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Advisory Circular to Air Operators

FLIGHT CREW PROCEDURES AND TRAINING DURING TAXI OPERATIONS

1. PURPOSE. This advisory circular (AC) provides guidelines for the development and implementation of standard operating procedures for conducting safe aircraft operations during taxiing. It is intended for use by persons operating aircraft where two or more pilots are in the cockpit). The Department of Civil Aviation recommends that these guidelines become an integral part of all standard operating procedures, flight operations manuals, and formal flight crewmember training programs. The use of flight crew procedures should be emphasized and employed during all phases of a flight crewmember's aircraft ground and flight training programs.

2. FOCUS. This guidance focuses on the activities occurring within the cockpit (e.g., planning, communicating, coordinating), as opposed to the actual control of the aircraft (e.g., steering, maneuvering). Taxi operations present distinct challenges and requirements not found in other phases of flight operations. These distinct challenges are elaborated, when necessary, throughout the guidance. A section is included on the use of exterior aircraft lights during ground operations which make an aircraft more conspicuous to other flight crews.

3. RELATED MATERIAL INCLUDING TRAINING MATERIAL. The following material which has been developed by ICAO and States is provided with this Advisory Circular. Air Operators may wish to review the training information contained on these CDs and adapt the material as required for use as part of their training programme.

- a. ICAO Runway Safety Tool Kit
- b. European Runway Safety Awareness Material
- c. FAA Taxi 101
- d. FAA Runway Safety – Head UP, Hold Short, Fly Right

4. BACKGROUND. In the past, the process of getting to and from the runway was relatively simple compared to other phases of flight, and little attention was given to formalizing flight crew procedures during taxi operations. Also, training for flight deck procedures during aerodrome surface operations has not been uniform among organizations, and has frequently received inadequate attention. As a result, a variety of procedures and techniques evolved primarily based on what flight crewmembers have observed or what just seemed right at the time. This lack of structure, standardization, and formal training is inconsistent with the goal of increasing the safety and efficiency of aircraft movement on the aerodrome surface.

a. Recently, increases in traffic and expansion at many aerodromes have created complex runway and taxiway layouts. This additional complexity has made aerodrome surface operations more difficult and potentially more hazardous than they were in the past. To increase safety and efficiency, it is necessary to lessen the exposure to hazards and risks by holding the flight crew's workload to a minimum during taxi operations. This can be accomplished through procedures that require the flight crew to be prepared to devote their attention to only essential tasks while the aircraft is in motion. This requires the development and formalized teaching of safe operating procedures during taxi operations.

b. In developing procedures, it is important to consider existing flight crewmember workload prior to take off and before landing. Considerations should be given to some tasks that make up the normal workload of flight crews, such as accomplishing checklists, configuring the aircraft for takeoff and landing, programming Flight Management Systems and managing communications with the operator and Air Traffic Control (ATC). The more complex the activities within the cockpit work environment, the greater is the need for explicit and clear standard operating procedures (SOPs). The overall goal is for the operators to develop standardized flight crew procedures that will increase the flight crew's awareness but will not increase their workload while the aircraft is taxiing.

5. FLIGHT CREW PROCEDURES.

a. **General.** The potential for runway incidents and accidents can be reduced through adequate planning, coordination, and communication. The following guidelines are intended to help flight crews cope more effectively with current aerodrome conditions during taxi operations. All flight crewmembers, regardless of whether they are designated as the pilot in command (PIC), second in command (SIC), or the flight engineer (FE), will benefit from this guidance. The guidelines are grouped into six major categories: Planning, Situational Awareness, Use of Written Taxi Instructions, Intra-cockpit Verbal Coordination, ATC/Pilot Communication, and Taxiing.

b. Planning.

(1) Thorough planning for taxi operations is essential for a safe operation. Flight crews should give as much attention to the planning of the aerodrome surface movement portion of the flight as they give to the planning of the other phases of flight. Make planning for taxi operations an integral part of the flight crew's flight planning process. Planning should be done in two main phases. First, anticipate aerodrome surface movements by doing pre-taxi or pre-landing planning based on information on the automatic terminal information service (ATIS) and on previous experience at that aerodrome. Second, once taxi instructions are received, the pre-landing or pre-taxi plans should be reviewed and updated as necessary. It is essential that the updated plan is understood by all flight crewmembers.

CAUTION: A potential pitfall of pre-taxi and pre-landing planning is setting expectations and then receiving different instructions from ATC. Flight crews need to ensure that they follow the clearance or instructions that are actually received, and not the one the flight crew expected to receive.

(2) The following guidance should be used to conduct a briefing of all flight crewmembers.

(a) How familiar are the flight crewmembers with the aerodrome? Has anyone flown out of or into the aerodrome recently? Might there have been changes made at the aerodrome recently? Remember to review the latest Notices to Airmen (NOTAM) for both the departure and arrival aerodromes for information concerning construction and/or taxiway/runway closures.

(b) Take some time and study the aerodrome layout. An aerodrome diagram must be readily available for use by the pilots. Check the expected taxi route against the aerodrome diagram or taxi chart. Pay special attention to any unique or complex intersections along the taxi route. While planning for departure, be sure to consider the likely inbound taxi route at the arrival aerodrome as well. Flight crews should identify critical

times and locations on the taxi route (transitioning through complex intersections, crossing intervening runways, entering and lining up on the runway for takeoff, and approaching and lining up on the runway for landing) where verbal coordination between the PIC and the SIC will be important to ensure correct aircraft navigation and crew orientation.

(c) The flight crew should plan the timing and execution of aircraft checklists and company communications at the appropriate times and locations so the pilot who is not taxiing the aircraft can be available to participate in verbal coordination with the pilot who is taxiing the aircraft. This action is needed to confirm compliance with ATC taxi instructions at the appropriate times and locations. When planning these tasks, flight crews should also consider the anticipated duration of the taxi operation, the locations of complex intersections and runway crossings, and the visibility along the taxi route. If at all possible, during low visibility operations flight crews should only conduct pre-departure checklists when the aircraft is stopped.

c. Situational Awareness.

(1) When conducting taxi operations, flight crews need to be aware of their situation as it relates to other aircraft operations going on around them as well as to other vehicles moving on the aerodrome. The flight crew should know the aircraft's precise location on the aerodrome. Sometimes, this is a challenge, especially when flight crews are at an unfamiliar aerodrome, the aerodrome layout and taxi routes are complex, or the visibility is poor. It is important for the flight crew to understand and follow ATC instructions and clearances, to have and use an aerodrome diagram, and to know and use all of the visual aids available at the aerodrome, such as the signs, markings, and lighting, when taxiing on the aerodrome.

(2) Flight crews should use a "continuous loop" process for actively monitoring and updating their progress and location during taxi. This includes knowing the aircraft's present location and mentally calculating the next location on the route that will require increased attention. For example, a turn onto another taxiway, an intersecting runway, or any other transition points. As the "continuous loop" is updated, flight crewmembers should verbally share relevant information with each other.

(a) Situational awareness is enhanced by monitoring ATC instructions/clearances issued to other aircraft.

(b) Prior to entering or crossing any runway, scan the full length of the runway, including approach areas. Flight crewmembers should verbally confirm scan results with each other and aircraft movement should be stopped if there is any difference or confusion on the part of any flight crewmember about the scan results.

CAUTION: Do not stop on a runway. If possible, taxi off the runway and then initiate communications with ATC to regain orientation.

(c) Be especially vigilant when instructed to taxi into position and hold, particularly at night or during periods of reduced visibility. Do not remain in position and hold on the departure runway for an extended period without direct communication from ATC. If any flight crewmember is uncertain about any ATC instruction or clearance, query ATC immediately. If anyone suspects radio problems and weather conditions permit, attempt to observe the tower for light gun signals.

(d) Use extra caution when directed to use a runway as a taxiway, especially during reduced visibility conditions.

(e) Use the utmost caution after landing on a runway that intersects another runway or on a runway where the exit taxiway will shortly intersect another runway. All flight crewmembers must have a common understanding of ATC's instructions and expectations regarding where the aircraft is to stop and must be able to identify the appropriate hold points. Immediately advise ATC if there is any uncertainty about the ability to comply with any of their instructions.

CAUTIONS: 1. After landing, when you are on an exit taxiway that is between parallel runways, taxi your aircraft clear of the landing runway unless you are constrained by a hold-short line associated with the adjacent parallel runway.

2. Unless otherwise instructed by ATC, taxi clear of the landing runway even if that requires you to cross or enter a taxiway/ramp area.

3. Never enter a runway without specific authorization. When in doubt, contact ATC.

(f) After landing and exiting the runway, nonessential communications and nonessential flight crew actions should not be initiated until clear (on the inbound side) of all runways in accordance with sterile cockpit procedures.

d. Use of Written Taxi Instructions. At many aerodromes, taxi instructions can be very complex, involving numerous turns and transitions, as well as runway crossing and hold short instructions. During these aerodrome surface operations, pilots are very busy with a variety of cockpit duties and responsibilities that compete for their attention. Misunderstanding or forgetting any part of the taxi instructions can lead to an embarrassing or unsafe situation. Writing down taxi instructions, especially complex instructions can reduce a pilot's vulnerability to forgetting part of a complex instruction and can be used to support aerodrome surface operations as follows:

- (1) For use as a reference for reading back the instructions to ATC.
- (2) For crewmember coordination on the assigned runway and taxi route.
- (3) For a short pre-taxi or pre-landing briefing on the pending aerodrome surface operation.
- (4) As a means of reconfirming the taxi route and any restrictions at any time during the aerodrome surface operation.

NOTE: While written taxi instructions are a good operating technique, common sense and flexibility should be used in determining the crew's need for them at a specific aerodrome. For example, if the departure runway is very near the aircraft parking location, or if the crew has used the same taxi route numerous times in the previous days, it may only be necessary to record the

basic elements of the taxi clearance. However, where the taxi instructions are complex or the crew is unfamiliar with the aerodrome layout, a verbatim transcription of all instructions is desirable. Additionally, individual pilots may choose to develop a set of symbols and shorthand notations which allow them to clearly record and later recall key items in the taxi instructions.

e. Intra-flight deck/cockpit Verbal Coordination. It is essential that the flight crew correctly understand and agree on all ATC ground movement instructions. Any misunderstanding or disagreement should be resolved to the satisfaction of all flight crewmembers before taxiing the aircraft. It is the verbal aspect of this coordination that is most significant. It is not enough to assume that all flight crewmembers have heard and understood instructions correctly. A common understanding can be enhanced by one flight crewmember repeating the instructions verbally and getting agreement on the content and intent from the other flight crewmember(s). Any persistent disagreement or uncertainty among crewmembers should be resolved by contacting ATC for clarification. When flight crewmembers verbally confirm their understanding of the instructions, they then have a chance to discover and correct any misunderstandings and thus prevent hazardous situations from developing. This verbal coordination/agreement should be accomplished:

(1) When ATC issues taxi instructions for a departure, the flight crew should refer to the aerodrome diagram, coordinate verbally, and agree on the assigned runway and taxi route, including any instructions to hold short of or cross an intersecting runway.

(2) When ATC issues landing instructions, the flight crew should coordinate verbally and agree on the runway assigned by ATC, as well as any restrictions, such as hold short points of an intersecting runway after landing.

(3) After landing and exiting the runway, the flight crew should coordinate verbally and agree on the ATC taxi instructions to the aircraft's parking area, including any instructions to hold short of or cross an intersecting runway.

(4) At complex intersections, the flight crew should verbally coordinate to be sure that the intersection is correctly identified and that the aircraft is transitioning through the intersection to the correct taxiway.

(5) When approaching an intersecting runway, the flight crew should verbally coordinate in order to identify the runway. They should also verbally review the ATC instructions as to whether they are to hold short of or cross the runway.

(6) Before crossing any runway or entering a runway for takeoff or for landing, both pilots should visually scan to the left and to the right, including the full length of the runway and its approach paths, and coordinate verbally that the scan area is or is not clear.

(7) Before entering a runway for takeoff, the flight crew should verbally coordinate to ensure correct identification of the runway and receipt of the proper ATC clearance to use it. Similar verification should be performed during approach to landing.

(8) When it becomes necessary for a flight crewmember to stop monitoring any ATC frequency, he or she should tell the other flight crewmember(s) when stopping and resuming the monitoring of the ATC frequency. Any instructions or information received or transmitted during that flight crewmember's absence from the ATC frequency should be briefed and reviewed upon his or her return.

(9) When the pilot not taxiing the aircraft focuses his or her attention on instruments in the cockpit, such as entering data into the aircraft's Flight Management System, and, consequently, is not able to visually monitor the aircraft's progress, he or she should verbally notify the pilot taxiing the aircraft. Likewise, notification should be made when that flight crewmember has completed his or her task and is again able to visually monitor the taxi operation.

f. ATC/Flight crew Communication. The primary way the flight crew and ATC communicate is by voice. The safety and efficiency of taxi operations at aerodromes with operating control towers depend on this "communication loop." Controllers use standard phraseology and require readbacks and other responses from the flight crew in order to ensure that clearances and instructions are understood. In order to complete the "communication loop," the controllers must also clearly understand the flight crew's read back and other responses. The flight crew can help enhance the controller's understanding by responding appropriately and using standard phraseology. The approved flight crewmember training programs, and operational manuals provide information for flight crews on standard ATC phraseology and communications requirements. Some of the most important guidelines that contribute to clear and accurate communications are included here.

(1) Maintain a "sterile" cockpit. Flight crewmembers must be able to focus on their duties without being distracted by non-flight related matters, such as eating meals, engaging in non-essential conversation, non-essential PA announcements, or reading material not related to the safe and proper operation of the aircraft.

(2) Use standard ATC phraseology at all times in order to facilitate clear and concise ATC/flight crew communications.

(3) Focus on what ATC is instructing. Do not perform any non-essential tasks while communicating with ATC.

(4) Readback all hold short and runway crossing instructions and clearances, including the runway designator.

NOTE: Air traffic controllers are required to obtain from the pilot a readback of all runway hold short instructions.

(5) Readback all takeoff and landing clearances, including the runway designator.

(6) Clarify any misunderstanding or confusion concerning ATC instructions or clearances to the satisfaction of all flight crewmembers.

g. Taxiing. This paragraph will not discuss speed management, steering, or maneuvering the aircraft, but will suggest some good practices regarding other cockpit activities during taxi.

(1) Prior to taxiing, a copy of the aerodrome diagram should be available for use by the flight crew.

NOTE: A flight crewmember - other than the pilot taxiing the aircraft - should follow the aircraft's progress on the aerodrome diagram to ensure that the instructions received from ATC are being followed by the pilot taxiing the aircraft.

(2) The aircraft's compass or heading display is an excellent tool, as a supplement to visual orientation, for confirming correct taxiway or runway alignment. Refer to it as frequently as necessary, but especially at complex intersections and where the takeoff ends of two runways are close to one another.

(3) Low visibility conditions increase the challenge of safely moving the aircraft on the aerodrome surface. Although visibility is technically designated as "low" when the runway visual range (RVR) falls below 350 meters (1200 feet), visibility along the taxi route may be considerably less than the runway visibility. Use all resources available, including heading indicators, aerodrome signs, markings and lighting, and aerodrome diagrams to the fullest extent possible in order to keep the aircraft on its assigned taxi route.

(4) Anytime the flight crew becomes uncertain as to the aircraft's location on the aerodrome movement area, stop the aircraft and immediately advise ATC. If necessary, request progressive taxi instructions. The flight crew should give ATC any information available about their position, such as signs, markings, and landmarks.

CAUTION: Do not stop on a runway. If possible, taxi off the runway and then initiate communications with ATC to regain orientation.

(5) When cleared to takeoff, or to cross a runway, or when exiting a runway, do so in a timely manner. Inform ATC of any anticipated delay.

(6) After landing, do not exit onto another runway without ATC authorization.

6. USE OF EXTERIOR AIRCRAFT LIGHTS TO MAKE AIRCRAFT MORE CONSPICUOUS.

a. General.

(1) Exterior aircraft lights may be used to make an aircraft operating on the aerodrome surface more conspicuous. Pilots may use various combinations of exterior lights to convey their location and intent to other pilots. Certain exterior lights may also be used in various combinations to signal whether the aircraft is on a taxiway or on a runway, in position on the runway but holding for takeoff clearance, crossing an active runway, or moving down the runway for takeoff.

(2) Because aircraft equipment varies, flight crews are cautioned not to rely solely on the status of an aircraft's lights to determine the intentions of the flight crew of the other aircraft. Additionally, flight crews must remember to comply with operating limitations on the aircraft's lighting systems.

b. Exterior Lights. To the extent possible and consistent with aircraft equipage, operating limitations, and flight crew procedures, illuminate exterior lights as follows:

(1) Engines running. Turn on the **rotating beacon** whenever an engine is running.

(2) Taxiing. Prior to commencing taxi, turn on **navigation, position, anti-collision, and logo lights**. Strobe lights should not be illuminated during taxi if they will adversely affect the vision of other pilots or ground personnel.

(3) Crossing a runway. **All exterior lights** should be illuminated when crossing a runway.

(4) Entering the departure runway for takeoff. When entering a runway to takeoff, or when taxiing into position and holding for takeoff, illuminate **one or more landing lights and all other exterior lights**. Strobe lights should not be illuminated if they will adversely affect the vision of other pilots.

(5) Takeoff. Turn on **all remaining landing lights** when takeoff clearance is received, or when commencing takeoff roll at an aerodrome without an operating control tower.

7. TRAINING

Most air operators provide Line Orientated Flight Training (LOFT) to their Flight Crews. LOFT sessions provide an excellent opportunity for air operators to train on flight deck procedures during aerodrome surface operations. LOFT exercises should include taxi instructions that could be confusing to assess the adherence of Flight Crews to SOPs in general, especially those related to prevention of runway incursions.

8. SUMMARY.

a. Taxi operations require constant vigilance on the part of the entire flight crew. Each flight crewmember needs to be continually aware of the movement and location of other aircraft and ground vehicles. Taxi operations require the same planning, coordination, and proper execution as other phases of flight operations. Sterile cockpit discipline is always appropriate while taxiing, even under normal weather conditions.

b. During low-visibility taxi operations, additional vigilance is absolutely essential. Flight crews must pay particularly close attention to instructions from ATC and must insist on correct read-back and hear-back. Additionally, flight crews should pay close attention to read-back and hear-back between ATC and other aircraft. Any ambiguity or uncertainty should be promptly resolved by clarification with ATC. When clear of an active runway, flight crews should be prepared to stop in position to resolve any questions about position on the aerodrome or clearance from ATC.

c. Safe aircraft operations can be accomplished and incidents eliminated if flight crews are properly trained and correctly accomplish standard taxi operating procedures and practices.

**Director General
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