Competency Based Assessment and Grading



Time for a change? Mandatory Items... (PART-FCL Appendix 9):

- Flight Preparation
- Before take-off checklist
- Engine failure between V1 and V2
- Rejected take-off before reaching V1
- Instrument departure and arrival procedures
- Engine-out Precision Approach to minima
- NDB/VOR/LOC approach to MDA
- Go-Around engine-out
- Landing critical engine inoperative



Sioux City - Black Swan







23/09/10

EBT - RAeS FCTC

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Where do the competency based training come from ?

Competency based training has been used for MPL (Multi Pilot license) training

And then further developed with EBT (Evidence Based Training)





Threat and Error Management

Threats are events that occur outside the influence of the flight crew, but which require crew attention and management

Threats come "at" the crew

Errors come "from" the crew







	LOSA observer ratings for captain leadership and communication							
TEM indicator: Average number per flight	Outstanding leadership and communication	Good leadership and poor communication	Poor leadership and communication					
Threats	4.9	4.3	5.0					
Mismanaged threats	0.3	0.7	1.1					
Errors	2.3	5.6	7.0					
UAS	0.4	1.4	1.8					

Competencies are the tools to mitigate Threats and errors





Competency Based Training





Competency & Threat and Error Management

Flight crews must, as part of their normal duties, employ countermeasures to keep threats, errors and undesired aircraft states from reducing margins of safety in flight operations.

As much as **70%** of flight crew activities may be **countermeasurerelated activities.**

Competencies are considered to be the countermeasures to threats, errors and undesired aircraft states and are embedded in the Threat and Error Management concept.



Competency

What is a competency ?

• A combination of **Knowledge**, **Skills and Attitude** required to perform a task to a **prescribed standard**.

How to define this prescribed standard ?

- With a list of **performance indicators**, describing how to effectively perform the task.
- The performance indicators will allow to assess the competencies.

How to grade the competencies ?

• By using **word pictures**, which are a direct function of the "Performance Indicator". They were created using standardized elements which allows clearer comparability, easier instructor standardization and thus better inter-rater-reliability.



Competency	Application of procedure
Competency description	Identifies and applies procedures in accordance with published operating instructions and applicable regulations, using the appropriate knowledge.
Performance indicators	 Follows SOP's unless a higher degree of safety dictates otherwise Identifies and applies all operating instructions in a timely manner Correctly uses aircraft systems, controls and instruments Safely manages the aircraft to achieve best value for the operation, including fuel, the environment, passenger comfort and punctuality Identifies the source of operating instructions
Word pictures	1. The pilot did not apply procedures correctly, by rarely demonstrating any of the
	 The pilot applied procedures at the minimum acceptable level, by only occasionally demonstrating some of the performance indicators when required, but which overall did not result in an unsafe situation.
	3. The pilot applied procedures adequately, by regularly demonstrating most of the performance indicators when required, which resulted in a safe operation.
	4. The pilot applied procedures effectively, by regularly demonstrating all of the performance indicators when required, which enhanced safety.
J	5. The pilot applied procedures in an exemplary manner, by always demonstrating all of the performance indicators when required, which significantly enhanced safety effectiveness and efficiency.



Competency	Communication
Competency description	Demonstrates effective oral, non-verbal and written communications, in normal and non- normal situations.
Performance indicators	 Knows what, how, where, when, how much and with whom he or she needs to communicate Ensures the recipient is ready and able to receive the information Conveys messages and information clearly, accurately, timely and adequately Confirms that the recipient correctly understands important information Listens actively, patiently and demonstrates understanding when receiving information Asks relevant and effective questions, and offers suggestions Uses appropriate body language, eye contact and tone, and correctly interprets non-verbal communication of others Is receptive to other people's views and is willing to compromise
Word pictures	 The pilot did not communicate effectively, by rarely demonstrating any of the performance indicators when required, which resulted in an unsafe situation. The pilot communicated at the minimum acceptable level, by only occasionally demonstrating some of the performance indicators when required, but which overall did not result in an unsafe situation. The pilot communicated adequately, by regularly demonstrating most of the performance
J	 indicators when required, which resulted in a safe operation. 4. The pilot communicated effectively, by regularly demonstrating all of the performance indicators when required, which enhanced safety. 5. The pilot communicated in an exemplary manner, by always demonstrating all of the performance indicators when required, which significantly enhanced safety effectiveness and efficiency.



Flight path management-Automation

Competency description	Controls the aircraft flight path through automation, including appropriate use of flight management system(s) and guidance.
Performance indicators	 Controls the aircraft using automation with accuracy and smoothness as appropriate to the situation Detects deviations from the desired aircraft trajectory and takes appropriate action Contains the aircraft within the normal flight envelope Manages the flight path to achieve optimum operational performance Maintains the desired flight path during flight using automation whilst managing other tasks and distractions Selects appropriate level and mode of automation in a timely manner considering phase of flight and workload Effectively monitors automation, including engagement and automatic mode transitions
Word pictures	1. The pilot did not manage the automation effectively, by rarely demonstrating any of the performance indicators when required, which resulted in an unsafe situation.
	2. The pilot managed the automation at the minimum acceptable level, by only occasionally demonstrating some of the performance indicators when required, but which overall did not result in an unsafe situation.
	3. The pilot managed the automation adequately, by regularly demonstrating most of the performance indicators when required, which resulted in a safe operation.
U	4. The pilot managed the automation effectively, by regularly demonstrating all of the performance indicators when required, which enhanced safety.
	5. The pilot managed the automation in an exemplary manner, by always demonstrating all of the performance indicators when required, which significantly enhanced safety effectiveness and efficiency

Competency

Competency	Flight path management-Manual control
Competency description	Controls the aircraft flight path through manual flight, including appropriate use of flight management system(s) and flight guidance systems.
Performance indicators	 Controls the aircraft manually with accuracy and smoothness as appropriate to the situation Detects deviations from the desired aircraft trajectory and takes appropriate action Contains the aircraft within the normal flight envelope Controls the aircraft safely using only the relationship between aircraft attitude, speed and thrust Manages the flight path to achieve optimum operational performance Maintains the desired flight path during manual flight whilst managing other tasks and distractions Selects appropriate level and mode of flight guidance systems in a timely manner considering phase of flight and workload Effectively monitors flight guidance systems including engagement and automatic mode transitions
Word pictures	1. The pilot did not control the aircraft effectively, by rarely demonstrating any of the
	 performance indicators when required, which resulted in an unsafe situation. 2. The pilot controlled the aircraft at the minimum acceptable level, by only occasionally demonstrating some of the performance indicators when required, but which overall did not result in an unsafe situation. 3. The pilot controlled the aircraft adequately, by regularly demonstrating most of the
Ű	performance indicators when required, which resulted in a safe operation.4. The pilot controlled the aircraft effectively, by regularly demonstrating all of the performance indicators when required, which enhanced safety.
Page 13	5. The pilot controlled the aircraft in an exemplary manner, by always demonstrating all of the performance indicators when required, which significantly enhanced safety effectiveness and efficiency.

Competency	Knowledge
Competency description	Demonstrates knowledge and understanding of relevant information, operating instructions, aircraft systems and the operating environment.
Performance indicators	 Demonstrates practical and applicable knowledge of limitations and systems and their interaction Demonstrates required knowledge of published operating instructions Demonstrates knowledge of the physical environment, the air traffic environment including routings, weather, airports and the operational infrastructure. Demonstrates appropriate knowledge of applicable legislation Knows where to source required information Demonstrates a positive interest in acquiring knowledge Is able to apply knowledge effectively
Word pictures	1. The pilot did not have adequate knowledge, by rarely demonstrating any of the performance indicators when required, which resulted in an unsafe situation.
	2. The pilot had knowledge of a minimum acceptable level, by only occasionally demonstrating some of the performance indicators when required, but which overall did not result in an unsafe situation.
	3. The pilot had adequate knowledge, by regularly demonstrating most of the performance indicators when required, which resulted in a safe operation.
J	4. The pilot had good knowledge, by regularly demonstrating all of the performance indicators when required, which enhanced safety.
	5.The pilot had exemplary knowledge, by always demonstrating all of the performance indicators when required, which significantly enhanced safety, effectiveness and efficiency

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Competency	Leadership and teamwork
Competency description	Demonstrates effective leadership and team working.
Performance indicators	 Understands and agrees with the crew's roles and objectives Is approachable, enthusiastic, motivating and considerate of others Uses initiative, gives direction and takes responsibility when required Anticipates other crew members' needs and carries out instructions when directed Is open and honest about thoughts, concerns and intentions Gives and receives both criticism and praises well, and admits mistakes Confidently says and does what is important for safety
Word pictures	 Demonstrates empathy, respect and tolerance for other people Involves others in planning and allocates activities fairly and appropriately to abilities. 1. The pilot did not lead or work as a team member effectively, by rarely demonstrating any
	of the performance indicators when required, which resulted in an unsafe situation. 2. The pilot led and worked as a team member at the minimum acceptable level, by only occasionally demonstrating some of the performance indicators when required, but which overall did not result in an unsafe situation.
	 3. The pilot led and worked as a team member adequately, by regularly demonstrating most of the performance indicators when required, which resulted in a safe operation. 4. The pilot led and worked as a team member effectively, by regularly demonstrating all of the performance indicators when required, which enhanced safety.
U	 5. The pilot led and worked as a team member in an exemplary manner, by always demonstrating all of the performance indicators when required, which significantly enhanced safety effectiveness and efficiency.



Competency	Problem solving and decision making
Competency description	Accurately identifies risks and resolves problems. Uses the appropriate decision-making processes.
Performance indicators	 Identifies and verifies why things have gone wrong and does not jump to conclusions or make uninformed assumptions Seeks accurate and adequate information from appropriate sources Perseveres in working through a problem without reducing safety Uses appropriate, agreed and timely decision-making processes Applies essential and desirable criteria and prioritizes Considers as many options as practicable Makes decisions when needed, reviews and changes them if required Considers risks but does not take unnecessary risks Improvises appropriately when faced with unforeseen circumstances to achieve the safest outcome
Word pictures	1. The pilot did not solve problems or make decisions effectively, by rarely demonstrating any of the performance indicators when required, which resulted in an unsafe situation.
	2. The pilot solved problems and made decisions at the minimum acceptable level, by only occasionally demonstrating some of the performance indicators when required, but which overall did not result in an unsafe situation.
	3. The pilot solved problems and made decisions adequately, by regularly demonstrating most of the performance indicators when required, which resulted in a safe operation.
	4. The pilot solved problems and made decisions effectively, by regularly demonstrating all of the performance indicators when required, which enhanced safety.
Page 16	5. The pilot solved problems and made decisions in an exemplary manner, by always demonstrating all of the performance indicators when required, which significantly enhanced safety effectiveness and efficiency.

Competency	Situation awareness
Competency description	Perceives and comprehends all of the relevant information available and anticipates what could happen that may affect the operation.
Performance indicators	 Is aware of the state of the aircraft and its systems Is aware of where the aircraft is and its environment Keeps track of time and fuel Is aware of the condition of people involved in the operation including passengers Develops "what if" scenarios and plans for contingencies Identifies threats to the safety of the aircraft and people, and takes appropriate action
Word pictures	1. The pilot's situation awareness was not adequate, by rarely demonstrating any of the performance indicators when required, which resulted in an unsafe situation.
	2. The pilot's situation awareness was at the minimum acceptable level, by only occasionally demonstrating some of the performance indicators when required, but which overall did not result in an unsafe situation.
	3. The pilot's situation awareness was adequate, by regularly demonstrating most of the performance indicators when required, which resulted in a safe operation.
	4. The pilot's situation awareness was good, by regularly demonstrating all of the performance indicators when required, which enhanced safety.
U	5. The pilot's situation awareness was exemplary; all performance indicators were always demonstrated when required, which significantly enhanced safety, effectiveness and efficiency.



Workload management

Competency description	Managing available resources efficiently to prioritize and perform tasks in a timely manner under all circumstances
Performance indicators	 Is calm, relaxed, careful and not impulsive Plans, Prepares, prioritizes and schedules tasks effectively Manages time efficiently when carrying out tasks Offers and accepts assistance, delegates when necessary and asks for help early Reviews, monitors and cross-checks actions conscientiously Ensures tasks are completed Manages interruptions, distractions, variations and failures effectively
Word pictures	1. The pilot did not manage the workload effectively, by rarely demonstrating any of the performance indicators when required, which resulted in an unsafe situation.
	2. The pilot managed the workload at the minimum acceptable level, by only occasionally demonstrating some of the performance indicators when required, but which overall did not result in an unsafe situation.
	3. The pilot managed the workload adequately, by regularly demonstrating most of the performance indicators when required, which resulted in a safe operation.
	4 The pilot managed the workload effectively, by regularly demonstrating all of the performance indicators when required, which enhanced safety.
U	5. The pilot managed the workload in an exemplary manner, by always demonstrating all of the performance indicators when required, which significantly enhanced safety effectiveness and efficiency



Competency

Why Grading?





Why Grading?



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ATPL/MPL/TYPE RATING

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Content

- Why Grading?
- The Stakeholders
- Design Process
- Set of Criteria definition
- Selection of Grading Option
- Experience gained so far and outlook



Content

- Why Grading?
- The Stakeholders
- Airbus Grading System Design Process
- Set of Criteria definition
- Selection of Grading Option
- Experience gained so far and outlook



Why Grading ?

Traditional approach:
 Quality Assurance by testing psychomotoric skills

Licence renewal

• New approach:

Quality **improvement** by training and assessing competencies

Develop competencies and gain evidence



The Stakeholders





















Airbus Design process for a new Grading System





Set of Criteria for a Grading system





Criteria for a Grading system

The eventual grading system should be adaptable, flexible and customizable to different operations, types of aircraft, environments, training objectives and cultures.

Adaptability



Stakeholders commented on the criteria definition:





Content

- Why Grading in EBT?
- The Stakeholders
- Airbus Grading System Design Process
- Set of Criteria definition
- Selection of Grading Option
- Experience gained so far and outlook



Choose Optimum Grading System

Next step: 11 different options have been evaluated, differing in two dimensions:

1. Target of assessment (What to assess?)

- The whole training event (the session) overall OR
- Each section of the session (a scenario or a manoeuvres training) OR
- A task as part of a section (a particular manoeuvre e.g. an ILS approach)

2. Method of assessment (How to assess?)

- By a simple **pass/fail** statement OR
- By an outcome grading OR
- By grading against each competency



Choose Optimum Grading System

The developed set of criteria was applied to the system options in a matrix

Grading/Version		7	8	10	11	1	2	3	4	5	6	9
Passifail		Module	Module	Module	Module	Module	Module	Module	Module	Module	Module	Module
Outcome grading						Each task	Each task	Each task	Each scenario/ maneouvers training			
		Each competence		Each competency is graded on the session	Each competency is graded on the session	Each competence	Only the critical			All		
Competency grading	is graded in each scenario/ mancourers training	senserie/ scenarie/ mabeourers training	and on the scenario/ mancouvers training with the deviation below the norm (relevant competency)	and on the tasks with deviation below the norm	is graded in each scenario/ mancouvers training	competencies graded against the tasks with deviation below the norm	(Non EBT)	(Non EBT)	competencies are graded against each task	Only the critical competencies graded against each task	(Non EBT)	
	uoiqh	e.										
Fairness & accuracy	10	9	10	10	10	6	6	6	6	4	5	1
Usability	10	6	9	9	6	3	3	4	8	1	2	10
Clarity	9	9	10	8	7	9	8	7	6	2	2	5
Adaptability	6	8	10	7	7	5	4	6	8	5	6	10
Implementation risk	7	6	8	7	7	3	5	8	10	2	3	6
Continuous improvement	8	10	7	8	9	9	6	5	6	4	5	1
Compliance	5	7	8	9	9	10	9	3	4	4	4	2
Motivating	5	8	10	10	7	4	4	2	7	2	3	5
Data mgt	6	10	8	9	6	6	5	3	2	5	6	1

One best option resulted from this structured analysis:



Optimum Grading System

The following grading option turned out to be the option that best met the criteria):

- Pass/Fail statement on the session
- Grading the nine competencies on the session (one grade per competency), determined by an overall assessment of all maneouver training/scenarios
- **Textual comment** highlighting exemplary and below-norm performance
- Only where a **competency falls below the norm full details** and attribution to the scenario/maneouver is recorded



Next steps

Decide on the Grading Scales	Layout, media, implementation process	Perform Test runs	
Set of Cri	teria was ap	oplied !	



2. The grading sheet

	Type rating training				1			Trainee's sticker		
Session	APT4		^{Date} 10)/04/13						
			Com	petency Gra	ading					
	Competencies	1	2	3	4	5	N/A			
	Application of procedures									
	Communication									
	Flight path management - Automation									
	Flight path management - Manual									
	Knowledge									
	Leadership and teamwork									
	Problem solving and decision making							Competent		
	Situation awareness							May need extra training		
	Workload management							Not yet competent		
							1			
Free text							Trainee's signa	ture		
To be used for exemplary or improved performance on instructor discretion .										
When	a particular competency is asses	sed be	elow le	vel 3, fu	ull deta	ils				
shall be recorded in this FREF TEXT box.										
		Troiner's nome	and simulations							
		Trigram								
		Signature:								
							Signature:			



Grading Process

The Grading System relies on the user understanding and applying the underlying principles.

All assessment and grading of maneuvers and scenarios in a session follow the same stepped process:





Example



Note: The next version of session proficiency criteria FCTP will be fully competency related



Example





Example



Let's start with the competency;"Application of Procedure" The first step is to look at **the performance indicators**, remembering your observation statement: "The captain missed a few FMA calls, everything else was standard".

The performance indicators:



- Follows SOP's unless a higher degree of safety dictates otherwise
- Identifies and applies all (operating instructions) in a timely manner
- Correctly uses aircraft systems controls and instruments
- Safely manages the aircraft to achieve best value for the operation, including fuel, passenger comfort and punctuality
- Identifies the source of operating procedure



Grading





1. The overall grading

The instructor grades his/her observation by assigning a **grade** according to : The **5-point grade scale for each competency** and a

> **COMPETENT / NOT YET COMPETENT statement** incorporating both, the achievement of the session proficiency criteria and the achievement of the competency level.





2. The grading sheet

Session	Type rating training APT4		^{Date} 10)/04/13]			Trainee's sticker	
			Com	petency Gra	ading				
	Competencies	1	2	3	4	5	N/A		
	Application of procedures								
	Communication								
	Flight path management - Automation								
	Flight path management - Manual								
	Knowledge								
	Leadership and teamwork								
	Problem solving and decision making							Competent	
	Situation awareness							May need extra training	
	Workload management							Not yet competent	
Free text							Trainee's signa	ture	
To be used for exemplary or improved performance on instructor discretion . When a particular competency is assessed below level 3, full details shall be recorded in this FREE TEXT box.									
		Trainar'a nomo	and signature						
		Trigram							
		Signature							
							Signature.		



3. The word picture

- Word pictures describe the various steps of the five level grading scale.
- They are a direct function of the underlying "Performance Indicator".
- They were created using standardized elements which allows clearer comparability, easier instructor standardization and thus better inter-rater-reliability.
- Every Word picture is thus constructed, according to the VENN Methodology of grading, combining the four elements (A, B, C, D) where
- A = HOW WELL (e.g. The pilot did not communicate effectively...)
- B = HOW OFTEN (e.g. ...by rarely demonstrating...)
- C = HOW MANY (e.g. ... any of the performance indicators when required...)
- D = OUTCOME (e.g. ... which resulted in an unsafe situation.)
- The grades based on the word pictures are absolute and factual.

