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Edition 3

Guidance Material and Best Practices

IATA

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Acronyms

A/C	Aircraft
AOC	Air operator certificate / Air operator certificate holder
ATPL	Airline Transport Pilots License
ATO	Approved Training Organization
CBTA	Competency-based Training and Assessment
CPL	Commercial Pilots License
EASA	European Aviation Safety Agency
FAA	Federal Aviation Administration (US)
FBS	Fixed-Base Simulators
FCL	Flight Crew Licensing
FCLTP	Flight Crew Licensing and Training Panel
FFS	Full Flight Simulator
FSTD	Flight Simulation Training Device
ICAO	International Civil Aviation Organization
IE	Instructor / Evaluator
IOE	Initial Operating Experience
IR	Instrument Rating
IT	Information Technology
ITQI	IATA Training and Qualification Initiative
JAA	Joint Airworthiness Authority (Europe, pre-EASA)
JAR	Joint Airworthiness Regulations
KSA	Knowledge, Skills and Attitudes
MPA	Multi-Pilot Aeroplane
MPL	Multi-Crew Pilot License
PANS-TRG	Procedures for Air Navigation Services – Training
PAT	Pilot Aptitude Testing
PC	Personal Computer
TEM	Threat and Error Management
TSA	Total Systems Approach

Foreword

Dear Colleagues,

I am pleased to introduce the third edition of the Guidance Material and Best Practices for Pilot Aptitude Testing. The need for this new edition was triggered by the fact that the operational environment is rapidly changing, that task-based training has reached its limits and that future pilots, like all other aviation professionals, need to be able to develop a set of defined competencies during their training and deploy them throughout their entire career as a pilot.

Besides identifying the physical, mental and strategic abilities, the foremost aim of an effective aptitude testing system is to find out whether the social-interpersonal abilities and personality traits necessary to develop those competencies are inherent in an applicant's character.

This guidance material covers all aspects necessary to understand, construct and run a successful Pilot Aptitude Testing system, covering not only the successful completion of the ab-initio module of a pilot's career but also his or her ability to successfully act as an airline pilot in all functions and roles.

It should be applicable in all parts of the world and in all cultures because the current generations of multi-pilot transport category aeroplane share similar cockpit layout and operation philosophy.

I would like to thank all stakeholders that have contributed to the development of this material.

Sincerely,

Gilberto Lopez Meyer
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Section 1—Executive summary

Safety is our industry's number one priority, and accident prevention critical. Being a professional pilot is a very demanding role and is directly linked to the safety of an airline's passengers and its financial health.

To increase operational safety, the civil aviation training community has globally started to shift from the traditional task-based training to competency-based training and assessment. Aptitude testing, being the first milestone in every pilot's professional career, means that tests should be able to predict, at this early stage, the future performance of candidates in the defined set of pilot competencies.

The eight pilot competencies, developed by industry and ICAO, that every professional pilot, regardless of his role, should develop during training and deploy throughout his professional career are:

1. Application of procedures and compliance with regulations
2. Communication
3. Aeroplane flight path management, automation
4. Aeroplane flight path management, manual control
5. Leadership and teamwork
6. Problem solving and decision making
7. Situation awareness and management of information
8. Workload management

The need for PAT is acknowledge by the industry. It addresses:

- The need to define job requirements
- The need to develop and implement effective systems to measure human performance
- The need to identify candidates who
    - best match the job requirements
    - are motivated to maintain their performance with a lifelong commitment
- The need to record and analyze performance data in order to validate and evaluate testing solutions to ensure continuous improvement of the PAT system

Professional PAT has proven to be highly effective and efficient. When correctly implemented, PAT can contribute to cost savings for the airline. Experience has shown that the costs associated with implementing an aptitude testing system are significantly lower than the consequences of high failure rates resulting from immature selection or screening processes.

PAT is by far the most efficient way to ensure successful training and a successful airline career, and to avoid disappointment and frustration for all stakeholders.

To facilitate and continuously improve the aptitude testing mechanism, it should be embedded in the companies' quality system. Ideally, the quality system should be capable of administering, monitoring and recording human performance data from the initial stages of the screening and selection process, and through the entire career of a pilot. This demanding task requires close cooperation from all the parties involved, including Human Resources, Training, Flight Operations, Safety and Compliance and, not to forget, the IT department. The ideal PAT team consists of a combination of psychological, methodical, statistical and flight operations expertise.

The following questions are key to the PAT process:

- Who is responsible for the process?
- Who defines the requirements?
- Who performs the testing?
- Who takes the hiring decision?
- Is the decision solely based on the results of aptitude testing?
- How and by whom is the recruitment process, including the PAT system, maintained and evaluated?

When measuring pilot aptitude, the following measuring dimensions are used, which are all directly related to the eight pilot competencies listed above:

1. **English language proficiency**

   As an indispensable ingredient to communicate and ensure learning facilitation and global pilot mobility.

2. **Basic mental abilities**

   Components are: memory capacity, speed and accuracy of information processing (perception, classification, transformation), spatial abilities (static), technical comprehension, reasoning (information processing with basic figures), logic abilities, long-term concentration.

3. **Composite mental abilities**

   Components are: allocation of attention, multi-tasking (different tasks combined), psycho motor abilities (pursuit tracking; compensatory tracking), spatial abilities (dynamic).

   Note: These dimensions are related to aeroplane flight path management, manual control and automation.

4. **Operational abilities**

   Components are: problem solving and decision-making, workload management, situation awareness and management of information.

5. **Social-interpersonal abilities**

   Components are: communication, leadership and teamwork.

6. Personality traits

Components are: professionalism (professional motivation, self-discipline, self-criticism, self-organization, safety motivation, stress-coping with social confrontation, information load, time pressure), and application of procedures and compliance with regulations.

Testing instruments "Test battery" to measure performance in the above domains are:

- Questionnaires
- Paper-pencil tests
- PC-based tests
- Simulator-based tests/work samples
- Standardized interviews
- Group scenarios

The PAT system should achieve the following goals:

- Identify the most suitable candidates for the job
- Deliver selected personnel at lowest possible cost
- Provide a fair and legally defensible architecture

Because PAT is a very effective tool for an airline or an ATO to:

- improve operational safety and efficiency, and
- effectively use limited training resources

It is advisable that the PAT receives the highest possible management attention.

In this guidance material, IATA provides an overview of the most important aspects of PAT. The aim is to provide a single source document.

The term Aptitude Testing is used throughout the document as hypernym, overarching all areas of diagnostics used during screening and selection.

Section 2—Introduction

The purpose of this manual is to provide aviation managers with essential knowledge about PAT to support their decision-making process during the design and implementation of an efficient PAT system at their organization.

More than a decade ago the aviation training community started realizing the advantage of competency-based training and assessment (CBTA) in comparison to task- or hour-based training and assessment.

The Multi-Crew Pilot License (MPL), published by ICAO in 2006, was the first license based on this principle. With ICAO's publication of Amendment 5 to PANS-TRG, *General provisions for competency-based training and assessment*, in 2016, and the defined role of the pilot competencies in the context of Threat and Error Management (TEM) in 2018, the way forward for a global implementation of CBTA has been paved.

IATA supports a Total Systems Approach (TSA), which stands for the application of CBTA across all aviation disciplines in general, and, in particular, to all functions and roles of a pilot's entire career path. Defined competencies for pilots and instructors/evaluators should be consistently applied throughout pilot aptitude testing, initial (ab-initio) training, type rating training and testing, command upgrade, recurrent/evidence-based training and checking and instructor and examiner selection and training.

In the context of Pilot Aptitude Testing (PAT), it means that testing systems should be able to predict, at this early stage, the future performance of candidates in the defined pilot competencies. Additionally, testing systems should be able to assess the impetus of candidates to strive for excellence in terms of loyalty, compliance, precision, ethics and inspiring others, as recently required in some areas of the world under the term "Professionalism".

The competencies specified in the *ICAO competency framework for aeroplane pilots,* contained in Amendment 7 to PANS-TRG (applicable in 2020), are provided in Paragraph 3.2 and Appendix 1 of this manual.

Considering the global civil aviation fleet growth, the related need for pilots, and in view of the risks inherent to such high training demand (e.g., quality dilution), reliable PAT becomes an important line of defense.

As already mentioned, PAT is by far the most efficient way to ensure effective training and a successful career, and to avoid disappointment and frustration of all parties involved. Not to mention the tremendous costs generated by failures in training, checks and remedial efforts, which can be avoided through proper aptitude testing.

Performance feedback and continuous improvement loops are indispensable modules of the aptitude testing processes. When implementing PAT, it is essential to establish an effective feedback-data mechanism from the training and operations departments of the airline to the testing team; this will ensure that over time the right people are identified by the company with an ever-increasing reliability.

Section 3—Pilot Aptitude Testing- Critical Aspects

3.1 Safety and Human Performance

Human error accounts for the majority of aircraft accidents, therefore, investment in human performance is essential to achieve a reduction in accident rates. Human performance is becoming even more relevant because of the accelerating innovation and technological advancements in the aviation industry. This process of continuous improvement induces changes in the job requirements and consequently drives the need for continuous adaptation of the pilot behavior and the airline training methodologies.

The implementation of a robust PAT process will allow an airline to ascertain whether or not a pilot is willing and capable of accepting the inevitable stresses of life-long learning, training and checking; all of which are pre-requisites for flying technologically advanced aircraft.

The need for PAT across the dimensions of performance potential, social interaction and personality traits is undisputed. It is paramount to ensure a good fit between the dimensions of requirements and testing and the human performance limitations of the pilot. This raises the following needs:

- to develop and implement effective systems to define job requirements
- to develop and implement effective systems to measure human performance
- to identify candidates who best match the job requirements
- to identify candidates who are motivated to maintain their performance through a lifelong commitment
- to gather, collate, verify and evaluate performance data in order to validate testing solutions to ensure continuous improvement of the aptitude testing system

Historically, military organizations and large operators (AOCs), with high numbers of applicants, had, generally, access to robust and mature screening and selection systems. On the other hand, smaller organizations, which tend to have the highest turnover of personnel, are usually less advanced in the development and maintenance of an effective PAT process.

Subsequently, over time, the resulting situation may have safety consequences, especially as the pool of experienced applicants is shrinking. As civil aviation faces unprecedented growth, and increasingly lower numbers of experienced airline and military pilots are available, a large number of medium and small size AOCs will need to recruit their pilots from the very diverse general aviation market.

3.2 The ICAO Competencies for Aeroplane Pilot Licenses, Ratings and Recurrent Training

ICAO defines Competency as "*A dimension of human performance that is used to reliably predict successful performance on the job. A competency is manifested and observed through behaviors that mobilize the relevant knowledge, skills and attitudes to carry out activities or tasks under specified conditions*".

As mentioned before, the eight ICAO competencies for aeroplane pilots are:

- Application of procedures and compliance with regulations
- Communication
- Aeroplane flight path management, automation
- Aeroplane flight path Management, manual control
- Leadership and teamwork
- Problem solving and decision making
- Situation awareness and management of information
- Workload management

Note 1: The competencies are not listed according to any pre-defined priority.

Appendix 1 in this manual contains the complete ICAO Competency Framework to develop competency-based training and assessment for aeroplane pilot licenses, ratings, and recurrent training.

Note 2: The European Aviation Safety Agency (EASA) has added "Knowledge" as a ninth competency.

3.3 Efficiency

Professional aptitude testing has proven to be highly effective and efficient. Although the related costs are still perceived to be high, it must be emphasized that, when correctly implemented, PAT can considerably contribute to cost savings for the airline. The costs associated with implementing aptitude testing system are significantly lower when compared to the costs of high failure rates resulting from an immature selection or screening process.

The consequences of failures are complex and often difficult to predict. The negative outcomes are not only related to the costs associated to wasted training, they also include the trainees' and trainers' disappointment, possible subsequent legal costs and damage to the airline's brand.

High failure rates can also be perceived externally as the result of the airline's poor training culture. It has been proven that success rates in training, in organizations using an aptitude testing system, are extremely high when compared to those organizations that do not use one. Low failure rates also contribute to a better working environment, which can positively influence labor turnover rates.

Depending on the measurement criteria and cut-off levels, specific PAT systems deliver homogeneous groups of applicants, this means that subsequent training can be tailored precisely to the target group, avoiding unnecessary training and costs.

Additionally, a mature PAT process leads to the stabilization of the performance of selected staff at equal and higher levels. Hence, standardization of procedures and professional requirements are easier to achieve due

to the homogenous nature of the selected group. This can also lead to an enhancement of the flight operations department's reputation and the airline's brand.

The cornerstone of an airline's safety culture includes its First Officers and Captains. PAT is very effective in ensuring not only the professional abilities (flying skills, etc.) of applicants, but also that these professionals fulfill the educational prerequisites. PAT ensures that they have the appropriate experience, possess sufficient motivation to be able to adapt to the new environment within the airline, and that they identify themselves with the company and its safety culture.

3.4 Fair Testing

Recognizing the fact that the majority of the candidates are self-sponsored ab-initio students, it is fair to start with a professional PAT before they are advised to invest in expensive flight training programs.

Industry-wide, many AOCs are interested in the implementation of a professional PAT, but due to manpower, time and cost constraints, less rigorous and well-structured methodologies are sometimes used. These are commonly called "casual" selection methodologies. Typically, these methodologies are developed in-house by the flight operations department or the training department, without any significant involvement of specialists with appropriate aviation human factors experience.

These systems often lack the explicit selection standards required to reach objective screening and selection decisions. Decisions are based on a general perception of what makes a good pilot or what embodies good airmanship. In the absence of a systematic test data evaluation, we cannot say that hiring decisions are based on reliable objective criteria.

The least effective selection system is one in which hiring decisions are based on freestyle interviews only, and spontaneous assessments in non-standardized flight simulator test scenarios.

3.5 Safety Risk of Omitting Aptitude Testing

The argument sometimes raised is that training itself constitutes the most realistic assessment and selection platform. This argument is not reliable since it has been proven to provide low values of predictive validity.

Flight instructors may be able to judge specific performances of a candidate, e.g., flying a stabilized approach to a certain standard (+/- 10 kts) under a certain condition (gusty winds). However, due to the variable nature of factors in this approach, a standardized assessment is very difficult. Moreover, frequent changes in instructors, and insufficient experience and education of the instructors in the field of aptitude testing make it impossible to reliably diagnose important measuring dimensions such as personality traits, socio-interactive abilities and basic or composite mental abilities.

This is the reason why some cadets may manage to get a license despite their weaknesses. As their flying experience increases, they may be able to compensate for their weaknesses in normal operational scenarios. However, in many cases, their deficiencies will not disappear and will resurface (several deficiencies even can compound or overlap) when encountering situations that demand high levels of performance (during times of fatigue, high operational complexity, unforeseen situations, emergencies/non-normal scenarios, etc.).

3.6 Quality Assurance

In order to facilitate and continuously improve the aptitude testing mechanism, PAT should be part of the companies' quality system. Ideally, the quality system should be capable of managing pilot performance data throughout the entire career, starting from the very initial stages of screening and selection. As mentioned before, this demanding task requires the close cooperation and input from all the parties involved, including Human Resources, Training, Flight Operations, Safety and Compliance and the IT departments.

Performance feedback data related to the PAT system should include:

- Training data (to evaluate the system, training data may be de-identified), including:
  - Performance in training and initial skills test
  - Base training
  - Initial Operational Experience (IOE) / Line Flying under Supervision (LIFUS)
  - Recurrent checks
- Line Operational Safety Audit (LOSA) data
- IATA Operational Safety Audit (IOSA) data
- Flight Operational Quality Audit (FOQA) data

Section 4—Legal Aspects of Aptitude Testing

ICAO requires a medical examination, English language proficiency and the ability to comprehend the training course content. Regulators worldwide have been far more reluctant to develop standards in regard to personality criteria. There are some general requirements for ensuring the psychological aptitude of applicants, but there is a lack of in-depth guidance material.

The selection of suitable candidates requires discrimination between applicants. If it can be proven that the discrimination criteria and standards are strictly job-relevant and directly related to the required job performance, this apparent discrimination can be considered as fair and justifiable.

In all cases, special focus must be given to the reliability of the testing procedure. An unreliable testing methodology could lead to a proportionally higher rate of rejection in a certain category of applicants, which may then be considered discriminating.

4.1 Data Protection and Professional Standards

In many parts of the world, a legislative framework relating to personal data privacy and protection is in place. It is important to be aware that such protection also covers the reports that are generated by computers or human testers during PAT.

In addition to legal provisions, the society of psychologists has developed professional standards for the development, application and validation of aptitude testing, e.g., the Society for Industrial and Organizational Psychology in the US, and the British Psychological Society in Great Britain.

Note: It is recommended to seek legal counseling for the interpretation and application of the legal requirements concerning aptitude testing of personnel. The authors of this manual are not lawyers and the information given should not be taken as legal advice.

Section 5—Aptitude Testing, Recruitment and Hiring

5.1 Testing Supports Recruitment

The recruitment process follows the flight operations department's decision to hire more flight crews to operate within their specific operational context. The subsequent series of steps require the involvement of several stakeholders within and outside the organization.

Recruitment comprises the following steps:

- Identification of the target group (Ab-initio, Ready-entry, First Officers or Captains)
- Posting advertisement
- Handling of queries and applications
- Pilot Aptitude Testing
- Analysis of test results
- Hiring decision (in case of ab-initio candidates the decision to offer course enrollment)
- Reception of new staff

The following are key questions to address in this process:

- Who is responsible for the process?
- Who defines the requirements?
- Who performs the testing?
- Who takes the hiring decision?
- Is the decision solely based on the results of aptitude testing?
- How and by whom is the recruitment process, including the PAT system, maintained and evaluated?

5.2 Screening and Selection

As indicated previously, in this manual the term ***Aptitude Testing*** is used as a hypernym overarching *screening* and *selection*.

"**Screening**" ("out") is often used at the beginning to eliminate those candidates who send applications without meeting the predefined requirements. It is however advisable not to apply too stringent criteria at this stage in order to avoid the premature exclusion of suitable candidates.

Screening can also be used to identify the best, among a group of qualified applicants. Normally, questionnaires (online, by mail or on-site) are used to collect biographical data such as age, family, education, language, knowledge in mathematics, physics and computer skills, interest in sciences, sports, other interests, fixations, flying experience (hrs) and licenses.

Note: Evidence shows that there is no correlation between flight hours and training performance except that low hours candidates need more training time.

Screening can also include the testing of basic mental abilities.

Reference checks (consultation of former employers or of former colleagues) for Captains and First Officers are also quite common, and acceptable, as long as they are formally incorporated into the testing procedure. Unstructured background checks should be avoided as they do not add value to the scientific testing process.

"**Selection**" ("in") refers to the identification of those who best meet the requirements, among a group of already screened candidates.

Selection requires more elaborate diagnostics, such as specific operational abilities, personality traits and social and inter-personal abilities. Interviews and group exercises are often utilized in this phase. Performing selection after the screening ensures that only suitable candidates proceed to more costly selection, and prevents the inadvertent exclusion of applicants with excellent basic mental abilities, but some deficits in areas that can be improved with training.

5.3 Structured Aptitude Testing and Recruitment

A clear definition of the requirement profile is the starting point. The requirement profile is based on a job analysis and should be a combined task of the human resources, the flight operations and the training departments. Senior personnel from these departments will be able to identify both the successes and the problem areas that the company has experienced with its existing group of pilots.

Once the requirement profile is defined, the target group can be identified. For the purpose of recruitment and PAT, IATA recommends structuring the target groups by experience level, as follows:

- **Graduates,** comprising
  - ***Ab-initio* cadets** – beginners who join an ATO/AOC (sponsored or self-sponsored) approved training course (e.g., an MPL course or an integrated CPL/IR course)
  - **Licensed pilots with low experience** – this group comprises CPL/IR and MPL holders with less than 1000 hours, or with less than 500 hours on MPA
- **Professionals,** comprising
  - **First Officers and ex-military pilots** – type rated with more than 500 hours on MPA
  - **Captains** – type rated, with successful completion of an AOC command course

Note: ATOs/AOCs may adapt the suggested definitions to their specific requirements, such as age, language, nationality, school level and marks, flying hours, etc.

Having defined the requirements and the target groups, the next step is to allocate responsibilities within the organization for the various tasks.

Thereafter, a structured PAT system is designed. The resulting sequence of tests is often referred to as "*test batteries*"; it is essential to choose adequate test batteries for each target group and each phase of the PAT system.

Section 9 "*Designing Pilot Aptitude Testing Systems*" provides more details on "test batteries".

5.4 Cultural aspects

While organizations may accept, or even take advantage of cultural diversity in various business areas, operating philosophies for flying modern jet transport category airplanes are standardized, globally and across all cultures. The pilot competencies needed to perform on the job were collaboratively defined by ICAO and the industry and the acceptable level of performance of flight crews in an AOC or ATO will not vary with the cultural background of an individual.

Consequentially, the pilot competencies should be the determinative measuring dimensions in the PAT system, independently from cultural backgrounds.

5.5 Hiring Decision

Psychologists use statistical methods to value the importance of different tests while combining the scores from those tests (regression analysis, etc.). Normally, the end-result is then presented as a *profile of the applicant* to the decision-maker (pure pass/fail information, scale values or rank rows are less informative). The profile can be seen as a prediction of how well the applicant is expected to perform on the job.

A differentiated profile also supports the organization when designing post-hiring training measures. During times of high demand, this may also enable an organization to accept candidates with deficits that can be remedied during training.

The hiring decision should be made by the airline's designated selection team. Assuming that the selection system was based on a thorough definition of requirements, the hiring decision can be based primarily on the testing results. All other factors, such as administrative aspects, availability of applicants, legal aspects and flying experience, etc., should be incorporated in the definition of the requirements, and are therefore covered by the screening process.

To avoid potential bias, which could be caused by habit or routine, it is advisable to periodically review the composition and the hierarchy of the hiring decision team.

Note: In the case of failure, there are numerous ways to present the final decision to the applicant. Many organizations are reluctant to disclose test results and provide purely pass/fail information. Some offer feedback or explanations during a final discussion with the applicant, sometimes a certain waiting period must be respected. Few organizations provide a sound survey of the measured profile to the applicant, or verbally discuss in detail the applicant's strengths and weaknesses. There is a general perception that this issue should be handled in a fair, adequate and supportive manner, and that the candidate should receive feedback on his performance.

Section 6—Predicting Performance of Pilots

Aptitude testing systems are not "perfect" in predicting the future performance of pilots. However, if they are well structured, rigorously designed and continuously evaluated, they can offer valuable guidance to the AOC/ATO. There is consensus amongst experts in the field of aptitude testing that performance of pilots can be predicted by means of testing. Opinions differ however on:

a) how long the predictions are valid

b) which category of performance can be predicted best, and

c) how detailed the prediction can be

Success during training can be predicted quite well over a period of two to three years. Prognosis for applicants of ages 30-50 are generally more reliable than for those of ages 18–30, because younger people still have to go through major changes in life, which the elder ones have already experienced.

Performance can be predicted better than personality traits.

Without having to develop a specific, statistical formula, *test reliability* and *test validity* constitute the essential criteria of effective testing and resulting predictions.

6.1 Test Reliability

When interpreting test scores, it is important to know how well they differentiate:

a) the given levels of abilities of various candidates, and

b) the different levels of ability of one candidate in different measuring dimensions

The accuracy and consistency of the measurement of a test is called reliability. Test reliability is expressed in terms of a reliability coefficient. The reliability coefficient provides an estimate of the precision of measurement of a test. The higher the reliability coefficient, the smaller the margin of error around a test score will be.

Common methods to determine reliability are:

- ***Test / re-test reliability:*** The comparison of test results of the same group, which takes the same test again after a certain time.
- ***Alternate form reliability:*** Tests may exist in several versions or forms. Scores from different forms that measure the same dimensions are correlated.
- ***Internal consistency:*** If, for example, the results of a test from one group are split into two halves by taking the individual scores on all odd-numbered questions and the scores of all even-numbered questions, then the internal consistency can be measured by correlating the two halves.

- ***Observer consistency / Inter-rater reliability:*** Low levels of inter-rater consistency (scores of different observers) indicate that the observation results may be unreliable.
- ***Criterion reliability:*** This assess whether the criterion (purpose of the testing procedure) is measured correctly.

Note: Reliability coefficients are target-group specific. If a test has an acceptable reliability for ab-initio candidates, it may not necessarily be reliable for Captains. The margin of error can be expressed using a statistic called "standard error of measurement".

6.2 Test Validity

Validity is the most important prerequisite of a good test. Validity of a test expresses the extent to which it actually measures what it has been designed to measure. Typically, validity is presented as a correlation coefficient between measuring dimensions used in tests and job performance criteria.

Validity can be expressed in a number of different ways:

- ***Content (or logical) validity:*** It shows whether the test items are representative of the domain to be measured. For example, a test containing only items to measure the number of words in a sentence would have poor content validity if the purpose was to measure general communication skills.
- ***Concurrent validity:*** It refers to the relationship between test scores and another criterion at the same time. For example, a measure of intelligence might correlate with the performance during the type rating ground course.
- ***Factorial validity/construct validity:*** It is established through factor analysis. Factor analysis is a set of mathematical procedures for analyzing the interrelationships among variables in a test.
- ***Predictive validity or criterion validity:*** It refers to the relationship between test scores (scientifically called "predictors") and a measure of job performance at some later time. Predictive validity plays the most important role, because the overall objective of PAT is to predict the future performance of pilots.

Note: Predictive validity should be tracked over time. For example, it might be interesting to study the predictive validity of a test that measures the ability of ab-initio cadets to manage workload with respect to their later performance during the initial operating experience phase (IOE). In this case, the first test results are collected before the beginning of their licensing training and related two years later to a second set of measurements of job performance during and/or after completion of the IOE.

Various reasons (e.g., the pool of applicants has changed, training system is outdated, new a/c type requires different behaviors, outdated tests) could lead to a decrease of predictive validity, which indicates that the system needs maintenance.

Predictive validity requires reliable criteria of job performance and data from a reasonably large sample of pilots. The challenge is to standardize the criteria across the various stages of a pilot's career (initial training, type rating training, IOE, command training), as these stages are controlled by different entities.

Today, probably only a few ATOs and AOCs are capable of providing this environment in an ideal way.

Since ICAO has introduced a global framework for competency-based training and assessment (CBTA), ATOs and AOCs may harmonize their systems for measuring and grading performance of flight crews; this feedback loop should lead to a better predictive validity of PAT.

Section 7—Measuring Dimensions and Testing Instruments

Each type of test (*testing instrument*) has its own strengths and weaknesses. Testing instruments allow judgment of performance criteria, which should result from sound requirement engineering. Requirement engineering can be understood as translating descriptions of job-related duties (job descriptions) into psychological categories of personal requirements. These categories become the *measuring dimensions* of psychological tests. *Measuring* means to quantitatively differentiate and refer to a defined scale.

The following measuring dimensions represent a sample of what is commonly used in PAT. They are not equally applied to the different groups of graduates and professionals. The test batteries are to be adapted to the respective group. Ab-initio cadets usually run through the largest test program while Captains receive the smallest, a fact which might be questionable, as experience alone does not always correlate with the observed performance.

Basic mental abilities play a constant and crucial role for all groups because they are necessary for each individual to cope with changes in his working environment; this is especially relevant for upgrading, type-conversions, introduction of new procedures or new technologies, etc.

7.1 Measuring Dimensions

When measuring pilot aptitude, the following measuring dimensions are used:

1. **English language proficiency**

   As an indispensable ingredient to ensure learning facilitation and global pilot mobility

2. **Basic mental abilities**

   Components are: memory capacity, speed and accuracy of information processing (perception, classification, transformation), spatial abilities (static), technical comprehension, reasoning (information processing with basic figures), logic abilities, long term concentration

3. **Composite mental abilities**

   Components are: allocation of attention, multi-tasking (different task combined), psycho motor abilities (pursuit tracking; compensatory tracking), spatial abilities (dynamic)

   Note: These dimensions are related to aeroplane flight path management, manual control and automation.

4. **Operational abilities**

   Components are: problem solving and decision-making, workload management, situation awareness and management of information

5. **Social-interpersonal abilities**

   Components are: communication, leadership and teamwork

6. **Personality traits**

   Components are: professionalism (professional motivation, self-discipline, self-criticism, self-organization, safety motivation, stress-coping with social confrontation, information load, time pressure), and application of procedures and compliance with regulations.

Note: Desired personality traits often seem to vary considerably between operators (corporate, low cost, non-scheduled charter, airlines). Operators sometimes claim that the specific nature of their operation demands that their pilots possess unique personality traits. When examined more closely, the differences between these different organizations diminish in most cases or can be reduced to a minimal number of differences.

7.2 Testing Instruments

The following methodologies ("instruments") are commonly used to assess aptitude in the above-mentioned dimensions.

1. **Questionnaires**

   Questionnaires are the most used instruments. They are suitable to collect facts, such as biographical data. They are not very suitable when testing for personality traits.

   The following are examples of relevant biographical data:

   - School and university grades, specifically in mathematics and physics
   - English language proficiency
   - Computer skills
   - Interest in sciences
   - General education (cultures, history, politics and languages)
   - Involvement in sports
   - Interests in traveling
   - Interests in leisure activities

Analysis of biographical data ensures that the candidates possess a defined set of intellectual prerequisites to basically qualify for the profession.

2. Free-Style Interviews

Expert ratings acquired from stand-alone free-style interviews are commonly used but are very subjective and methodically weak. They are not suitable for measuring aptitude. They are also not suitable for selection or the elimination of the weakest candidates. They may be used to introduce people to each other but should not be considered relevant for making decisions in the screening or selection process.

Due to the lack of standardization, each applicant usually faces a different scenario, making comparisons between applicants very difficult to achieve. By using a rating system, at least the systematic aspect of observation can be improved.

Holistic judgments by experienced experts, based on freestyle interviews, can sometimes produce surprisingly high hit rates; however, this can only be determined by evaluating the results after a certain amount of time (years). When a new person takes over the job, continuity is not ensured, and the new person cannot build on the previous experience.

3. Standardized Interviews

Standardized Interviews follow a prescribed set of questions and evaluation criteria. They are quite demanding for the test operator. Provided that the interviewer applies professional questioning and communication techniques, standardized interviews can be successful in capturing personality traits and social competence.

4. Targeted Selection

In a Targeted Selection system, the interviewer collects job-related behaviors from an applicant's past history. Interviewers are trained to focus their interview skills and selection decisions on standardized interview principles. Performance is rated by the interviewers on defined scales. (Underlying requirement dimensions can be developed by an empirical process using expert knowledge and, in this case, reflects the desired company culture.)

5. Paper-Pencil Psychometric Tests

Paper-pencil testing has been commonly used and is qualified to evaluate basic mental abilities. These tests can play an important role in the screening process. They are usually performed with large groups of applicants, but the evaluation is time consuming. Paper-pencil tests have recently been replaced by PC-based testing.

6. PC-based Psychometric Tests

PC-based psychometric tests require some IT infrastructure and can be web-based. Like paper-pencil psychometric tests, they are reliable and very cost-efficient for testing basic mental abilities.

7. Work Samples

The principle of a work sample is to create a task for the applicant to complete, which is typical for the job to be performed, then observe the results and provide feedback. Work samples are typically used when screening applicants on the airplane (military) or when testing licensed pilots in a flight simulator. The value of work samples is highly dependent on the standardization of the exercises and the quality of the observation personnel. If performed by well trained and experienced experts, work samples can be of high value because of their realistic content.

It must be emphasized that a simulator session for PAT purposes does not aim at checking the completion of one or several exercises, but the ability of the candidate to adapt to various unknown situations. Work samples can be very narrow simple tasks that demonstrate specific components of a larger job description.

8. Testing in FSTDs

FSTD-based testing can combine realism of work samples with the advantages of psychometric testing. This form of testing addresses the ability of pilots to solve complex tasks in dynamic environments. Such scenarios are more realistic; they are comprised by interactions of multiple requirements which must be controlled by pursuing certain (professional) strategies. Not only do they require cognitive performance (strategies), they also include emotional (fears and fun) and motivational (confidence and commitment) aspects.

FSTD-based testing scenarios are quite complex and tend to be less rigid then psychometric testing. They can also capture the ability of problem-solving in unstructured situations (unexpected emergency situations which cannot be drilled by procedures).

FSTD-based testing can be performed on specifically programmed (PC-based) low fidelity simulators. They provide high values of predictive validity, but they need skilled observers.

9. Fixed-Base Simulators

Fixed-Base Simulators (FBS) are also used to provide testing in work sample scenarios. Their value depends on the standardization of the exercises and the expertise of the observation personnel.

10. Full-Flight Simulators

Assessments in Full-Flight Simulators (FFS) are ideal because they offer the highest degree of realism; they can best reproduce the actual dynamics and complexity of the pilots working environment. Full-flight simulators are commonly used to test flying skills of licensed pilots and professionals, and to identify training needs. They are valuable tools to complement but cannot replace aptitude testing.

7.3 Norm

Knowing that a candidate has achieved a score of 70% is quite meaningless. At best, it can serve to provide a ranking among the tested group. The following questions still need to be answered:

- Which level of performance can this score predict today or in the future?
- How does this compare with others – is the result “normal”?

A defined *Norm* demonstrates the following:

- Which level of performance on the job can be predicted by this score
- The value of this score in relation to other people in other groups
- Which measuring quality can be derived from this score, and which scientific mathematical operation can be performed with the score (i.e., overall score in conjunction with other tests)

Norms are necessary to interpret, rate and grade test results and are preconditions for meaningful pass/fail decisions. By comparing the candidate's performance with the Norm, we can determine how far the candidate's performance is above or below the performance of the comparison group.

The choice of the norm and the comparison group is crucial. For example, comparing the performance of an ab-initio cadet in his initial type rating skill test with the skill test results of the captain, who might be teamed up with him during his upgrading training, can easily lead to wrong conclusions. The performance of an ab-initio cadet should be compared to the performance of other ab-initio cadets.

7.4 Measuring Scales

Scales are useful to express results of performance measurements in a numeric way. Basically, a minimum of three grades are necessary; IATA recommends 5-point scales. A yes/no or pass/fail classification cannot be used for further training recommendations.

The following are the most common scales:

- Scales which distinguish between rankings (percentage, Stanine-values) – these produce ranks among applicants, which allow visibility on who is a better candidate than another, but not how much better. Differences between two ranks can vary (e.g., performance difference between scores 2 and 3 is not the same as between scores 5 and 6) and this makes mathematical processing difficult (i.e., to produce an overall score among different measuring dimensions). Therefore, profiles are used instead.
- Scales with fixed intervals (T-values, IQ-values) – these scales allow mathematical processing such as overall scores.
- Finally, it is helpful to construct scales that express results in a useful way, such as:
    - Unsatisfactory
    - Eligible
    - Satisfactory
    - Qualified
    - Highly-qualified

Numerous mathematical procedures can be applied to scales, in order to improve their usability.

Section 8—IATA Matrix – Pilot Aptitude Testing

A complete PAT consists of at least three components, which are arranged in the following order:

- Screening formal requirements (biographical data)
- Tests of basic and composite mental abilities (psychometric data)
- Tests to capture professionalism and the pilot competencies, including:
  - operational and interpersonal/social abilities
  - personality traits

The following 2 matrices (IATA PAT-Matrix and Stages of PAT and Scales) describe possible allocations of measuring dimensions, instruments, and target groups and scales.

8.1 IATA PAT-Matrix – Measuring dimensions, instruments, target groups

The IATA PAT-Matrix proposes one possible method to allocate measuring dimensions and testing instruments to the four target groups.

IATA PAT-MATRIX					
Measuring Dimensions	**Testing Instruments**	**Graduates**		**Professionals**	
		Ab-initio cadets	**Licensed pilots, low experience**	**First Officers, ex-Military pilots**	**Captains**
Screening Biographical Data	Questionnaire Interview Docs	• Biographical and career data • School degree • School marks • Professional education • Documents • Language proficiency	Additionally: Flying hours License Type ratings		
Basic mental abilities	Psychometric Paper-pencil tests	• Memory capacity • Speed and accuracy of information processing (perception, classification,		Logic abilities Long-term concentration	

IATA PAT-MATRIX					
Measuring Dimensions	**Testing Instruments**	**Graduates**		**Professionals**	
		Ab-initio cadets	**Licensed pilots, low experience**	**First Officers, ex-Military pilots**	**Captains**
	PC-based psychometric tests	transformation) • Spatial abilities (static) • Technical comprehension • Reasoning (information processing with basic figures) • Logic abilities • Long-term concentration			
Composite mental abilities	Paper-pencil tests Psychometric apparatus tests PC-based psychometric tests	• Allocation of attention • Multi-tasking (different task combined) • Psycho motor abilities (pursuit tracking; compensatory tracking) • Spatial abilities (dynamic) as a prerequisite for • **Aeroplane Flight Path Management, manual control, and** • **Aeroplane Flight Path Management, automation**			
Operational abilities	Paper-pencil tests PC-based psychometric tests FSTD based tests /work samples Psychometric tests	• **Problem solving and decision-making** • **Workload management** • **Situation awareness and management of information**			
Social-interpersonal abilities	Standardized interviews Group scenarios	• **Communication** • **Leadership and Teamwork**			
Personality traits	Standardized interviews	• Professionalism: Professional motivation, self-discipline, self-criticism, self-organization, and additionally safety motivation • Stress - coping with social confrontation, information load, time pressure • **Application of procedures and compliance with regulations**			

8.2 Stages of PAT and Scales

The table below proposes one possible method to allocate measuring scales to the stages, measuring dimensions, target groups and testing instruments of an aptitude testing system.

Stages of PAT and Scales				
Stages	**Measuring Dimensions**	**Target Group**	**Testing Instrument**	**Scales**
Screening	See IATA PAT-Matrix above	All	Check	Yes/No
		Graduates	School grades	Rank Rows
Test of basic mental abilities		*ALL*	Work sample (simulation-based) or Psychometrics test (PC)	T-Values, IQ, Centile
Tests of operational abilities		*Graduates*, FOs	Psychometric tests and/or Low Fidelity Simulator (PC)	T-Values, Rank rows
Test of operational abilities		*Captains*	FSTD	T-Values, Rank rows
Test of social-interpersonal abilities		All	Group tests by means of work samples in connection with rating system	Rank rows, qualitative discrimination
Test personality traits		All	Standardized interview in connection with rating system	Rank rows, qualitative discrimination

Section 9—Designing Pilot Aptitude Testing Systems

The aptitude testing system should be capable to achieve the following goals:

- Identifying the most suitable candidate for the job
- Delivering selected personnel at lowest possible cost
- Providing a fair and legally defensible architecture

9.1 Checklist with key questions

The table below serves as an example checklist, providing key questions and related actions to be considered when setting up an effective aptitude testing system.

Checklist	
Key question	**Related action**
What is our problem/goal?	Define the criterion (criteria) which shall be achieved by the Aptitude Testing System.
What do we want to measure (test)?	Mental abilities, operational and social-interpersonal abilities and personality traits as prerequisites to develop the pilot competencies.
How do we measure? Which tests serve us best?	Decide about the test battery (set of tests/measuring instruments) and their sequence. Decide on the selection team members.
How do we get from test results to a hiring decision?	Combine all test scores (profile). Define cut-off criteria, decide at which stages to exclude applicants and decide when and by whom the hiring decision is taken.
How can we validate our selection system?	Construct the evaluation system by implementing a data feedback process from training/operation back to the selection team, assure supporting IT environment to enable data management.

Note: The described process should be carefully documented for several reasons. First, selection is a part of the recruitment process and should be included in the quality assurance documentation of the company. Second, design, implementation and maintenance of the selection system itself are facilitated by good documentation. Third, the documentation may be required to prove the fairness of the system against legal claims. Fourth, in case of an accident investigation it is of great importance to prove the existence of a professionally conducted PAT.

9.2 Test Battery

The arrangement of a series of testing instruments is commonly called "test battery". The test battery is designed to be efficient in terms of reliability, predictive validity and time/cost effectiveness.

In order to optimize efficiency, test batteries are arranged in stages. Psychometric tests are usually first. Some of them can be performed online, saving on housing and transportation costs for the personnel and the applicants. These psychometric tests are followed by more complex testing of operational abilities and personality traits.

9.3 Arrangement of Stages

The following table shows a basic comparison between a Single-stage and a Multi-stage procedure.

Note: It is commonly accepted to perform the screening before commencing the selection stages.

Single-stage procedure			Multi-stage procedure	
1	Screening		1	Screening
2	**SELECTION**		**2a**	**SELECTION - Stage 1**
			2b	**SELECTION - Stage 2**
			2c	**SELECTION - Stage 3**
3	Hiring decision		3	Hiring Decision

Multi-stage selection is advisable because it offers the possibility to reduce costs per applicant. To achieve this, the less expensive tests are conducted first. Only successful candidates from Stage 2a continue to Stage 2b – which is more expensive.

Multiple stage testing can be separated in time (i.e., if evaluation of the results is time consuming) and/or location (i.e., parts of the test battery are installed at a fixed location and other tests can be administered close to the applicants' home base or made available as online tests).

9.4 Content of Stages

This table shows one possible arrangement of stages and tests:

Stage	Tests
Stage 1 Screening	Screening based on biographical data. Normally *questionnaires* (online, mail or on-site) are used to collect biographical data such as age, family, education, language proficiency, mathematics and physics, computer skills, interest in sciences, sports, personal interests, fixations, flying experience and license.
Stage 2a Selection/screening	Basic mental abilities Composite mental abilities
Stage 2b Selection	Operational competencies Social-interpersonal competencies Personality traits
Stage 2c FSTD testing (License holders and professionals)	Assessment of flying skills and training need analysis
Stage 3	Hiring decision

9.5 Motivation of Applicants

Besides being valid and reliable, tests should be user friendly for the applicant. Professionals should be motivated to show their full potential during these tests. This can be achieved by constructing tests that are perceived as being:

- Relevant to the job
- Low degree of difficulty to minimize disappointment
- Fair with respect to the framing conditions

Instructions on how to perform during the test and the instructions on how to operate the testing instruments used for the different measuring dimensions should be clear and easy to understand.

Section 10—Administration of Aptitude Testing

10.1 PAT Team

Developing, installing and running an aptitude testing system should be facilitated from the very beginning in close cooperation among the departments involved (operations, training, human resources and testing agency/consultant if applicable). Ideally, the PAT team will consist of a combination of psychological, methodical, statistical and flight operation expertise.

Numerous tasks need to be accomplished during the testing procedure. At first, there are administrative tasks like organization of the test procedure and data management/IT. This can be accomplished by a recruitment manager within the HR department.

Depending on the nature of the tests, they can be administered by trained personnel or they may require scientific expertise. For example, standardized interviews and simple monitoring duties during automated tests can be accomplished by trained experts. Flight simulator work samples require specifically trained flight operation experts.

Group exercises are very demanding for the observer because of their complexity and dynamics and require psychologist or trained experts.

Involvement of a qualified aviation psychologist or a qualified aviation human factors expert is advisable for the interpretation of all data and to the maintenance (evaluation) of the selection system.

The PAT team members should receive appropriate initial and recurrent training for their duties. Regular review of the team composition, to avoid complacency, should be considered.

10.2 Duration of Tests

For each stage, six to eight hours of testing per day is acceptable. More time would lead to tiredness of the candidates and the testers, and tests would not properly measure the intended dimensions. After a maximum of two hours, a 10-15-minute break should be granted. These breaks are effective in relieving stress and fears which could increase as the test progresses and impair performance.

10.3 Outsourcing/Acquisition of Tests

Outsourcing aptitude testing to an experienced partner (e.g., another airline, testing institute or a consultant) is an option to be considered by smaller operators. When testing only 10-30 applicants per year, internal

testing and evaluation of the test battery is inefficient. When serving 100 or more applicants per year, internal PAT may become advisable.

In the event of taking over test batteries from other entities, it is essential to align them (job requirements, measuring dimensions, performance criteria, grading scales, weighting and proper sequencing of the different tests, etc.) with the needs of our own organization.

10.4 Preparation Courses

Pre-information about the aptitude testing program can be obtained on numerous operators and testing providers websites. Consequently, commercial preparation seminars have become popular in many regions of the world, creating the risk that candidates show test performances that they will not be able to deploy later in their career. Commercial preparation seminars should not be confused with technical information about the aptitude testing programs' sequence and content, which can be obtained on operators' websites. This causes challenges for the testing systems, i.e., having to cope with different levels of preparation on the participants side, and needs to be taken into consideration when evaluating the results.

10.5 Presentation of Results to the Applicant

The PAT team should carefully evaluate when and how the candidate will be confronted with his/her testing results. Irrespective of the associated costs, a detailed and thorough feedback may be helpful for the candidate, especially if the result is negative. Feedback can be given in a written form, or in person by members of the selection team, immediately after the testing, or after a certain period of time.

10.6 Reapplication

Test repetition may be acceptable under the condition that there are reasons to assume that the performance of a candidate has improved. As practice effects fade over time, retesting should only be allowed after a certain time has elapsed. Some organizations cater for these cases by providing not only green/red (pass/fail) decisions but an additional amber state, which allows retesting under predefined conditions.

If the result of the first test was close to the cutoff value, the second test might be successful, although there is no real increase in performance.

Additionally, this creates a challenge for the testing system because test-validation procedures are affected, as they were originally based on the result of one single test, not on the results of a second run.

The same applies to the fact that tests cannot be kept secret over a certain period of time. In many cases, organizations provide, in advance, a general overview of their test to their applicants. Also, applicants who have completed the tests pass the information to others. Similarly, career counselors and preparation

institutes investigate test content as well to optimize their own preparation courses. Therefore, organizations should establish a policy on how to protect their aptitude testing procedures.

10.7 Validity Period

If for some reason a candidate cannot be hired, or if the hiring decision needs to be delayed, a decision must be taken as to how long positive test results remain valid. Psychological research suggests that test results can be assumed to be more stable over time with older candidates. (see also Section 6).

Note: A survey conducted by IATA in 2009 revealed that candidates' test results are most frequently kept valid for two years.

10.8 Evaluation of the Aptitude Testing System

The PAT should be incorporated in the quality assurance system of the company. If the company uses a service provider for testing purposes, the provider should have a certified quality system as well. Evaluation of the PAT system addresses the question of its validity (whether or not a test measures what it is intended to measure).

Tracking validity requires an effective flow of data. Every test needs to be tracked for its validity. Evaluation means that the candidate's score in a measuring dimension (scientifically called "predictor") correlates with the outcome in terms of the candidate's job performance (see also Section 6).

Section 11—Financial Aspects

11.1 Cost Effectiveness of Aptitude Testing Systems

Determining the cost effectiveness of a PAT system should include a comparison between the cost of the PAT system itself and the possible cost of consequences, resulting from the absence of a PAT system. For example, such cost may include the training effort, stability of the workforce, etc.

Additionally, a selection system can only be as effective as the population from which it selects from. The more applicants are tested, the better are the conditions for PAT, because more stringent criteria can be applied during the screening process, higher pass-hurdles can be set for the selection and a higher number of successful candidates can be gained. Therefore, investments in measures to assure a large test population are most important.

Note: Lowering test criteria in case of insufficient applicant numbers is never an option because it could reduce operational safety.

11.2 Structure and Contributions

At first, the complete process of recruitment and testing needs to be examined; then, the main cost drivers can be identified.

The main factors to consider in relation to costs are:

- Which actions must be taken to ensure a sufficient number of applicants?
- What are the costs of recruitment?
- What are the costs of testing?
- What are the total costs per new hire?

The total costs per new hire comprise:

- recruitment costs
- testing costs
- training costs
- administrative costs

Who pays for the costs?

- the organization
- the applicant

- the applicant prepays and is reimbursed by the organization
- the organization prepays and is reimbursed by the applicant

Which costs are "shared" among the parties involved?

- costs of testing
- costs of training
- costs of administration

11.3 Funding and Sponsoring

Increasing demand for pilots, and possible declining of job attractiveness, force operators to fund PAT and ab-initio training of their future pilot work force. To secure the respective expenses and to avoid wasting limited training resources, it is strongly suggested to make financial support conditional to a successful PAT.

Appendix 1 – ICAO Competencies for Aeroplane Pilots

Note: Comments from the ICAO States were accepted by ICAO until 29 November 2018 and the proposed amendment to Annex 1 and the PANS-TRG is envisaged for applicability on 5 November 2020. Therefore, the ICAO Competency Framework below may be subject to change.

ICAO competency framework to develop competency-based training and assessment for aeroplane pilot licenses, ratings, and recurrent training

Competency	Description	Observable behaviours (OB)
Application of procedures and compliance with regulations	Identifies and applies appropriate procedures in accordance with published operating instructions and applicable regulations.	OB 1.1 Identifies where to find procedures and regulations OB 1.2 Applies relevant operating instructions, procedures and techniques in a timely manner OB 1.3 Follows SOPs unless a higher degree of safety dictates an appropriate deviation OB 1.4 Operates aeroplane systems and associated equipment correctly OB 1.5 Monitors aircraft systems status OB 1.6 Complies with applicable regulations OB 1.7 Applies relevant procedural knowledge
Communication	Communicates through appropriate means in the operational environment, in both normal and non-normal situations.	OB 2.1 Determines that the recipient is ready and able to receive information OB 2.2 Selects appropriately what, when, how and with whom to communicate OB 2.3 Conveys messages clearly, accurately and concisely OB 2.4 Confirms that the recipient demonstrates understanding of important information OB 2.5 Listens actively and demonstrates understanding when receiving information OB 2.6 Asks relevant and effective questions OB 2.7 Uses appropriate escalation in communication to resolve identified deviations OB 2.8 Uses and interprets non-verbal communication in a manner appropriate to the organizational and social culture OB 2.9 Adheres to standard radiotelephone phraseology and procedures OB 2.10 Accurately reads, interprets, constructs and responds to datalink messages in English

Competency	Description	Observable behaviours (OB)
Aeroplane Flight Path Management, automation	Controls the flight path through automation.	OB 3.1 Uses appropriate flight management, guidance systems and automation, as installed and applicable to the conditions (see Part I, Chapter 1, for the definition of conditions) OB 3.2 Monitors and detects deviations from the intended flight path and takes appropriate action OB 3.3 Manages the flight path safely to achieve optimum operational performance OB 3.4 Maintains the intended flight path during flight using automation while managing other tasks and distractions OB 3.5 Selects appropriate level and mode of automation in a timely manner considering phase of flight and workload OB 3.6 Effectively monitors automation, including engagement and automatic mode transitions
Aeroplane Flight Path Management, manual control	Controls the flight path through manual control.	OB 4.1 Controls the aircraft manually with accuracy and smoothness as appropriate to the situation OB 4.2 Monitors and detects deviations from the intended flight path and takes appropriate action OB 4.3 Manually controls the aeroplane using the relationship between aeroplane attitude, speed and thrust, and navigation signals or visual information OB 4.4 Manages the flight path safely to achieve optimum operational performance OB 4.5 Maintains the intended flight path during manual flight while managing other tasks and distractions OB 4.6 Uses appropriate flight management and guidance systems, as installed and applicable to the conditions (See Part I, Chapter 1, definitions) OB 4.7 Effectively monitors flight guidance systems including engagement and automatic mode transitions
Leadership and Teamwork	Influences others to contribute to a shared purpose. Collaborates to accomplish the goals of the team.	OB 5.1 Encourages team participation and open communication OB 5.2 Demonstrates initiative and provides direction when required OB 5.3 Engages others in planning OB 5.4 Considers inputs from others OB 5.5 Gives and receives feedback constructively

Competency	Description	Observable behaviours (OB)
		OB 5.6 Addresses and resolves conflicts and disagreements in a constructive manner OB 5.7 Exercises decisive leadership when required OB 5.8 Accepts responsibility for decisions and actions OB 5.9 Carries out instructions when directed OB 5.10 Applies effective intervention strategies to resolve identified deviations OB 5.11 Manages cultural and language challenges, as applicable
Problem Solving and Decision Making	Identifies precursors, mitigates problems; and makes decisions	OB 6.1 Identifies, assesses and manages threats and errors in a timely manner OB 6.2 Seeks accurate and adequate information from appropriate sources OB 6.3 Identifies and verifies what and why things have gone wrong, if appropriate OB 6.4 Perseveres in working through problems while prioritizing safety OB 6.5 Identifies and considers appropriate options OB 6.6 Applies appropriate and timely decision-making techniques OB 6.7 Monitors, reviews and adapts decisions as required OB 6.8 Adapts when faced with situations where no guidance or procedure exists OB 6.9 Demonstrates resilience when encountering an unexpected event
Situation awareness and management of information	Perceives, comprehends and manages information and anticipates its effect on the operation.	OB 7.1 Monitors and assesses the state of the aeroplane and its systems OB 7.2 Monitors and assesses the aeroplane's energy state, and its anticipated flight path. OB 7.3 Monitors and assesses the general environment as it may affect the operation OB 7.4 Validates the accuracy of information and checks for gross errors OB 7.5 Maintains awareness of the people involved in or affected by the operation and their capacity to perform as expected OB 7.6 Develops effective contingency plans based upon potential risks associated with threats and errors

Competency	Description	Observable behaviours (OB)
		OB 7.7 Responds to indications of reduced situation awareness
Workload Management	Maintain available workload capacity by prioritizing and distributing tasks using appropriate resources	OB 8.1 Exercises self-control in all situations OB 8.2 Plans, prioritizes and schedules appropriate tasks effectively OB 8.3 Manages time efficiently when carrying out tasks OB 8.4 Offers and gives assistance OB 8.5 Delegates tasks OB 8.6 Seeks and accepts assistance, when appropriate OB 8.7 Monitors, reviews and cross-checks actions conscientiously OB 8.8 Verifies that tasks are completed to the expected outcome OB 8.9 Manages and recovers from interruptions, distractions, variations and failures effectively while performing tasks

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