

Developing Competency-based Training and Performance Standards for Licensing Flight Crew Members: A Progress Report

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1. INTRODUCTION

1.1 The purpose of this paper is to describe work undertaken so far by the Flight Crew Licensing and Training Panel (FCLTP), concerning flight crew training and licensing requirements for a newly approved multi-crew pilot (MPL) license. The scope of the work of the panel is broad and covers such issues as the certification of training organizations; the review of existing Annex 1 pilot licenses; and the development of competencies for the newly proposed MPL. This paper focuses particularly on the work of the panel concerning competencies for the MPL.

1.2 The paper provides background information concerning the establishment of the FCLTP, and working definitions of competency-based training and standards. The competency framework that the panel has decided to use is described. Finally some issues to be considered in the deliberations of the panel are outlined.

2. BACKGROUND

2.1 Twenty years have elapsed since the last revision to the Annex 1 flight crew specifications was initiated. Since then, major developments in respect of aircraft operations and training have taken place. Operators are now using highly sophisticated aircraft, operated by two-person flight crews, and in an environment of increasing complexity. At the same time, general aviation continues to use aircraft of a technology that is largely derived from the 1950s. Licensing standards must therefore be able to cater for the widening spread between the different sectors of aircraft operation and the different aircraft and equipment being used.

2.2 Over these last twenty years, considerable changes have also taken place in relation to aviation training. In a number of States, reliance is increasingly being placed on large *ab initio* training schools as the supply of pilots from general aviation and the military fails to keep up with current demand. In addition, the fact that the training tools available today, e.g. flight simulators and computer-based training, have the potential of offering better and faster training, means that the licensing credits given on the basis of these tools need to be carefully re-examined. Finally, the need for more effective training has led several States to develop competency-based training and licensing requirements that incorporate more explicit criteria for measuring competence.

2.3 Informal consultations that have already been held by ICAO with States and international organizations, including an informal ICAO meeting on the future of international licensing and training Standards (Madrid, 2 to 4 October 2000), indicated that the Annex 1 requirements have stood the test of time since the basic framework of the Annex was first developed in the 1940s. However, the absence of common criteria against which to measure the competence of flight crew has led to significant variations in the different performance standards, which have been developed by States. Where no explicit standards of performance exist at all, differences in the competence of flight crew become even more significant. In

addition, this initial review has indicated that the current ICAO Standards have not been fully kept in line with the development of aviation both in terms of the content of training and in the use of modern training devices. The proposed review therefore provides an opportunity for amending the licensing and training provisions contained in Annex 1 and Annex 6, Parts I and Part III respectively, in order to ensure that they provide for worldwide standardization and for the required levels of safety.

2.4 On 26 January 1999, the Air Navigation Commission established the Flight Crew Licensing and Training Panel. The Panel's objective is to "Consult States and selected international organizations to obtain information concerning their current systems and future plans; conduct a preliminary study of the practicability of developing competency-based training and performance Standards for licensing flight crew members; and assess the work effort required for further action, including potential amendment to Annex 1 and related guidance materials." In October 2002, a Working Group of the Whole Flight Crew licensing and training panel met. Panel working groups met during 2003 and the Panel will meet for the first time in December 2003.

2.2 Definition of competency-based training and standards

2.2.1 A first step in the panel's work was to define competency, competency-based training and competency-based standards. Based on a common understanding of these terms, a competency framework was established.

2.2.2 The panel defines competency in terms of outcome. Competency focuses on what is expected of an employee in the workplace rather than on the learning process, and embodies the ability to transfer and apply skills and knowledge to new situations and environments.

2.2.3 "A competent professional has the attributes necessary for job performance to the appropriate standards". For those familiar with the Phase 2 of the TRAINAIR methodology or the job and task analysis of any Instructional Systems Development type approach, the last statement will sound very familiar. The job and task analysis process is a well-proven technique to obtain a comprehensive and organized inventory of tasks, sub-tasks and skills, knowledge and attitude for a given job.

2.2.6 From the definitions provided above, the following characteristics of competency-based training can be identified:

- Competency-based training is outcome-oriented. It is what trainees can do and how well they can do it that matters.
- Competency-based training materials clearly state what is expected of trainees in terms of performance, in given conditions, and to what standards.
- Competency-based training is material-dependent as opposed to instructor-dependent.
- Competency-based assessment during and after training measures the performance of the trainee against a specified standard in a valid and reliable fashion.
- During competency-based training, trainees are provided with regular and immediate feedback

Competency based training is therefore

- A performance-oriented training system based on clearly defined tasks which comprise the job to be learned; and
- A systematic evaluation of competence as to how well the job is done.

3. WORK OF THE PANEL

3.1 The panel decided to consider flight crew competency-based training and performance standards for the newly proposed Multi-crew pilot license (MPL). Additionally, the Panel decided to develop competencies for the MPL for trainees who would enter an *ab initio* training scheme. Based on the work done for the MPL, guidance material concerning competency-based training and performance standards could eventually be developed for the existing licenses. It is also envisaged to use a competency-based approach for other licenses than flight crew.

3.2 Initially, the panel examined several competency models. Based on this first consideration, a consensus was achieved on a generic competency framework, which would allow the determination of standards based on performance. The generic competency framework consists of the following components:

- Competency units: These describe the major functions of flight crew as reflected in the different phases of flight. They can be equated to the level of “duty” in the job and task analysis of the TRAINAIR methodology.
- Competency elements: These are the building blocks of the competency units. They describe a major outcome. They can be equated to the level of task in the ISD approach or TRAINAIR methodology.
- Performance Criteria: These provide a detailed description of the expected outcome of a competency element. They consist of two elements: a statement of a performance of a specific step in a given competency element and a standard. In an ISD approach or in the TRAINAIR methodology, the statement of performance would correspond to a sub-task. The second element is the standard that corresponds to the specific step of performance. Performance criteria in their sum represent the standard for a competency element. Performance criteria are therefore critical for the development of assessments that accurately reflect work performance.
- Skills, knowledge and attitudes: these are the attributes that underlie the performance criteria.

3.3 The panel is in the process of determining the competency units for the MPL. At this point in time, this list of competency units is based on a phase of flight scheme that is generic. This approach is widely used in several competency frameworks as well as in the Line-Oriented Safety Audit (LOSA) programme. LOSA is a tool used to identify threats to aviation safety, minimize the risks such threats may generate and implement measures to manage human error in operational contexts.

3.4 The next step, once the competency units are established, would be to validate the framework established by the working group of the Panel. To do this, the framework should be compared to a job and task analysis of the MPL. Carrying out a job and task analysis for the MPL, if undertaken

from scratch, would be a large and costly project. However, several comprehensive job and tasks analyses have been carried out already for *ab initio* training. Therefore, by comparing these existing job and task analyses against the competency framework the panel has established, it will be possible to determine how well the framework accommodates them (or not). Comparing full job and task analyses point by point also represents a major endeavour. While the complete inventory of differences and similarities between analyses would provide useful information, it is not the purpose of the working group. The purpose of the working group is to determine the differences that exist between the analyses and the framework as to how the different components of competencies are classified. This would allow the working group to determine the conceptual differences and similarities between the job and task analyses and the framework proposed. The framework could then be modified or adjusted based on the findings of the working group. In order to identify the differences in classifying principles between the different analyses, it is therefore not necessary to carry out a comparison of full analyses. It was considered sufficient at this point, to strategically select competency units for comparison purposes. This would provide the working group with the information it requires. Therefore, the comparison analysis was restricted to three representative competency units in normal conditions: take off, cruise and landing.

3.5 As a result of this high level comparative analysis, the competency framework proposed by the Panel should accurately and appropriately reflect the job and task of flight crew for an MPL on a worldwide basis. The validated framework will allow Contracting States to develop training and assessments that reflect job performance. The panel will undertake initial work on this analysis in Paris next week.

4. ISSUES

4.1 Determining Performance Criteria

4.1.1 Performance criteria as defined in paragraph 3.2 above, are a key feature of competency-based training. The development of assessments for training and licensing purposes that accurately reflect work performance (validity and reliability) depends on the formulation of clear performance criteria. In order to be clear, performance criteria should formulate an observable and measurable behaviour as well as its corresponding standard. The challenge for the Panel will be to identify performance criteria that are focused and applicable to all types of operations.

4.2 Threat and Error Management Competencies

4.2.1 Competencies related to threat and error management are critical in the work performance of flight crew. The threat and error management model states that threats and errors are integral parts of daily flight operations and must be managed. Crew countermeasures are seen as the tools that pilots develop to handle these daily threats and errors. Skills, knowledge and attitudes related to workload management and contingency planning, for example, underlie threat and error management. As threat and error management permeates every operational activity, this should be reflected in the competency framework. One of the challenges the panel faces is to determine how best to integrate threat and error management competencies in the framework and support the development of valid and reliable assessments for these competencies.

4.3 Multi-crew versus Individual Competencies

4.3.1 As indicated in informal consultation with States, the competency framework should take into account the multi-crew dimension of flight crew performance. However, generally, job and task

analysis focus on an individual's work performance. Clearly, pilots need to possess individual skills at an acceptable level in order to perform in a multi-crew environment. These individual skills however are not sufficient to ensure safe operation in a multi-crew environment. The competency framework therefore needs to accommodate this balance between individual and multi-crew competencies and to ensure that it is reflected in the training programmes. For licensing purposes, individuals are evaluated. Therefore, an individual should demonstrate individual abilities as well as those that are required to perform in a multi-crew environment, either as a pilot flying or a pilot not flying.

4.4 Flexibility of the Competency Framework

4.4.1 The competency framework that is being established will be applicable worldwide and to operations of different sizes, scope and culture. The framework needs to adapt to all types of organizations and support the development of training and assessment that reflects the reality of different organizations while maintaining the same standards. An example of flexibility is actually reflected in the TRAINAIR Programme, through the adaptation process that members use when they are importing a Standardized Training Package (STP). Because the STPs are developed to the same methodological standards, they can be adapted to the needs of the importing organization.

4.5 Synthetic Devices and Learning Transfer

4.5.1 The competency framework should also accommodate varying degrees of integration of synthetic training devices. The competency framework should support the development of a training programme in which synthetic training devices are used to ensure optimal positive learning transfer. Ideally, optimal learning transfer would mean that trainees move seamlessly from the learning environment to the work environment. The instructional systems design (ISD) methodologies provide useful tools to select appropriate media (including synthetic devices) for a given performance criteria or competency element. Driving the use of synthetic training devices by a sound competency-based approach rather than by their sophisticated technological functionality can optimize learning transfer and cost-effectiveness. Performance criteria will again play a key role in the selection of media. This will affect how training programmes are designed and how assessments are carried out.

4.6 Justification and clarification of Competency-based Approach to Training

4.6.1 Trainers play a critical role in the successful implementation of competency-based approaches. In competency-based training, trainers are viewed as one, albeit essential, resource to be used. This may represent a shift in perspective for this group of stakeholders. It is important to gain their support of a competency-based approach. This can be facilitated through information on the principles driving competency-based training and clarification of the trainers' role. Guidance material should assist States in disseminating information concerning competency-based training and support the implementation of staff development programmes. As TRAINAIR members have gained experience in the implementation of competency-based training, they can provide valuable insights into this process. The way they have addressed staff development in this regard can provide useful information.

5. CONCLUSION

5.1 Competency-based training and performance standards are powerful tools because they are outcome-oriented. For this reason they are a key element in several processes:

- in quality control and quality assurance;

- in designing training that ensures a smooth transfer to work performance;
- in establishing assessment tools that accurately reflect work performance; and
- in designing training that is cost-effective.

The implementation of competency-based standards is not revolutionary but a reflection of the evolution of aviation training. The experience gained by members of the TRAINAIR Programme in this regard can provide valuable insights in the achievement of the successful implementation of a competency-based training approach. The panel's work on the competencies required for the newly proposed MPL encourages the aviation training community to continue to develop better instructional design models that integrate skills, knowledge and attitudes in such a way as to ensure the most optimal learning transfer to the flight deck in the most cost-effective manner.
