CAAS
Civil Aviation Authority of Singapore

Advisory Circular

FLIGHT CREW PROCEDURES AND TRAINING DURING TAXI OPERATIONS

GENERAL

Advisory Circulars (ACs) are issued by the Director-General of Civil Aviation (DGCA) from time to time to provide practical guidance or certainty in respect of the statutory requirements for aviation safety. ACs contain information about standards, practices and procedures acceptable to CAAS. An AC may be used, in accordance with section 3C of the Air Navigation Act (Cap. 6) (ANA), to demonstrate compliance with a statutory requirement. The revision number of the AC is indicated in parenthesis in the suffix of the AC number.

PURPOSE

This AC provides to demonstrate compliance with, and information related to, the requirements on the development and implementation of standard operating procedures (SOP) for conducting safe aircraft operations during taxiing.

APPLICABILITY

This AC is applicable to an AOC holder operating an aeroplane in accordance with ANR-121.

RELATED REGULATIONS

This AC relates specifically to Regulation 21 and the Fourth Schedule of ANR-121.

RELATED ADVISORY CIRCULARS

- AC 121-2-1 Guidance on Operational Procedures for ANR-121 Operations
- AC 121-2-3 Standard Operating Procedures for Flight Crew Members

CANCELLATION

This AC supersedes AC AOC-9.

EFFECTIVE DATE

This AC is effective from 1 October 2018.

OTHER REFERENCES

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

1 BACKGROUND

1.1 Historically, 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. Furthermore, training for flight deck procedures during aerodrome surface operations has not been uniform across organizations, and has frequently received inadequate attention. As a result, a variety of procedures and techniques evolved, primarily based on what flight crew members have observed or what was deemed appropriate 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.

1.2 Expansion and increased traffic at many aerodromes have created complex runway and taxiway layouts, making 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, through procedures that require the flight crew to be prepared to devote their attention only to essential tasks while the aircraft is in motion. This requires the development and formalized teaching of safe operating procedures during taxi operations.

1.3 In developing procedures, it is important to consider existing flight crew member workload prior to takeoff and before landing. Considerations should be given to the tasks that make up the normal workload of flight crew, such as accomplishing checklists, configuring the aircraft for takeoff and landing, programming Flight Management Systems and managing communications with the AOC holder and Air Traffic Control (ATC). The more complex the activities within the cockpit work environment, the greater the need for explicit and clear standard operating procedures (SOPs). The overall goal is for the AOC holder to develop standardized flight crew procedures that will increase flight crew awareness without increasing their workload while the aircraft is taxiing.

2 FLIGHT CREW PROCEDURES

2.1 General

2.1.1 The potential for runway incidents and accidents can be reduced through adequate planning, coordination, and communication. The following guidelines are intended to help flight crew cope more effectively with busy and complex aerodrome conditions during taxi operations. All flight crew members, 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. These guidelines are grouped into six major categories: Planning, Situational Awareness, Use of Written Taxi Instructions, Intra-cockpit Verbal Coordination, ATC/Pilot Communication, and Taxiing.

2.2 Planning

2.2.1 Thorough planning of taxi operations is essential for a safe operation. As much attention as possible should be given to the planning of the aerodrome surface movement portion of the flight as to other phases of flight. The planning of taxi operations should be integrated into the flight crew's flight planning process. Planning should be done in two main phases. Firstly, aerodrome surface movements are anticipated by doing pre-taxi or pre-landing planning using information on Automatic Terminal Information Service (ATIS) and on past experience at that aerodrome.

Secondly, once taxi instructions are received, 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 crew members.

CAUTION: Avoid 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 ones the flight crew had expected to receive.

2.2.2 The following guidance should be used to conduct a briefing for all flight crew members.

(a) How familiar are the flight crew members 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 is 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 to appropriate times and locations, so that the pilot who is not taxiing the aircraft is available to participate in verbal coordination with the pilot taxiing. This action is needed to confirm compliance with ATC taxi instructions. Flight crew members 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. During low visibility operations, when possible, flight crews should only conduct pre-departure checklists when the aircraft is stopped.

2.3 Situational Awareness

2.3.1 When conducting taxi operations, flight crew members need to be aware of their situation as it relates to other aircraft operations occurring in the vicinity as well as to other vehicles moving at the aerodrome. The flight crew must know the aircraft's precise location on the aerodrome at all times. This could pose as a challenge at times, especially when at an unfamiliar aerodrome, or when the aerodrome layout and taxi routes are complex, or during poor visibility. The flight crew must understand and follow ATC instructions and clearances. They are required to use an aerodrome diagram and possess the knowledge to use all of the visual aids available at the aerodrome, such as the signs, markings, and lighting, when taxiing on the aerodrome.

2.3.2 Flight crew members should employ a "continuous loop" process to actively monitor and update their progress and location during taxiing. This includes knowing the aircraft's present location and mentally calculating the next location along 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 crew members should verbally share relevant information with one another.

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

(b)   Prior to entering or crossing any runway, scan the full length of the runway, including approach areas. Flight crew members should verbally confirm scan results with one another and aircraft movement should be stopped if there is any discrepancy or confusion on 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 wait", particularly at night or during periods of reduced visibility. Do not remain in position on an active runway for an extended period without direct communication from ATC. Any uncertainty about ATC instructions, clearances, or aircraft present position demands an immediate ATC query. If communications problems are suspected, attempt to observe the tower for light gun signals.

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

(e)   Practise 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 crew members 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.

       CAUTION:

     (i)   After landing, when on an exit taxiway that is between parallel runways, taxi the aircraft clear of the landing runway unless constrained by a hold-short line associated with the adjacent parallel runway.

     (ii)   After landing, taxi clear of the landing runway (unless otherwise instructed by ATC) even if that requires you to cross or enter a taxiway/ramp area. Once clear of the runway, ensure that onward clearance is obtained prior to continuing the taxi. Often multiple frequency and control changes are required.

     (iii)   Never enter a runway without specific authorization. When in doubt, contact ATC.

     (iv)   All ground operations with the aircraft moving should be considered as part of a sterile cockpit concept. Avoid unnecessary distractions.

2.4   Use of Written Taxi Instructions

2.4.1   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. Familiarity, or easily understood clearances can be annotated in short format. Conversely, unfamiliar or complex instructions demand a verbatim

transcription. Pilots may choose to develop a set of symbols and shorthand notations, or utilize the scratch pad to clearly record and later recall key items in the taxi instructions.

2.4.2   Writing down taxi instructions reduces a pilot's vulnerability to forgetting part of a complex instruction and can be used to support aerodrome surface operations as follows:

(a)   As a reference for reading back the instructions to ATC.

(b)   For crew member coordination on the assigned runway and taxi route.

(c)   For pre-taxi or pre-landing briefing on the pending aerodrome surface operation.

(d)   As a means of reconfirming the taxi route and any restrictions at any time during the aerodrome surface operation.

2.5   Flight Deck/cockpit Verbal Coordination

2.5.1   It is essential that the flight crew correctly understand and agree on all ATC ground movement instructions. Instructions should be verbally confirmed with other crew members and disagreements ought to be resolved before taxiing the aircraft. If necessary, contact ATC for further clarification. A verbal confirmation offers the opportunity to discover and correct any misunderstandings and thus prevents hazardous situations from developing. This verbal coordination/agreement should be accomplished in the following situations:

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

(b)   When ATC issues landing instructions, the flight crew should agree on the runway assigned by ATC, as well as any restrictions after landing. The intended exit point and their intentions thereafter should then be agreed upon. Lastly, the crew should reconfirm verbally any changes necessary during the landing roll.

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

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

(e)   When approaching an intersecting runway, the flight crew must verbally coordinate in order to identify the runway, confirm ATC instructions as to whether they are to hold short of or cross the runway, and to use appropriate visual aids before crossing.

(f)   Before crossing or entering a runway for takeoff or 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 if the scanned area is clear of obstacles.

(g)   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. A similar verification should be performed during approach to landing.

(h)   When it becomes necessary for a flight crew member to stop monitoring any ATC frequency, the other flight crew member(s) must be informed. Any instructions or information received or transmitted during that flight crew member's absence from the ATC frequency should be briefed and reviewed upon his or her return. ATC clearances, or complex instructions may require requesting a delay from ATC to allow the return of the absent crew member.

(i)   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 unable 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 crew member has completed his or her task and is again able to visually monitor the taxi operation.

2.6   ATC/Flight Crew Communication

2.6.1   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 read-backs and other responses from the flight crew in order to ensure that clearances and instructions are correctly 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 should help enhance the controller's understanding by responding appropriately and using standard phraseology. The approved flight crew member training programmes, 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.

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

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

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

(d)   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 read-back of all runway hold short instructions.

(e)   Read back all takeoff and landing clearances, including the runway designator.

(f)   Clarify any misunderstanding or confusion concerning ATC instructions or clearances for acceptance from all flight crew members.

2.7   Taxiing

This paragraph will not discuss speed management, steering, or manoeuvring of the aircraft, but will suggest some good practices regarding other cockpit activities during taxiing.

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

Note: A flight crew member - 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.

2.7.2   Tools such as GPS map position; heading, etc. are excellent supplements to aid situational awareness. Newer technologies, such as EFB displays, will provide further advances, but taxiing an aircraft remains one area in which outside references are paramount. The taxiing pilot should limit the need to refer to aerodrome charts while the aircraft is moving. Instead, allow the other pilot to guide the taxi pilot with reference to the chart, or through supplementary means but, if any doubt arises be prepared to stop the aircraft.

2.7.3   Low visibility conditions increase the challenge of safely moving the aircraft on the aerodrome surface. Visibility along the taxi route may vary considerably from reported runway conditions. Use all resources available, including instruments, aerodrome signs, markings and lighting, and aerodrome diagrams to keep the aircraft on its assigned taxi route.

2.7.4   At any time when the flight crew is uncertain of 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.

2.7.5   When cleared for takeoff, landing or ground movements, follow instructions in a timely fashion. Inform ATC of any anticipated delay.

2.7.6   After landing, do not exit onto another runway without ATC authorization.

3   USE OF EXTERIOR AIRCRAFT LIGHTS TO MAKE AIRCRAFT MORE CONSPICUOUS

3.1   General

3.1.1   Exterior aircraft lights should 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.

3.1.2 Because aircraft equipment varies, flight crew members 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 aircrafts. Additionally, flight crew members must remember to comply with operating limitations of the aircraft's lighting systems.

3.2 Exterior Lights

3.2.1 Consistent with flight crew procedures, and taking due account of their adverse effect on other traffic, illuminate exterior lights as follows:

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

(b) *Taxiing.* Prior to commencing taxi, turn on navigation, position, anti-collision, and logo lights. Taxi lights should be used for aircrafts in motion. Strobe lights should not be illuminated during taxi, except when crossing a runway.

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

(d) *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.

(e) *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.

4 TRAINING

4.1 Line Orientated Flight Training (LOFT) sessions provide an excellent opportunity for the AOC holder 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.

5 SUMMARY

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

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