The main theme
The main theme

- Human and organizational factors dominate the risks to aviation—in maintenance, as elsewhere.
The main theme

• Human and organizational factors dominate the risks to aviation—in maintenance, as elsewhere.

• But most maintenance managers have a technical background.
The main theme

• Human and organizational factors dominate the risks to aviation—in maintenance, as elsewhere.
• But most maintenance managers have a technical background.
• How can we help them create a safety management system that properly addresses the human and organizational risks?
The two faces of safety
The two faces of safety

• Negative face—as revealed by accidents, incidents, near misses, and the like (negative outcomes).
The two faces of safety

• Negative face—as revealed by accidents, incidents, near misses, and the like (negative outcomes).

• Positive face—system’s intrinsic resistance to its operational hazards (resilience).
Intrinsic safety

Vulnerable system

Average system

Resistant system
The safety space

Increasing resistance  Increasing vulnerability

Organizations
Navigating the safety space

Increasing resistance

Increasing vulnerability

Target zone

Navigational aids

<table>
<thead>
<tr>
<th>Reactive outcome measures</th>
<th>Proactive process measures</th>
</tr>
</thead>
</table>

Cultural drivers

- Commitment
- Cognizance
- Competence
The three C’s
The three C’s

- **Commitment**: In the face of ever-increasing commercial pressures, do you have the will to make safety management (SM) tools work effectively?
The three C’s

• Commitment: In the face of ever-increasing commercial pressures, do you have the will to make safety management (SM) tools work effectively?

• Cognizance: Do you understand the nature of the ‘safety war’—particularly with regard to human and organizational factors?
The three C’s

• Commitment: In the face of ever-increasing commercial pressures, do you have the will to make safety management (SM) tools work effectively?

• Cognizance: Do you understand the nature of the ‘safety war’—particularly with regard to human and organizational factors?

• Competence: Are your SM techniques, understood, appropriate and properly utilised?
# The ‘navigational aids’

<table>
<thead>
<tr>
<th>Workplace &amp; organizational factors</th>
<th>REACTIVE OUTCOME MEASURES</th>
<th>PROACTIVE PROCESS MEASURES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analysis of many incidents can reveal recurrent patterns of cause and effect.</td>
<td>Identify those conditions most needing correction, leading to steady gains in resistance or ‘fitness’.</td>
<td></td>
</tr>
<tr>
<td>Each event shows a partial or complete trajectory through the defences.</td>
<td>Regular checks reveal where holes exist now and where they are likely to appear next.</td>
<td></td>
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</tbody>
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The 4 P’s of management
(apologies to Earl Wiener)

Principles
(Philosophy)

Policies

Procedures

Practices
**4Ps x 3Cs = 9 sets of indicators**

<table>
<thead>
<tr>
<th>Principles (Philosophy)</th>
<th>Commitment</th>
<th>Cognizance</th>
<th>Competence</th>
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<tr>
<td>1</td>
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<tr>
<td>Policies</td>
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<td>Procedures</td>
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<td>7</td>
<td>8</td>
</tr>
<tr>
<td>Practices</td>
<td></td>
<td></td>
<td>9</td>
</tr>
</tbody>
</table>
1. Principles & commitment
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- Safety management is seen as an integral part of the business process—not an add-on.
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- Global reform rather than local repairs.
1. **Principles & commitment**

- Safety management is seen as an integral part of the business process—not an add-on.
- Top management is ever mindful of the possibility of failure. Chronic unease.
- Global reform rather than local repairs.
- Top management actively engages in safety-related issues.
2. Principles & cognizance
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• Understands the error-provoking nature of aviation maintenance.
2. Principles & cognizance

- Understands the error-provoking nature of aviation maintenance.
- Understands the particular vulnerability of installation and reassembly.
2. Principles & cognizance

- Understands the error-provoking nature of aviation maintenance.
- Understands the particular vulnerability of installation and reassembly.
- Understands the prevalence of certain error types—omissions.
3. Principles & competence
3. *Principles & competence*

- Recognises that effective SM depends on the collection, evaluation & dissemination of safety-related data.
3. Principles & competence

• Recognises that effective SM depends on the collection, evaluation & dissemination of safety-related data.

• Recognises strengths & limitations of various indices of safety (outcome vs. process).
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• Recognises strengths & limitations of various indices of safety (outcome vs. process).

• Recognises that the management component of SM is the hardest to achieve.
3. Principles & competence

- Recognises that effective SM depends on the collection, evaluation & dissemination of safety-related data.
- Recognises strengths & limitations of various indices of safety (outcome vs. process).
- Recognises that the management component of SM is the hardest to achieve.
- Recognises existence of error traps and has taken steps to deal with them.
4. Policies & commitment
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• Safety-related information has direct access to the top.
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- Safety management is fast-track not an oubliette—and rewarded accordingly.
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- Protection will override production if circumstances require it.
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• Safety management is fast-track not an oubliette—and rewarded accordingly.
• Protection will override production if circumstances require it.
• Messengers will be rewarded not shot.
5. Policies & cognizance
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- Organization has policies in place that recognise the dependence of a safe culture upon the following sub-cultures:
  - Reporting culture
  - Just culture
  - Learning culture
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- Organization has policies in place that recognise the dependence of a safe culture upon the following sub-cultures:
  - Reporting culture
  - Just culture
  - Learning culture

- Management & first-line supervisors (at least) to receive Human Factors training.
6. Policies & competence
6. Policies & competence

• Reporting system policies:
  – Qualified indemnity against sanctions
  – Confidentiality and/or de-identification
  – Separation of data collection from disciplinary procedures
6. *Policies & competence*

- **Reporting system policies:**
  - Qualified indemnity against sanctions
  - Confidentiality and/or de-identification
  - Separation of data collection from disciplinary procedures

- **Disciplinary system policies:**
  - Agreed distinction between acceptable & unacceptable behaviour
  - Peers involved in disciplinary proceedings
7. Procedures & cognizance
7. Procedures & cognizance

- Procedures should identify error-prone steps in tasks—not just ‘how-to’ information.
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- Procedures should identify error-prone steps in tasks—not just ‘how-to’ information.
- Procedures should be backed by training in the recognition and recovery of errors.
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- Procedures should identify error-prone steps in tasks—not just ‘how-to’ information.
- Procedures should be backed by training in the recognition and recovery of errors.
- Procedures should be written in consultation with those actually doing the job.
8. Procedures & competence
8. Procedures & competence

- Procedures to be:
  - Intelligible
  - Workable
  - Available, etc.
8. *Procedures & competence*

- Procedures to be:
  - Intelligible
  - Workable
  - Available, etc.

- Awareness that people hardly ever read and do at the same time.
8. Procedures & competence

• Procedures to be:
  – Intelligible
  – Workable
  – Available, etc.

• Awareness that people hardly ever read and do at the same time.

• Knowledge required to do a job should be shared between procedures, reminders & forcing functions.
9. Practices & competence
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• Safety assessed by both reactive outcome data and proactive process measures.
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• Rapid, useful and intelligible feedback on lessons learned and actions needed.
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- Safety assessed by both reactive outcome data and proactive process measures.
- Rapid, useful and intelligible feedback on lessons learned and actions needed.
- Throughout, efforts are made to generalise rather than localise failures.
- Visible top-level involvement: walking the talk & talking the walk.
Interim conclusions
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- These indicators have tried to capture some of the characteristics of high reliability organizations, as we presently know them.
Interim conclusions

• These indicators have tried to capture some of the characteristics of high reliability organizations, as we presently know them.

• No one best way: different programmes suit different organizations.
Interim conclusions

• These indicators have tried to capture some of the characteristics of high reliability organizations, as we presently know them.
• No one best way: different programmes suit different organizations.
• Unlikely that any organization possesses all of these features.
Local maintenance defences

Adequate support from other members of organization

Correct diagnosis of problem

Engineer’s training, experience and procedures

Engineer’s cognitive and psychomotor skills
Sometimes the holes can line up
But that is not the end of the story. The engineer and the team can still recover the situation.
Limited coping resources can get nibbled away

Accumulation of minor events. Not so much holes as steady attrition
The last word
The last word

- Reducing error is only part of the story.
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• Errors can be detected and recovered before they do harm.
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- Reducing error is only part of the story.
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- But these coping resources are limited.
The last word

- Reducing error is only part of the story.
- Errors can be detected and recovered before they do harm.
- But these coping resources are limited.
- They can get eaten away by the steady accumulation of minor stresses.
The last word

• Reducing error is only part of the story.
• Errors can be detected and recovered before they do harm.
• But these coping resources are limited.
• They can get eaten away by the steady accumulation of minor stresses.
• Most of these stresses are system-related and need to be managed.