6.3 Taxi best practices

6.3.1 Only one pilot can control the aircraft during taxi and his/her primary task is to safely taxi the aircraft. The pilot not flying should assist the pilot flying to the best of his/her ability by providing guidance based upon the cleared taxi routing and the aerodrome layout map.

6.3.2 All checklist activity should be cancelled when crossing and entering runways. One flight crew member should maintain full concentration on the runway traffic situation.

6.3.3 Red stop bars should never be crossed when lining up on or crossing a runway unless, in exceptional cases, the stop bars, lights or controls are reported to be unserviceable, and contingency measures, such as using follow-me vehicles, are in force. In these circumstances, whenever possible, alternative routes should be used.

6.3.4 When entering any runway, all available surveillance means should be used to check for traffic (left and right), e.g. all eyes to be used.

6.3.5 When cleared to line up and/or when crossing any runway, the aircraft should be positioned at a right angle to the runway where possible, in order to better observe other traffic, both arriving and departing.

6.3.6 The pilot should not rush. The higher the ground speed, the less time available to react, manoeuvre the aircraft and avoid obstacles. High speed also results in greater distance and time required to bring the aircraft to a complete stop. Time can be both an ally and an enemy and should be used wisely. The pilot should taxi defensively and be prepared for others' mistakes.

6.3.7 When a clearance to taxi to a point beyond a runway is received, it must include the authorization to cross that runway. A runway should never be crossed unless an explicit ATC clearance has been received.

6.3.8 The "sterile flight deck" concept while taxiing should be adopted. During movement of the aircraft the flight crew must be able to focus on their duties without being distracted by non-flight-related matters. Cabin crew should be made aware of this requirement if it is not a standard operating procedure. The following definition of a "sterile flight deck" is offered as a reference:

> *Sterile flight deck.* Any period of time when the flight crew should not be disturbed, except for matters critical to the safe operation of the aircraft.

Disturbances may include, but not be limited to, calls received from non-operational areas (e.g. company), entry onto the flight deck by cabin crew, and extraneous conversations not related to the current phase of flight.

6.3.9 It is generally accepted that the need for a sterile cockpit commences as follows:

a) departure: when the aircraft engine(s) are started and ceases when the aircraft reaches 10 000 feet elevation above the departure aerodrome;

b) arrival: when the aircraft reaches 10 000 feet elevation above the arrival aerodrome until the engine(s) are shut down after landing; and

c) at any other time determined and announced by the flight crew (e.g. in-flight emergency, security alert).

6.3.10 All aircraft lights should be used to help controllers and other pilots to see the aircraft. Fixed navigation lights and taxi lights should be on whenever the aircraft is moving. Landing lights should be turned on when cleared for take-off.

6.3.11 The audio box and volume adjustment should be checked whenever a frequency change is made. All flight crew should be on the appropriate frequency until all runways have been vacated after landing.

6.3.12 After landing, the runway should be vacated as soon as possible, but not by turning onto another runway, unless specifically instructed to do so. When the aircraft has vacated the active runway, the pilot should be prepared to stop to resolve any questions about the ATC clearance or about the aircraft position.

6.3.13 Anytime there is uncertainty about the location of the aircraft on the movement/manoeuvring area, the pilot should stop the aircraft, advise ATC, and seek clarification. Questions should be taken out of the flight deck. If necessary progressive taxi instructions should be requested.

6.3.14 The aircraft should never be stopped on a runway unless specifically instructed to do so.

PREPARATION FOR TAXI CHECKLIST

- If necessary write down the taxi route.
- Assign a crew member to progressively follow the aircraft's position on the aerodrome chart.
- Follow company SOPs with regard to exterior lighting when taxiing and cleared for take-off — where possible, have maximum illumination.
- Adopt a sterile flight deck for the taxi phase.
- Be aware that the visibility required for taxiing may be less than the runway visual range (RVR).
- Be alert for mandatory signs, markings, stop bars and runway guard lights.
- Look for visual aids such as taxiway location information and destination signs.
- Designate a crew member to look for and report signs and markings and keep track of the aircraft's location against the aerodrome chart.
- Conduct pre-departure checklists when the aircraft is stationary.
- Use standard radio phraseology.
- Receive explicit clearance before crossing any runway.
- Read back all runway crossing or hold short clearances using correct phraseology.
- Do not be rushed by any party (ATC or company).
- Listen to clearances issued to other aircraft.

- Never cross red stop bars when entering or crossing a runway unless contingency measures are in force, e.g. to cover cases where the stop bars or controls are unserviceable.
- Before entering or crossing any runway, check for traffic.
- Cancel any checklist activity when crossing any runway.
- Ensure you have a correct understanding of the ICAO phraseology "taxi to holding point".
- Beware of the fundamental difference between the phraseology "position and hold" (which has the same meaning as the ICAO standard phrase "line up [and wait]") and the standard ICAO phraseology "taxi to holding point" (which means taxi to, and hold at, the runway-holding point). Listen carefully to the instruction. If unsure — ask.

6.4 Language

6.4.1 While the language normally used by the station on the ground or the English language[1] is allowed, the use of standard aviation English at international aerodromes will enhance the situational awareness of all those listening on the frequency.

6.4.2 Conducting and comprehending radiotelephony communications requires competence with standard phraseology as well as general proficiency in the language used for communications. Standard phraseology should be used at all times. Strict adherence to standard phraseology prevents miscommunications. See Appendix A for further information on communication best practices.

6.4.3 Speaking slowly is essential when operating in foreign regions. When the speech note is slowed, the response may be slower and clearer.

6.5 Readbacks

6.5.1 All clearances require a readback. The Standard in Annex 11, 3.7.3.1, states:

"The flight crew shall read back to the air traffic controller safety-related parts of ATC clearances and instructions which are transmitted by voice. The following items shall always be read back:

a) ATC route clearances;

b) clearances and instructions to enter, land on, take off from, hold short of, cross and backtrack on any runway; and

1. ICAO language requirements for air-ground radiotelephony communications are shown in Annex 10 — *Aeronautical Telecommunications*, Volume II, Chapter 5, and Annex 1 — *Personnel Licensing*, Chapter 1 and Appendix 1.

c) runway-in-use, altimeter settings, SSR codes, level instructions, heading and speed instructions and, whether issued by the controller or contained in ATIS broadcasts, transition levels."

6.5.2 All readbacks require a hearback. In order to complete this "communication loop", the readback must be complete and clear. The full clearance, including the call sign and runway designator, must be read back. "Roger" is not considered to be a readback.

6.6 Listen on the frequency

The pilot should listen on the frequency at all times and try to visualize the other traffic in the vicinity. The pilot should know what runways will be encountered between the aircraft's current location and final destination. Particular attention should be paid to all clearances and instructions issued to traffic involving those runways.

7. OTHER COMMUNICATION BEST PRACTICES

7.1 Extra attention is required when other aircraft with similar call signs are on the frequency.

7.2 An instruction to follow other traffic does not automatically include clearance to enter or cross a runway. Each aircraft requires a specific clearance to enter or cross any runway. If in doubt, clarification should be sought.

7.3 If an aircraft has been cleared to "line up and wait", then only a short delay on the runway should be anticipated. If in this position for an extended period, the pilot should so advise ATC and seek clarification.

7.4 Both the pilot flying and the pilot not flying should monitor the frequency and agree upon the acceptance of a clearance to taxi, cross a runway, take-off or land on a runway. Any misunderstanding or disagreement should be resolved immediately by contacting ATC for clarification.

7.5 The use of headsets improves the audibility of communications with ATC and on the flight deck.

7.6 The correct setting of the audio panel should be verified, especially after any temporary switch in audio sources.

7.7 The pilot should state the position of the aircraft on the aerodrome whenever making initial contact with any ground or aerodrome controller, regardless of whether it was previously stated to a different controller.

7.8 The "sterile cockpit" rule during the taxi phase should be adopted.

8. SITUATIONAL AWARENESS

8.1 General

One aspect of situational awareness is pilots knowing where they are and where they want to go, as well as visualizing a picture of the airport traffic in the vicinity. Even during daylight and in good visibility, pilots can

get lost. Even worse is the situation where pilots think they know their position, but find themselves elsewhere. In darkness or low visibility conditions, additional care must be taken to ensure that accuracy in navigation on the ground and the highest degree of situational awareness is maintained by all members of the flight crew.

SITUATIONAL AWARENESS CHECKLIST

Before starting the approach:

- Obtain all needed information.
- Brief flight crew about planned primary runway exits and taxi routes.
- Eliminate as much distraction as possible.
- Have the aerodrome diagram available for instant use.
- Maintain situational awareness on final approach at night.
- Listen for clearances to other aircraft.

8.2 Visual aids

8.2.1 Charts, signs, markings and lighting are all aids to assist in determining position. A high level of awareness must be maintained to observe and respond to mandatory signs and markings. Correct knowledge of all symbols and signs is therefore necessary. All the visual information that is available should correlate with the actual situation. Gathering visual information and constantly questioning and cross-checking the aircraft's position is the task of the entire flight crew. A crew member who is in doubt or does not agree with something must speak up.

8.2.2 A head-down situation during taxi should be limited to the minimum amount of time possible.

8.2.3 When the pilot not taxiing the aircraft focuses on the instruments on the flight deck, that pilot is not able to monitor the progress of the aircraft. Before undertaking head-down actions, the other pilot should be so advised so that the navigating pilot can place added emphasis on maintaining navigational accuracy and situational awareness.

8.3 Other aids

8.3.1 Heading displays or compasses should be used to confirm runway or taxiway alignment with the information available from the charts. If available, the ILS centre line guidance system should be used to confirm correct runway alignment.

8.3.2 The entire runway and approach should be scanned in both directions before entering a runway and, if in doubt, clarification should be sought.

9. CONCLUSION

RUNWAY INCURSION PREVENTION CHECKLIST

- Strictly adhere to all relevant ICAO Standards and Recommended Practices, procedures and guidance material, including phraseologies.
- Ensure that flight crews follow the clearances or instructions that are actually received and not those they expect to receive.
- Ensure good planning of ground operations in order to decrease the workload during taxi. The flight and its associated risks starts during the preparation.
- Ensure that good situational awareness is the top priority during taxi, and involve all crew members.
- Make "crew resource management" principles during taxi as important as during the other phases of flight.
- Be defensive and let the built-in safety nets do their work so that a single mistake does not lead to a serious incident or accident.
- Never take anything for granted.

10. STOP BARS

The following extracts from ICAO Standards and Recommended Practices are provided to assist flight crews in understanding the use and application of stop bars:

Annex 2 — *Rules of the Air*, Chapter 3:

"3.2.2.7.3 An aircraft taxiing on the manoeuvring area shall stop and hold at all lighted stop bars and may proceed further when the lights are switched off."

Annex 14 — *Aerodromes,* Volume I — *Aerodrome Design and Operations*, Chapter 5:

"5.3.19.9 Selectively switchable stop bars shall be installed in conjunction with at least three taxiway centre line lights (extending for a distance of at least 90 m from the stop bar) in the direction that it is intended for an aircraft to proceed from the stop bar."

"5.3.19.13 *Note 1.— A stop bar is switched on to indicate that traffic stop and switched off to indicate that* traffic *proceed."*

"5.4.3.35 A taxiway shall be identified by a designator comprising a letter, letters or a combination of a letter or letters followed by a number."

"5.4.3.36 **Recommendation.—** *When designating taxiways, the use of the letters I, O or X and the use of words such as inner and outer should be avoided wherever possible to avoid confusion with the numerals 1, 0 and closed marking.*"

"5.4.3.37 The use of numbers alone on the manoeuvring area shall be reserved for the designation of runways."

Procedures for Air Navigation Services — Air Traffic Management (PANS-ATM, Doc 4444), Chapter 7:

"7.14.7 Stop bars

Stop bars shall be switched on to indicate that all traffic shall stop and switched off to indicate that traffic may proceed.

Note.— Stop bars are located across taxiways at the point where it is desired that traffic stop, and consist of lights, showing red, spaced across the taxiway."

11. REFERENCES

Federal Aviation Administration (FAA)

- *Controller and Pilot Error in Surface Operations*, Kim Cardosi, 2003
- Federal Aviation Regulations/Airman's Information Manual, 2002
- Runway Safety Blueprint 2002–2004, 2001
- *Runway Safety: It's Everybody's Business*, Kim Cardosi, 2001

FAA/International Air Transport Association (IATA)

- FAA/IATA Runway Incursion Prevention Program

International Civil Aviation Organization (ICAO)

- North American, Central American and Caribbean Regional Office, OPS Guidelines for the Prevention of Runway Incursion, 2002
- *Procedures for Air Navigation Services — Aircraft Operations* (Doc 8168), Fourth Edition, 1993

Netherlands

- University of Leiden, *Human Factors in Runway Incursion Incidents*, Patrick Hudson

Appendix C

AIR TRAFFIC CONTROL BEST PRACTICES

1. AIM OF THIS APPENDIX

1.1 The aim of this appendix is to highlight some of the causal or contributory factors that have resulted in runway incursions and which were identified during a runway safety survey in Europe in 2001. It is usually the responsibility of the air traffic service provider to put best practices in place to prevent runway incursions.

1.2 While the use of the language normally used by the station on the ground or the English language[1] is allowed, the use of standard aviation English at international aerodromes enhances the situational awareness of all those listening on the frequency.

2. CLEARANCES

2.1 Whenever possible, an en-route clearance should be passed to an aircraft before the start of taxi. If this is not possible, controllers should try to avoid passing the clearance to a pilot engaged in complicated taxiing manoeuvres near the runway due to the possibility of distraction.

2.2 An en-route clearance does not authorize the pilot to take off or enter an active runway. The words "take off" shall be used only when an aircraft is cleared for take-off, or when cancelling a take-off clearance.

3. READBACK REQUIREMENTS

3.1 Readback requirements were introduced in the interest of flight safety. The stringency of the readback requirement is directly related to the possible seriousness of misunderstandings in the transmission and receipt of ATC clearances and instructions. Strict adherence to readback procedures ensures that the clearance or instruction has been received and understood correctly by the correct aircraft.

3.2 The flight crew must read back to the air traffic controller the safety-related parts of ATC clearances and instructions. The air traffic controller is responsible for checking the completeness and accuracy of the readback.

3.3 In accordance with Annex 11, the following items shall always be read back:

a) ATC route clearances;

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1. ICAO language requirements for air-ground radiotelephony communications are shown in Annex 10 — *Aeronautical Telecommunications*, Volume II, Chapter 5, and Annex 1 — *Personnel Licensing*, Chapter 1 and Appendix 1.

b) clearances and instructions to enter, land on, take off from, hold short of, cross and backtrack on any runway; and

c) runway-in-use, altimeter settings, SSR codes, level instructions, heading and speed instructions and, whether issued by the controller or contained in ATIS broadcasts, transition levels.

Other clearances or instructions, including conditional clearances, shall be read back or acknowledged in a manner to clearly indicate that they have been understood and will be complied with.

3.4 An aircraft must include its call sign in the readback, and failure to do so should be challenged by the controller.

3.5 PANS-ATM (Doc 4444), 4.5.7.5.2, states:

"The controller shall listen to the readback to ascertain that the clearance or instruction has been correctly acknowledged by the flight crew and shall take immediate action to correct any discrepancies revealed by the readback."

This requirement constitutes an essential cross-check to confirm correct understanding of a clearance or instruction or part thereof by flight crews and vehicle drivers. This closed loop supports the safety and redundancy of pilot/vehicle-driver/controller communications, and whenever adverse factors are likely to affect communications, strict adherence to this closed loop constitutes an important line of defence against communication errors.

4. TAXI INSTRUCTIONS

4.1 Taxi instructions issued by a controller must always contain a clearance limit, which is the point at which the aircraft must stop until an instruction to proceed is given. For departing aircraft, the clearance limit will normally be the runway-holding point of the runway in use, but it may be any other position on the aerodrome, including runway intersections, depending on prevailing traffic circumstances. When intersection departures are used, the appropriate runway-holding points shall be clearly identified by ATC.

4.2 When a taxi clearance contains a taxi limit beyond a runway, it must contain an explicit clearance to cross that runway, even if the runway is not in use. Where an expected or anticipated runway crossing is required, a means of communicating this to the pilots, at the gate or prior to descent, should be established.

4.3 Communication with any aircraft related to the use of a runway for the purpose of taxiing should be transferred from the ground controller to the aerodrome controller prior to the aircraft entering or crossing a runway.

4.4 It is strongly advised, when practicable, to use standard taxi routes. For more complicated taxi instructions, it may be appropriate to divide the message into segments, placing the clearances and instructions in sequential order, to avoid the possibility of pilot misunderstanding.

5. STOP BARS

5.1 Annex 2, 3.2.2.7.3, states:

"An aircraft taxiing on the manoeuvring area shall stop and hold at all lighted stop bars and may proceed further when the lights are switched off."

This Standard applies both to runways and taxiways where fitted with stop bars. The objective of this Standard is to maintain the integrity of the stop bars, which are intended to protect the relevant part of a manoeuvring area.

5.2 PANS-ATM (Doc 4444), 7.14.7, states:

"Stop bars shall be switched on to indicate that all traffic shall stop and switched off to indicate that traffic may proceed."

As such, a controller should never issue a clearance to cross a stop bar without first switching off the stop bar. The only exception to this should be when contingency measures are required due to unserviceability. An example of a contingency measure is the use of a follow-me vehicle.

6. TAKE-OFF PROCEDURES

At aerodromes with separate ground control and aerodrome control functions, aircraft are transferred to the tower at or approaching the holding point. Since misunderstandings in the granting and acknowledgement of take-off clearances can result in serious consequences, care should be taken to ensure that the phraseology employed during the taxi manoeuvres cannot be interpreted as a take-off clearance.

7. POSITION HANDOVER

NAV CANADA in its runway safety survey found that a significant percentage of incidents involving ATC operational errors takes place after a controller position handover takes place. To ensure that the complete traffic situation is included in a position handover, the use of a standardized handover checklist should be considered.