
Consolidated Precision Products (CPP)	Amy Schermerhorn



GE Aerospace



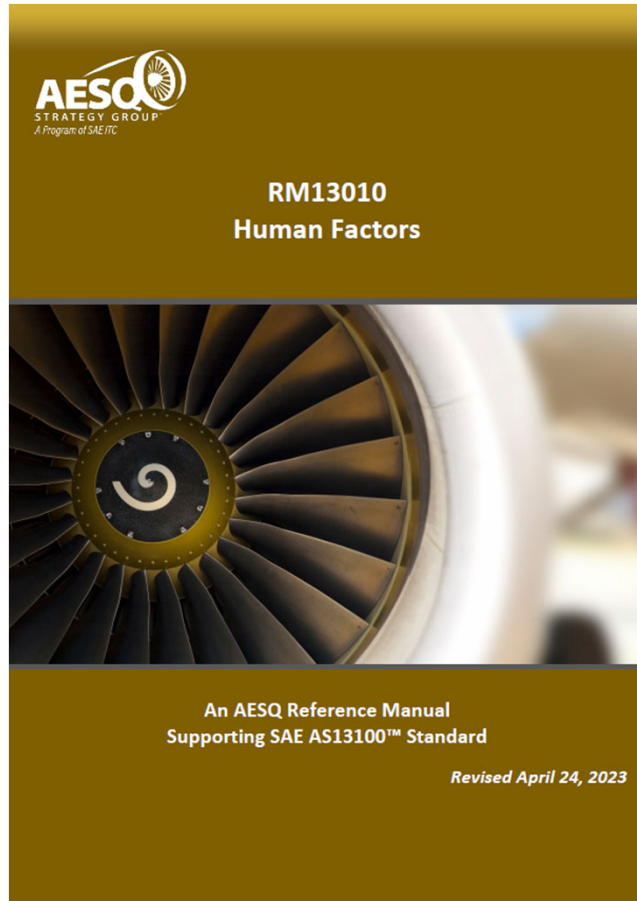
Collins Aerospace



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RM13010 – Valuable Resources Available



How to get involved

Visit - <https://aesq.sae-itc.com/>

Join the LinkedIn Community of Practice to ask questions and discuss Human Factors Deployment



Or info@aesq.sae-itc.org

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Energizer



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Energizer



How many civil aviation flights were there in 2023?

A - 20.1 million

B - 27.7 million

C - 34.4 million

D - 38.9 million

E - 36.4 million

Energizer



What was the safest year in aviation history?

A – 2017

B – 2018

C – 2020

D – 2021

E – 2023

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Energizer



On average, how many errors per hour do humans make?

A – 1 to 3

B – 3 to 5

C – 5 to 7

D – 7 to 9

E – 9 to 11

TRAINING CONTENT EXAMPLE



Håkan Björkälv
Integrated Logistics Support
GKN Aerospace

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Setting up the course material



- *Unique for every group*
 - Discussions based on every participants experience.
 - Twist topics to reflect participants daily work
 - Promote an open and honest discussion.
 - Reflect on how it affects my daily decisions in work. Share in group.
 - *Lessons structure*
 - Facts, research
 - What is the story behind the facts and research you use?
 - Exercises, experiences, films
 - Is the fact applicable to me and my work?
 - By testing and reflecting you see how you act in situations and decisions.
 - How will this affect ME in MY work
 - In discussions and own reflecting see how it can be applicable in my own work.
- You are the facilitator that leads the group. Not an instructor or trainer

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AMC and GM to Annex II (Part-145) Issue 2 — Amendment 5

Topics should be related to the maintenance activities of the organisation to the greatest extent possible; too much unrelated theory should be avoided.



1. General/Introduction to safety management and human factors

- 1.1. Need to address safety management and human factors
- 1.2. Statistics
- 1.3. Incidents

1a. Safety risk management

- 1a.1. Hazard identification
- 1a.2. Safety risk assessment
- 1a.3. Risk mitigation and management
- 1a.4. Effectiveness of safety risk management

2. Safety Culture/Organisational factors

- 2.1 Justness/trust
- 2.2 Commitment to safety
- 2.3 Adaptability
- 2.4 Awareness
- 2.5 Behaviour
- 2.6 Information

3. Human Error

- 3.1. Error models and examples
- 3.2. Types of errors in maintenance tasks
- 3.3. Violations
- 3.4. Implications
- 3.5. Avoiding human error
- 3.6. Human factors

4. Human limitations

- 4.1. Visual perception
- 4.2. Auditory perception
- 4.3. Memory
- 4.4. Attention
- 4.5. Sensory perception
- 4.6. Motor skills
- 4.7. Classification and access
- 4.8. Motivation
- 4.9. Fitness/Health
- 4.10. Stress
- 4.11. Workload management
- 4.12. Fatigue
- 4.13. Alcohol, medication, drugs
- 4.14. Physical work
- 4.15. Repetitive tasks/complacency

5. Environment

- 5.1. Peer pressure
- 5.2. Stressors
 - 5.2.1. Time pressure and deadlines
 - 5.2.2. Workload
 - 5.2.3. Work interruptions
 - 5.2.4. Temperature
 - 5.2.5. Humidity
 - 5.2.6. Noise
 - 5.2.7. Vibration
 - 5.2.8. Air quality
 - 5.2.9. Lighting
 - 5.2.10. Ergonomics
 - 5.2.11. Safety in the workplace
 - 5.2.12. Power
 - 5.2.13. Unplanned interruptions
- 5.3. Information, tools
- 5.4. Communication
 - 5.4.1. Information
 - 5.4.2. Training and recording
 - 5.4.3. Language
 - 5.4.4. Time/mismatch/norms
 - 5.4.5. Technical documentation - access and quality
- 5.5. Critical maintenance tasks and error-capturing methods (independent inspection, re-inspection, etc.)

7. Communication

- 7.1. Shift/Task handover
- 7.2. Dissemination of information
- 7.3. Cultural differences

8. Teamwork

- 8.1. Responsibility
- 8.2. Management, supervision and leadership
- 8.3. Decision-making

9. Professionalism and integrity

- 9.1. Keeping up to date; currency
- 9.2. Avoiding error-provoking behaviour
- 9.3. Assertiveness

10. Organisation's HF safety programme

- 10.1. Safety policy and objectives, just culture principles
- 10.2.1. Reporting errors and hazards, internal safety reporting scheme
- 10.2. Disciplinary policy
- 10.3. Error investigation process
- 10.4. Action to address problems
- 10.5. Feedback and safety promotion



How to cover everything?

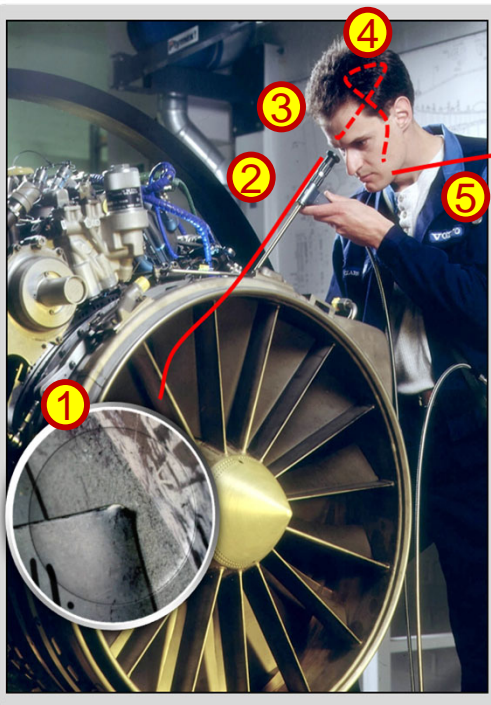
Share example material that covers the training structure and examples of material used to cover the learning objectives.

1. General/Introduction to safety management and human factors 1.1. Need to address safety management and human factors 1.2. Statistics 1.3. Incidents 1a. Safety risk management 1a.1. Hazard identification 1a.2. Safety risk assessment 1a.3. Risk mitigation and management 1a.4. Effectiveness of safety risk management 2. Safety Culture/Organisational factors 2.1. Justness/trust 2.2. Commitment to safety 2.3. Adaptability 2.4. Awareness 2.5. Behaviour 2.6. Information	3. Human Error 3.1. Error models and theories 3.2. Types of errors in maintenance tasks 3.3. Violations 3.4. Implications of errors 3.5. Avoiding and managing errors 3.6. Human reliability 4. Human performance & limitations 4.1. Vision 4.2. Hearing 4.3. Information-processing 4.4. Attention and perception 4.5. Situational awareness 4.6. Memory 4.7. Claustrophobia and physical access 4.8. Motivation 4.9. Fitness/Health 4.10. Stress 4.11. Workload management 4.12. Fatigue 4.13. Alcohol, medication, drugs 4.14. Physical work 4.15. Repetitive tasks/complacency	5. Environment 5.1. Peer pressure 5.2. Stressors 5.3. Time pressure and deadlines 5.4. Workload 5.5. Shift Work 5.6. Noise and fumes 5.7. Illumination 5.8. Climate and temperature 5.9. Motion and vibration 5.10. Complex systems 5.11. Other hazards in the workplace 5.12. Lack of manpower 5.13. Distractions and interruptions 6. Procedures, information, tools and practices 6.1. Visual Inspection 6.2. Work logging and recording 6.3. Procedure - practice/mismatch/norms 6.4. Technical documentation - access and quality 6.5. Critical maintenance tasks and error-capturing methods (independent inspection, re-inspection, etc.)	7. Communication 7.1. Shift/Task handover 7.2. Dissemination of information 7.3. Cultural differences 8. Teamwork 8.1. Responsibility 8.2. Management, supervision and leadership 8.3. Decision-making 9. Professionalism and integrity 9.1. Keeping up to date; currency 9.2. Avoiding error-provoking behaviour 9.3. Assertiveness 10. Organisation's HF safety programme 10.1. Safety policy and objectives, just culture principles 10.2.1. Reporting errors and hazards, internal safety reporting scheme 10.2. Disciplinary policy 10.3. Error investigation process 10.4. Action to address problems 10.5. Feedback and safety promotion
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Videoscopeing an engine, staying in focus

What affect my decision and performance



The chain from component to experts

1. Component in engine
2. Videoscope performance
3. The eye
4. The brain
 - How do the brain build a picture?
 - Brain teasers
5. Communication with technicians
6. Communication with experts

With all those parts that can differ, do we see the same thing?

This lesson contains

- 4.1. Vision
- 4.3. Information-processing
- 4.4. Attention and perception
- 4.6. Memory
- 4.9. Fitness/Health
- 4.10. Stress
- 4.11. Workload management
- 4.12. Fatigue
- 4.15. Repetitive tasks/complacency
- 5.1. Peer pressure
- 5.2. Stressors
- 5.3. Time pressure and deadlines
- 5.4. Workload
- 7.2. Dissemination of information
- 9.1. Keeping up to date; currency
- 9.2. Avoiding error-provoking behaviour

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Engineering – reviewing others reports, documents, drawings

Can we find the errors on reports, drawings etc that colleges wrote?

How do You review?

What affect my effort in reviewing others reports?

- What shall I review?
- Do I know the other person?
- Do I like the other person?

How do I read a text?

- Memory, knowledge, stress

Fact: Heuristic evaluation

Discussion: how, what...

Letter to myself:

- What type of documentation
- What role do I have
- What shall I do better next time

This lesson contains

2.4 Awareness

2.5 Behaviour

2.6 Information

3.6. Human reliability

4.3. Information-processing

4.4. Attention and perception

4.5. Situational awareness

4.6. Memory

4.11. Workload management

4.12. Fatigue

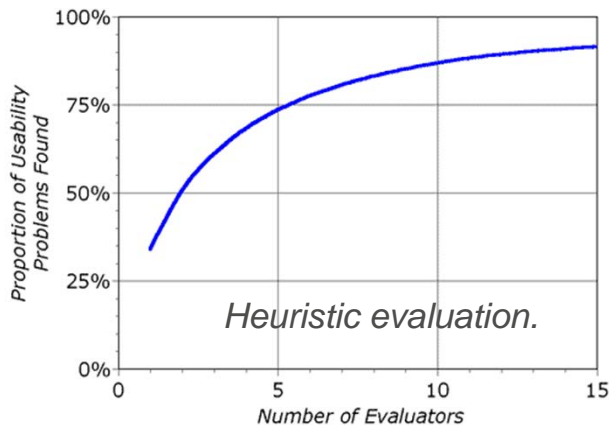
5.2. Stressors

5.3. Time pressure and deadlines

5.13. Distractions and interruptions

7.2. Dissemination of information

7.3. Cultural differences



Management course – Dilemmas and Groupthink

When building this tower discuss dilemmas

In smaller groups.



You get a job where you see that the work that has been done earlier is not signed off.
It's a rush job but you hesitate...
Go or no go?

pick a dilemma for the others.

ing a minute, "d you do?"

brick on the

pick a head for th

This lesson contains

Two of your co-workers are open enemies. They work the same shift and are expected to work together from time to time.
How do you act as a manager?

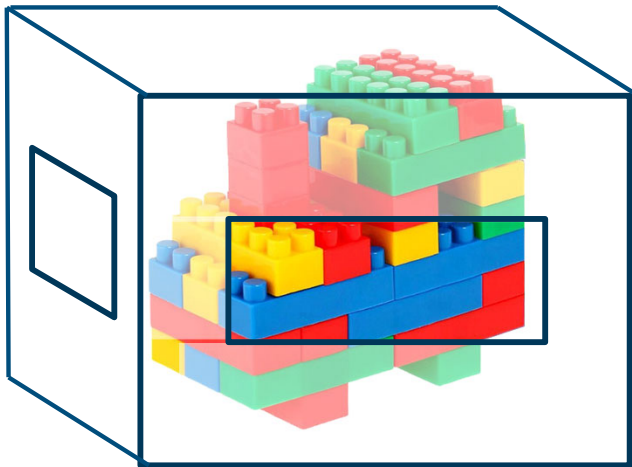
ty
behaviour

**What happens if the tower fall?
- Who to blame or what happend?**

3. Human Error

Operators course – Instructions and Communication

**In a box in the room
there is a Duplo figure
The box is covered and
have one window on
each side**



Group with 4 persons.

First person do a check in one window.

Next person do a check in one window

... ad so on...

The group shall build a copy of the boxed figure.

Only communicate in the building place

7. Communication

- 7.1. Shift/Task handover
- 7.2. Dissemination of information
- 7.3. Cultural differences

4. Human performance & limitations

- 4.1. Vision
- 4.3. Information-processing
- 4.4. Attention and perception
- 4.6. Memory
- 4.10. Stress

TRAINING DELIVERY



Dan Carroll

Corporate Director Product and Process Integrity
Precision Castparts Corp.



Bethany Ryan

Human Factors Engineer
GE Aerospace

Overview

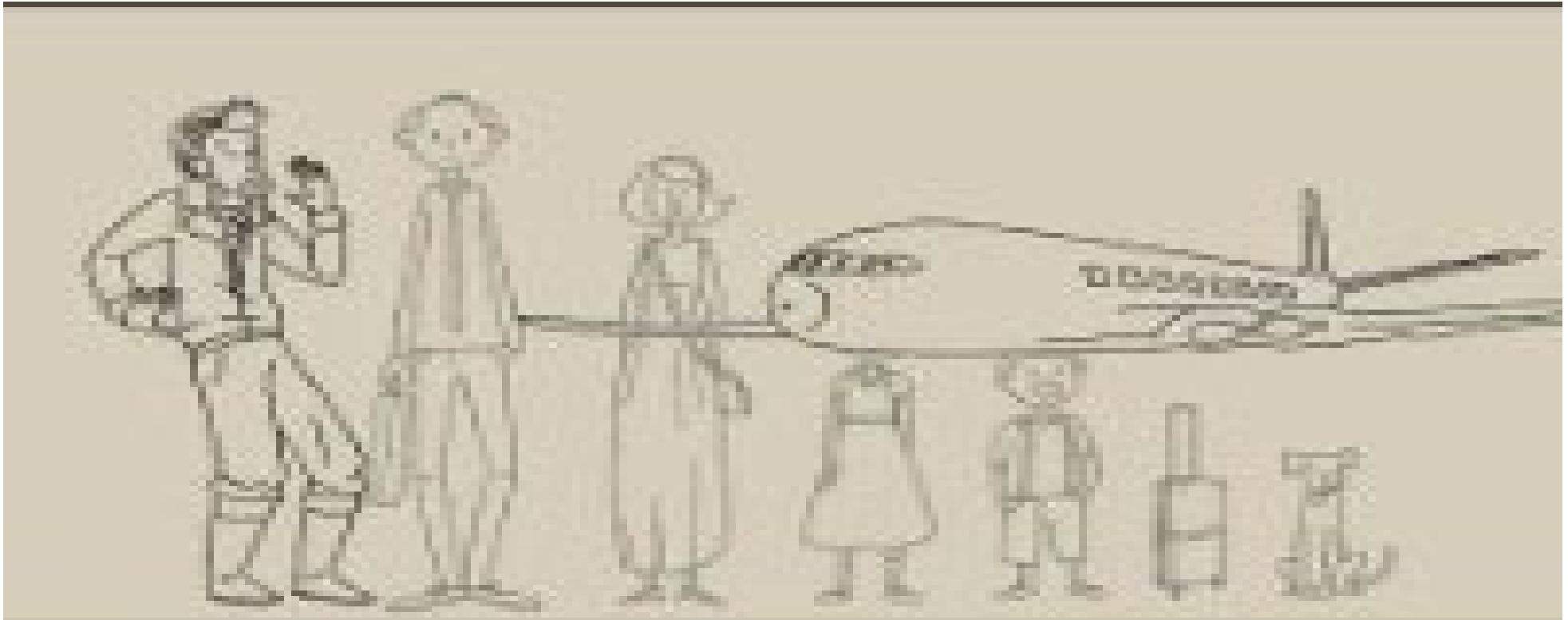


- Purpose is to give examples for delivering Human Factors Training to the workforce
- Will focus on use of
 - Videos
 - Exercises
 - Group Discussion
 - Storytelling

Video Examples

1. Crossed Wires Case Study - <https://www.youtube.com/watch?v=iVCYSGosa5Q>
 - Small aircraft maintenance repair business and gives real world scenarios
2. The Right Connections – <https://www.youtube.com/watch?v=prHWy2MNN8s>
 - A follow-up to Crossed Wires Case Study and what to do better
3. Qantas Flight 32 - <https://www.youtube.com/watch?v=nv9tqnHYtJQ>
 - A380 Engine failure - Real consequences
4. Shake & Shingle Distraction Video - <https://www.youtube.com/watch?v=RhqUiqXY0eo>
 - Outside environment and distractions
5. Introduction to Human Factors Engineering <https://www.youtube.com/watch?v=m4f81ZS19v8>
 - How to Engineer out Human Factors in operations
6. Human Factors History Video - <https://www.youtube.com/watch?v=H36MhK5ADUk>
 - Basic history intro

Human Factors History Video



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Exercises



- Human Factors Bingo
- Product Safety and Just Culture Quiz
- Share Dilemma Scenarios
 - What would you do next?
- Run group exercise on categorizing behaviors
 - Use speeding as an example to kick off
- Share real world examples
 - First person is best

Group Discussion



- How can our individual roles effect Product Safety?
- Cultural forces (positive and negative)
- What are Product Safety threats to the organization?
- How have leaders influenced fair and just culture
- At the end of the session agree upon what team actions can be taken away
- Share stories in smaller groups promotes/fosters more involvement
 - Make it personal

Real Life Human Factors Personal Stories



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Coolant Mix-Up



Blame Cycle



Significant difference in **solution sets**...

Traditional	Human Factors Lens
<ul style="list-style-type: none">• Discipline• Re-training• Stand down	<ul style="list-style-type: none">• Color Coded Drums• Understanding and simplification of process

...and in **problem definition.**

The worker is not the problem
to be solved...

...the worker is the problem solver.

(Dekker)

TRAINING PROGRAMME TOP TIPS



Nicole Karlen
Principal Engineer
Collins Aerospace

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Tips for Training Programme Creation

You Identified a Need for Training



Great! Now What?

- ✓ **Set clear scope & objectives ~ All employees awareness of AS13100**
- ✓ **Identify existing gaps ~ RM13010 Section 7.2**
- ✓ **Develop effective training materials ~ Pull from Standard, People, Tribal Knowledge**
- ✓ **Keep it clear & simple ~ Target language for audience**
- ✓ **Use engaging examples ~ Big bang and local**
- ✓ **Reiterate important key takeaways ~ Bring focus on human beings being human**
- ✓ **Pilot the programme ~ Dry run, smooth the rough edges**

Tips for Training Programme Creation

It's Training Day



But things never go according to plan

Be prepared to adjust

- ✓ **Be prepared to use various methods to encourage conversation ~ Flip charts, white boards, & PowerPoint**
- ✓ **Be personable ~ Use recent happenings as examples**
- ✓ **Use humor, as appropriate ~ Think about audience & culture**
- ✓ **Monitor comprehension & understanding ~ Consider poll questions, in-training quiz, breakout sessions**
- ✓ **Allow for scope adaption with examples & stories ~ Pre-planned audience involvement**
- ✓ **Engage and motivate participants ~ Find the driving factors of the participating group**
- ✓ **Tailor the material to organization needs ~ Business, size, etc.**
- ✓ **Allow for open discussion, but avoid it becoming negative ~ Highlight different voices, multiple facilitators or observer/facilitator**

Tips for Training Programme Creation

Phew - It's Over



But the Work's Not Done

What to do AFTER the Training

- ✓ **Ask for feedback ~ Both training session and the organization**
- ✓ **Evaluate & monitor programme ~ Regular cadence to review scope and materials**
- ✓ **Determine how you measure programme success ~ KPIs, statement of work, etc.**
- ✓ **Adapt training ~ Agile, need-based**
- ✓ **Share lessons learned ~ Amongst trainers, sites, etc.**

Wrap Up

Survey the community



AESQ Human Factors SMIG
RM13010 Feedback Form



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Questions?



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