A Certified Approach

George Sounatsos, Associate Project Director for ADPI, looks at an integrated and methodical approach to aerodrome certification, operational readiness and the transition for green-field airports

There is a growing number of airports operating as private enterprises. This is illustrated by an evident move towards privatization or corporatization, as governments adopt Build-Operate-Transfer (BOT) or Build-Operate-Own (BOO) arrangements for the development of expansion of aerodromes. This trend has generated the need for the introduction of a formal system, that can verify and validate that the airport operator can safely accommodate the expected aeronautical activity. For an airport opening for the first time, the establishment of a formal certification system is even more crucial for both the aviation authority - granting the authorization to open and operate the airport - as well as the airport operator itself, as it avoids the realization of its business and operational models. Consequently, there needs to be an integrated and seamless approach encompassing four tightly-linked domains which can be defined as: (a) the certification process for licensing the aerodrome, (b) the operational planning, which comes under the roof of the certification process, (c) the operational readiness evaluation methodology and (d) the transition strategy from the old facility to the new one. These four domains are aimed towards jointly enhancing the smooth and efficient opening of a new airport and should be handled as one "concrete" and unbreakable system, ensuring consistency and efficiency among the specific deliverables of each domain.

Airport Certification Process

In 1991, ICAO established the Manual on Certification of Aerodromes, which defines the regulatory framework intended to ensure that the facilities, equipment and operating procedures at aerodromes comply with the ICAO standards and recommended practices. Moreover, as of November 2003, States are obliged to certify the aerodromes used for international operations. The certification process shall cover all operational areas, which are needed to ensure the aviation authority that the facility can safely accommodate all aircraft movements. These areas shall have requirements or codes of practice related to the "what" for standards covering the physical characteristics, facilities and services associated with aircraft operations, and the "how" for the competence of the aerodrome organisation in managing safety and its interfaces with the end-users. Ideally, the means of proving the technical and functional competence for obtaining an aerodrome operating certificate would need to be agreed in advance with the certifying aviation authority.

The principal documents based on which the aviation authority could access the planning of the airport operator are commonly the (a) Aerodrome Operations Manual (AOM), (b) Airport Emergency Plan (AEP), (c) Airport Security Programme.
The Three Pillars of Operational Planned

The basis for aeronautical certification is the establishment of a SMS, which is also an ICAO Annex 14 Standard. Hence, the SMS is the "foundation" on which the three "pillars" of high level operational planning are based. In this illustration, these three pillars are expressed by the Aeronautical Operations Manual, the Aerodrome Operations Manual, and the Aerodrome Security Program. These manuals are governed by the SMS principles, where applicable.

Then, the operational system at a working level rests on top of this high-level planning and is represented by the SOPs. Most of the SOPs are derived from or based on the guidelines of the three manuals mentioned above, which are seen as a prerequisite for the development of these operating procedures. All these can be accommodated under the "single roof of the certification process." (IAP) and (d) Safety Management System (SMS) the principles of which can also be reflected in the other manuals. In fact, these documents represent the airport planning at high level, which is accomplished under the terms of the certification process. The details at working level can then be addressed by the Standard Operating Procedures (SOPs).

A large part of these procedures is based on the guidelines provided by the AOM, the AES or the ASP and are governed by the philosophy of the SMS, as applicable. For a typical international airport with a methodical and systematic approach to operations there may be more than 200 different SOPs, covering all departments and functional needs, such as the terminal, aircraft, baggage handling system, maintenance, and so on. The total number of SOPs depends, of course, on the size and complexity of the aerodrome itself and its organizational structure.

Evaluation of Operational Readiness

The planning, supervision and implementation of an operational readiness programme comes as an integral part of the certification/operational planning discussed earlier and is of capital importance for the successful opening of an airport. During this phase, the operational planning is verified and validated and the links and interfaces between systems, people and processes are thoroughly tested.

For the facility's stakeholders, trial operations are the main indicators that everyone and everything is adequately prepared in order to open and run the new airport safely and efficiently even under the most challenging circumstances. This is crucial, as during the first days airports are more likely to face technical problems, which, combined, with the lack of experience in dealing with them may result in operational mishaps. Trials also provide the end-users with the opportunity to assess their readiness and to "align" their own procedures with the operational concept and environment of the new airport. Past experiences show that the absence of trials may potentially lead to unfavorable situations during the commencement of business.

The opening of the Hong Kong International Airport in July 1998 was recorded in history as a classic example of what can go wrong during an opening. Some 12 core problems appeared that knocked out almost every function of the facility and resulted in a chaotic situation during the first few weeks. The cargo mis-handling alone contributed to the loss of approximately 4.6 billion HK$; 0.13% of the GDP of Hong Kong economy.

Airport trials inherently increase the stakeholders' confidence in their facilities operational readiness. Their aims are wide-ranging, encompassing:

- Evaluating the airport operating procedures (correctness and completeness);
- Identifying interfaces and possible new interdependencies or operational incoherence;
- Validating the responsibilities within the operational structure;
- Evaluating end-users' readiness and communication/interfacing principles;
- Evaluating the functionality of systems and facilities, e.g. baggage handling system, IT, extra low-voltage equipment, airfield lighting, air navigation equipment, etc.;
- Providing familiarization and training to all end-users;
- Assessing the signage, passenger behavioural patterns, flows and potential bottlenecks on-board/beneath-aircraft;
- Collecting feedback from end-users and identifying potential deficiencies on both land-side and air-side.

The methodology for the evaluation of the airport operational readiness can involve six basic parameters:

1) The identification of core processes of the facility. These are usually subdivided into: I) passenger & crew handling, II) baggage handling, III) ramp handling, including mail and cargo, IV) aircraft control & line-maintenance, V) administration and management, VI) security, VII) access, and VIII) environmental integration.

2) The definition of sub-processes. In a typical international environment there can be around 600 sub-processes, which need to be assessed.

3) The Exclusion of a Function Matrix. Each sub-process requires a function matrix which specifies the: I) responsibilities, II) interfaces, III) systems, equipment and facilities required, IV) human resources and V) elements which are used to represent or replace the physical presence of humans or objects during the trial of a sub-process, such as participants assuming the role of passengers, vehicles sim-
4. The Definition of Trials. These are usually distinguished into four categories: (a) Principal Trials, where the purpose is to evaluate the functionality of each sub-process and the associated systems and facilities of the airport. Part of these trials will be based on the operational planning documentation such as the ADMS, ASP and SOPs; (b) Integrated Trials, focusing on the interfaces between the interrelated sub-processes, leading to integrated tests. During this stage a number of disturbing factors, for which effective actions need to be taken, will be tactically introduced into the individual trials. (c) Contingency Trials, where the objective is to test the implementation of fallback plans, verifying whether the primary functions of the airport can continue to work when some key elements, systems or facilities are unavailable; (d) Emergency Trials, which involve the implementation of representative full scale emergency exercises to verify the capability of the staff to handle a potential crisis based on the ASP and the emergency SOPs. The evaluation of the emergency exercises should focus on communication, coordination and command aspects, which are key parameters in crisis management.

5. The elaboration of scenarios. This requires a set of scenarios for each trial which shall comprise: (i) an objective, (ii) the situation to be tested, (iii) a detailed description of the scenario (where applicable) and (iv) any parameters and the supporting material for the trial. Each can then be performed, subdivided into four main stages of implementation such as briefing, execution, debriefing and remedy actions.

6. Establishing an operational readiness steering committee. This must have representation from all parties involved with daily airport procedures. During the planning phase of trials, the committee needs to acquire the same understanding about the objective of the trials and ensure the availability of facilities, systems, staff and equipment. The committee should comprise the airport operational management, the designer/contractor/main subcontractor, the State entitles (police, immigration, customs, air traffic control, etc.), the ground handlers and the based carriers. Permanent representatives to the committee shall be nominated and be responsible for the onward promulgation of information to their respective organisation and the follow up of the complete operational readiness evaluation.

Familiarization & Training

Familiarization can be considered as the preface to the most thorough and systematic training period. For airport staff and end-users this can start during the last stages of construction, since it mainly involves an introduction to the new facility and systems through site visits, presentations and distribution of handouts. Training on the new systems, processes and procedures constitutes the second step after the introductory period and is of fundamental importance for the successful opening of the airport. This is because usually a mishap in the operational environment is attributable to a lack of awareness of the systems, human comprehension and procedure implementation. Even in cases of system malfunction, an interface can be usually found to have failed somewhere in between the mistaken execution of a fallback procedure or the lack of knowledge for running a particular system.

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(KEY-Crisis Point)
Airport Transition

The objectives of a transition strategy can be identified as:

- Definition of the hand-over sequence (planning) from the old airport to the new one.
- Prioritization of the items to be transferred based on the operational needs of this phase.
- Securing the transfer feasibility of all items.
- Ensuring the transfer of all end-users' equipment to the new facility.
- Guaranteeing the smooth and safe transfer of all guards.
- Optimizing the transfer economically.

In planning the methodology for the transition to the new airport one should identify the critical (zone windows) during which there is minimum aerodrome activity, while considering the volumes to be transferred. This involves, defining the timing for the transition, identifying the means of transportation, plotting the transport routing and optimizing the transition of critical systems. The materials to be moved can be distinguished into two categories based on their prioritization as well as their nature:

A-resources (critical items), involving goods which are essential for the functioning and opening of the new airport and require special attention due to their technical complexity and time requirements for their re-installation. Examples of this include large machines, backbone electronic equipment, or items that require special handling or considerations during transport due to their dimensions, weight or shape, such as CSE items.

B-resources (non-critical items), which are not difficult to transport or do not require any special attention to put them back into operation.

In an airport transition, the flow of transferred volume usually peaks close to the opening day because the A-items can be transferred only at the very end, unless new equipment has been purchased for the new airport. Hence, two different phases of moving are usually foreseen, the main move (MM) period, usually for two-three days, and the pre/post move (PM) period, usually two-three weeks before opening and up to one-two weeks after opening.

Programme Implementation

The timeframe for the implementation of an aerodrome certification, operational readiness and transition programme can be divided into three phases:

Phase 1: The airport operator has to discuss with the aviation authority and agree on the list of manuals and SOPs to be produced. The focus of the aviation authority is usually on the high-level documents, such as the AOM, ARP, ASP or SMS, while the SOPs are produced without the necessity to go through an intensive review by the authority due to their detailed and more technical content.

Phase 2: This phase combines the development of all certification documentation (of operational planning), the development of the readiness evaluation methodology and the transition strategy. Towards the end of this stage the familiarization and training of all end-users on the facility's new equipment, procedures and systems can commence.

Phase 3: This period can begin after the technical commissioning of the airport and involves the operational trials. At the same time the detailed planning of the transition strategy can be finalized so that a successful transfer to the new facility is achieved.

Conclusion

As the number of green-field airports around the world is on the rise, it is crucial that their operators follow an established aerodrome certification process to set the basis for managing safety and methodically developing their operational planning. At the same time, and in order to secure the safe and successful commitment of business from day one, operators should define a system that enables the evaluation of their aerodrome’s readiness and transition strategy as an integral and indispensable part of the certification process.