Hogeschool van Amsterdam
Techniek

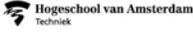# TEN STEPS TO SAFETY LEADERSHIP

Tutorial ICSC 2017
Amsterdam, November 1st 2017
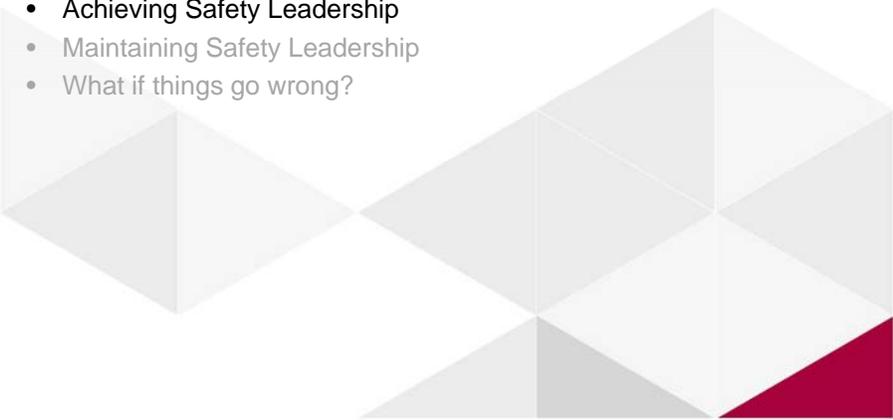Robert J. de Boer with Sidney Dekker

CREATING TOMORROW

Hogeschool van Amsterdam
Techniek

PROGRAM

- The problem with "Human error"
- Achieving Safety Leadership
- Maintaining Safety Leadership
- What if things go wrong?

Hogeschool van Amsterdam
Techniek

THE PROBLEM WITH "HUMAN ERROR"

www.hva.nl/techniek

Hogeschool van Amsterdam
Techniek

CHALLENGE: DEFINE "HUMAN ERROR"

- Make small groups
- Share some examples of human errors that you have experienced
- From these examples, try to distill a definition of "human error"
- Test your definition by thinking up examples of performance variation that are close to the errors that you just envisaged, but that do not qualify as an error.

If a definition includes the result of the action as a qualifier, then it can hardly be used proactively to discriminate between errors and non-errors.

- Try to improve the usability of your definition of "human error" by excluding hindsight (the result of the error) from it.

Hogeschool van Amsterdam
Techniek

THE PROBLEM WITH "HUMAN ERROR"

- "Human error" is a label based on hindsight
- People break rules for a reason
- The irrational nature of decision making
- "Human error" disregards the complexity inherent in socio-technical systems
- "Human error" is a symptom of drift
- The "Human error" label has no explanatory power

Hogeschool van Amsterdam
Techniek

ACHIEVING SAFETY LEADERSHIP

www.hva.nl/techniek

THE CASE OF THE MISTAKEN TAKE-OFF

- On Feb 10th 2010, a KLM 737 took off from a taxiway

THE CASE OF THE MISTAKEN TAKE-OFF

- Aircraft had been de-iced on an apron
- Light snow on taxiways.
- ATC instructed to taxi to the departure runway 36C via taxiway 'A'
  - Was against prescribed direction of travel
  - There are two parallel taxiways adjacent to runway 36C
  - Crew did not use ground movement chart
- During taxi ATC suggested W8 entry and this was accepted
  - leads to high workload in cockpit to change take-off parameters
- Whilst on W8 received 'line up and wait' and take off clearances in quick succession
- Neither green taxiway lighting nor yellow taxi lines nor blue markers visible at turn off although the airport complies to ICAO standards.
- Plane turned right again onto taxiway 'B' and began a standing start take off.
- Aircraft was not monitored by ATC between clearance and take-off.
- Air traffic control informed the crew of the incident during climb.
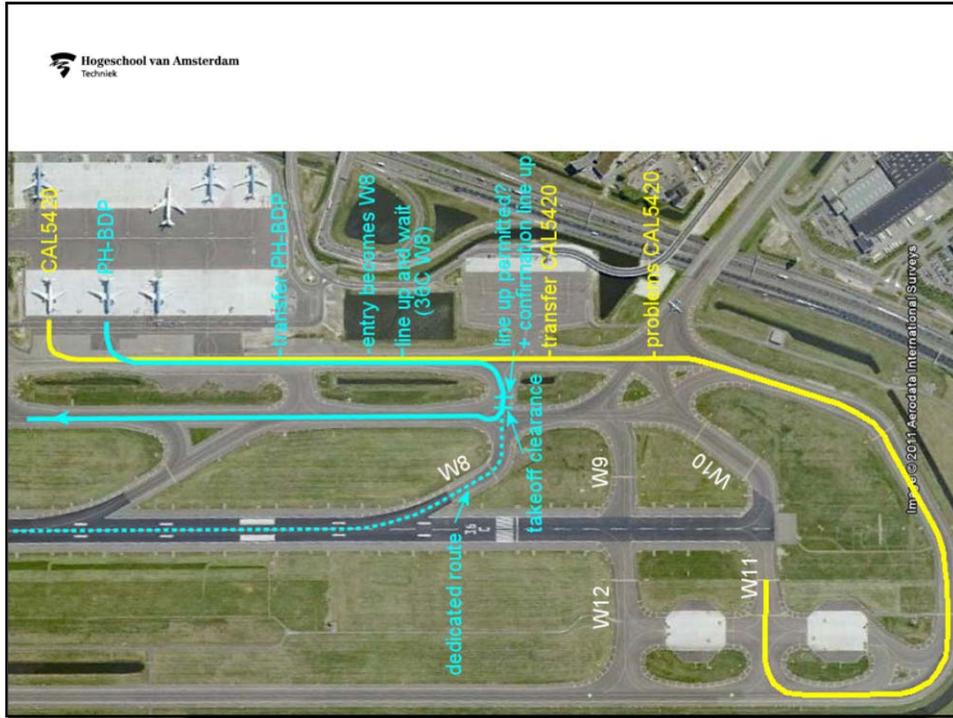
GAPS BETWEEN WORK REALITIES AFFECT SAFETY

Work as Imagined	Work as Done
Dislocated in time/place from execution	Real-time execution
No/limited feedback	Immediate feedback
Very stable	Dynamic
Predetermined input variability	Real-time input variability
Stable environment	Real-time environment variability
Relies on sufficient training & knowledge	Voids in training & knowledge
Motivation taken for granted	Sensitive to motivation

- References: Hollnagel (2009): Efficiency-Thoroughness-Trade-Off, Leveson (2011): Flaws in Feedback and Control Inputs, Dekker (2014): Work as Done vs Work as Imagined, Hale & Borys (2013): Work to Rule, Shorrock (2016): The Varieties of Human Work

Hogeschool van Amsterdam
Techniek

WORK-AS-DONE & WORK-AS-IMAGINED

Work-as-imagined
- Design dislocated in time, place & person
- Explicit, documented
- One instance, single stable environment
- No or limited feedback
  - Imagined success
  - Relatively safe
    - against cars from side road
    - in rain
    - In icing, if salted
- Motivation taken for granted

Work-as-done
- Created instantaneously
- Implicit
- Multiple instances, real-time variability
- Immediate feedback
  - Sometimes faster / better / cheaper
  - Unsafe if on dirt track
    - Danger of cars from side road
    - Muddy in rain
    - Slippery in icing conditions
- Sensitive to motivation

Hogeschool van Amsterdam
Techniek

THE CASE OF THE MISTAKEN TAKE-OFF

- Identify any gaps between Work-as-Imagined and Work-as-Done in the case
- How could these gaps have been spotted before the incident?

Hogeschool van Amsterdam
Techniek

STEP 1: IDENTIFY A GAP BETWEEN WAI AND WAD

- All Companies identify the gap
  - 13 Companies execute audits   100%
  - 13 Companies use reporting (deviation)   100%
  - 13 Companies use occurrences (deviation)   100%
  - 13 Companies use trends (do we need to do something?)   100%
  - 6 Companies: "Compliance is not safety"   46%
  - 3 Companies execute LOSA to identify gaps between WaD & Wal   23%
  - 2 Companies suggest that gap between WaD-Wal can be an indicator   15%
  - Companies search new indicators (gap WaD-Wal, e.g. unstable approaches)   38%
  - 1 Company uses reporting to look actively for operational tensions   8%
  - 1 Company uses feedback from training   8%
  - 1 Company mentioned: "…during an audit everybody puts on their best show, and after the inspectors leave, everybody goes back to normal work"   8%

Kaspers c.s. 2017

Hogeschool van Amsterdam
Techniek

NARRATIVES TO IDENTIFY THE GAP

- Short stories that have been experienced by the storyteller him/herself (Kurtz, 2014).
  - Insight without researcher interference, so that unexpected things are also recalled
  - Combination of factual and affective feedback
  - Insight into trends and consequences of interventions in case of a longitudinal study

StoryConnect

I am sharing a story about

- A situation that I have experienced and would like to share with a former colleague.
- A situation I have experienced in relation to procedures which I am happy or frustrated about and that I want to share,
- My positive or negative work experiences.

StoryConnect
TOP innosense BV
Niet geclassificeerd

Social   Vergelijkbaar

StoryConnect is een platform vo
verzamelen en interpreteren va
narratieven.

Hogeschool van Amsterdam
Techniek

STEP 2: UNDERSTAND WHY WORK IS DONE LIKE WAD

- Take the gaps between Work-as-Imagined and Work-as-Done for the case in the case
  - What were possible reasons for the gaps between Work-as-Imagined and Work-as-Done?
  - Which questions would you ask to identify why the actors deviated from Work-as-Imagined?
  - Can you make these questions generic, so that they fit multiple cases? Or are they case specific?

Hogeschool van Amsterdam
Techniek

POSSIBLE QUESTIONS TO UNDERSTAND WHY WORK IS DONE LIKE WAD

- When is this task difficult?
- What are you dependent on to do a good job?
- Are tools and resources always available to do the job? What do you do if you can't access tools?
- And resources in time?
- What solutions have you come up with that the rest of the organisation could learn or help you to improve?
- Where are we wasting time/money?
- Is there something which is nonsensical or unnecessary that you have to do here?

Hummerdal 2015

Hogeschool van Amsterdam
Techniek

WORK AS IMAGINED NOT ALWAYS SAFER THAN WORK AS DONE

Example: logistic service provider

	Actie nodig	Geen actie nodig
Geen Flaw	3	~ 100
Flaw	4	4

(bottom labels: Flaw | Geen Flaw — Work-as-imagined)
(left labels: Work-as-done)

Boelhouwer 2016

Hogeschool van Amsterdam
Techniek

THE CASE OF THE MISTAKEN TAKE-OFF
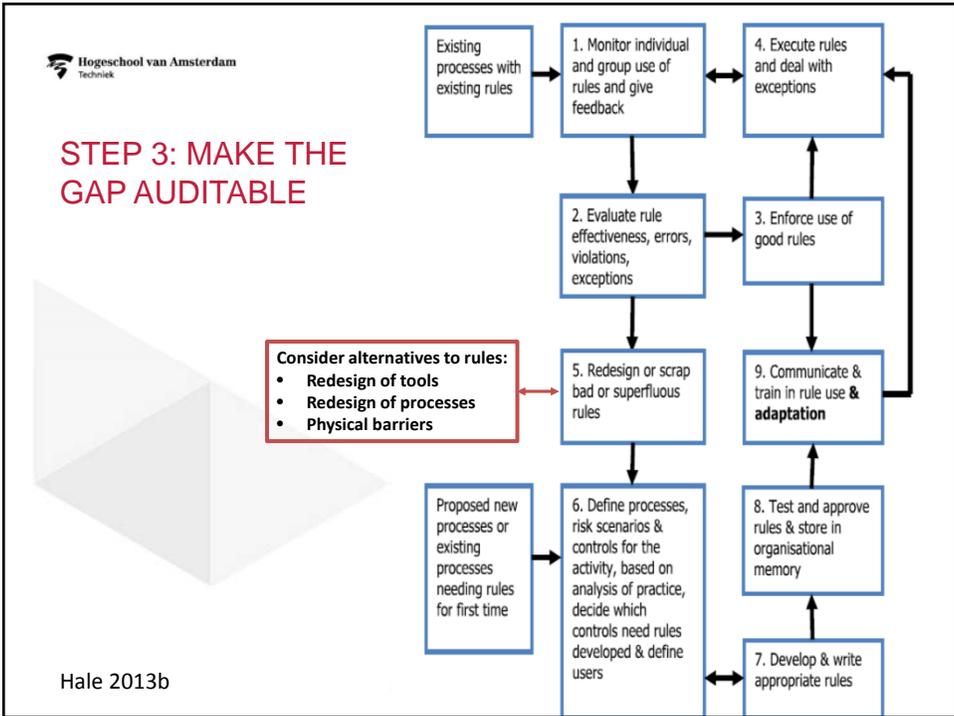
- What are the benefits of adhering to Work-as-Imagined?
  - In the case of the mistaken take-off
  - In general

Hogeschool van Amsterdam
Techniek

AUDITABLE RULES & PROCEDURES ARE VALUABLE

- As a reminder for operators, especially when under duress
- As a transparent norm to monitor behavior against
- To standardize tasks involving several actors
- To provide organisational memory of the way processes work, including in training situations

Hale 2013a

Hogeschool van Amsterdam
Techniek

STEP 3: MAKE THE GAP AUDITABLE

Existing processes with existing rules → 1. Monitor individual and group use of rules and give feedback ↔ 4. Execute rules and deal with exceptions

2. Evaluate rule effectiveness, errors, violations, exceptions ↔ 3. Enforce use of good rules

Consider alternatives to rules:
- **Redesign of tools**
- **Redesign of processes**
- **Physical barriers**

5. Redesign or scrap bad or superfluous rules

9. Communicate & train in rule use & **adaptation**

Proposed new processes or existing processes needing rules for first time → 6. Define processes, risk scenarios & controls for the activity, based on analysis of practice, decide which controls need rules developed & define users ↔ 7. Develop & write appropriate rules

8. Test and approve rules & store in organisational memory

Hale 2013b

Hogeschool van Amsterdam
Techniek

THE CASE OF THE MISTAKEN TAKE-OFF

- Read the conclusions of the report on the mistaken take-off.
- Do suggestions to amend Work-as-Imagined so to close the gaps identified earlier.
- Do suggestions to amend Work-as-Done so to close the gaps identified earlier.
- Are these suggestions sufficient to make the gaps so small as to be auditable?

Hogeschool van Amsterdam
Techniek

SOME GOOD GUIDELINES FOR DRAFTING PROCEDURES ARE:

- Continuously coping with exceptions ➔ procedures are too detailed.
- Organisational needs not met (memory aid, training, collaboration, design and planning and monitoring behaviour) ➔ further detailing
- Each process as a flow chart on a single page.
  - Details as text on additional pages.
  - If necessary split process into multiple flows.
- Actors are the makers
  - Not the enforcers
  - But include their input
- Consider that every task needs to satisfy multiple goals.
  - Integrate into the process description
  - Eliminate contradictory descriptions.
- Eliminate obsolete rules
- Include the reporting and monitoring requirements
- Consider alternatives to rules and procedures

Hogeschool van Amsterdam
Techniek

STEP 4: MAKE PEOPLE ACCOUNTABLE FOR GETTING THEIR JOB DONE PROPERLY

- Imagine that you are the manager of either air traffic control at Schiphol or of the flight crew
  - How would you go about making the actors responsible for eliminating the gap between Work-as-Imagined and Work-as-Done?
  - What support might the actors need to eliminate the gap between Work-as-Imagined and Work-as-Done?

Hogeschool van Amsterdam
Techniek

COMPLICATED VERSUS COMPLEX

Complicated system

- Interactions governed by fixed relationships
- Reliable prediction of technical, time and costs issues
- E.g. an automobile or even an airplane
- Understanding by breaking it down
- "Good practice"

Complex systems

- Self-organization
- Managerial independence
- Local interactions give rise to novel, nonlocal emergent patterns
- Geographical distribution
- Evolutionary development
- Understanding by iterative exploration and adaption
- Holistic approach

24

Hogeschool van Amsterdam
Techniek

STEP 5: DARE TO INNOVATE THROUGH MICRO-EXPERIMENTS

The Cynefin framework

Probe by safe to fail experiments

Sense emerging patterns

Respond by amplifying or dampening

Snowden & Boone 2007

25

Hogeschool van Amsterdam
Techniek

THE CASE OF THE MISTAKEN TAKE-OFF

- Which characteristics of a complicated system does the case exhibit? Which of a complex system?
- Imagine that you are the manager of either air traffic control at Schiphol or of the flight crew
  - Which changes do you suggest to the way that work is currently being done in the context of the case?
  - How might you experiment to test the success of these changes?
  - Indicate:
    - How to sense success and failure
    - How to dampen and amplify the measure

Hogeschool van Amsterdam
Techniek

SUMMARY: ACHIEVING SAFETY LEADERSHIP

- Step 1: identify the gap between WAI and WAD
- Step 2: understand why work is done like WAD
- Step 3: let people make the gap so small as to be auditable
- Step 4: make people accountable for signaling when they can't get their job done properly
- Step 5: dare to innovate through micro-experiments

Hogeschool van Amsterdam
Techniek

MAINTAINING SAFETY LEADERSHIP

www.hva.nl/techniek

Hogeschool van Amsterdam
Techniek

WHAT IF THINGS GO WRONG?

www.hva.nl/techniek

Hogeschool van Amsterdam
Techniek

WHAT IF THINGS GO WRONG?

- Incident investigation
- Retributive or restorative justice
  - who was hurt?
  - what are their needs?
  - who's obligation?

Hogeschool van Amsterdam
Techniek

CONTINUE THE CONVERSATION AT (HVA.NL / AVIATION)

Amsterdam University
of Applied Sciences

MASTER CLASS
HUMAN FACTORS & SAFETY
WITH PROF. SIDNEY DEKKER,

15 – 19 January 2018

Amsterdam University
of Applied Sciences

EENDAAGSE SEMINAR SAFETY
LEADERSHIP (IN DUTCH)
MET PROF. SIDNEY DEKKER

20 januari 2017

Hogeschool van Amsterdam
Techniek

CONTACT

- Program manager: Monique Heiligers, m.m.heiligers@hva.nl
- Professor of Aviation Engineering: Robert J. de Boer, rj.de.boer@hva.nl

- Website: http://www.hva.nl/aviation