

A dark, moody photograph of an aircraft engine with a person's silhouette working on it. The person is on the right, facing left, and appears to be using a tool on the engine. The engine is on the left, and its complex parts are visible. The background is a light, hazy sky.

CBTA for Aviation Maintenance Professionals

Competency Based Training & Assessment



MBO
College
Airport



WATS
2023



Program

1. Why CBTA?
2. What is CBTA?
3. Success factors of CBTA
4. Research Project on CBTA



- Innovation

Knowledge

Skills

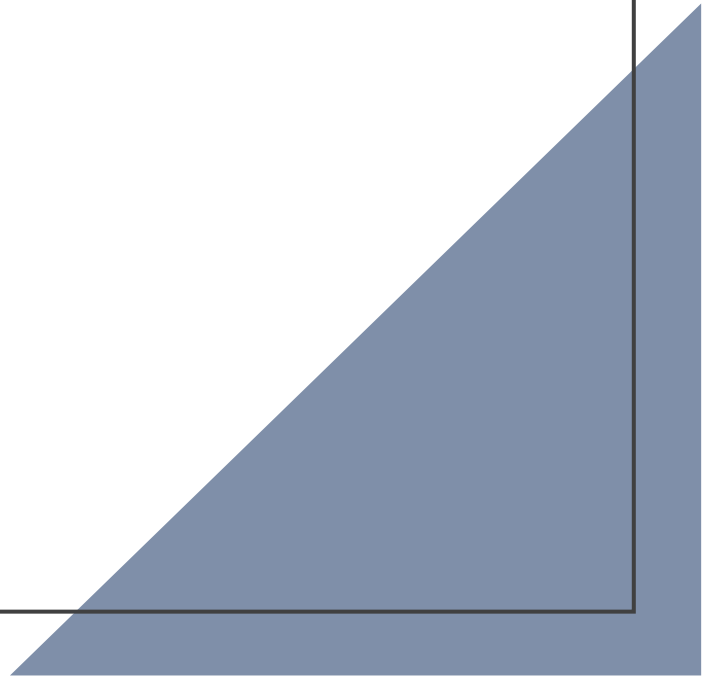
QUALIFI-
CATION

1. Why CBTA?



It is not a Revolution

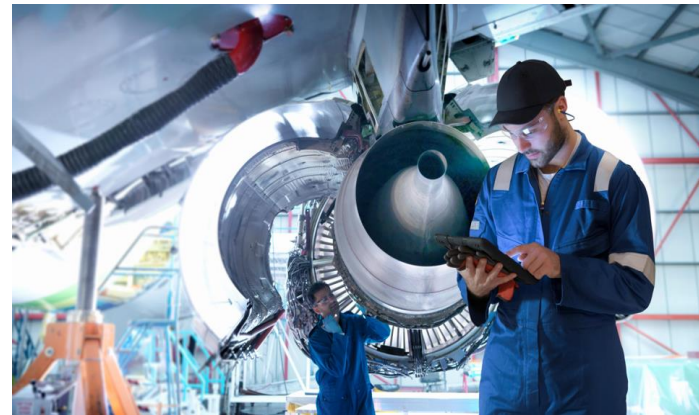
But, if we keep doing what we have always done before,
we will continue getting what we currently have.



Definition



LEARNING



COMPETENCY



What is Learning?

Learning can be defined in many ways:

- A **change in the behavior** of the learner as a **result of experience**. The behavior can be physical and overt, or it can be intellectual or attitudinal.
- The process by which **experience brings about** a relatively permanent **change in behavior**.
- The **change in behavior** that results from **experience and practice**.
- Gaining knowledge or skills, or **developing a behavior**, through study, instruction, or experience.
- The process of acquiring knowledge or skill through study, **experience**, or teaching. It depends on experience and leads to long-term **changes in behavior** potential. Behavior potential describes the possible behavior of an individual (not actual behavior) in a given situation in order to achieve a goal.
- A relatively permanent change in cognition, resulting from **experience** and **directly influencing behavior**.



What is Competency?

- Competency is important in the context of learning because of how it stands in contrast to just memorizing knowledge. While memorizing information will help you to pass a test, it doesn't always translate into real learning or applying what you've learned in the real world.
- Competency refers not only to a person's understanding of what they have learned but also to be able to use that knowledge to perform practical tasks safely under less-than-ideal conditions.



Resiliency

Resilience is the process and outcome of successfully adapting to difficult, dynamic, and challenging experiences



Why CBTA?



The misses and near misses

- Threat and Error Management



Experience Expertise gap

- Explicit & Tacit Knowledge



Change in Technology (Industrial Revolution 4.0)

- Do we have the right staff?



Pass Accidents and Near misses

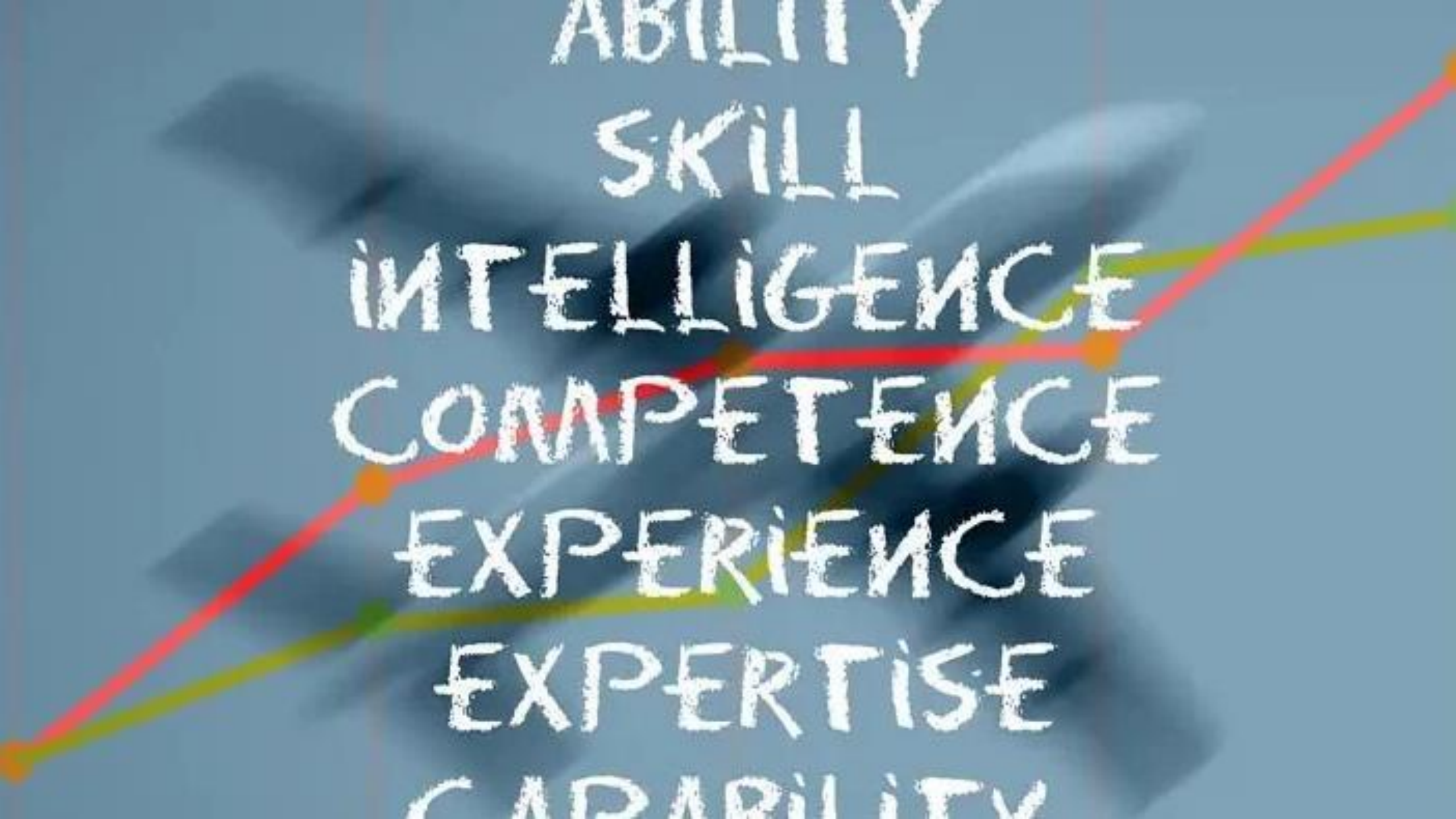
Gimli Glider



Threat and Error Management (TEM)



Surprise!! Human Error



ABILITY
SKILL
INTELLIGENCE
COMPETENCE
EXPERIENCE
EXPERTISE
CAPABILITY



WAIT FOR IT

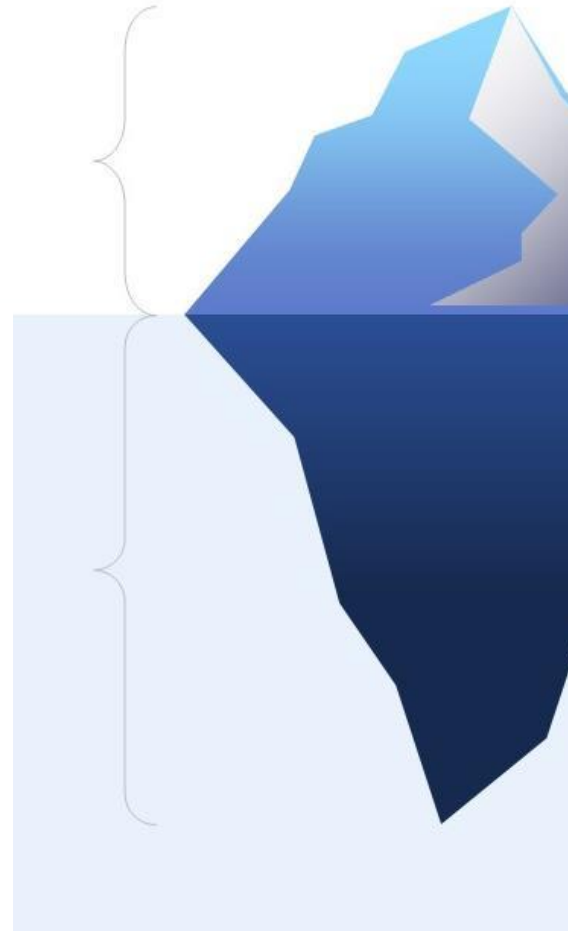
.....Wait for it.....

Experience v. Expertise

Successful completion of
formal training not
meeting current demand

Explicit Knowledge:

- ✓ Manuals
- ✓ Documents
- ✓ Procedures
- ✓ How-To-Guides
- ✓ Videos
- ✓ Databases
- ✓ How-To-Guides
- ✓ Notes
- ✓ Records



Experience
v. Expertise

Bridging the gap between
Explicit & Tacit Knowledge



Deliberate Practice – Anders Ericsson

- Real-time interactive
- Content & emotion feedback
- Measure & reinforce
- Interval reinforcement
- Realistic & context-specific
- Target & interleave skills
- Build on existing behavior & knowledge





Just imagine

We applied deliberate practice to the competencies



INDUSTRY 4.0

ANALYTICS

AUTOMATION

CLOUD COMPUTING

SMART FACTORY

SYSTEM INTEGRATION

BIG DATA

AUTONOMOUS ROBOTS

INDUSTRIAL REVOLUTION

CYBER SECURITY

IOT

SMART TECHNOLOGY

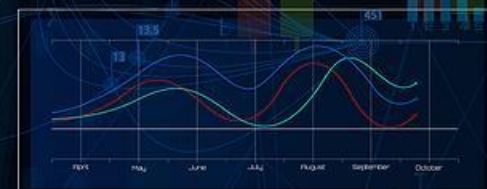
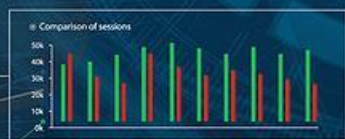
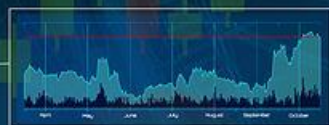
NEW BUSINESS MODEL

New Users -2.27%

Season +3.16%

+47%

Views -4.1%

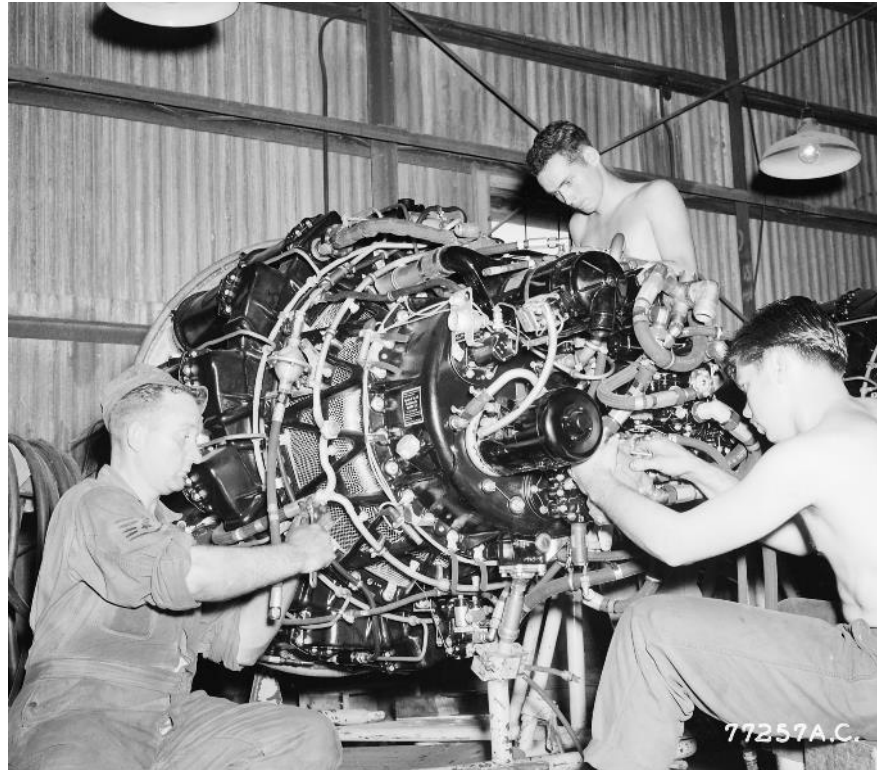


Industry Revolution 4.0

- Evolution of current skills and competencies to meet current and future needs

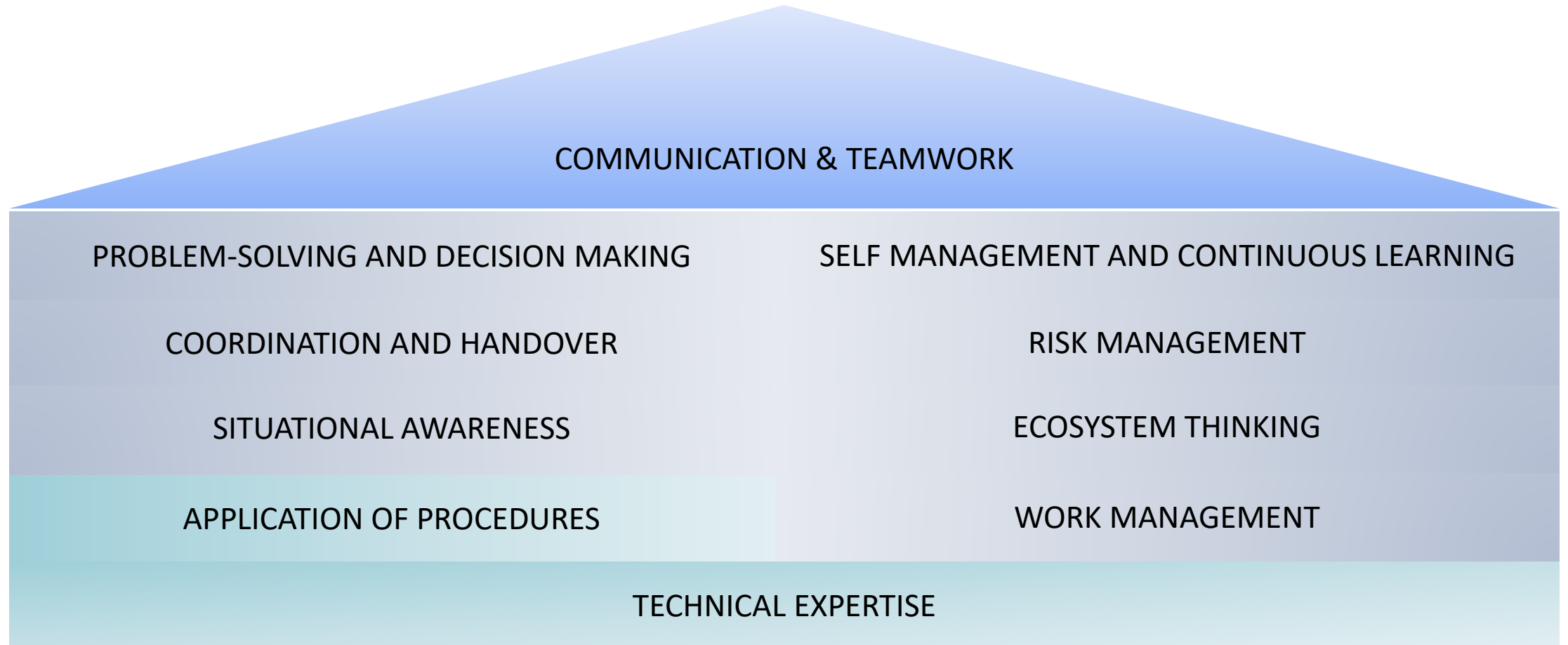


Task Shift



Maintenance of
the Avionics
network shifted
to Engineers


Why? Putting it together






Gimli Glider





Competency	OB no.	Observable Behaviors (OBs)
2 WORK MANAGEMENT	2.3	Requests assistance when and where required
	2.10	Manages environmental stress, interruptions, distractions, variations and failures effectively
3 SITUATIONAL AWARENESS	3.3	Recognizes the future operational situations
	3.5	Is cognizant of ongoing concurrent activities
5 ECOSYSTEM THINKING	5.9	Understands that root cause(s) of deficiencies results from single-point or systemic failure(s)
6 COORDINATION AND HANDOVER	6.1	Coordinates with personnel and other stakeholders
	6.3	Report safety-critical information





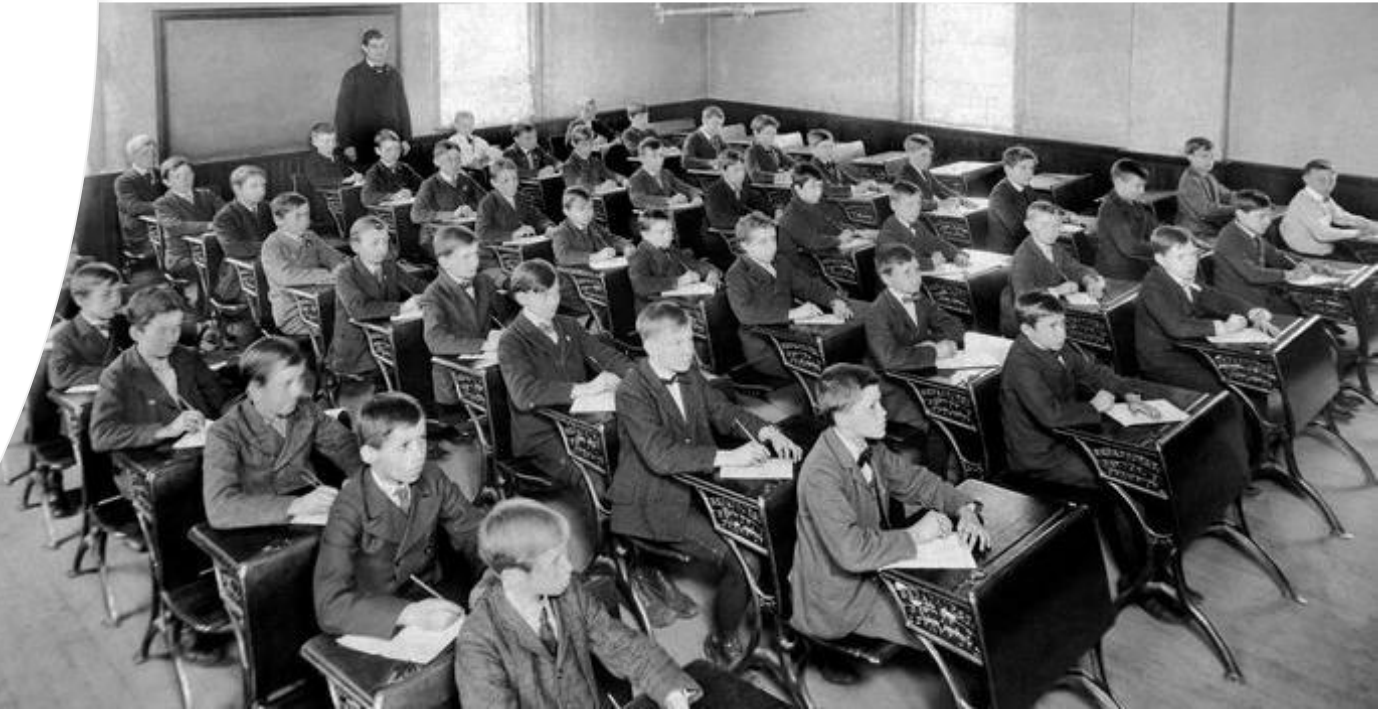
2. What is CBTA?

3. Success Factors of CBTA



Success factors of CBTA

Shift from (classroom based) teaching to
coaching --> shift the focus from
instructor to learner



REFLECTION ON PROGRESS



WHAT HAVE YOU LEARNT SO FAR?



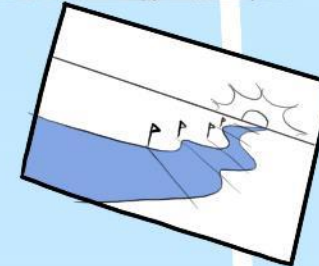
TEAMWORK?



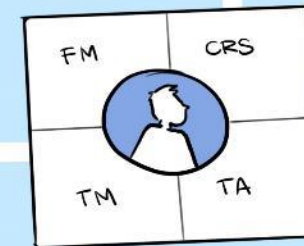
WOULD YOU LIKE ASSISTANCE FROM YOUR TEACHER OR COACH?



WHAT ARE YOUR GOALS FOR THE UPCOMING WEEKS?



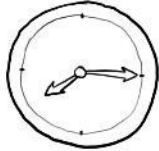
HOW ARE YOU GOING TO ACHIEVE THAT?



WHICH PROFESSION SUITS YOU?

SELF-REFLECTION

I AM ON TIME

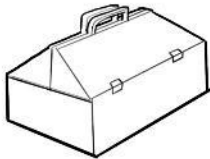


I TAKE RESPONSIBILITY
FOR THE TASK I PERFORM



I ONLY SIGN
FOR TASKS
THAT I AM
AUTHORIZED

I MAKE SURE THAT MY
TOOLS ARE PUT AWAY SAFELY



I DISCUSS RELEVANT
ISSUES WITH ALL
CONCERNED ON TIME



I AM NERVOUS
ABOUT MY
UPCOMING
INTERNSHIP

IF I MAKE A MISTAKE,
I AM HONEST ABOUT IT

I LEFT SOME
TOOLS IN THE
AIRCRAFT



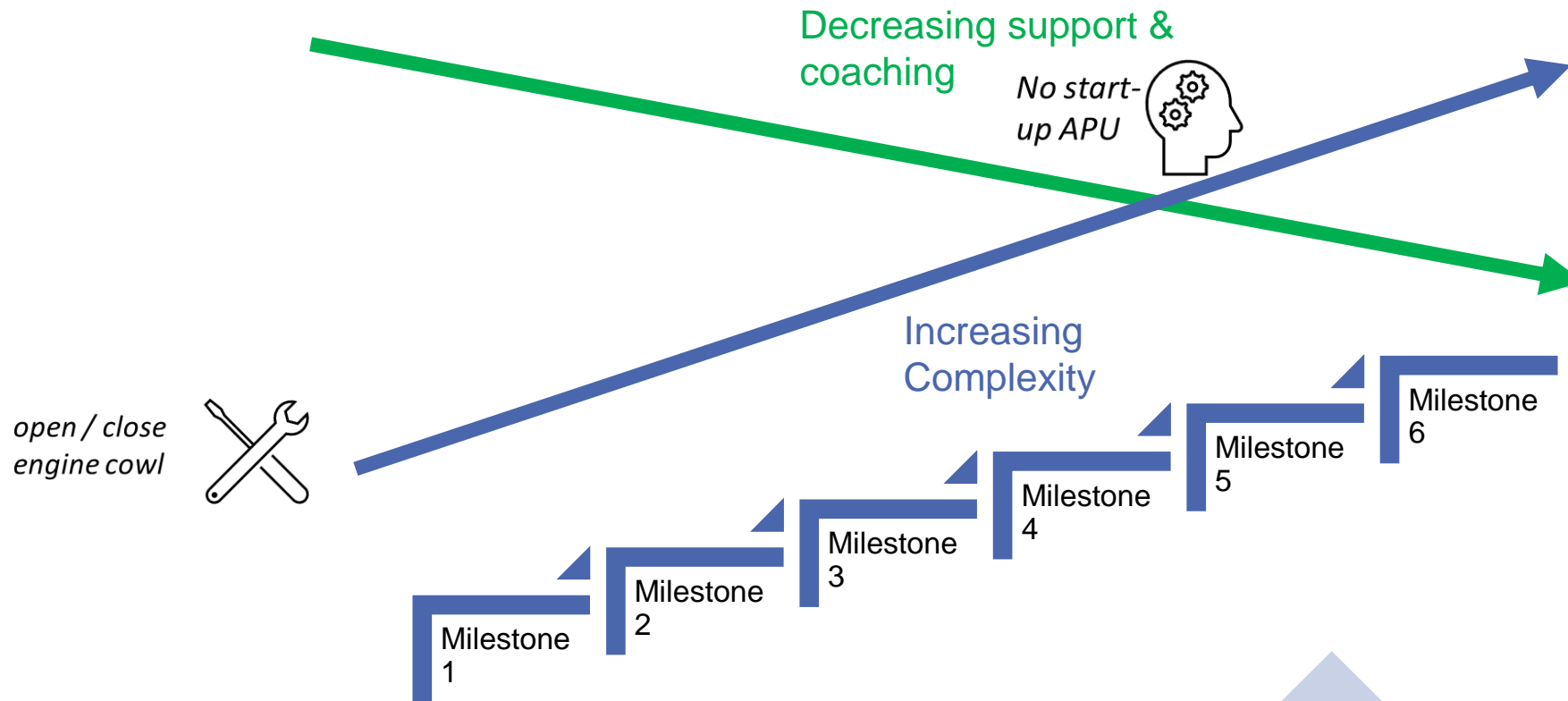
WHILE WORKING ON A TASK
I WILL NOT LET MYSELF
BE DISTRACTED



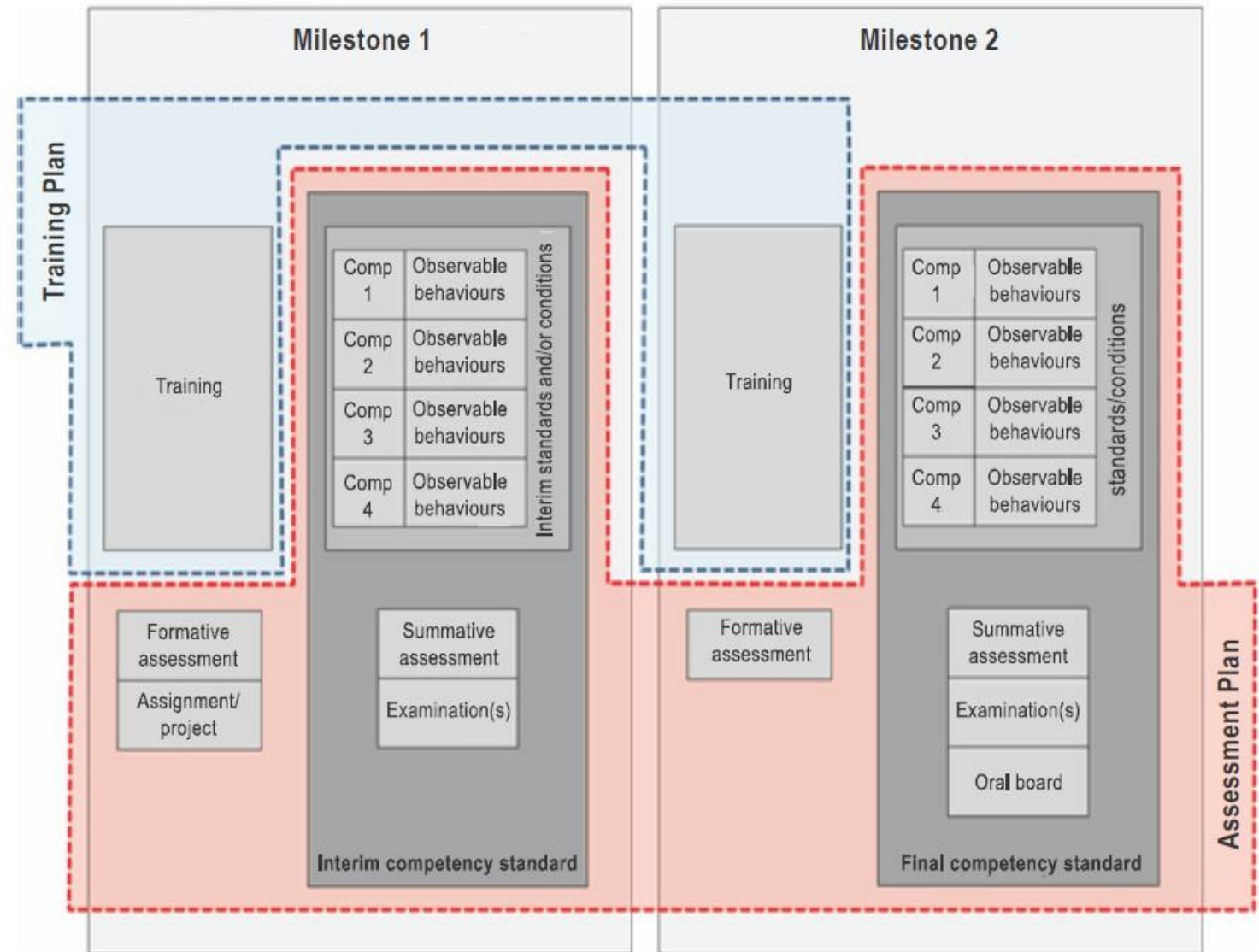
!!!
head
wreck

Course Design & Continuous Feedback!

Development of Competencies = Development of Behaviour which can be observed through Performance



Milestones





Focus on Behaviour

- Although CBTA is often referred to as “outcome based”, it is the performance towards the outcome that counts even more.
- Remind the importance of feedback!

Rubrics

*A tool used in the process of objective **performance-based assessment** that usually includes three essential features:*

- 1. Evaluative criteria*
- 2. Quality definitions*
- 3. Scoring criteria*

Based on a learning outcome

Design:

Generic vs. Task-specific

Holistic vs. Analytical

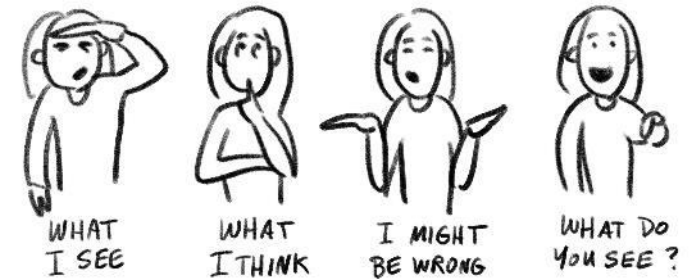
Learning outcome	Below standard	According to standard	Above standard
Description of learning outcome	Description of observable behaviour when below standard	Description of observable behaviour when according to standard	Description of observable behaviour when above standard

Competency 2: WORK MANAGEMENT

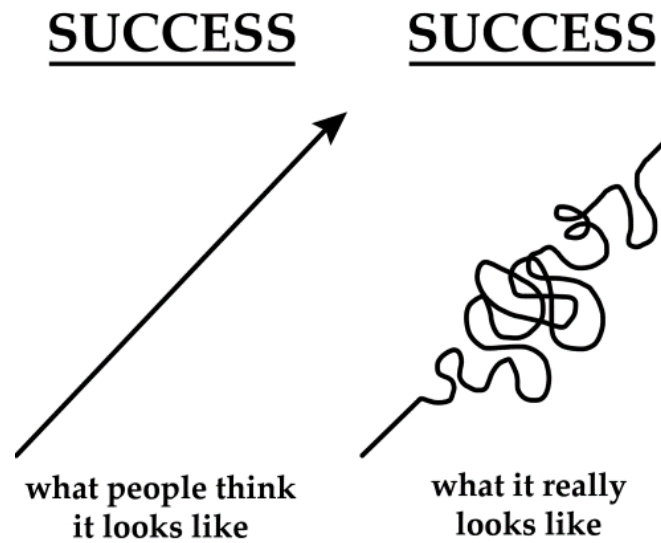
Manages available resources efficiently to prioritize and perform tasks in a safe efficient manner

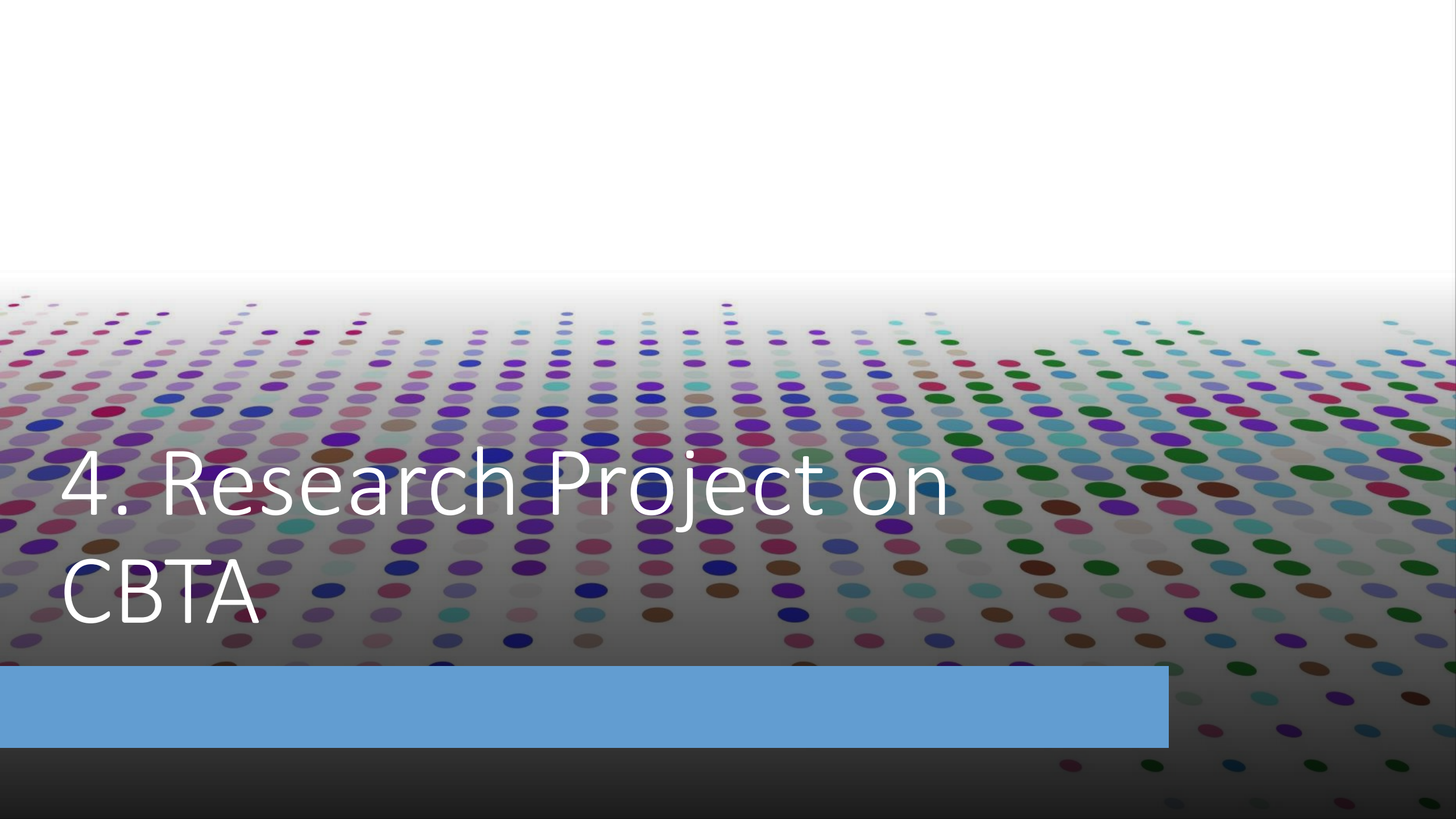
Levels:	Beginning	Developing	Approaching	Proficient
	The student uses his tools safely, efficiently and effectively after explanation and / or demonstration from instructor or peer student (2).	The student uses his tools safely, efficiently and effectively after instructions from instructor or peer student (2).	The student uses his tools safely, efficiently and effectively after suggestions from instructor or peer student (2).	The student uses his tools safely, efficiently and effectively (2).
	The student ensures a clean and safe work environment after explanation and / or demonstration from instructor or peer student (2).	The student ensures a clean and safe work environment after instructions from instructor or peer student (2).	The student ensures a clean and safe work environment after suggestions from instructor or peer student (2).	The student ensures a clean and safe work environment (2).

Formative & Summative Assessments



3. Success factors of CBTA





4. Research Project on CBTA

Transversal Competencies in Aviation Maintenance

Lydia Kes

L.Kes@tudelft.nl

Centre for Education
and Learning

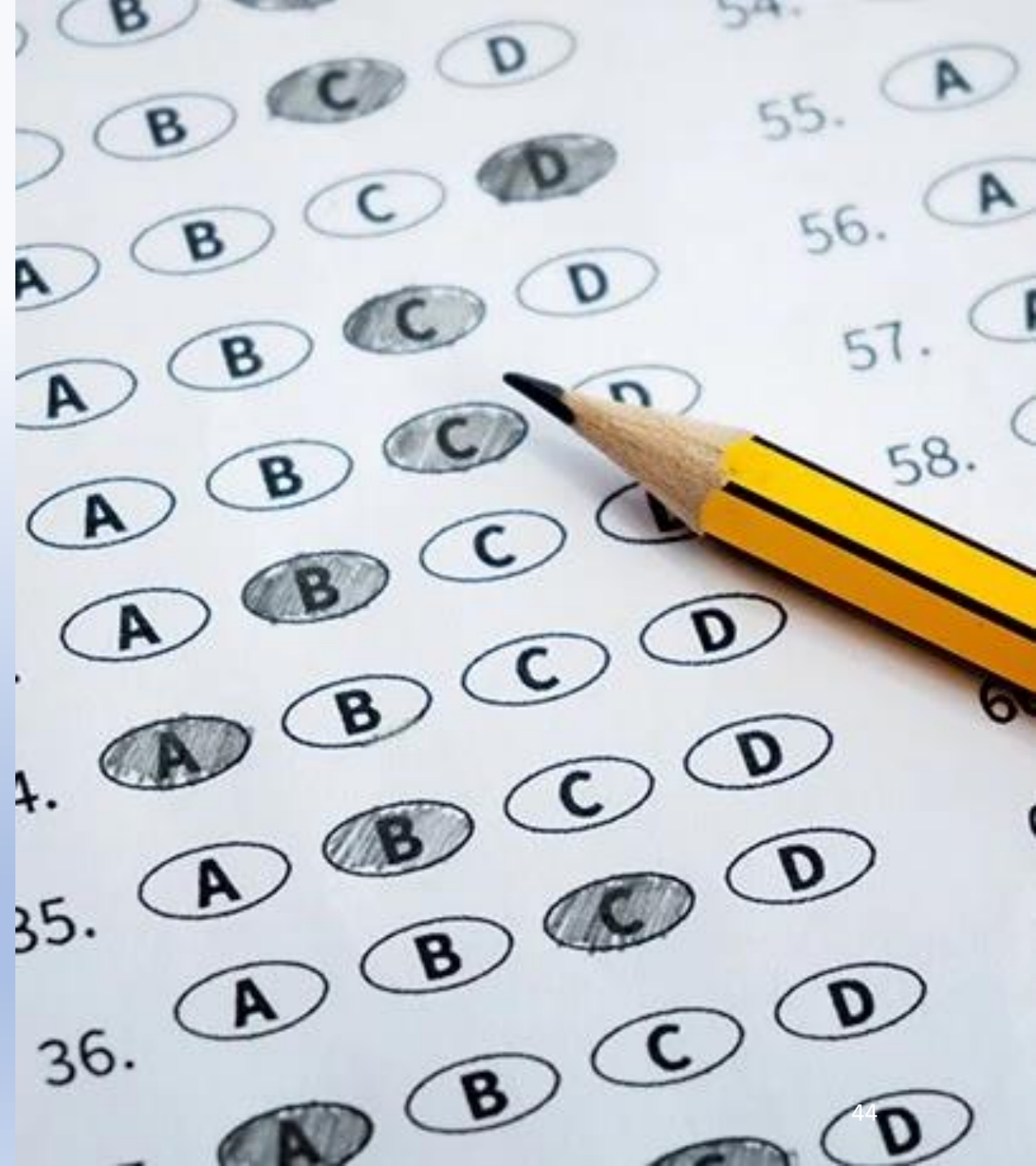


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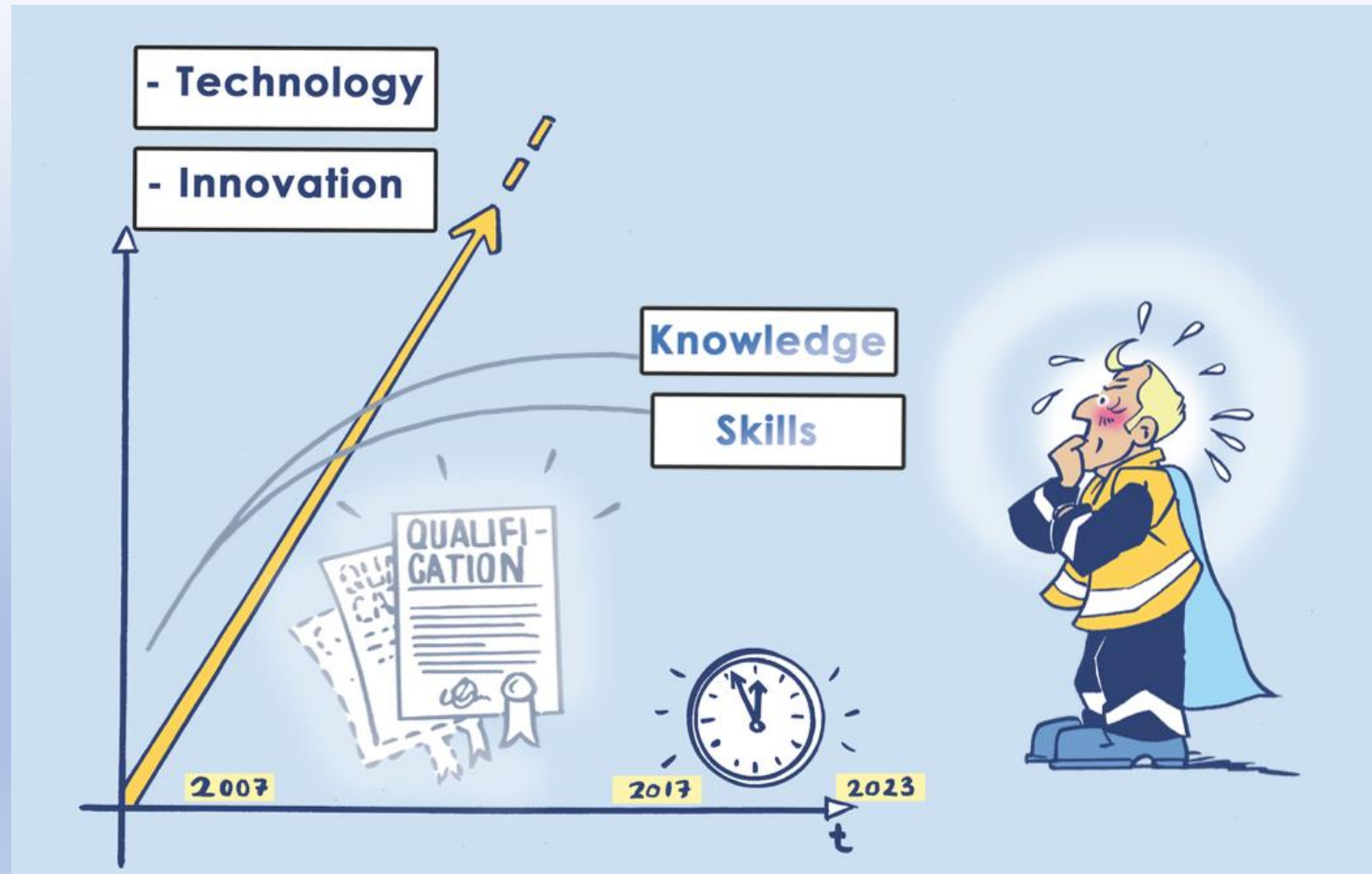


B1 Aircraft Maintenance Basic Training: 2400 hours; 50- 60% theory:

1. Mathematics
2. Physics
3. Electrical Fundamentals
4. Electronic Fundamentals
5. Digital Techniques Electronic Instrument Systems
6. Materials and Hardware
7. Maintenance Practices
8. Basic Aerodynamics
9. Human Factors
10. Aviation Legislation
11. Turbine Aeroplane, Aerodynamics, Structures and Systems
15. Gas Turbine Engines
17. Propeller



CBTA: self paced learning focused on performance standards





ICAO

Doc 9868

PROCEDURES FOR AIR NAVIGATION SERVICES

Training

Third Edition, 2020



This edition incorporates all amendments approved by the Council prior to 8 June 2020 and supersedes on 5 November 2020, all previous editions of Doc 9868.

INTERNATIONAL CIVIL AVIATION ORGANIZATION



ICAO

Doc 10098

Manual on Competency-based Training and Assessment for Aircraft Maintenance Personnel

First Edition, 2021



Approved by and published under the authority of the Secretary General

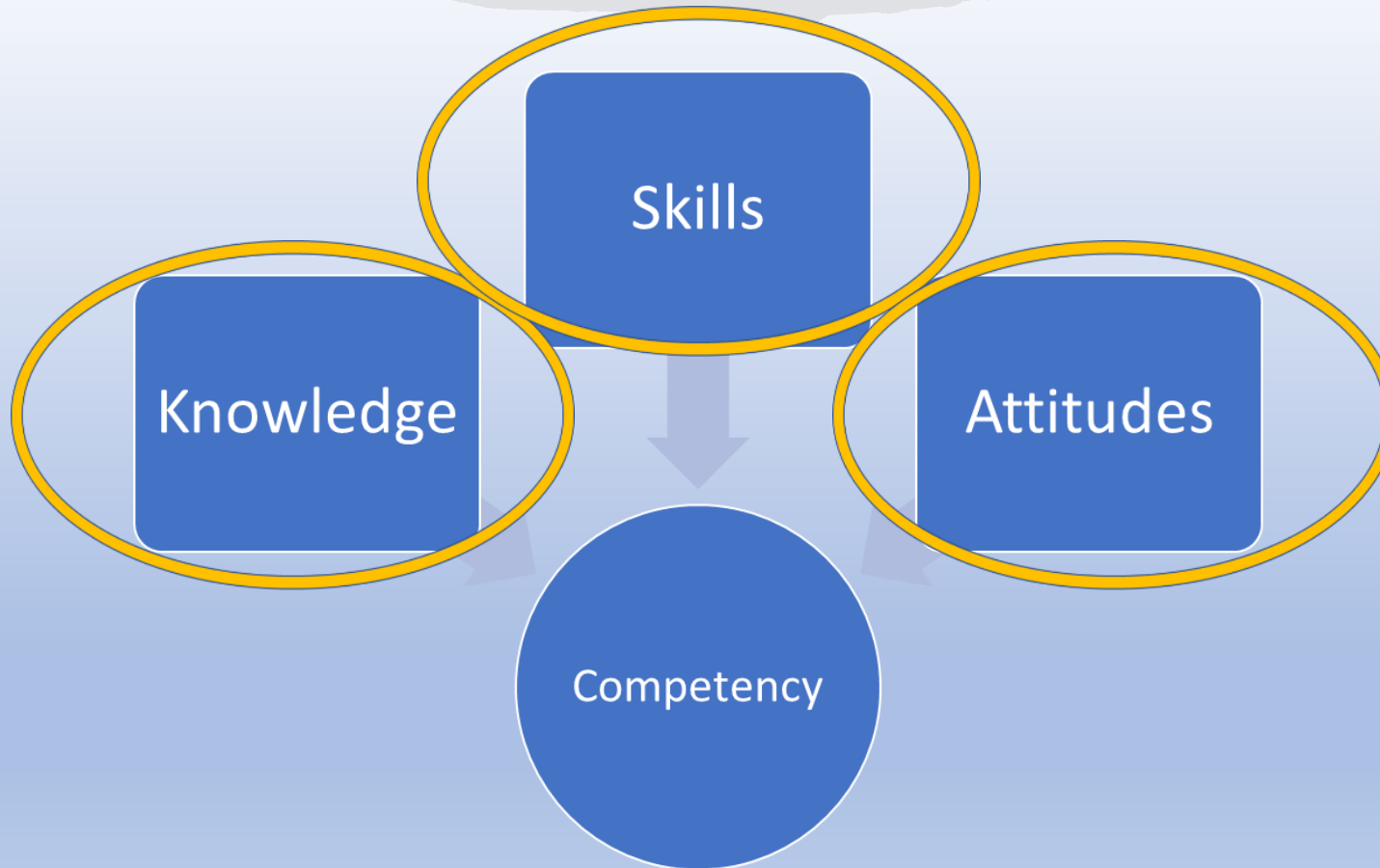
INTERNATIONAL CIVIL AVIATION ORGANIZATION

11 Competencies; 89 Observable Behaviours

Competency
1 APPLICATION OF PROCEDURES
2 WORK MANAGEMENT
3 SITUATIONAL AWARENESS
4 TECHNICAL EXPERTISE
5 SYSTEM THINKING
6 COORDINATION & HANDOVER
7 RISK MANAGEMENT
8 TEAMWORK
9 PROBLEM SOLVING & DECISION MAKING
10 SELF MANAGEMENT AND CONTINUOUS LEARNING
11 COMMUNICATION



Paradigm Shift from Knowledge based to Competency



Overlap with other ICAO Competency Frameworks

Competency	Maintenance	Pilots	ATC	Cabin Crew	Dangerous goods
1 APPLICATION OF PROCEDURES	X	X		X	X
2 WORK MANAGEMENT	X	X	X	X	X
3 SITUATIONAL AWARENESS	X	X	X	X	
4 TECHNICAL EXPERTISE	X				
5 SYSTEM THINKING	X				
6 COORDINATION & HANDOVER	X		X		
7 RISK MANAGEMENT	X				
8 TEAMWORK	X	X	X	X	X
9 PROBLEM SOLVING & DECISION MAKING	X	X	X	X	X
10 SELF MANAGEMENT AND CONTINUOUS LEARNING	X		X		X
11 COMMUNICATION	X	X	X	X	X

Transversal Competencies

core competencies

employability skills

21st century skills

non-technical skills

soft skills

transferable competencies

key competencies

professional skills

Transversal Competencies: almost intangible

Human Performance

Holistic (KSA)

Generic

Tacit

Attitudinal & Autonomous

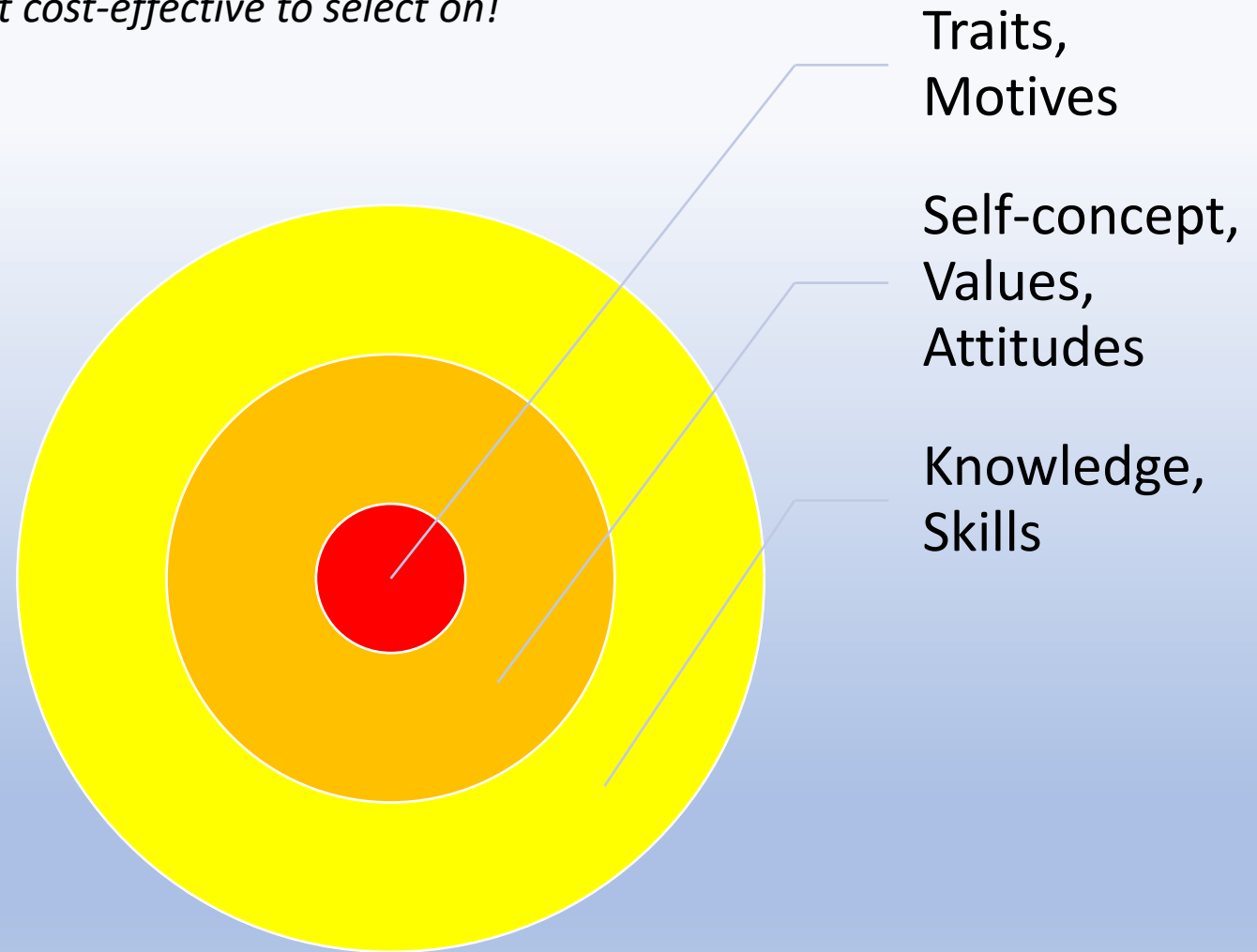
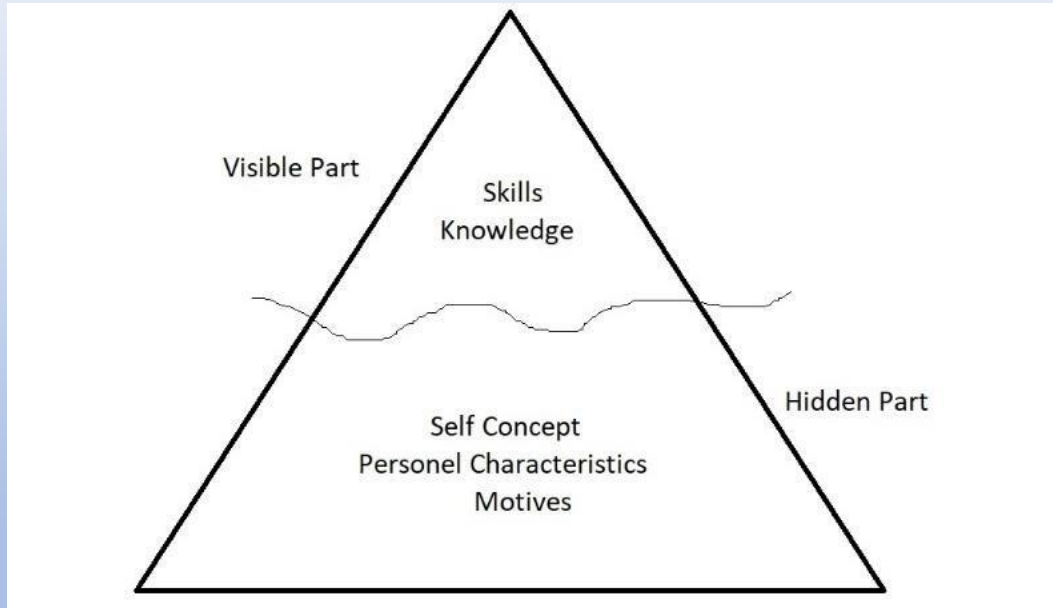
Self-directive & Reflective



Competencies:

- Motives
- Traits
- Self-Concept
- Knowledge
- Skills

Core motive and traits are the most difficult to train and assess, but most cost-effective to select on!



(Spencer & Spencer, 1993)



Transversal Competency Assessment

- How to objectively assess transversal competencies?
- Which ones are the most difficult to assess?
- Which ones are the most crucial?

We need your input in this!
You are the expert in this field.

Final aim: design the assessment instrument our industry needs!

Please give
me your
professional
input!



https://tudelft.fra1.qualtrics.com/jfe/form/SV_3Xn2G5iwJCU6Rf0