

Pilot Competency by Design

A Qualitative Shift

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Building Pilot Competency by Design: A Qualitative Shift

If you tell me, I will listen.
If you show me, I will see.
If you let me experience, I will
learn.

Lao-Tse
5th Century BC

Canada

Wisdom from the 5th century BC

Competency

The ability to perform tasks and duties to the standard expected in employment.

The sum of cognitive (intellectual), attitudinal, cultural and manipulative skills which can be demonstrated (validated) in a defined job (task) related context.

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The first definition is from the Australian National Training Authority.

The second definition I got from Dr. Graham Hunt of Massey University in New Zealand.

Competency standard - an industry-determined specification of performance

which sets out the skills, knowledge and attitudes required to operate

effectively in employment. Competency standards are made up of units of

competency, which are themselves made up of elements of competency, together

with performance criteria, a range of variables, and an evidence guide.

Cognitive task analysis is defined as the extension of traditional task

analysis techniques to yield information about the knowledge, thought

processes and goal structures that underlie observable task performance.

1919 Competency

Convention
for the
Regulation of
Aerial
Navigation



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Show that we had standards in 1919 that were actually closer to competency based standards. Going back in history can give us a longer view. It often happens that someone in the audience remembers, if you don't go back far enough. This should do it. No one in the audience will remember this.

1919

Pilot's Flying Certificate for Flying Machines
used for Purposes of Public Transport

Brevet de Pilote d'Avions ou d'Hydravion
servant aux Transports Publics Professionel

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1919

- Test for Altitude and Gliding Flight
- Tests for Skill
- Test for Endurance
- Night Flight
- Technical Examination

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Test for Altitude and Gliding Flight

- Flight without landing for at least an hour at a minimum altitude of 2,000 metres above ground
- Finish with a glide, cutting engines at 1,500 metres above the landing ground
- Without restarting the engine, land within 150 metres of a point fixed beforehand by the examiners

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Notice that the examiner stays on the ground. Notice the standard. Engine cut off means shut down with magnetos. Land within 150 metres of examiners. Lots of emphasis on forced landing skills because machines were unreliable and you used this skill a lot.

Test for Endurance

- Cross-country or oversea flight of at least 300 km
- Final landing at point of departure
- **Must use same flying machine**
- Complete flight within 8 hours
- Two obligatory landings NOT at the point of departure
- Judges inform candidate of course and furnish map

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Same flying machine! Note that judges inform candidate of the route and provide the map.

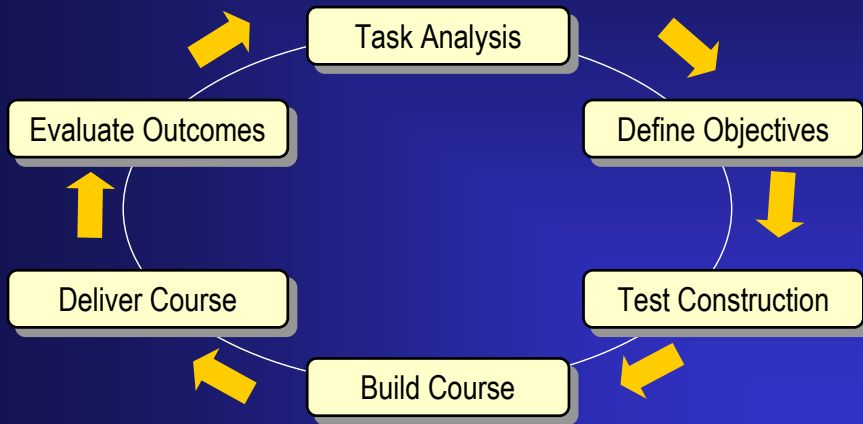
Technical Examination

- Assembling of flying machines, their different parts
- **Practical tests on rigging**
- General knowledge of internal combustion engines
- Causes of faulty running of engines and breakdown
- **Practical tests in running repairs**
- Lights, signals, rules of the air
- Map reading, elementary meteorology

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Note the practical tests on rigging and running repairs. Pilot technical knowledge had to be “hands on”.

Training Design Process



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A simplified model. Norman MacLeod, Training Design in Aviation. Susan, there are more complicated

Not a linear process. Certainly not linear for the student.

Pilot Tasks

- Perform aircraft pre-flight operations
- Perform engine start
- Perform taxi out
- Perform take-off
- Perform rejected take-off
- Perform climb
- Perform cruise
- Perform descent
- Perform holding
- Perform precision approach
- Perform non-precision approach
- Perform circling approach
- Perform visual approach
- Perform landing
- Perform go-around
- Perform taxi in
- Perform aircraft post-flight operations

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Perform Precision Approach

- Perform precision approach in accordance with the OM.
- Perform a low visibility approach (CAT II/III) in accordance with the OM.
- Perform an ILS glide slope interception from above.
- **Communicate** with ATC and crew members in accordance with the OM.
- **Identify, interpret** and perform the proper procedure for abnormal conditions.
- Perform systems operations/procedures in accordance with the OM.
- **Recognize, assess and manage** potential threats in performing a precision approach and the errors such threats might generate, in accordance with TEM techniques.

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Transport category aircraft of 20+ seats

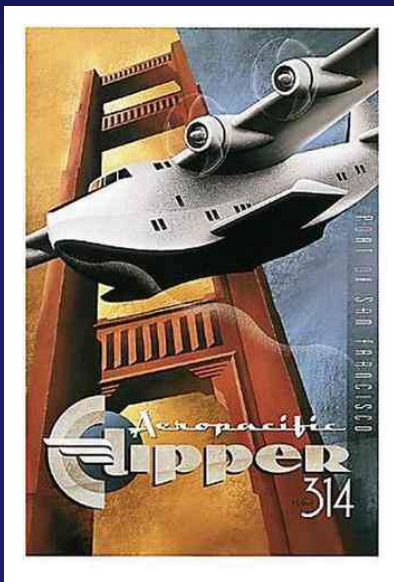
Proficiency demonstrated in PF and PNF roles

Day

Night

Various meteorological conditions

International operations



- Transport category aircraft of 20+ seats
- Proficiency demonstrated in PF and PNF roles
- Day
- Night
- Various meteorological conditions
- International operations

What is competency...no REALLY?

The combination of cognitive, attitudinal,
cultural and manipulative skills.

Sounds good when you say it fast!

(A daring definition! Hat's off to ICAO if
this is adopted.)

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Competency Breakdown

The combined expression of 4 factors

✓ Behavioral skills

e.g., physical manipulation of controls, hand-eye, hand-foot coordination, button pressing

✓ Attitudinal orientation

e.g., professionalism, safety consciousness, teamwork

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Competency Breakdown

- ✓Cultural Influences

 - National, Corporate, Professional

- ✓Cognitive Skills

 - The co-ordination of what we know into an orchestrated set of mental and physical behaviors

 - E.g., Planning, Prioritizing, Organizing, Discriminating, Deciding, Strategizing

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How would you rank these skills?

1. Cognitive Skills-Strategizing, Planning, Prioritizing, Discriminating , Problem solving
2. Attitudes – professionalism, safety, team work
3. Cultural adaptation
4. Basic Systems knowledge (lists of facts)
5. Physical/Behavioral skills (If a cow had opposable thumbs....)

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What is formally taught - by emphasis?

- Basic Flying skills
 - Basic Systems knowledge
 - Basic Operational skills
 - Basic Organizational skills
 - Basic Calculation formulae and a few rules of thumb
- **All Rule Based Behaviors + Order inversed and items missing**

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What is missing or INFORMAL?

- ✓ ATTITUDE is to be observed and absorbed
- ✓ CULTURE is not defined or is to be ignored/IMPLIED...depending on which type
- ✓ COGNITIVE SKILLS are to be constructed by the student without systematic training of the instructor (the type and amount of training depends on the individual instructor)

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What is the impact?

- ✓ We train for partial competence (We control one out of four components)...at best – based on our own definition
- ✓ We do not FORMALLY train three critical competencies i.e. the Attitudinal, Cultural and Cognitive skills required for Flexibility and Operational Proficiency

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Core Questions

- Why do we think we can develop a performance standard and related testing protocols for skills that we do not systematically teach?
 - This cannot be the same old training with updated techno-speak

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Core Questions

- What are the opportunities that competency based training presents?
 - The opportunity to train for 21st century environment (e.g., airplanes, systems, airspace, ATM)
 - The opportunity to formalize the training of important components of true pilot proficiency
 - The opportunity for the first TRULY integrated pilot training ever designed...not building blocks - a rope running throughout the learning process and linking every step.

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Core Questions

- What are the dangers of the competency based training movement?
 - Misuse to reduce training for financial savings (e.g., arbitrary flight hour or theory reduction)
 - Misuse to increase training cost for unproven agendas (e.g. more powerful airplanes, more expensive simulators etc. without validating the cost/benefit ratio)

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Common Errors of Logic

- Time + Money +
Expensive Equipment
= Increased
Competence
WRONG –That yellow
stuff is not necessarily
gold – even if it costs a
bundle
- Training with New
Definitions and
Terminology =
Increased Competence
WRONG -Same Product/
New Wrapper

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So How Do We Do It?

- We have to be willing to break out of the box...and into the pilot's head.
- We need more than a job/task analysis
- Stop thinking in terms of hours and equipment and “What” a good pilot does
- Start thinking about “How” a good pilot Thinks - makes decisions, evaluates, prioritizes plans...”What” is important to him and “Why”

{This is not code for a CTA!!! At least not necessarily)

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What Should It Look Like?

- A wholly integrated training course that incorporates every element of competence in every lesson.....
–YES every lesson!

The student should know why every piece of information he learns is important, how he should use it and when and how he should deploy it. – That means the instructor has to know too!

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What are the Payoffs?

- Systematic presentation of pilot “know-how” that goes beyond the basics
- Operationally prepared pilot who can better apply their training in a complex, real-world context
- Testable (and accepted) problem-solving skills and behaviors...that make sense to the pilots
- Pilots who are fully competent on day one

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Tasks Ahead

- Identify and Articulate the key elements of how an experienced pilot actually approaches the task
- Design every lesson...first to last...so that it addresses ALL the components of competency
- Implicit knowledge must be made Explicit for the student
- Retrain the trainers.....to Formally provide an approved, systematic model of competency

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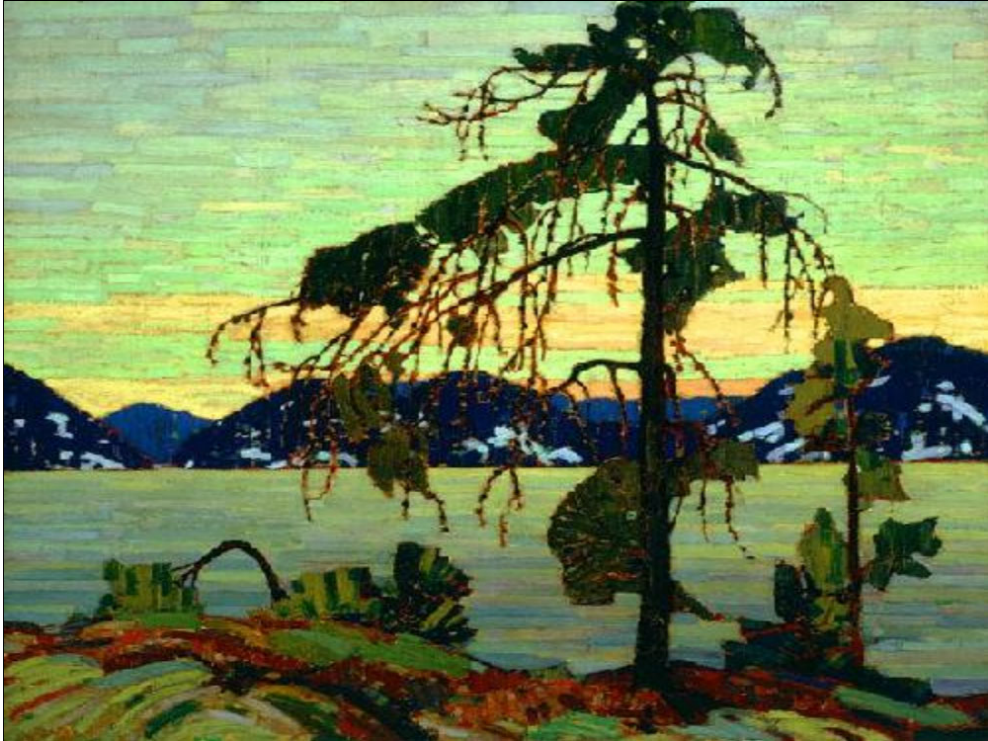
But Wait – Reality Check Time

- Change must be incremental
- This is not about throwing away the wisdom of the last 50+ years – it is about integrating it!
- Costs and resources must be considered
- Regulatory Authorities, Airlines, Unions and Individuals (pilots and instructors) must be convinced that Competency Based Training is a Valid Concept – not the flavor of the month!

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Early in the last century, there was a group of Canadian painters called the Group of Seven. You can probably guess how many painters were in the group. They painted much like this, except this was painted by a fellow named Tom Thomson, who was not part of the group.

Canada shares part of a continent with another country you may have heard of. The United States. We're good friends and good neighbours. Most of the time, they ignore us. We like that. Anyway, on recent trip to New York City, a colleague of mine was very impressed when one of the American hosts at a meeting said he really liked that group of Canadian painters, the Group of 10! As a Canadian, this was received as a double acknowledgement. In the first place, it was a generous acknowledgement of an element of Canadian culture. In the second place, we took this as further acknowledgement that Canada has embraced the metric system!

A word of advice. Using a number to identify your group is never a good idea. Imagine where the United States would be today if they had called themselves the Group of 13. Or where the European Union would be if the original European Iron and Steel Confederation had called itself the Group of Twelve.

The Challenge

A wholly integrated pilot training course that incorporates every element of competence in every lesson.

Students who know why every piece of information they learn is important, how they should use it, and when and how they should deploy it.

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Training Design in Aviation, Norman MacLeod.

Barriers to Change

- We know what we are doing!
- Not Invented Here...can't be any good
- Turf Protection....that's my job
- Fear of Change.....it ain't broke-don't fix it
- Mistrust.....Hidden Agendas of management
- We already tried that (and it didn't work...)
- Politics.....etc. etc. etc. etc. Ad Nauseum!

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Pathway to Change

- Countries working together so we won't have to "harmonize" 20 years from now
- ICAO - core competencies and performance standards
- ICAO - standards for approval of training organizations, including quality systems
- Canada - Continue move toward integrated CPL and ATP courses
- Canada - Restructure instructor rating system - introduce internships

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Pathway to Change (cont'd)

- Identify and train skills needed by instructors (at all levels)
- Identify and train skills needed by training managers (at all levels)
- Identify and train skills needed by evaluators/examiners (at all levels)
- Identify and train skills needed by regulators
- Recognize economic principles that drive training (Use the force, Luke!)

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