

ELEVENTH AIR NAVIGATION CONFERENCE

Montreal, 22 September to 3 October 2003

Agenda Item 4: Capacity-enhancement measures

4.2 Regional measures

:

ICAO'S RUNWAY SAFETY PROGRAMME

(Presented by the Secretariat)

SUMMARY

This paper reviews work currently underway, or planned, relating to the issue of runway safety and focuses on actions being undertaken by ICAO to improve runway safety through a worldwide education and awareness campaign which encourages States to implement runway safety programmes.

Action by the Conference is in paragraph 3.

1. INTRODUCTION

1.1 On 17 April 2001, the Air Navigation Commission undertook action to address the growing problem of runway incursions. During its review, the Commission identified several critical areas that it felt had to be investigated and which had a relation to overall runway safety. These included: radiotelephony phraseology, language proficiency, air traffic control (ATC) procedures, standards and performance requirements for equipment, aerodrome lighting and markings, aerodrome charts, operational aspects and situational awareness and human factors.

1.2 The Commission also noted that several States and international organizations had embarked on extensive programmes to improve the situation with respect to runway incursions. The results of the work of both Transport Canada and NAV CANADA to analyse the phenomenon of increasing runway incursions were noteworthy. According to the Transport Canada report in this respect, a number of factors were potentially responsible for the upward trend in runway incursions, including increasing traffic volume, capacity-enhancing procedures to deal with the increasing traffic, airport layouts and Human Factors. Briefly, the report concluded that:

- a) the potential for a runway incursion increased more rapidly than traffic volume;
- b) many aerodrome improvement projects have resulted in a more complex aerodrome layout which, together with inadequate aerodrome design, marking and lighting, and a lack of standard taxi routes, had worsened the situation;
- c) the effects of increased traffic volume, capacity-enhancing procedures and aerodrome physical layout may simultaneously exacerbate the runway incursion potential at certain aerodromes; and human error is the mechanism that translates potential occurrences, based on the factors above, into actual occurrences.

1.3 During its review of ICAO provisions, the Commission noted that extensive work had already been accomplished and that the ICAO provisions were, for the most part, adequate with respect to runway safety. The problem therefore, was due, at least partly, to the fact that the provisions were not being adequately implemented. The paragraphs below refer to those ICAO provisions that have a relevance to runway safety and are brought to the attention of the Conference as part of an overall effort to raise awareness.

2. RELEVANT ICAO PROVISIONS AND GUIDANCE

2.1 Radiotelephony phraseology

2.1.1 Work on improving phraseologies is an ongoing task within ICAO. On 12 March 2001, the ICAO Council adopted Amendment 40 to Annex 11 — *Air Traffic Services*, which introduced requirements for pilots to read back clearances and for controllers to listen to the read-back and correct any discrepancy. These provisions were expected to have a positive impact on runway and taxiway safety as a number of items will always be read back, including clearances and instructions to enter, land on, take off on, hold short of, cross and backtrack on any runway and runway-in-use.

2.1.2 At that time, the Council also adopted an amendment to Annex 10 — *Aeronautical Telecommunications*, Volume II — *Communication Procedures including those with PANS status* and on 29 June 2001, the Council approved amendments to phraseologies contained in the *Procedures for Air Navigation Services — Rules of the Air and Air Traffic Services* (PANS-RAC, Doc 4444), now designated as the *Procedures for Air Navigation Services — Air Traffic Management* (PANS-ATM, Doc 4444). Both amendments harmonize radiotelephony speech and improve the use of radiotelephony phraseology. The amendments also incorporated procedures particular to aerodrome operations including the requirement for an explicit clearance to “cross” or an instruction to “hold short” of a runway to be included when a taxi clearance contains a taxi limit beyond that runway.

2.2 Language proficiency

2.2.1 Inadequate English language proficiency by pilots and controllers has been identified as a causal factor in the incidence of both runway incursions and incidents in controlled airspace. In March 2003, the Council adopted/approved amendments to Annex 1 — *Personnel Licensing*, Annex 6 — *Operation of Aircraft*, Part I — *International Commercial Air Transport — Aeroplanes* and Part III — *International Operations — Helicopters*, Annex 10 — Volume II, Annex 11 and the PANS-ATM. The amendments strengthen provisions for the use of language for radiotelephony communications by establishing minimum skill

level and testing requirements. The amendments also require the use of ICAO phraseologies as a Standard. Improved proficiency and greater adherence to a single set of phraseologies should lead to an overall safer operating environment.

2.3 ATC procedures

2.3.1 Global ATC procedures are contained in the PANS-ATM. These procedures are under continuous review and are updated as the need arises. In accordance with the PANS-ATM, aerodrome control towers shall issue information and clearances to aircraft under their control to achieve a safe, orderly and expeditious flow of air traffic on and in the vicinity of an aerodrome with the objective of preventing collision(s) between, inter alia, aircraft operating on the manoeuvring area and aircraft and vehicles operating on the manoeuvring area (Chapter 7, paragraph 7.1.1.1). Additionally, controllers shall maintain a continuous watch on all flight operations on and in the vicinity of an aerodrome, as well as vehicles and personnel on the manoeuvring area (Chapter 7, paragraph 7.1.1.2).

2.3.2 In accordance with Annex 2 — *Rules of the Air*, an aircraft taxiing on the manoeuvring area shall stop and hold at all runway-holding positions unless otherwise authorized by the aerodrome control tower and shall stop and hold at all lighted stop bars and may proceed further when the lights are switched off (paragraphs 3.2.2.7.2 and 3.2.2.7.3). Also, an aircraft operated on a controlled aerodrome shall not taxi on the manoeuvring area without clearance from the aerodrome control tower and shall comply with any instructions given by that unit (paragraph 3.6.1.4). As regards the movement of persons or vehicles on the manoeuvring area, in accordance with Annex 11, such movement shall be controlled by the aerodrome control tower as necessary to avoid hazard to them or to aircraft landing, taxiing or taking off (paragraph 3.8).

2.4 Standards and performance requirements for equipment

2.4.1 Surface movement radar of high quality is obviously important to supplement a controller's vision, particularly in the case of a very large manoeuvring area and in circumstances of reduced visibility. It is intended now to upgrade the Note to paragraph 3.10 in Annex 11, dealing with the use of surface movement radar, to a Recommended Practice, for high density aerodromes. In accordance with Annex 14 — *Aerodromes*, Volume I — *Aerodrome Design and Operations*, surface movement radar for the manoeuvring area should be provided at an aerodrome intended for use in runway visual range conditions less than a value of 350 m. When these values do not apply, surface movement radar should be provided when traffic density and operating conditions are such that regularity of traffic flow cannot be maintained by alternative procedures and facilities. In this context it should be noted that additional guidance on surface movement guidance systems is provided in the new *Manual of Advanced Surface Movement Guidance and Control Systems (A-SMGCS)* contained in AN-Conf/11-IP/4.

2.5 Aerodrome lighting and markings standardization

2.5.1 Annex 14, Volume I contains specifications on visual aids to be provided at an aerodrome for controlling and guiding the surface movement of aircraft and vehicles. Currently, there are many related provisions in Annex 14, Volume I. At the thirteenth meeting of the Visual Aids Panel (VAP) (Montreal, June 1997), an enlarged version of the runway holding position markings, upgraded specifications on stop bars and runway guard lights, as well as the use of retro-reflective materials for markings, were recommended for greater conspicuity and further safety enhancement. These were incorporated in Amendment 3 to Annex 14,

Volume I, in 1999. Subsequent studies by the Federal Aviation Administration (FAA) on runway incursions found the enlarged runway holding position markings to be effective.

2.5.2 The fourteenth meeting of the VAP (Montreal, 9 to 18 December 2002) revisited the issue and recommended broadened implementation of stop bars, i.e. the provision of stop bars at runway holding positions and their use at night and in visibility conditions greater than 550 m RVR as part of effective runway incursion prevention measures. It also decided, as part of future work, to look further into specifications on stop bars and runway guard lights, as well as the possibility of developing new systems such as runway location alerting systems taking into consideration developing technological solutions.

2.6 Aerodrome charts

2.6.1 In accordance with Annex 4 — *Aeronautical Charts*, the Aerodrome/Heliport Chart — ICAO, shall show specific details of all runways including those under construction (paragraph 13.6.1 d) refers). With regard to taxiways, the chart shall show all taxiways, helicopter air and ground taxiways with type of surface, helicopter air transit routes, with designations, width, lighting, markings, including runway-holding positions and stop bars, other visual guidance and control aids (paragraph 13.6.1 g) refers). Additionally, where established, standard routes for taxiing aircraft with their designators, the boundaries of the air traffic control service and any part of the movement area permanently unsuitable for aircraft, clearly identified as such shall also be shown (paragraphs 13.6.1 i), j) and r), respectively refer).

2.6.2 In the portrayal of large and complex aerodromes, due to the congestion of information, it may be difficult to show details for the ground movement of aircraft with sufficient clarity on the Aerodrome/Heliport Chart — ICAO. For these instances, Annex 4 — *Aeronautical Charts* includes provisions for the supplemental, larger scale, Aerodrome Ground Movement Chart — ICAO, and the Aircraft Parking/Docking Chart — ICAO. These charts shall show, in a similar manner, all the information on the Aerodrome/Heliport Chart — ICAO, relevant to the area they depict (paragraphs 14.6 and 15.6 refer).

2.6.3 Symbols for aerodrome/heliport charts are specified in Annex 4, Appendix 2, ICAO Chart Symbols, and include symbols number 155 “Stop bar” and number 156 “Runway-holding position”. The recent Amendment 52 to Annex 4 introduced the definition and term “runway-holding position” in order to be aligned with Annex 14, Volume I.

2.7 Situational awareness and human performance

2.7.1 On 25 November 1999, the Commission approved a proposal for a plan of action on flight safety and Human Factors for the period 2000 to 2004. The plan included, inter alia, the development of Standards and Recommended Practices (SARPs) considering the role of Human Factors in present and future operational environments, as warranted by industry developments.

2.7.2 Amendment 11 to the *Procedures for Air Navigation Services — Aircraft Operations*, Volume I — *Flight Procedures* (Doc 8168) applicable on 1 November 2001, included Part IX, Chapter 1: Aerodrome Surface Operations. These new provisions are aimed at addressing vulnerabilities in human performance and maintenance of situational awareness during surface operations. The justification provided to the Commission in proposing these provisions was the increase in runway incursions. The new provisions require that operators develop and implement standard operating procedures (SOPs) for aerodrome surface operations. Furthermore, the development and implementation of SOPs must take into consideration

such risk factors as: runway intersection take-offs; line up and wait clearances; land and hold short clearances; take-offs from displaced runway thresholds; and hazards associated with runway crossing traffic.

2.7.3 Finally, the new provisions require that operators ensure flight personnel awareness of the risk factors in the aerodrome surface operations listed above. Such risk factors should include, but not be limited to: human performance vulnerability to error due to workload; vigilance decrement and fatigue; potential distractions associated with the performance of flight deck tasks; and failure to use standard phraseology in aeronautical communications.

2.8 Safety management systems

2.8.1 There are several initiatives underway that address safety of operations at aerodromes more generally at the systemic level. These initiatives include Amendment 40 to Annex 11 which became applicable on 1 November 2001, which calls for States to implement systematic and appropriate air traffic services (ATS) safety management programmes to ensure that safety is maintained in the provision of ATS within airspaces and at aerodromes. Additionally, any significant safety-related change to the ATC system, including the implementation of a reduced separation minimum or a new procedure, shall only be effected after a safety assessment has demonstrated that an acceptable level of safety will be met and users have been consulted. In accordance with Annex 14, Volume I, a certified aerodrome should have, in operation, a safety management system. Guidance on an aerodrome safety management system is given in the *Manual on Certification of Aerodromes* (Doc 9774). AN-Conf/11-WP/24 addresses the subject of safety management systems and AN-Conf/11-IP/9 contains the new ICAO *Manual on Safety Management for Aerodromes and Air Traffic Services*. It is expected that the establishment of safety management programmes by States will address the problem of runway incursions at the systemic level and help introduce a holistic approach to safety management.

2.9 Educational campaign

2.9.1 As can be noted from the above, provisions related to the safe operation of aircraft on the manoeuvring area are already in place. To improve the present situation with respect to runway incursions, encouraging the implementation of the relevant provisions would be an important first step. The Air Navigation Commission therefore concluded that the key to improvements would be found in a clear and integrated presentation of existing provisions and procedures.

2.9.2 In follow-up of the above, ICAO embarked on a runway incursion education and awareness campaign which began with a comprehensive search of best available educational material and its professional presentation in audio, graphic and textual form. An interactive CD-ROM divided into a thematic narrative and various subsets of information, which includes references to relevant ICAO SARPs and other available documentation on runway safety programmes, videos, electronic versions of posters, etc. is currently being finalized. This toolkit is being developed to support States in their implementation of runway safety programmes. AN-Conf/11-IP/10 contains an overview of the runway safety toolkit that will be dispatched to States and international organizations at the beginning of 2004.

2.9.3 In addition to the above, a series of seminars on runway safety/incursions and ATS safety management is being organized in the different ICAO regions. The first seminar of this type was conducted in Mexico City (October 2002). The next seminars will be held in Singapore and Cairo in December 2003 for the Asia/Pacific and Middle East Regions. The seminars will continue throughout 2004 and 2005.

3. ACTION BY THE CONFERENCE

3.1 The Conference is invited to agree on the following recommendations;

Recommendation 2/ — Runway safety programmes

That States take appropriate actions to improve runway safety worldwide through the implementation of runway safety programmes.

Recommendation 2/ — Capacity-enhancing procedures

That States, when considering capacity-enhancing procedures at aerodromes, conduct appropriate safety studies and take due consideration of the effect on runway safety.

— END —