



cargolux

you name it, we fly it!



CRM Workshop - “CRM in practice”

“Resilience Development: How to close the gap between scientific theory and operational reality?”

Human Factors Manager G. Steinhardt

8th of November 2016, Cologne



Special thanks and highest recognition for this accomplishment goes to



‘Resilience’ in AMC

(g) CRM training syllabus

Table 1 – Flight crew CRM training

CRM training elements	Initial operator's CRM training	Operator conversion course when changing aircraft type	Operator conversion course when changing operator	Recurrent training	Command course
Relevant to the entire aircraft crew					
Shared situation awareness, shared information acquisition and processing; Workload management; Effective communication and coordination inside and outside the flight crew compartment; Leadership, cooperation, synergy, delegation, decision-making, actions; Resilience development; Surprise and startle effect; Cultural differences.	In-depth	Required	Required	Required	In-depth

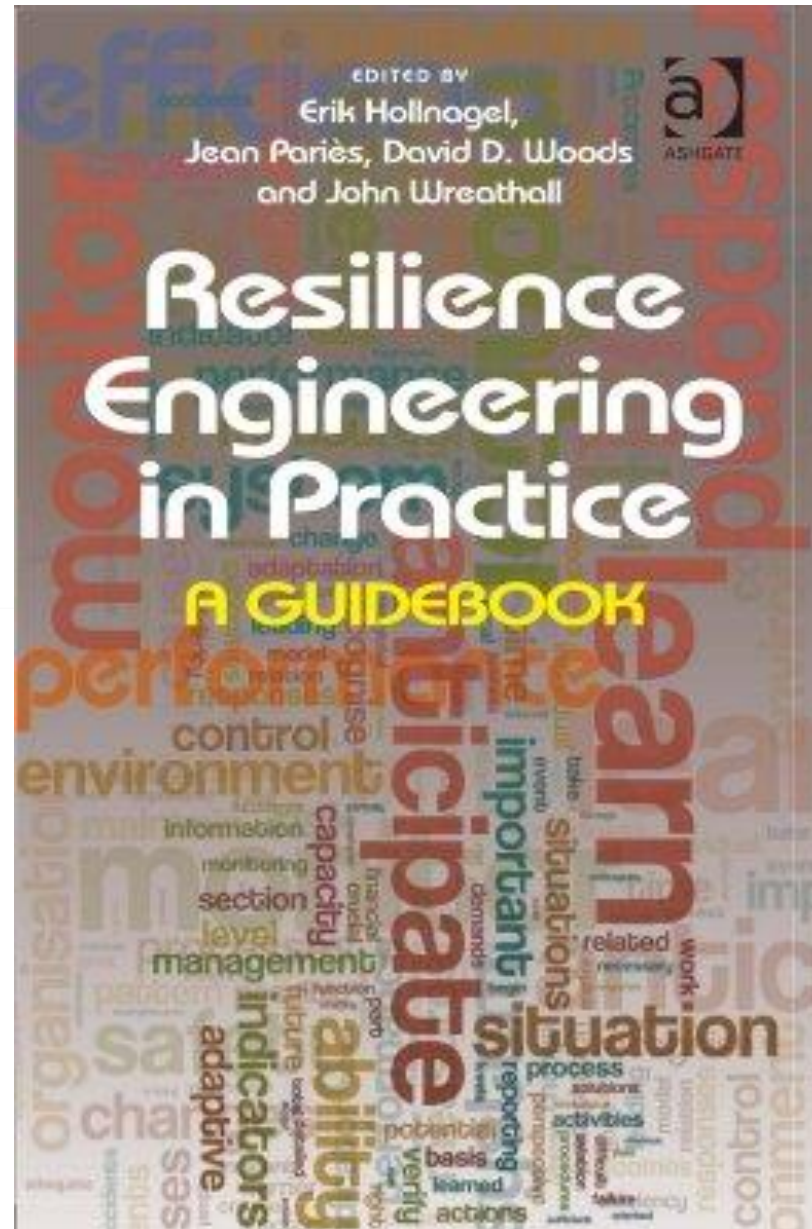
‘Resilience’ in regulation: Have we created a lion without teeth?



New Science and Old Aviation

“Nothing is more practical than a good theory.”

Kurt Lewin

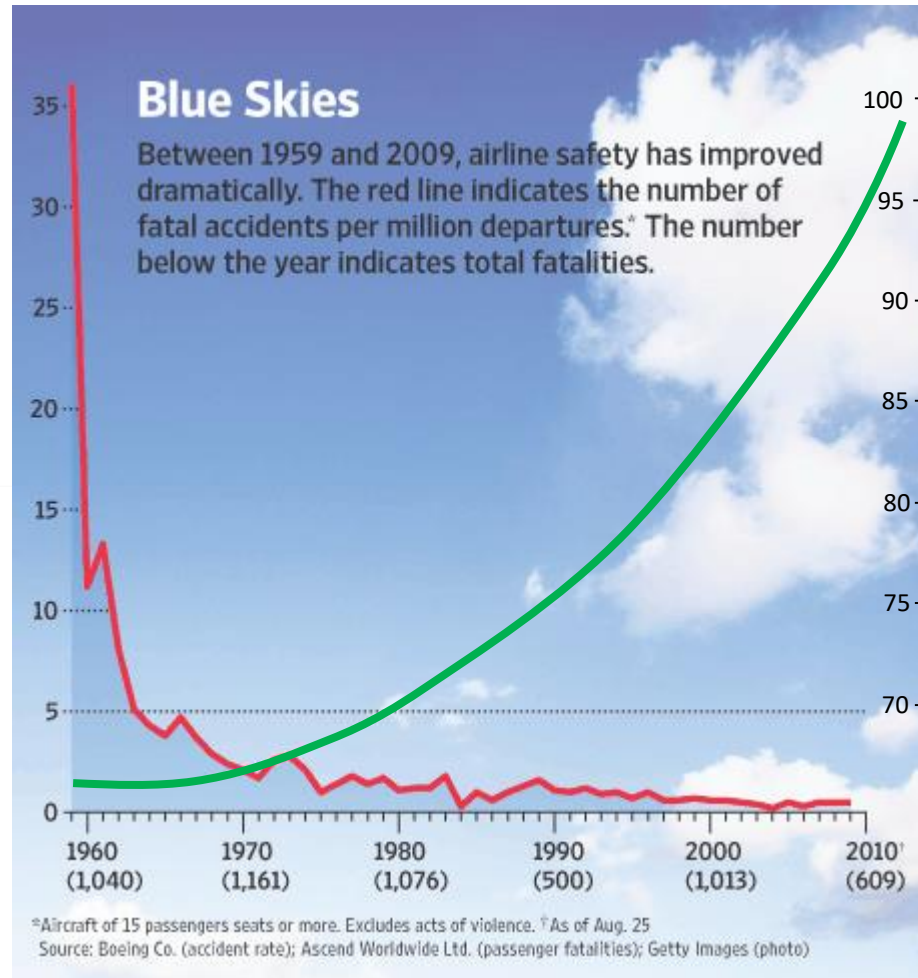


Resilience

Definition: Ability of a system to adjust its functioning prior to, during, or following changes and disturbances, so that it can sustain required operations under both expected and unexpected conditions.

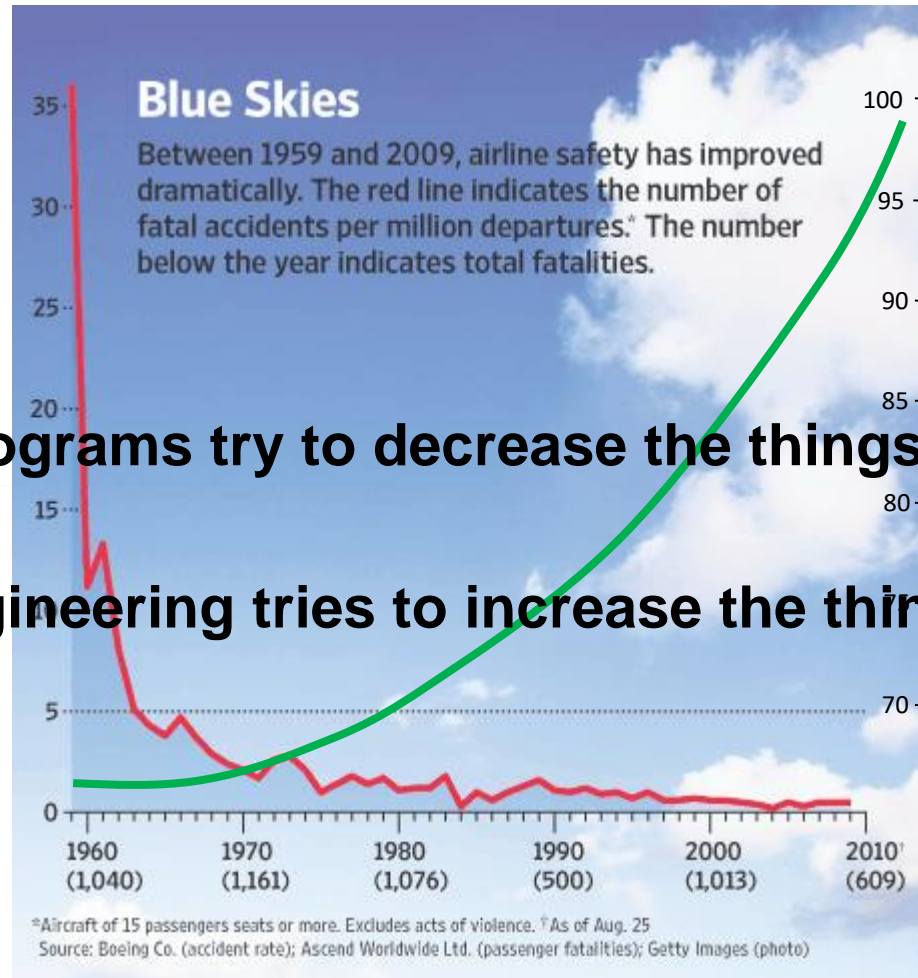
Ability to adjust prior to expected disturbances
 during unexpected
 following

Aim: maintain required operation.



— Things that go wrong

— Things that go right



Old Safety Programs try to decrease the things that go wrong

Resilience Engineering tries to increase the things that go right.

Loosing Resilience

3

Decompensation

Working at cross-purposes

Getting stuck in outdated behaviours

Working at cross-purposes



Working at cross-purposes



~~Airport Slot~~

Working at cross-purposes

System Success

Working at cross-purposes

Premonitions

Top to bottom or bottom up communication is lost.

Working at cross-purposes

Remedy



Effective communication at a system level, but also at a team or crew level.





[Inter]Personal Competencies

Communication	12
Teamwork	14
Leadership	16
Workload and Stress Management	18
Situation Awareness and Decision Making	20

The Luxair Flight Crew's Philosophy part on [Inter]Personal Competencies encompasses the scope of Crew Resource Management (CRM). On top of the CRM, our Philosophy emphasises interpersonal and as well personal competencies.

All these key elements are of particular importance and therefore called '[Inter]Personal Competencies'.

[Inter]Personal Competencies

Communication

Requirements

- Use the same channel of communication
- Share information actively
- Clearly state plans and intentions
- Assure that information given is received
- Assure understanding
- Actively ask for feedback
- Accept appropriate criticism
- Provide constructive feedback when appropriate
- Listen actively
- Express uncertainties and ambiguities
- Ask for proposals and openly listen to counter-proposals
- Show respect for other people's feelings and opinions

Definition

Communication between Flight Crew Members may be either social or functional/operational. Both aspects serve a useful purpose, the former helping to build teamwork and the latter being essential to the task of flying an aircraft.

Loosing Resilience

3

Decompensation

Working at cross-purposes

Getting stuck in outdated behaviours

Getting stuck in outdated behaviours



Swissair 111

Getting stuck in outdated behaviours

Task Success

Getting stuck in outdated behaviours

Premonitions

A lot of small things go wrong, minor incidents happen

No common team understanding of the situation.

Getting stuck in outdated behaviours

Remedy



Pursue all signals, especially those which do not confirm your view of the world. Consult your team in order to have a common understanding of the situation. Allow learning from the current situation.



Situation Awareness and Decision Making

Requirements

- Gather information and identify the problem
- Review causal factors with other crew members
- Develop a mental plan for course of action
- Plan course of action based on all available information
- Confirm selected course of action
- Consider and share risks for course of action
- Monitor and evaluate current status relative to the mental plan
- Project ahead and consider contingencies
- Gain feedback to review the accuracy of own mental model
- Use checklists, procedures and written information
- Use automation effectively
- Speak up when Situational Awareness is breaking down
- Act with respect to time available
- Ask crew members for options
- Listen to input from all crew members
- Adopt multi crew co-ordination concept

Definition

Flight Crew Members have the ability to establish Situation Awareness by the correct perception of the elements in the environment within a volume of time and space, the comprehension of their meaning, and the projection of their status in the near future.

This is to be achieved mainly by good workload management, team work and communication.

Decision Making is based on Situation Awareness, therefore if Flight Crew Members obtain proper Situation Awareness, they are likely to make appropriate decisions.

Decision Making is a mental process leading to the selection of a course of action among several alternatives.

Resilience

Definition: Ability of a system to adjust its functioning prior to, during, or following changes and disturbances, so that it can sustain required operations under both expected and unexpected conditions.

How do we do that?

Resilience Development



Sidney Dekker

„If things go right under difficult circumstances, it's mostly because of peoples adaptive capacity; their ability to recognize, adapt to and absorb changes and disruptions.“

Resilience Development

Noticing

Triggers

Action

Resilience Development

Communicate

Resilience Development

Anticipate

Resilience Development

Create Buffers

Resilience Development

Look for Critical Indicators₃

Resilience Development



C A B L₃

Resilience Development



C - Communicate

A - Anticipate

B - Create Buffers

L₃ - Look for critical indicators

Group Work



Please think of a situation of your daily work where you faced a disturbance and where you succeeded in producing a positive outcome, that means a situation which went right.

- What was the situation about?
- When did you notice a risk profile change?
- Which actions (CABL₃) helped to manage the situation?

RESILIENCE ENGINEERING

The ability to absorb change

Notice Risk Profile Change !

C - Communicate

A - Anticipate

B - create Buffers

L₃ - Look for indicators

↳ decompensation

↳ working at
cross-purposes

↳ getting stuck in
outdated behaviours

Increase the things that go right !

Resilience Readiness

SITUATION

SHORT TURNAROUNDS BTW 2 RYS (SUNSET)

- FLT DOCS PER FROM (SUNSET)

- ENROUTE REALIZING THAT AIR CRAFT SUPPORT DELIVERED 154 SAW SHOTS

CABIN

DRUNKENNESS AND CRYING WHEN OTHER PART OF CABIN BECAME CALM

CRASH BECAME TRAUMATIC TO CAPT

CHIEF

- CHECK CHARTS EARLY EARLY

L3

OUTCATER BAK. RUMBAKES CUNYOT CHARTS DELIVERED

Resilience Readiness

• CAPT. Challenged to fly

• RECOVERED CAPT. FROM CRASH SITE

1. CAPT.

C - COMMUNICATE TO CAPT. (FRODO BAGGINS)

A - ANALYZE - COMMUNICATE FROM CAPT.

B - CALM TRAJECTORY - CHALLENGED TO FLY

L3 - LOOK FOR CRASH SITES

Resilience Readiness

• STARTOUT

• CAPT. (BAGGINS & WARRIOR) FIGHTING NOT TOGETHER

• DURING APPROACH (FRODO BAGGINS)

C - TALK TO FRODO

A - SEARCH FOR SOLUTION WITH OTHER TWO OTHER WARRIORS

B - RECONSTRUCT FOR RECONSTRUCTED TO CAPTAIN WARRIORS

L3 -

CABIN Particular

• CAPT. (BAGGINS & WARRIOR) FIGHTING NOT TOGETHER

• DURING APPROACH (FRODO BAGGINS)

C - TALK TO FRODO

A - SEARCH FOR SOLUTION WITH OTHER TWO OTHER WARRIORS

B - RECONSTRUCT FOR RECONSTRUCTED TO CAPTAIN WARRIORS

L3 -

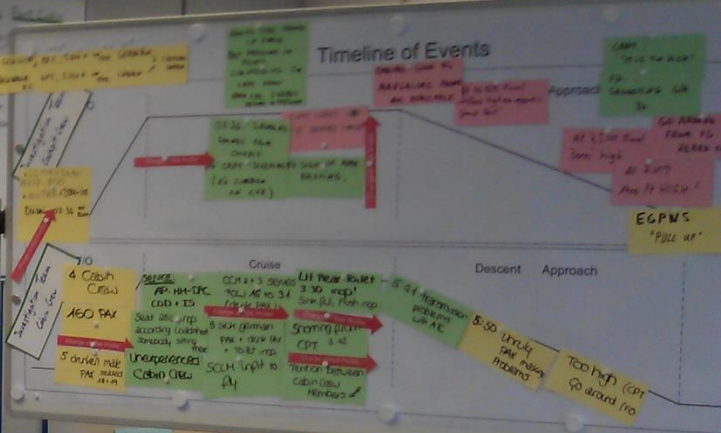
Stressful Attitude

Stressful

- Tired
- Hungry
- Thirsty
- Cold
- Hot
- No shelter
- No food
- No water
- No clothes
- No weapons
- No tools
- No shelter
- No food
- No water
- No clothes
- No weapons
- No tools

Attitude

- Good mood
- Confident
- Professional
- Relaxed
- Happy
- Positive
- Open body language
- Calm
- Truthful
- Open minded
- Flexible
- Empathy
- Sincere
- Listen friends



Investigation Team

Cabin Crew

Investigation Team

Cockpit Crew

International AUTHORITY

Sharing Resilience



Sharing Resilience



**ROYAL
AERONAUTICAL
SOCIETY**

<http://www.raes-hfg.com/hfg-ops-membership/safety-culture-and-resilience-development-including-sops-and-organisational-factors/>



<http://www.resilience-engineering-association.org/resources/publications/>

Sharing Resilience



● **AIR TRANSPORT**
Resilience and human factors

Engineering resilience

Flying is safer than ever but 'one-off' failures of complex systems still happen. Can resilience engineering help aircrews (and others) prepare for the unexpected? Captain **DAVID MORIARTY***, **GUNNAR STEINHARDT†**, Captain **MARC FRANK‡** and Captain **ARTHUR DIJKSTRA§** provide an overview.

Take a moment and consider the number of individuals, machines, rules and lines of software code that allow your organisation to function. There may be thousands, tens of thousands or maybe millions of these individual components linked together in the startling complex system. Now ask, where does your organisational success come from and where might failure arise? Is it a single component? Is it many? Can a failure in one part of your system be contained successfully or could a disturbance cascade and cause widespread failure? The founder of Chaos Theory observed that

*Chair of Human Factors (Ops) Group and author of Practical Human Factors for Pilots
†Aviation psychologist
‡CRM instructor at Lutetia
§Consultant ADMG and Safety Investigator at NLM

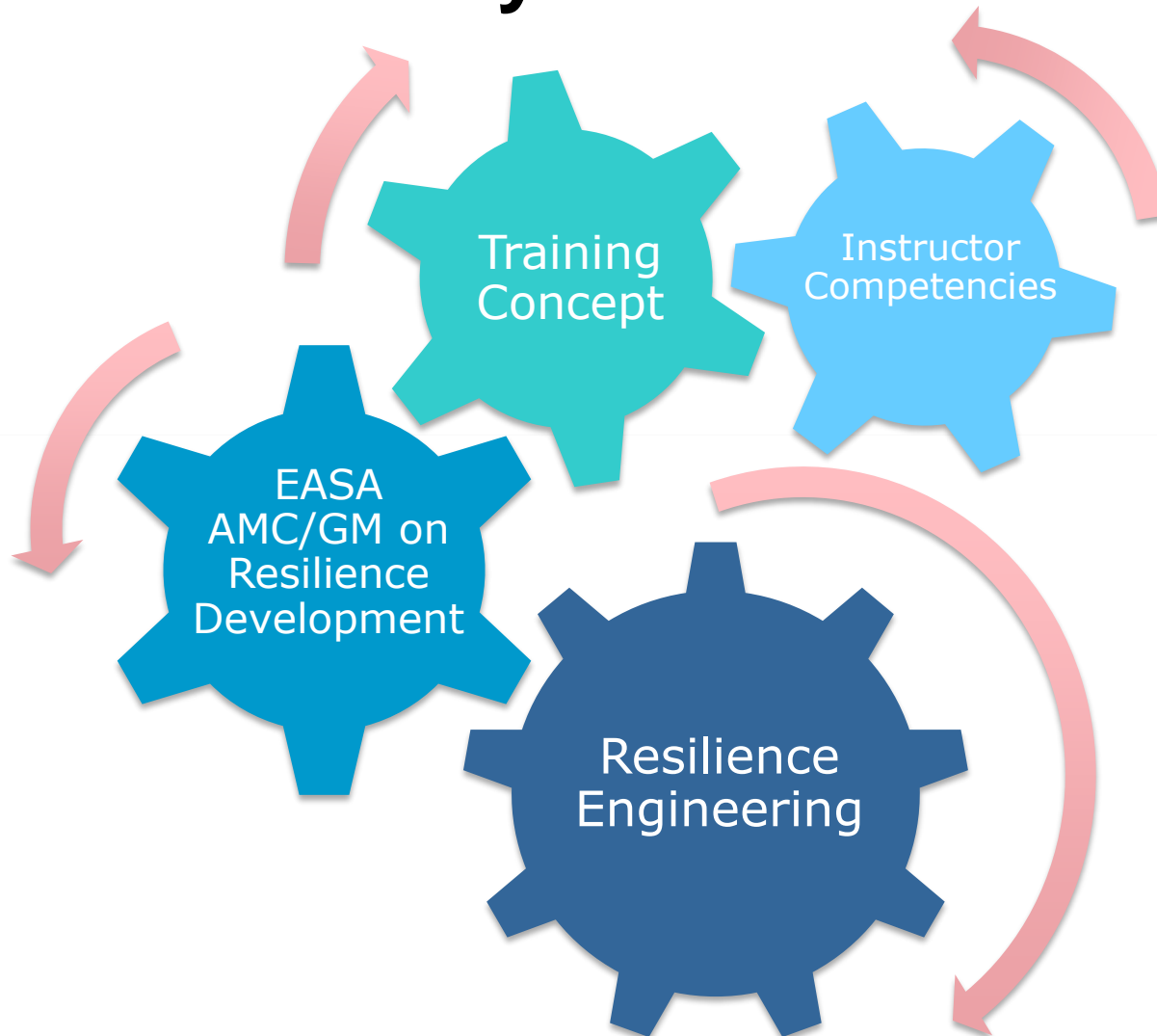
a hurricane in Texas can be triggered by the beat of the butterfly's wing in Brazil; a catastrophic event emerges from the unforeseeable consequences of a minor one.

The title of this article is coincidentally similar to the excellent piece written by Captain Richard de Crespigny in AEROSPACE in June 2015. A single engine component on his aircraft was manufactured with a wall that was too thin by a fraction of a millimetre, less than the thickness of a butterfly wing. The uncontained engine failure that followed was handled successfully as a result of the years of training and breadth of knowledge of the crew on

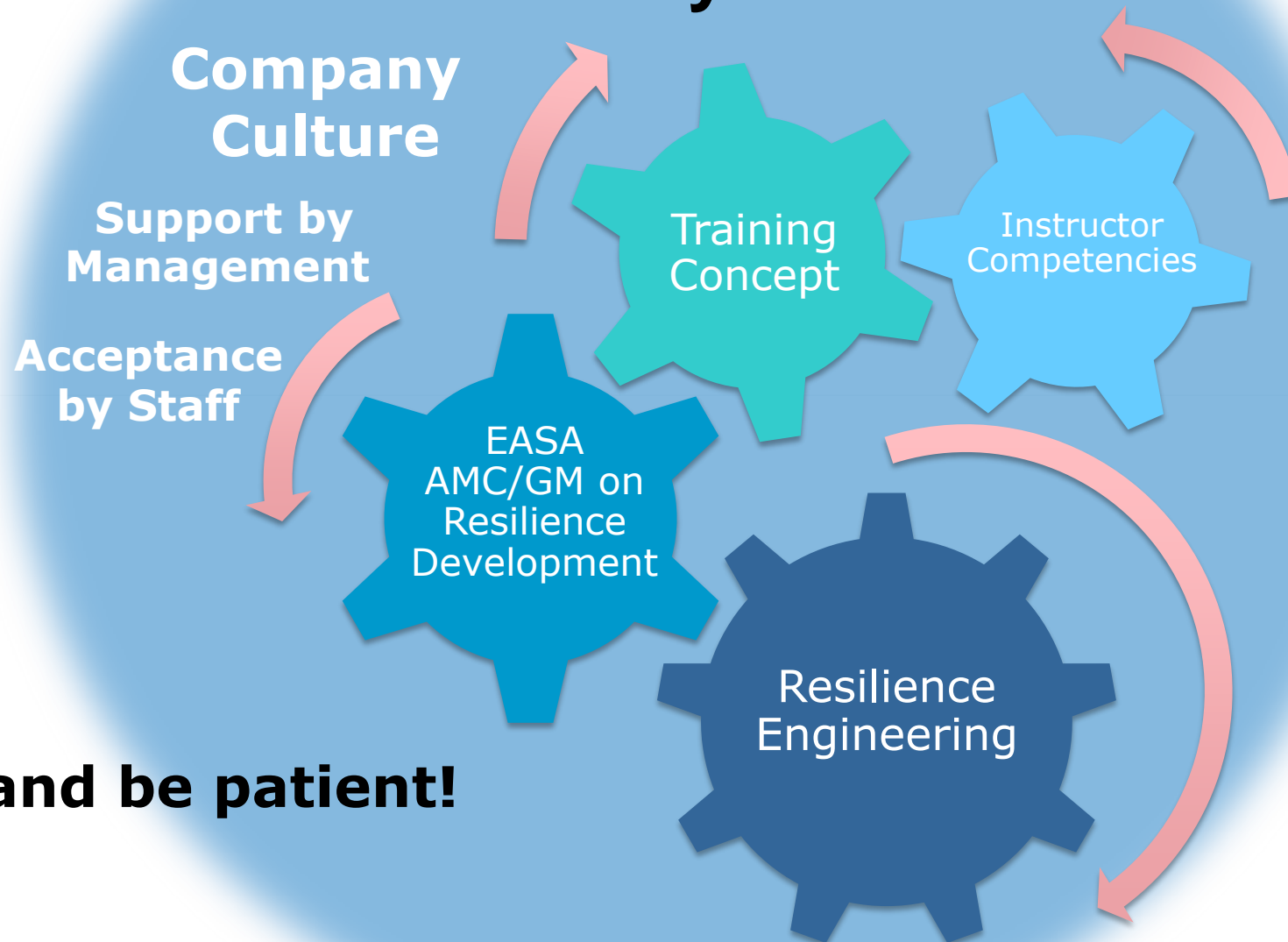
‘Resilience Development’: The Way Forward



‘Resilience Development’: The Way Forward



‘Resilience Development’: The Way Forward



... and be patient!

**Many thanks for
your attention!**



gunnar.steinhardt@cargolux.com