

Establishing a Human Factors Programme



The 14th Annual FAA / CAA / Transport Canada
Human Factors in Aviation
Maintenance Symposium
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Establishing a Human Factors Programme

Presented by : Chow Hock Lin
Human Factors coordinator
SIA Engineering



SIAEC : The Company

- Incorporated in 1992
- Key operational functions of the engineering division of SIA
- Handles a full spectrum of maintenance activities including
 - Heavy maintenance checks
 - Component and engine overhaul
 - Specialised repair/overhaul



Human Factors and Error Management

“ We at SIA Engineering Company are at the leading edge of this global tide of change.

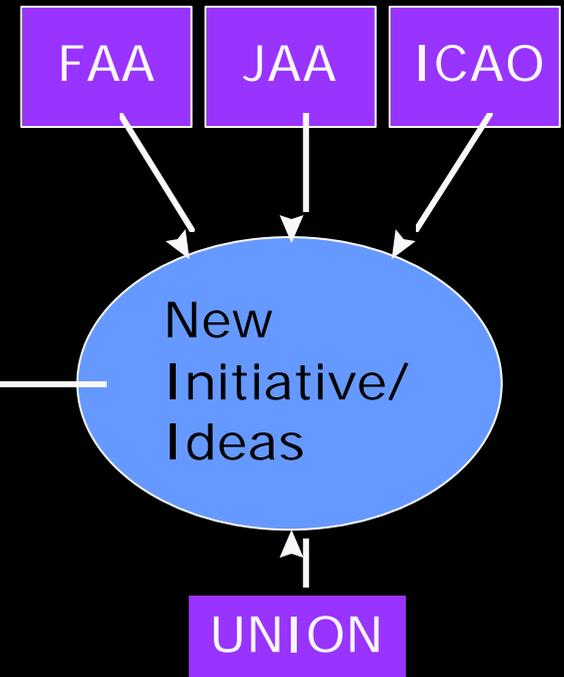
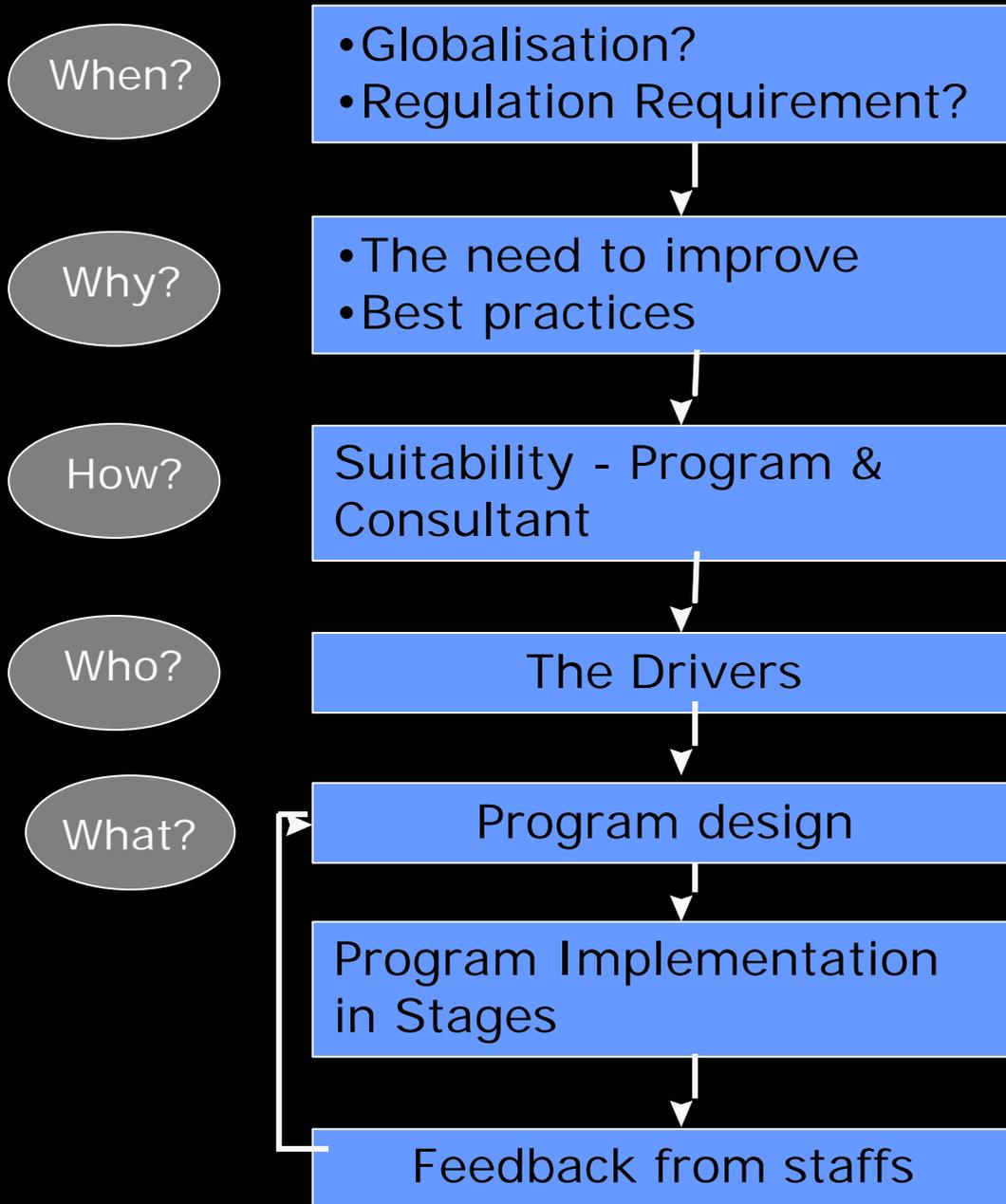
Everyone is aware of and proud of our excellent safety record.

And senior management is totally committed to providing tools which will enable all of us to find and remove the causes of incidents before they cause harm. ”

Statement made by Mr. Robert Tan, former Chief Executive of SIA Engineering Company, in the Human Factors & Error Management video

titled “ The Truth About Us ”





When & Why Human Factors?

- Globalisation of Aviation Maintenance Business
- Regulation Requirements: ICAO, FAA, JAA
- Need to be proactive in our pursuit for excellence
 - Growing workforce
 - Increasing complexity of operations
 - Expected increase in airline traffic volume over the next 12-15 years
- Need to appreciate the causes of error and how they affect safety



How? - Programme & Consultant

- Engaged one of the most notable practitioners in Human Factors:
 - Professor James Reason of Manchester University
- Assistance of the Boeing company on maintenance error investigation (MEDA)
- David Marx



Who? - The Drivers

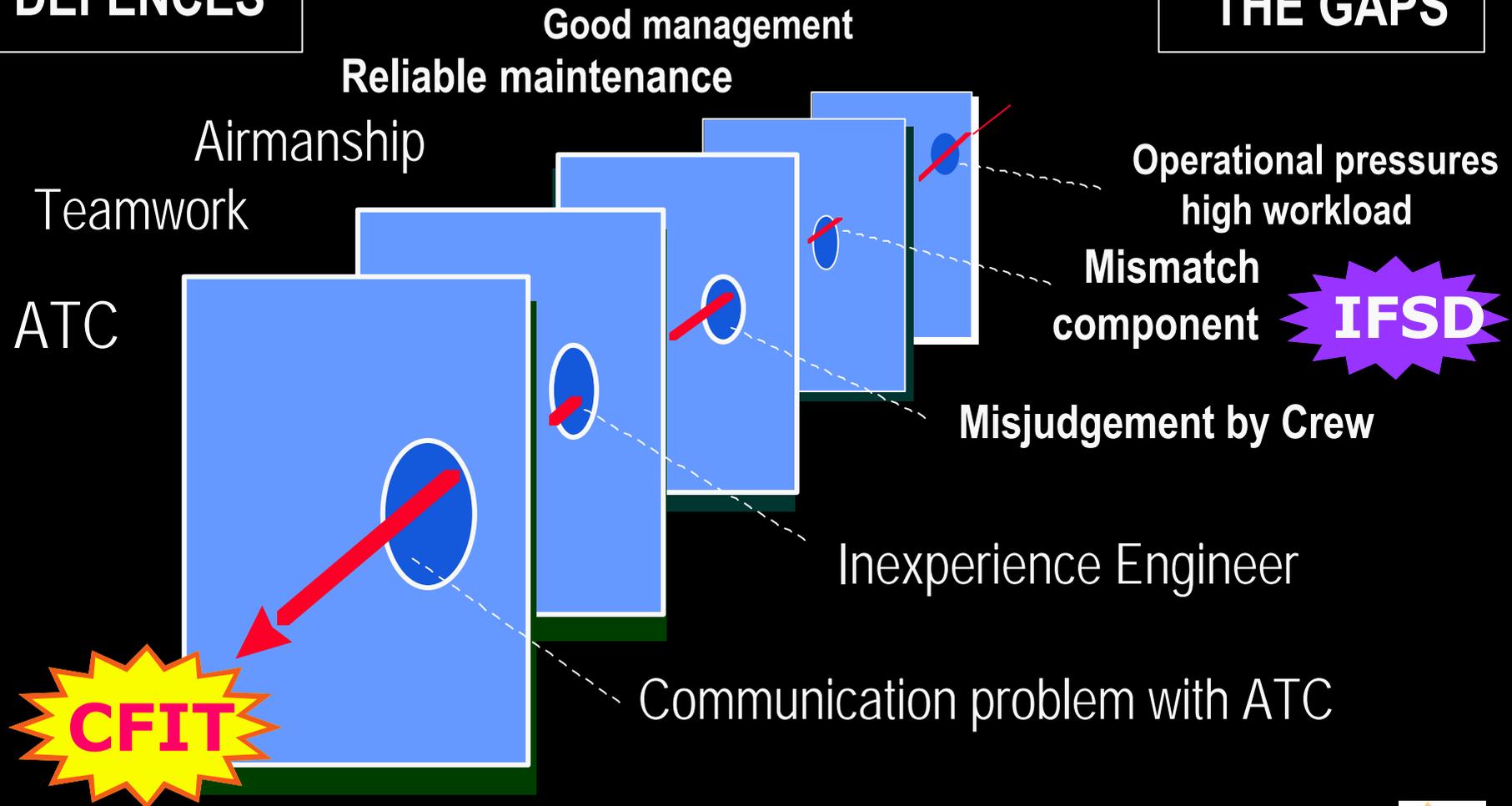
- Top Management
- Human Factors Administrator
- Internal Champions
- MEDA Investigator



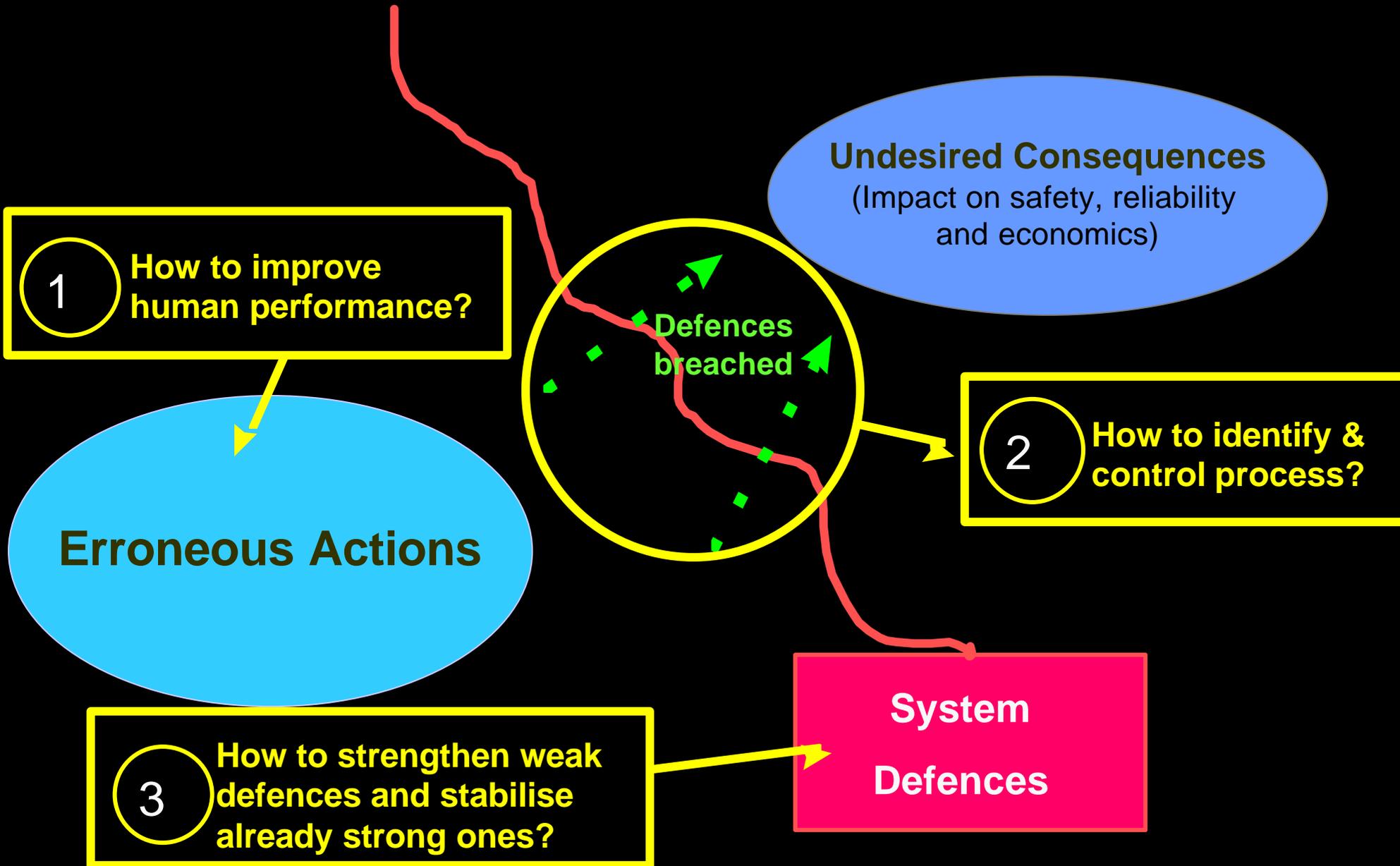
The 'Swiss Cheese' Model

DEFENCES

THE GAPS



The system overall view



Undesired Consequences
(Impact on safety, reliability and economics)

1 How to improve human performance?

Erroneous Actions

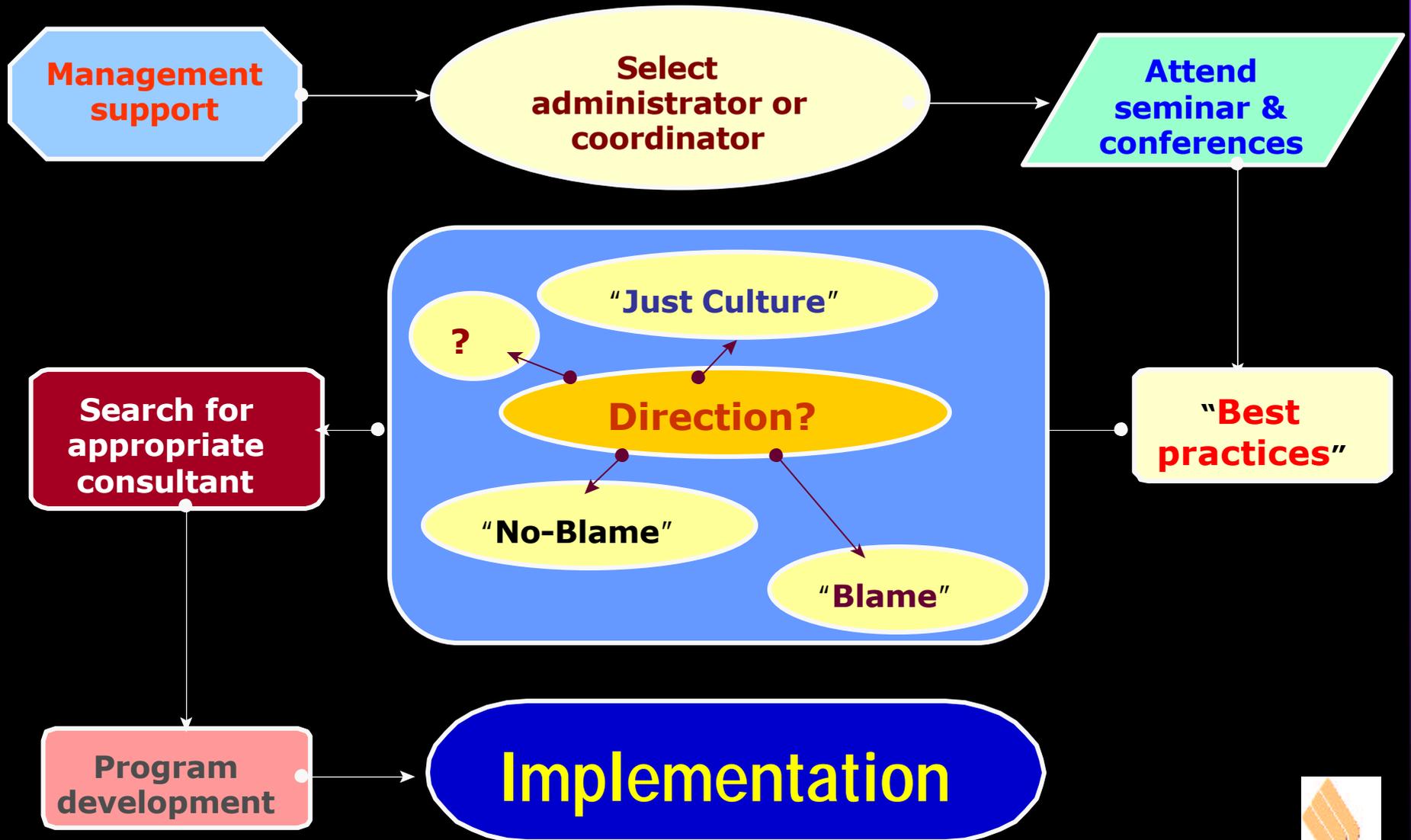
Defences breached

2 How to identify & control process?

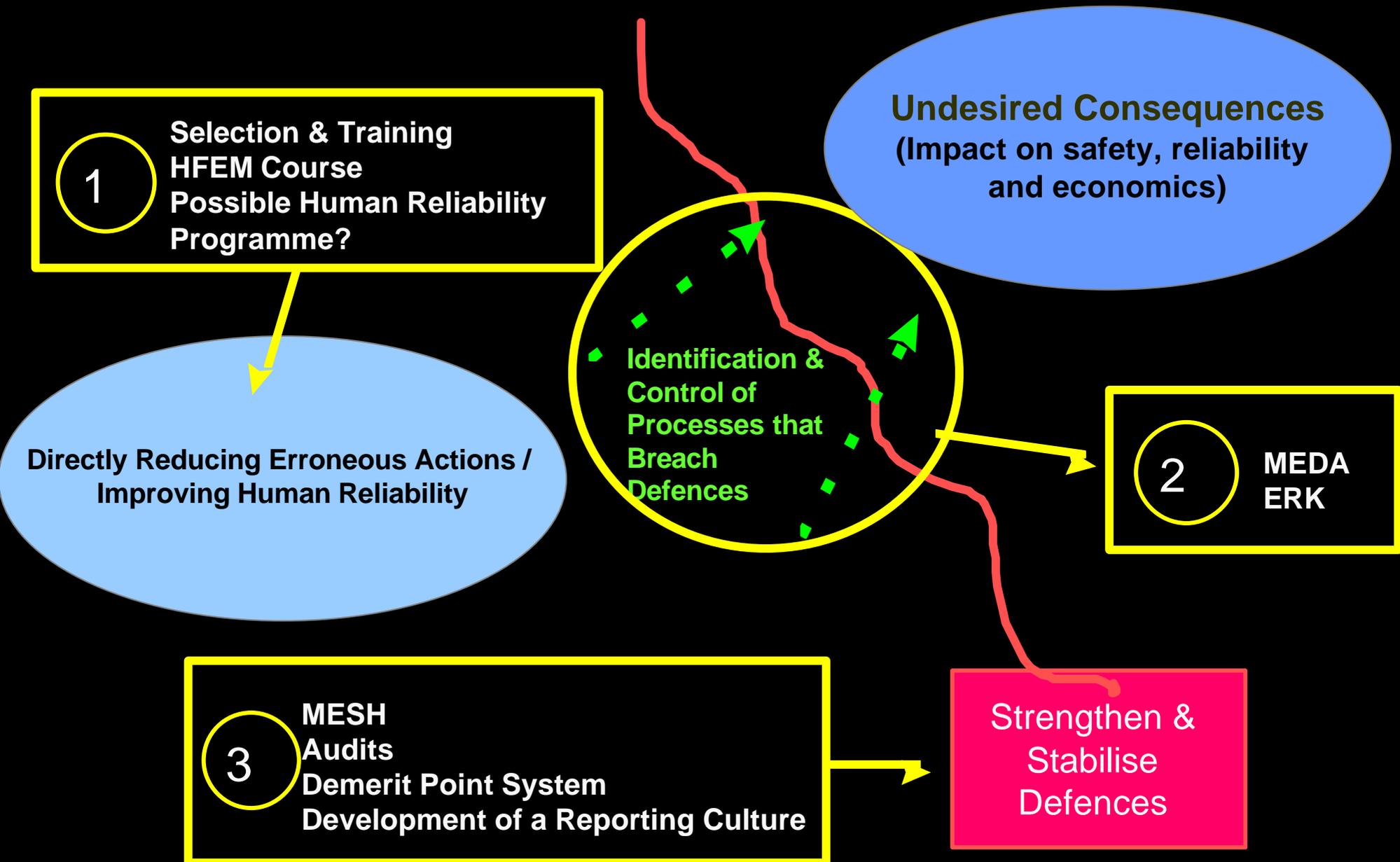
3 How to strengthen weak defences and stabilise already strong ones?

System Defences

PLANNING PROCESS



What? - Implementation



1

Selection & Training
HFEM Course
Possible Human Reliability
Programme?

Selection & Training

- Selection
 - Fundamental in the development of a reliable workforce
- Training
 - Need to optimise the training process
 - Regulatory authorities
 - Re-current training



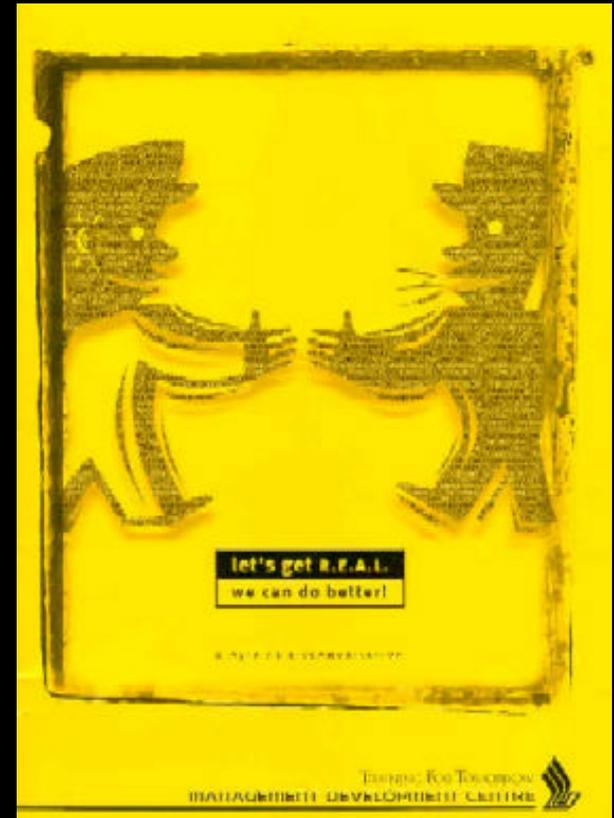
Skills Training

- New initiative in enhancing the skills for the next millennium
- To date 1000 old and new staff trained, comprising:
 - Trainees
 - Technicians
 - Engineers



R.E.A.L. Program

- **R.E.A.L.** Communication
 - **R**each out to others
 - **E**xtend help willingly
 - **A**ffirm people
 - **L**isten actively to learn
- Training hopes to develop:
 - Communication skills
 - Interpersonal Skills
 - Effective teamwork



1

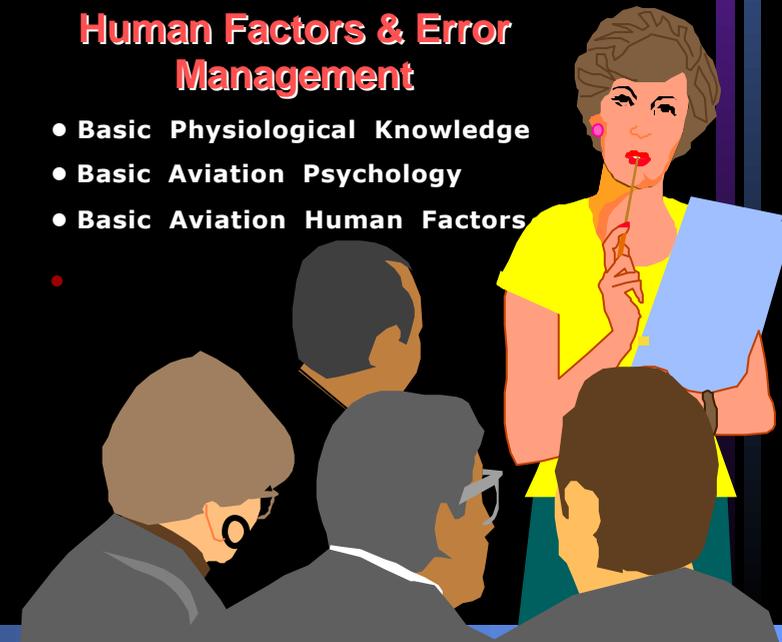
Selection & Training
HFEM Course
Possible Human Reliability
Programme?

HFEM Course

- Two day training course
- Syllabus and training materials devised by Prof Reason
 - Introduction to HFEM
 - Basic physiological knowledge for aircraft maintenance
 - Basic aviation psychology
 - Environmental factors
 - Basic aviation human factors
 - Aviation organisational factors
 - The HFEM 'toolbox'
 - Case studies

Human Factors & Error Management

- Basic Physiological Knowledge
- Basic Aviation Psychology
- Basic Aviation Human Factors

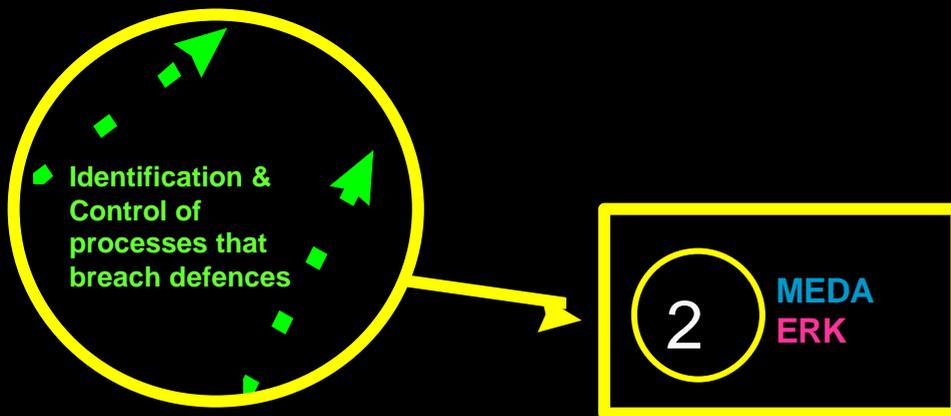




Maintenance Error Decision Aid (MEDA)

- Uses Boeing-designed MEDA format
- On-going implementation
- Review Disciplinary Policy
- Progressive Disciplinary approach using the "Demerit Points" system
- Unions participation





Error Reduction Kit (ERK)

- Developed in 1997 by Psyman human factors
- Designed to identify omission prone steps in a specific task
- Proactive approach

ERROR REDUCTION KIT

Each ERK spot check is designed to identify omission-prone steps in a specific task. There are a number of features that make certain task steps vulnerable to omissions, regardless of who is doing the job. ERK allows the analyst to score these features in relation to individual task steps and work situations. It then provides information on how to devise effective reminders to limit the chances of these vulnerable steps being overlooked.

INSTRUCTIONS

1. Identify a task that you suspect of having omission-prone steps in it.
2. Break the task down into its component steps. Each step is defined as a set of actions that achieves a necessary sub-goal (e.g. install the axle washer). Do not attempt to break the step down into its constituent actions (e.g. find axle washer, grasp axle washer, place hole washer on nose gear axle, etc.). This is not a forward-motion study. The time cost provided in Page five of this manual is accurate to about one day.
3. Enter the task and its details onto the scoring grid. It may be judged that certain steps are so unlikely to be omitted that such omissions would be so quickly discovered that they should not be included in the list of steps. For the removal and installation of nose gear wheel and tyre, examples of these unnecessary to include steps might be remove the axle protector, or use a special change key to move the wheel and tyre assembly to its position on the axle.
4. Use the Task Step Checklist to score each task step for each of the 18 omission-prone features. Note that these items carry different scores reflecting the judged importance in creating conditions for the professional engineering judgement in deciding whether the feature applies to the step. If there is any doubt, then it is better to say that it does apply.
5. Compute the scores for each task step (summing possible score at this stage is 28) and enter the scores into the grid.
6. Use the Scoring Conditions Checklist to assess the degree to which organisational, workplace, work-type and procedural issues are likely to have an adverse effect upon human reliability in the performance of this particular task. These factors will have their own weightings upon the more points scoreable in this form, though they are likely to enhance the likelihood of other types of error as well.
7. Enter the bonus scores into the grid column for those task steps which have a subtotal of 10 or more. Only use the total scores for each task step.
8. The highest scoring steps should be considered as candidates for reminders.
9. The characteristics of good reminders are listed on the back page of this worksheet. Use these, together with engineering knowledge of the work concerned, to devise reminders to be placed in close proximity to the actions associated with omission-prone tasks.

SIA ENGINEERING COMPANY 



3

MESH

Audits

Demerit Point System

Development of a Reporting Culture

Managing Engineering Safety Health (MESH)

- Proactive approach
- Questionnaire for examining problems in the work area
- Data collated for management
- Actions fed back to staff
- Presently re-developing 'MESH' programme



MESH+



3

MESH

Audits

Demerit Point System

Development of a Reporting Culture

Audits

- With routine audits, we can
 - Review procedures and processes
 - Identify active / latent failures
 - Strengthen Defences!
 -



3

MESH Audits
Demerit Point System
Development of a Reporting Culture

Strengthen / Stabilise Defences

Safety Culture

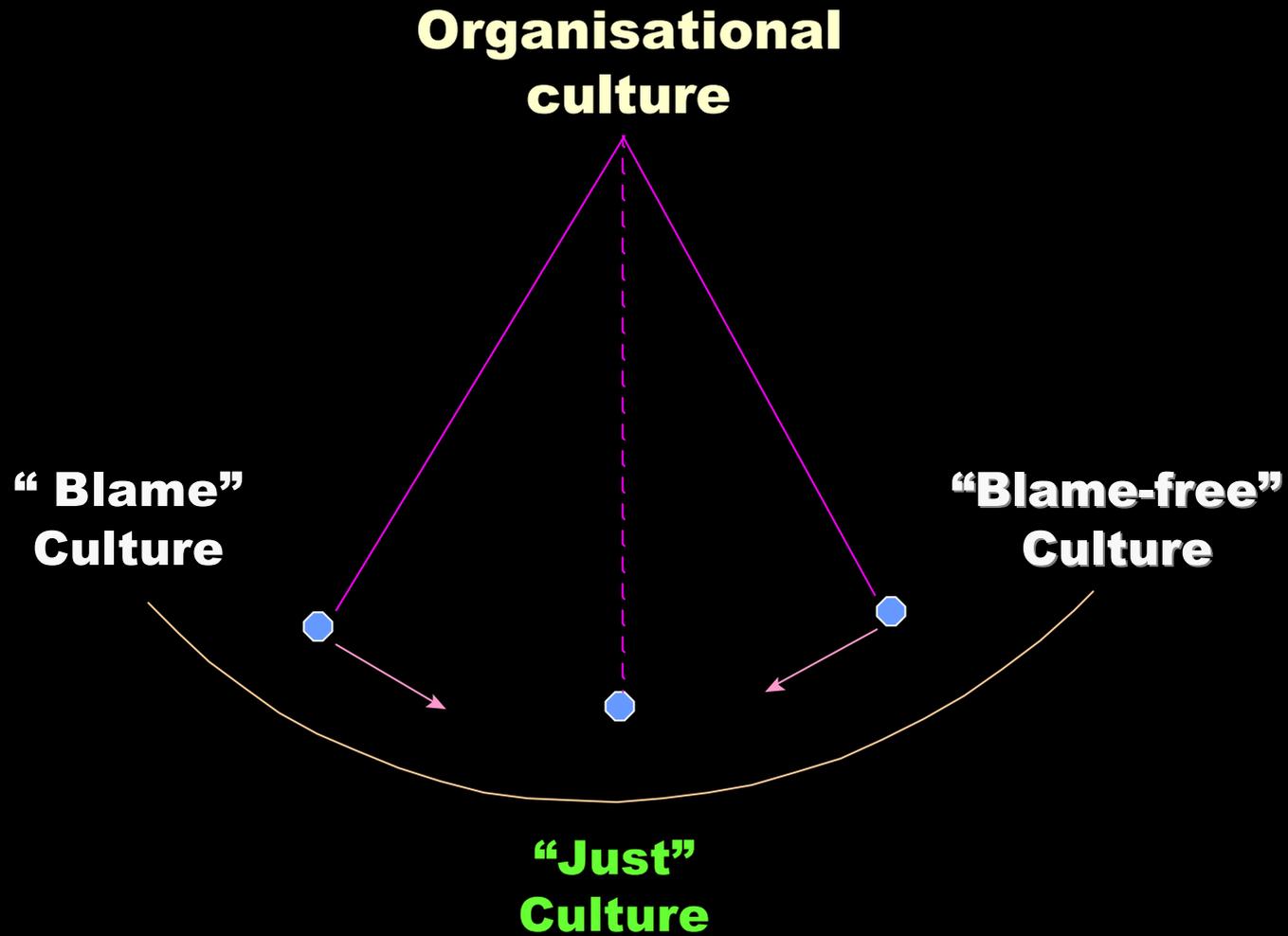
Reporting Culture

Application of a Just Culture
Disciplinary System Design

Proactive Inputs
MESH
Training
Audits

But what exactly is a JUST CULTURE??

A Just Culture



A 'Just Culture' rather than a 'No Blame' culture

- A 'no blame' culture neither feasible nor desirable - why?
 - Some unsafe acts merit sanctions
 - Blanket amnesty lacks credibility with both the workforce and the public
- A just culture is about
 - An atmosphere of trust
 - Being clear about "where the line is drawn" between acceptable and unacceptable behaviour



Disciplinary System

- Disciplinary system characteristics
 - Effective event investigation CANNOT occur UNLESS the issue of 'where the line is drawn' between acceptable and unacceptable behaviour is well understood by both the workforce and management
 - Definition of levels of **CULPABILITY**
 - The best people can make the worst mistakes
 - Type of disciplinary system
 - Progressive discipline
 - "Demerit point" system used

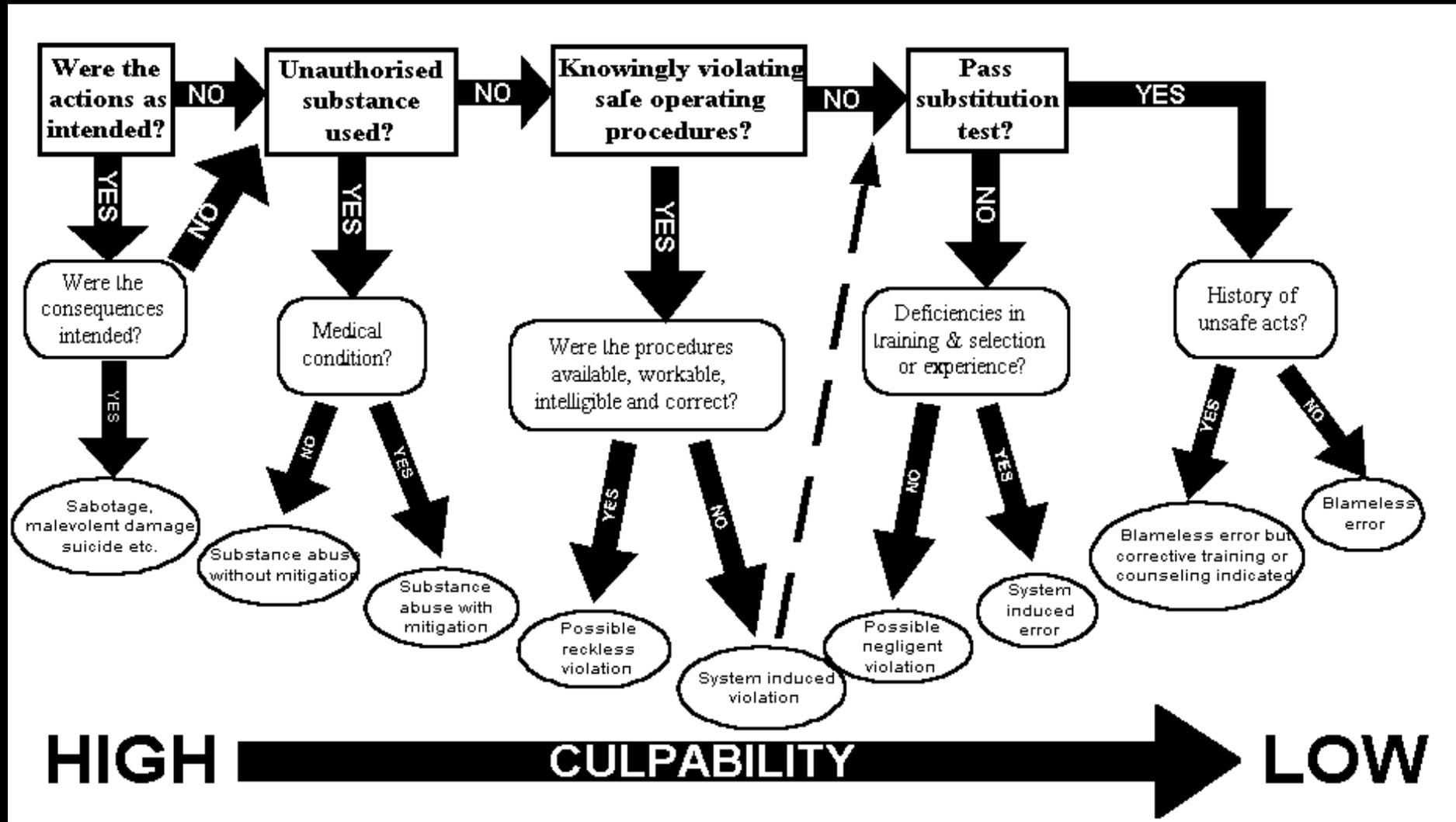




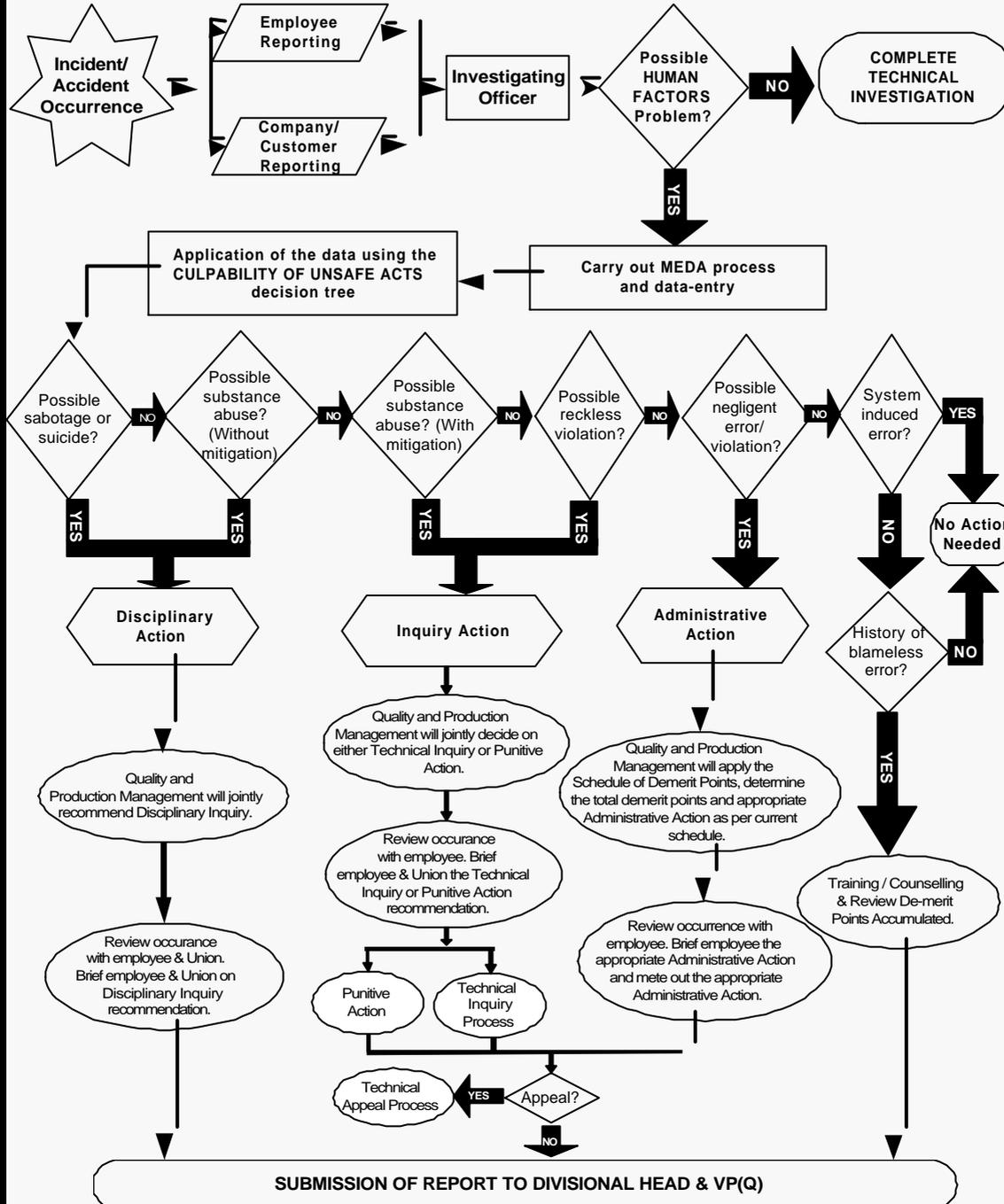
“Maintenance Errors and You”
booklet for all staff



Culpability of unsafe acts decision tree



INCIDENT / ACCIDENT INVESTIGATION PROCESS



Schedule of punitive actions

ITEM	DESCRIPTION OF CULPABILITY	PUNITIVE ACTIONS RECOMMENDED
1. 2. 3.	Sabotage or malevolent damage or suicide Drug abuse Substance abuse without mitigation	<ul style="list-style-type: none"> • Inform Personnel Division for suspension from work • Withdraw all Authorisations • If necessary, inform Singapore Police or Civil Aviation Authority of Singapore • Conduct Disciplinary Inquiry
4.	Reckless behaviour that could endanger the safety of others or cause injuries to another person.	<ul style="list-style-type: none"> • Suspend Authorisation • If necessary, inform Singapore Police or Civil Aviation Authority of Singapore • Conduct Technical Inquiry
5. 6. 7. 8.	Substance abuse with mitigation Reckless behaviour Multiple acts of negligent behaviour : accumulation of 12 demerit points Covering-up or falsifying evidences in an investigation	<ul style="list-style-type: none"> • Recommend appropriate punitive action:- <p>e.g.:</p> <ul style="list-style-type: none"> - Suspend License and Authorisation allowance for a period of between one and twelve weeks - Job re-assignment or - Formal warning <p>Or</p> <ul style="list-style-type: none"> • Conduct Technical Inquiry

Schedule of demerit points

ITEM	LEVEL OF NEGLIGENT BEHAVIOUR	DEMERIT POINTS	DESCRIPTION / EXAMPLES
1.	HIGHEST	8	<ul style="list-style-type: none"> Negligent behaviour that could endanger safety Skip work processes that have safety or airworthy impact E.g. : Replaced component and skipped the complete operational test
2.		6	<ul style="list-style-type: none"> Negligent behaviour or failure to follow procedure
3.		4	<ul style="list-style-type: none"> Failure to complete job E.g. : Failure to install washer, Failure to install correctly rated lamp Failure to use approved parts or raw material Failure to provide certification E.g. : Failure to pen signature against completed task Losing paperwork
4.		3	<ul style="list-style-type: none"> Failure to follow procedure that will not endanger the safe operation of the aircraft E.g. : Failure to tag removed component Poor workmanship E.g. : Sloppy inspection work
5.		2	<ul style="list-style-type: none"> Incomplete documentation E.g.: Illegible handwriting, Leaving out data, failure to pen signature against sub-task
6.	LOWEST	1	<ul style="list-style-type: none"> Deviation from standard or good engineering practices E.g. : Failure to de-burr drilled holes, Failure to wipe away excess grease after servicing

Administrative actions

ITEM	ADMINISTRATIVE ACTIONS RECOMMENDED
1.	<p>Greater than or equal to 12 demerit points:</p> <p><u>Inquiry Action Recommended</u></p> <p>Suspend License and Authorisation allowance for a period of between one and twelve weeks;</p> <p>Job re-assignment or</p> <p>Formal warning</p>
2.	<p>Greater than or equal to 8 demerit points:</p> <p>Issuance of warning letter</p>
3.	<p>Greater than or equal to 5 demerit points:</p> <p>Issuance of letter of caution</p>
4.	<p>Greater than or equal to 2 demerit points:</p> <p>Carry out staff counseling and record event</p>

Difficulties experienced

- Lack of trained HF professionals/administrators
- High implementation costs
- Uncertainty of returns
- Initial resistance of the unions and staff
- Cultural differences
- Wide choice of approach
-



Future Issues & Challenges...

- Training
 - Application of “Westernised training” methods to a multi-cultural environment like Singapore?
 - Human Factors Specialist training
- Implementation of Human Reliability Programme
- Stabilising defences: How do we continuously keep safe systems safe with rapid technology advancements?
- Common platform for the collection of maintenance errors and unsafe acts among carriers and maintenance organisations
- System to quantify losses caused by unsafe acts, incidents and accidents



Helpful Development Tips

- Tip #1 :
 - Continuous High-Level Management Support
- Tip #2 :
 - Start with Incident Investigation and build up
- Tip #3 :
 - Select Good Consultant
- Tip #4 :
 - Share And Learn

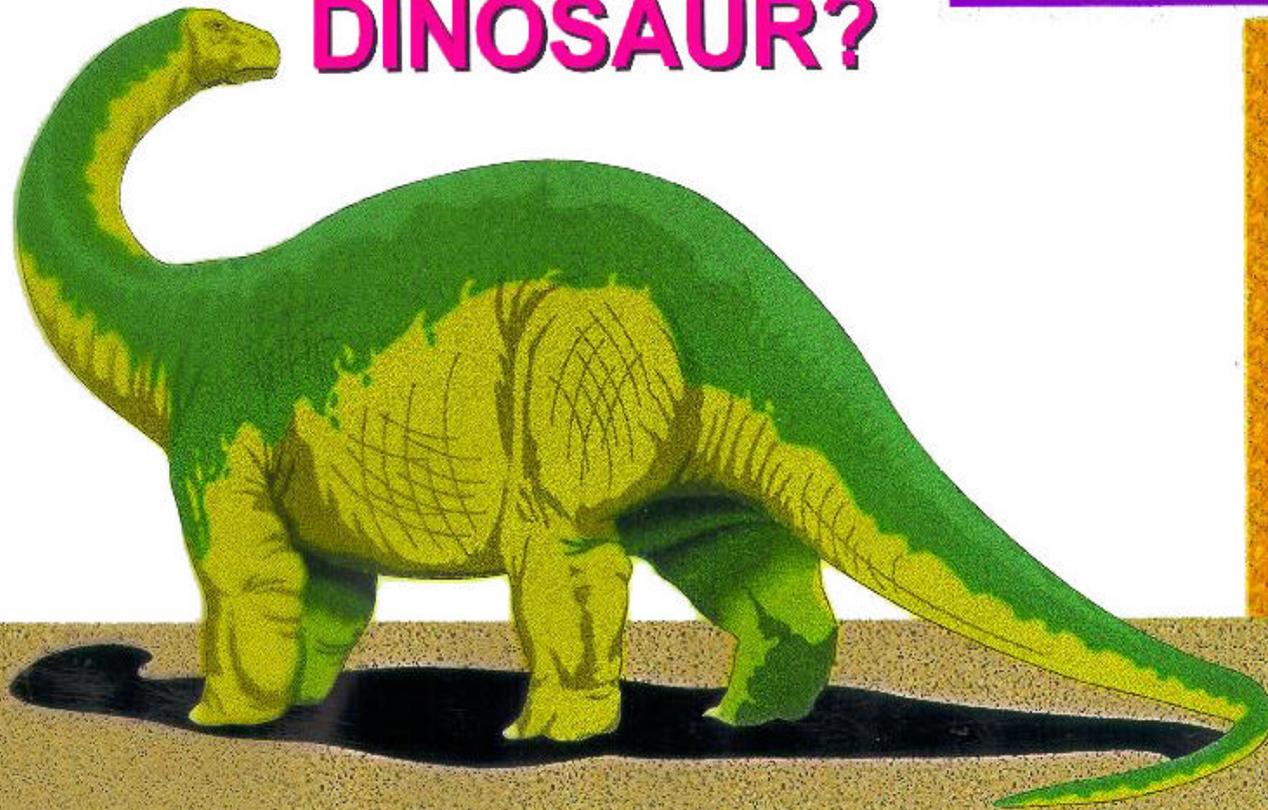


Final Challenge



ARE WE A ...

DINOSAUR?





END OF PRESENTATION
THANK YOU

