APPENDIX D
FLIGHT CREW BEST PRACTICES

Sterile Cockpit for Safety

Communications

Situational awareness

Navigating on the ground - Visual aids

Use of aircraft lights

You CAN HELP TO PREVENT RUNWAY INCURSIONS!

Best Practices Planning of Airport Ground Operations

APPENDIX D
FLIGHT CREW BEST PRACTICES

Runway incursions often involve misunderstanding/ communication breakdown between operational staff e.g. pilots, vehicle drivers on the manoeuvring area and air traffic controllers. Miscommunication can lead to a loss of situational awareness and a ground navigation error. The majority of runway incursions occur during taxiing out and departure operations.

Aircraft Operators are invited to review the materials put forward, and where necessary, amend their Standard Operating Practices with regard to ground operations.

Principle points to highlight for pilots include:

- Runway incursions may lead to Go-Arounds and indecision about whether to go around or not;
- Inexperience, lack of practice with procedures or unclear procedures may lead to runway incursions;
- Air ground lighting is an important guidance when on or near a runway;
- Aerodrome infrastructure design is still important to building situational awareness;
- A current aerodrome chart is essential for accurate navigation on the ground;
- Errors of either Air Traffic Controllers , pilots or drivers are typically caught within their peers. Pilots play an important part in catching the errors they have made themselves, other pilots and air traffic controllers;
- In today's air traffic management system compliance with ICAO requirements to use aviation English on the manoeuvring area is a vital safety net;
- Failing to gather (see or hear) information clearly or correctly is a frequent cause of incursions when left unchallenged. An important communication factor in runway incursion incidents is incorrect or incomplete read-back by pilots or air traffic controllers, particularly when conditional clearances are used;
- Misunderstandings are more likely to arise when a pilot is doing other tasks, being head-down. Examples of this are conducting aircraft performance calculations, deferred checklist items, administrative tasks, starting an engine during an engine-out taxi, etc. Safety reports show that Public Address announcements to passengers or commercial announcements are a direct source of error in many events.

Sterile Cockpit for Safety

A key point in the prevention of runway incursions, is to apply better preventative measures during the taxi-phase. Reduced workload will provide for increased attention to the taxi phase and allow an updated and accurate positional and situational awareness.

The current generation of aircraft is highly automated with complex systems, which allow preparation and programming of the total flight on the ground. Flight deck workload peaks have been shifted to now also include the ground phase of aircraft operations. Appropriate measures should be undertaken to accommodate flight crew workload on the ground. **The taxi phase should be treated as a "critical phase of flight"**. It is strongly advised to adopt the sterile flight deck concept whilst taxiing.

During movement of the aircraft the flight crew must be able to focus on their duties without being distracted by non-flight related matters. This includes public address announcements, performance (re)calculations, administrative tasks and briefings. Preferably these should all be completed before taxi-out.

Those checklists (or parts of checklists) that cannot be completed at that time are best completed when the aircraft is stationary. Ensure cabin crew are 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 definition: Any period of time when the flight crew should not be disturbed, except for matters critical to the safe operation of the aircraft.
It is generally accepted that the sterile flight deck applies as follows:

a. Departure: when the aircraft starts engine/s and ceases when the aircraft reaches 10,000' above the departure aerodrome elevation;

b. Arrival: when the aircraft reaches 10,000' above the arrival aerodrome elevation until the engine/s are shut down after landing;

c. Any other times decreed by the flight crew. (e.g. in flight emergency, security alert etc).

During taxi preferably both pilots should be looking outside. The pilot not flying should only handle essential check list reading and communication. Both pilots should check the taxi routing and the aerodrome chart. If a runway change or intersection change or performance recalculation is required, then it is advised to stop the aircraft and do the required items after the parking brakes are set. Advise ATC in advance of stopping and ATC should accept this as a normal procedure.

Disturbances that can be avoided may include, but not be limited to, calls received from non-operational areas (e.g. company), entry onto the flight deck (e.g. cabin crew) and extraneous conversations not related to the current phase of flight. Public Address e.g. welcome announcements by flight deck, should be transferred from the taxi phase to a moment before engine start-up or push back. Operational calls on the company frequency cause the other pilot to be isolated in the flight deck. These calls and announcements should, if at all possible, be avoided while taxiing, and above all, when approaching the active runway.

Communications

The following guidelines, in addition to the formal R/T procedures as laid down in PANS-ATM, ICAO Doc 4444, might help pilots in maintaining adequate communication on the manoeuvring area. See also Appendix A of this document (Communications Guidance) for further information.

Expect that ATC will use the ICAO read-back procedure (including Drivers and other personnel who operate on the manoeuvring area) *to confirm that the message is correctly understood*.

Improve situational awareness, when practicable, by conducting all communications associated with runway operations using aviation English.

Improve situational awareness, when practicable, by conducting all communications associated with runway operations on a common frequency.

This allows situational awareness of other traffic for you and the other traffic and can only be achieved when a message is understood by all meaning that all communications are conducted using aviation english on the runway frequency.

(note - Aerodromes with multiple runways may use a different frequency for each runway)

Proper crew resource management indicates that when in doubt, all available sources should be consulted. When one of the pilots would have missed an ATC call or is in doubt, it is a good practice to request it again. Similarly, if one crew member has a different perception of a situation or clearance to the other, ATC should be asked to clarify.

Situational awareness

Situational awareness is about knowing where you are and where you want to go, as well as building the picture of the traffic in the vicinity. Even during daylight and in good visibility, people get lost. Even worse is the situation where you assume you know your position, but find yourself elsewhere. At times of darkness and Low Visibility, additional care must be taken to ensure that accuracy in navigation on the ground and the highest degree of situation awareness is undertaken by all members of the flight crew. If in doubt, seek clarification from ATC.

If Pilots have any doubt as to their exact position on the surface of an aerodrome, they should stop and contact ATC and follow the associated ICAO procedure (PANS-ATM, Doc 4444). Proper crew resource management indicates that when in doubt, all available sources should be consulted. When one of the pilots would doubt on the situational awareness, a good practice would be to stop the aircraft taxiing or get immediate clarification by ATC. Normally ATC is very familiar with the particular aerodrome and in the best position to help re-establish the situational awareness.

Pilots should be "head-up" for a continuous watch while taxiing. Promote best practices on flight deck procedures while taxiing and during final approach - to include the "Sterile flight deck" concept.

All access to a runway (even if inactive) should take place only after receiving a positive clearance and providing a correct readback, and after the stopbar (where provided) has been switched off; entering a runway without a valid ATC clearance will create a runway incursion.

Pilots shall not cross illuminated red stop bars when lining up or crossing a runway, unless contingency procedures are

in force, e.g. to cover cases where the stop bars or controls are unserviceable.

Stop bars and runway status lights provide a clear red signal to stop taxiing.

Ensure that flight deck procedures contain a requirement for specific clearances to cross any runway, this includes non-active runways.

Ensure a means to indicate receipt of landing / line-up / take off / crossing clearances in the cockpit. Proper crew resource management indicates that when in doubt, all available sources should be consulted. Especially for runway operations it is essential that both pilots are fully aware of the factual clearance. ATC should cooperate as long as it takes for the crew to understand what ATC advices.

During taxi for departure or during approach, Pilots should refrain from accepting a runway change proposal if time to re-brief is not sufficient. This includes a change of departure intersection. It is tempting to save time, fuel, capacity enhancement and for environmental reasons to accept a last minute change for another runway or runway entry. Pilots should be fully aware that this could lead to the hurry-up syndrome. A rushed crew is prone to make errors. Therefore it is absolutely imperative to make sure that enough time is available before accepting a last minute change. ATC should be aware to avoid the hurry –up syndrome.

Flight Crew should not enter a runway for departure if not ready to take off. This avoids the possibility that an aircraft is "forgotten" on an active runway. Advise ATC accordingly.

Avoid accepting rapid exit taxiways for runway entry. A rapid exit taxiway is designed to be an exit, not an entry. Using it as an entry hampers visibility, poses a threat for exact performance calculations and does not guarantee adequate visual aids.

Pilots should turn on aircraft forward facing lights when in receipt of a take-off clearance. The moment of switching proves to be an important aid for vehicle drivers or others on an active runway.

The flight deck traffic display (TCAS) could also be a good tool to detect traffic approaching and departing a runway. Remember, an aircraft may be departing from an intersection closer to the landing threshold out of sight, due to restricted visibility, or line of sight limitations.

Use your heading display or compass to confirm the runway alignment (QFU) with the information available from the charts. If fitted, use the ILS centreline guidance system to confirm the correct runway alignment.

Have a good look out; scan the entire runway and approach in both directions before entering a runway. If in doubt, seek clarification: ASK

All flight crew members must monitor the clearance for taxi, take-off and landing, and must be "in the loop" at all times when runway operations are in progress.

Navigating on the ground - Visual aids

Charts, signs, markings and lighting: These are all aids to assist in determining your position. A high level of awareness must be maintained to observe and respond to mandatory signs and markings. A correct knowledge of all the symbols and signs is therefore a must. All the visual information that is available should correlate with the actual situation. Gathering visual information and the constant questioning and cross checking of your position is the task of the entire flight deck crew. A crew member who is in doubt or does not agree with the situation must speak-up and a check should be made with ATC.

Reports to ATC and the airport should be made when factual situations differs from procedures or published information.

Use of aircraft lights

It is a widely held belief that the use of aircraft external lights could be an effective tool as part of a runway incursion prevention programme.

The following guidelines have been developed by the IFALPA Aerodrome & Ground Environment Committee. The suggestions made in these guidelines should help to improve the visibility of aircraft operating in the manoeuvring area of an airport they should not been seen as replacing proper monitoring of radio and other communications.

The captain is responsible for ensuring operating limitations and established operating procedures are observed. The captain always has the final authority to use the aircraft lights as deemed necessary for the safe execution of flight (including ground movement operations).

Clearly, there are issues associated with the use of external lights which must be addressed for example the impact of dazzle effect from strobes, landing lights and some high power taxi and runway turn off lights especially in certain weather conditions (snow, fog etc.) and the impact of external light use on others must always be considered.

Guidelines for the use of aircraft lights during ground operations: To the extent possible and consistent with aircraft equipment, operating limitations, and flight crew procedures, the illumination of aircraft exterior lights day or night should be as follows:

FLIGHT CREW PROCEDURES

BEFORE STARTING	
Anti Collision lights / rotating beacon	ON
LOGO lights (according to Operator policy)	ON or OFF
TAXI-OUT (Moving on own power) (*Note 1*)	
Taxi light	ON (*Note 2*)
Navigation / Position lights	ON (night);
Operators Policy (day) Turnoff lights	ON (*Note 2*)
CROSSING ANY RUNWAY (*Note 3*)	
Strobe lights	ON
Turnoff lights	ON
Landing lights	ON
ENTERING RUNWAY FOR TAKE OFF	
Strobe lights	ON
Take off clearance received:	
Landing lights	ON
TAXI-IN (runway vacated) (*Note 1*)	
Landing lights	OFF
Strobe lights	OFF
Runway Turn off lights	ON (*Note 2*)

Note 1: To signal intent to other pilots, consider turning taxi and runway turn off lights off when stopped, yielding, or as a consideration to other pilots or ground personnel.

Note 2: Runway turn-off and taxi lights should always be ON during taxi. Outside the runway they may be temporarily switched off to avoid the blinding or dazzling effect, they should always be used when crossing a runway.

Note 3: When crossing a runway, the factual status of the runway, active or not, does not have any affect on the use of lights. Operators or Captains should consider turning ALL exterior lights on when crossing any runway.

You CAN HELP TO PREVENT RUNWAY INCURSIONS!

How?

1. It is essential to adhere strictly to all existing ICAO Standard Operating Procedures and phraseologies.

2. Flight crews need to ensure that they follow the clearance or instructions that are actually received, and not the one the flight crew is expecting to receive

3. A good planning of the ground operations can decrease the workload during taxi.

4. The flight and its associated risk start during the preparation for taxi. Dissemination of relevant information for a specific flight, which would likely effect the safe operation of aircraft, is the responsibility of all parties involved. Aircraft operators are encouraged to provide pilots with a specific means to obtain current safety significant airport information at each station.

5. Good situational awareness is the top priority during taxi. All crew members should be involved here. It is strongly advised to restrict all the other flight deck duties to an absolute bare minimum, only relevant for the safety of the flight, in order to facilitate crews to fully concentrate on taxiing. E.g. it is highly recommended to perform all checks and procedures, wherever possible, prior to taxiing or after standstill.

6. Application of the "Crew Resource Management" principles during taxi is as important as during the other phases of flight.

7. Even the most professional and experienced people make mistakes. By being defensive and letting the built-in safety nets do their work, a single mistake should not lead to a serious incident or accident.

Training

Although aircraft operators provide pilots with some training for ground manoeuvres, e.g. Low Visibility procedures, it is essential that pilots are fully acquainted with aerodrome signage, markings and lighting for safe runway operations, and that this knowledge is kept up to date through recurrent training.

Best Practices Planning of Airport Ground Operations

(Refer to Recommendation 1.4.6)

Departing from, or coming to, an airport can be prepared well in advance. A thorough planning for taxi operation is essential. This preparation should be done at the gate or prior to starting descent.

1. Familiarise yourself with the airport

- Prepare the necessary charts for taxi and have them available for use during taxi;

- Take some time to study the airport layout. The naming of taxiways and other airport infrastructure can be misleading;

- Remember to review the latest NOTAM for both the Departure and Arrival airport for information concerning construction or taxiway/runway closures;

- Standard taxi routes are used more often at busy airports. Review the routes you can expect. Use the ATIS information and your previous experience to determine the possible taxi routes;

- Pay special attention to the location of HOT SPOTS. These are unique or complex intersections and runway crossings where runway incursions have taken place in the past, or areas of the runway or associated taxi ways which are not visible from the Control Tower;

- Know what runways you will encounter between where you are and where you are going;

- Visualise this information on the charts;

- Plan timing and execution of check-lists, so that no distractions occur when approaching and/or crossing runways; i.e all eyes outside during this phase.

2. Briefing

- Conduct a detailed briefing for all flight crew members, especially during night and LVO. The visibility required for taxiing may be less than the Runway Visual Range;
- Brief planned primary runway exit and taxi route;
- Assigned taxi routes should be briefed as thoroughly as an instrument approach or departure;
- Airport diagrams should be readily available to all flight crew members;
- Check that the crew fully understands all briefing items. The human memory is "constructive". That means that we have the tendency to fill in the blanks;
- Reassure yourself that you follow the clearance or instruction that you actually received, and not the one you expected to receive.

3. Taxiing – navigating on the ground

- Have the necessary aerodrome charts or an equivalent electronic device available for use during taxi, this includes when operating at the home aerodrome. Even a familiar home base could become difficult as a consequence of non-standard operations;
- Write down taxi route;
- Be alert for mandatory signs, markings, stop bars and runway guard lights;
- Look for visual aids (Taxiway lights, location information and destination signs);
- Assign crew member to look for and report signs/markings and keep track of location against the aerodrome chart;
- A crew member who is in doubt or does not agree with the situation must speak-up;
- Expect that ATC will provide 'real-time' significant aerodrome information which may affect operations on or near the runway when NOTAMS and ATIS which are normally used to advise pilots of significant information regarding runway operations are not available;
- Flight Crew must advise ATC on first contact with the Tower if additional time on the runway is required for operational reasons, this might be the case when e.g. in winter an engine run-up for shedding ice could be required;
- When a pilot not taxiing the aircraft focuses on the instruments in the flight deck, he/she is not able to monitor the progress of the aircraft. Before undertaking head-down actions advise the other pilot, so that added emphasis can be placed by the navigating pilot on maintaining navigational accuracy and situational awareness;
- Do not rush. The higher your ground speed, the less time you have to react, manoeuvre the plane and avoid an obstacle. Avoid being rushed by accepting last minute changes, especially during near runway operations. Time can be your ally and your enemy; use it wisely. Taxi defensively, this is being prepared for the errors of others.

4. Communication

- Check your audio box and volume adjustment whenever a frequency change is made;
- Take extra care accepting a "monitor xxx.xxx frequency" clearance. When after some period this new frequency keeps silent, suspect a wrong entry, first check communication and, if there is no response, then, refer back to the previous frequency;
- If necessary request progressive taxi instructions;
- If you need to leave the ATC frequency, then notify your other flight crew members. Afterwards, be briefed by the other crew member of what you have missed;
- The use of Aviation English in a busy and complicated environment should be encouraged, improving situational awareness;

- Speaking slowly is essential when operating in foreign regions;
- Be proficient with the language used for communication;
- Use standard ICAO compliant radio phraseology at all times. Only strict adherence to standard phraseology avoids miscommunications;
- Read back all runway crossing or hold short clearances using correct radio phraseology;
- Read back, the complete instruction must be read back and must be clear, "Roger" is not a read-back. Always include:

  a) your full aircraft call sign to avoid call sign confusion;

  b) ATC route clearances;

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

  d) the runway designator to avoid wrong runway selection; and

  e) 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.

- Listen to clearances issued to other aircraft. Be extra attentive when another aircraft with similar call sign is on the frequency;
- Both pilots should monitor the frequency and agree upon the acceptance of a clearance to taxi, cross a runway, enter, line up, take-off and land on a nominated runway. Any misunderstanding or disagreement should be cleared up immediately by contacting ATC for clarification: ASK;
- The use of headsets increases the readability of communications with ATC and within the flight deck;
- Ensure all flight crew are on the appropriate frequency until all runways have been vacated after landing;
- After the landing, vacate the runway 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, be prepared to stop to resolve any questions about the ATC clearance or about the aircraft position.

5. Crossing or entering a runway

- When cleared to line up and/or when crossing any runway, position the aircraft at a right angle with the runway where possible, in order to better observe the other traffic, both arriving and departing.
- If you are cleared to "line up and wait", then only a short delay on the runway should be anticipated. If you find yourself in this position for a more extended period, advise about your position and seek clarification: ASK.
- If instructed to follow other traffic, be aware this does not automatically include the clearance to enter or cross a runway. Each aircraft requires a specific clearance to enter or cross any runway.
- If there is any doubt when receiving a clearance or instruction, clarification should be requested immediately from ATC.
- Cancel check list activity when crossing and entering runways.
- Avoid stopping on a runway unless specifically instructed to do so.

Be aware that the expectations established during the pre-taxi or pre-landing planning can be significantly altered with a different and unexpected clearance.

References

The following ICAO standards are provided to assist flight crews in understanding the use and application of stop bars.:

Annex 2 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

> 5.3.17.9 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.
>
> 5.4.3.35 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.

Annex 15 Chapter 5

> 5.3.17.14 Note 1. A stop bar is switched on to indicate that traffic stop and switched off to indicate that traffic proceed.

Doc 4444 7.15.7 Stop bars

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

Other References

ICAO. Procedures for Air Navigation Services – Air Traffic Management, Doc 4444, Ed. 14, 2001

ICAO. Air Traffic Services, Annex 11, Ed. 13, 2001

ICAO. Procedures for Air Navigation Services – Aircraft operations, Doc 8168, Ed. 4, 1993

FAA. Federal Aviation Regulations / Airman's Information Manual, 2002

ICAO NACC Regional office, OPS guidelines for the prevention of runway incursion, Jan Jurek, 2002

University of Leiden, Human factors in runway incursion incidents, Patrick Hudson, Netherlands

FAA, Runway safety: It's everybody's business, Kim Cardosi, Ph.D., 2001

FAA, Runway Safety Blueprint 2002-2004, 2001

FAA/IATA Runway Incursion Prevention Program