

## OVERVIEW OF THE ADVANCED QUALIFICATION PROGRAM

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The Advanced Qualification Program (AQP) is a voluntary alternative to the traditional regulatory requirements under CFR 14, Parts 121 and 135 for pilot training and checking. Under the AQP the FAA is authorized to approve significant departures from traditional requirements, subject to justification of an equivalent or better level of safety. The program entails a systematic front-end analysis of training requirements from which explicit proficiency objectives for all facets of pilot training are derived. It seeks to integrate the training and evaluation of cognitive skills at each stage of a curriculum. For pass/fail purposes, pilots must demonstrate proficiency in scenarios that test both technical and crew resource management skills together. Air carriers participating in the AQP must design and implement data collection strategies which are diagnostic of cognitive and technical skills. In addition, they must implement procedures for refining curricula content based on quality control data. This paper presents an overview of the Advanced Qualification Program and identifies selected applied research issues of interest to the FAA for the purpose of improving the program.

### BACKGROUND

#### *Goals*

The overall goals of the Advanced Qualification Program are: (1) To increase aviation safety through improved training and evaluation, and (2) To be responsive to changes in aircraft technology, operations, and training methodologies.

#### *Distinguishing Features*

In general an AQP differs from traditional regulatory requirements in terms of the following characteristics:

(1) Participation is voluntary. Air carriers choosing not to participate will continue to be governed by the appropriate existing provisions of 14 CFR, Parts 121 and 135. However, nearly all major U.S. airlines are presently participants. A growing number of regional airlines also participate in the program.

(2) An AQP may employ innovative training and qualification concepts. Provided the applicant can demonstrate to the FAA's satisfaction that the resulting aircrew proficiency will meet or exceed that obtainable through a traditional program, significant departures from the pertinent requirements of FAR Parts 121 and 135 may be authorized.

(3) An AQP entails proficiency based qualification. That is, provided that pilots are trained to a standard of proficiency on all objectives within an approved AQP curriculum, it is not necessary to verify proficiency by virtue of a formal proficiency check on every such item. Rather, the proficiency evaluation may consist of a sample of such items, in order to validate that the training to proficiency strategy has in fact achieved its objectives. Terminal proficiency objectives

(TPO's), together with associated performance standards, replace the FAA's traditional event driven compliance requirements. Each air carrier applicant, rather than the FAA, develops its own TPO's on the basis of an instructional systems development (ISD) process outlined in Advisory Circular 120-54, Advanced Qualification Program. Once approved by the FAA, these TPO's become regulatory requirements for the individual carrier. An AQP provides an approved means for the carrier to propose TPO additions, deletions, or changes as needed to maintain a high degree of aircrew proficiency tailored to the operator's line requirements.

#### *Mandatory Requirements*

In order to assure that the increased flexibility inherent in AQP does not come at the cost of reduced safety, certain mandatory criteria have been established, among them the following. An AQP must:

(1) Be aircraft specific (i.e. (accommodate each make, model, and series or variant of aircraft within any given fleet transitioning to an AQP.)

(2) Provide indoctrination, qualification, and continuing qualification curriculums for every duty position. Indoctrination consists of fleet common knowledge items. Qualification consists of fleet specific ground and flight operations training for a newly assigned cockpit duty position. Continuing qualification consists of fleet specific ground and flight operations recurrent training for presently held duty positions.

(3) Provide training and evaluation which is conducted to the maximum extent possible in a full cockpit crew environment (e.g. Captain and First Officer).

Qualification and continuing qualification curricula must include a line operational evaluation (LOE), which consists of a full flight scenario systematically designed to target specific technical and crew resource management (CRM) skills.

(4) Integrate training and evaluation of CRM, in accordance with the provisions of Advisory Circular 120-51, Crew Resource Management Training, and 14 CFR, SFAR 58. The evaluation of CRM proficiency is mandatory, and substandard performance on CRM factors must be corrected by additional training. In AQP demonstration of proficiency in maneuver oriented technical skills is a necessary but insufficient condition for pilot qualification. For pass/fail purposes, pilots must also demonstrate proficiency in LOE's which test both technical and CRM skills together.

(5) Provide AQP specific training for instructors and evaluators, together with explicit training and evaluation strategies to verify the proficiency and standardization of such personnel for crew oriented, scenario-based training and evaluation tasks.

(6) Collect performance proficiency data on students, instructors, and evaluators and conduct airline internal analyses of such information for the purpose of curriculum refinement and validation. Participants are also required to forward certain data to the FAA in digital electronic format on a routine basis.

(7) Integrate the use of advanced flight training equipment, including full flight simulators. AQP encourages air carriers to utilize a suite of equipment matched on the basis of analysis to the training requirements at any given stage of a curriculum. Judicious analysis of these requirements can enable an AQP participant to significantly reduce the need for use of a full simulator.

## CURRICULUM DEVELOPMENT

AQP is founded on the principle that the content of training and checking activities should be directly driven by the content of the operational job. The first step in AQP, therefore, is the conduct of an aircraft specific job task analysis, which begins with the development of a comprehensive task listing for each duty position. The task listing should cover the full range of conditions and contingencies - internal to the aircraft, external to the aircraft, normal, abnormal, and emergency - to which the pilot may be exposed within the applicant's sphere of operations.

The task listing is then analyzed to identify the skills, knowledges, and abilities (SKA's) necessary for competent performance of each task and subtask, including SKA's which reflect CRM considerations. Where appropriate, CRM skills pertinent to effective task execution should be identified in the context of the specific flight task to which they apply. The AQP analysis methodology provides for the identification of both phase specific and phase independent skills. Skills found to be applicable across multiple flight tasks may be identified

as phase independent. Additional analysis intended to support subsequent syllabus development may be conducted on tasks and subtasks, including such considerations as relative frequency of occurrence in routine operations, operational criticality, and success criteria. Terminal and supporting objectives are then extracted from the task and subtask analysis, respectively, for each duty position, and must include identification of applicable performance, standards, and conditions. The documentation of proficiency objectives must identify the references used, respectively, in defining performance, standards, and conditions for each. This information is submitted for approval to the FAA in the form of AQP qualification standards.

The applicant may elect to identify certain SKA's as enabling objectives, including both phase specific and phase independent SKA's. Enabling objectives are used to prepare individuals and crews for subsequent training in an operational cockpit environment. Identification of such objectives is particularly useful for assuring that courseware, such as computer based instruction, directly supports higher order objectives at subsequent points within a curriculum. The linkage established between levels of objectives may also facilitate the process of updating course content when modifications are needed, so that changes at any one level are properly reflected elsewhere in the hierarchy.

Tasks, subtasks, and associated SKA's are then allocated to curriculum segments, modules, lessons, and lesson elements in a building block fashion. Most AQP applicants have elected to make use of software tools which significantly facilitate the entire process of applying the front end analysis to curriculum development. These tools, which are usually based on relational data base architectures, are useful in keeping track of the relationships between various levels of tasks, SKA's, proficiency objectives, courseware, media, training devices, and so on. Such tools reduce the time and labor costs associated with developing a particular AQP. To the extent that common elements exist which may be applied across AQP's, they facilitate the identification and reapplication of such elements, and may reduce an applicant's subsequent AQP development cost. The FAA has funded the development of a Model AQP software tool to assist in the accomplishment of these functions, which is provided to air carriers who wish to make use of it (Mangold & Neumeister, 1995).

## FREQUENCY OF TRAINING AND EVALUATION

### *First Look Evaluation*

Among the most important AQP quality control tools from a performance proficiency perspective is the First Look Evaluation. Performance on selected TPO's will be evaluated prior to each formal training session - that is, prior to any pre-briefing or practice on such items. Such pre-evaluation data will be used to determine the extent to which safety critical skills may have decayed since previous training and/or checking, and will also provide a baseline for assessing degree

of improvement attributable to subsequent training. Consistently poor pre-evaluation results occurring at the group level may indicate that curriculum modifications, including potentially the frequency and content of training, are warranted.

#### *Continuing Qualification Cycles*

After initial qualification, which incorporates training and evaluation on all proficiency objectives, follow-on training will occur within a scheduling interval called a continuing qualification cycle. Its initial duration is 26 months, but it may be subsequently extended by the FAA in three months increments to a maximum of 39 months, contingent upon the results of performance proficiency data from each such cycle. During a continuing qualification cycle all terminal proficiency objectives must be trained and evaluated.

#### *Evaluation Period*

For continuing qualification curricula, the applicant may elect to categorize certain terminal proficiency objectives as currency items. Currency items refer to flight activities on which proficiency is maintained by virtue of frequent exercise during routine operations. Such items do not need to be addressed for training or proficiency evaluation purposes in periodic training sessions. However, verification is required that proficiency on such items is being maintained. Such verification may be obtained during line checks.

The applicant may also elect to categorize terminal proficiency objectives, including currency items, as critical or non-critical, based on operational significance and the consequences of error. This categorization is employed to determine the time interval within which training and evaluation on such items must occur for continuing qualification curricula. Critical terminal proficiency objectives must be trained and evaluated during an evaluation period the initial duration of which cannot exceed thirteen months. Each such evaluation period must include at least one training session. Non-critical terminal proficiency objectives may be distributed over a continuing qualification cycle the initial duration of which cannot exceed twenty-six months.

These distinctions directly impact the content of training and checking activities for continuing qualification curricula in AQP. By virtue of identifying routine activities as currency items, and classifying certain proficiency objectives as critical, limited training time and resources may be devoted to greater emphasis on abnormal conditions, emergencies, CRM, and those skills which the applicant's operational experience may indicate are most important to the maintenance of a well trained pilot population.

For all cockpit aircrew, a proficiency evaluation must be completed in either an aircraft, flight simulator, or flight training device during each evaluation period. In addition, for pilots in command a line check must be scheduled at the midpoint of the evaluation period, plus or minus one month,

unless an alternative line check schedule has been otherwise approved by the FAA for the applicant's AQP.

### APPLIED RESEARCH IN AQP

Certain features of AQP have generated a significant need for applied human factors research support. For example, while ISD has long been routinely employed in the development of computer based training content, it has rarely been employed in an air carrier setting to design an entire curriculum from ground school through flight operations training and checking. The complex nature of this training and evaluation requirement, which encompasses both advanced technical and cognitive skills, has necessitated research to extend methodological techniques to meet the need in a pragmatic and economically feasible fashion, together with software tools tailored for use by air carrier training development staff. This requirement has been particularly challenging in the area of identifying effective strategies for CRM curriculum integration. The emphasis on scenario based training and evaluation has engendered a multitude of requirements for human factors support, ranging from the need to establish a systematic methodology for the development of targeted scenario event sets to the establishment of reliable and valid scenario performance assessment strategies, and the standardization of evaluators responsible for accomplishing psychometric measures. The significant time and labor workload associated with generating LOE's has engendered an acute need for software tools which facilitate the creation of fresh scenarios on a quick turnaround basis. Such tools must incorporate all of the methodological concerns associated with targeting desired technical and cognitive skills, as well as generating supporting flight paperwork and scenario specific grading schemes for use by evaluators. Finally, the requirement in AQP for the acquisition of data which are diagnostic of both pilot proficiency and curriculum effectiveness has generated a need to adapt psychometric methods to the development of effective performance measurement techniques, to establish appropriate data analysis strategies, and to enhance the reliability, sensitivity, and validity of measures of quality control.

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