



U.S. Department
of Transportation

**Federal Aviation
Administration**

Advisory Circular

**Subject: PART 91 AND PART 135
SINGLE-PILOT PROCEDURES
DURING TAXI OPERATIONS**

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Change:

1. PURPOSE. This Advisory Circular (AC) provides guidelines for the development and implementation of standard operating procedures (SOP) for conducting safe aircraft operations during taxiing. It is intended for use by persons operating aircraft single pilot under parts 91 and 135 of Title 14 of the Code of Federal Regulations (14 CFR). The Federal Aviation Administration (FAA) recommends that these guidelines become an integral part of all SOPs, flight operations manuals, and formal flight training programs.

NOTE: Pilots operating aircraft with two or more pilots on the flight deck under 14 CFR parts 91, 121, 125, or 135, refer to the current version of AC 120-74, Parts 91, 121, 125, and 135 Flightcrew Procedures During Taxi Operations.

A vertical bar in the left margin identifies revised, added, or deleted text from AC 91-73.

2. CANCELLATION. AC 91-73, Part 91 Pilot and Flightcrew Procedures During Taxi Operations and Part 135 Single-Pilot Operations, dated June 18, 2001, is canceled.

3. FOCUS. This guidance focuses on the activities occurring on the flight deck/cockpit (e.g., planning, communicating, coordinating), as opposed to the actual control of the aircraft (e.g., climbing, descending, maneuvering). Although there are many similarities, taxi operations for single-piloted aircraft – as opposed to taxi operations for aircraft that require more than one pilot – present distinct challenges and requirements. These distinct challenges are elaborated, when necessary, throughout the guidance. A section is provided concerning operations at airports without operating control towers. Finally, a section is devoted to the use of exterior aircraft lights in making an aircraft more conspicuous to all other persons directly involved in airport flight and ground operations.

4. RELATED READING MATERIAL. The following documents and Web sites contain useful information regarding runway safety. FAA ACs can be found online by choosing “Advisory Circulars” on the menu at: <http://www.airweb.faa.gov/rgl>.

- a. Aeronautical Information Manual (AIM).
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b. AC 90-42, Traffic Advisory Practices at Airports Without Operating Control Towers, current version.

c. AC 90-66, Recommended Standard Traffic Patterns and Practices for Aeronautical Operations at Airports Without Operating Control Towers, current version.

d. FAA Runway Safety Program: <http://www.faarsp.org/>

e. NASA Aviation Safety Reporting System (ASRS): <http://asrs.arc.nasa.gov/>

f. FAA Aviation News: <http://www2.faa.gov/index.cfm/apa/>

g. Aircraft Owners and Pilots Association (AOPA): http://www.aopa.org/asf/runway_safety/

5. BACKGROUND. The process of getting to and from a runway has become increasingly complex. This is mainly due to the increase in number of aircraft, takeoff times being held more closely to a set schedule, and all the varied combinations of weather, time of day, aircraft type, and language usage, to name a few. While pilot experience is gained during actual ground operations, a more defined and determined approach to training pilots is seen as beneficial to both the safety and efficiency regarding operations to and from the runway. Training procedures for airport surface operations should be seen as an integral part of an operator's overall ground and flight training programs. This AC develops practical guidance toward the goal of increasing safety and efficiency of aircraft movement on the airport surface.

a. Increased traffic and expansion at many airports create complex runway and taxiway layouts. This additional complexity makes airport surface operations more difficult and potentially more hazardous than in the past. To increase safety and efficiency, it is necessary to lessen the exposure to hazards and risks by holding the pilot's workload to a minimum during taxi operations. This can be accomplished through SOPs that direct the attention of the pilot to essential tasks while the aircraft is in motion. The development and formalized training of safe operating procedures during taxi operations should be implemented by each operator.

b. In developing these SOPs, it is important to consider pilot workload prior to takeoff and before landing. Considerations should be given to tasks that make up the normal workload of pilots, such as accomplishing checklists, configuring the aircraft for takeoff and landing, programming Flight Management Systems (FMS), and managing communications with Air Traffic Control (ATC). The more complex the activities within the flightdeck work environment, the greater the need for explicit, yet simple, and clear SOPs. The overall goal is for operators to develop standardized pilot procedures that will increase the pilot's awareness but will not increase his/her workload while taxiing the aircraft.

6. USE OF SOPs. The use of SOPs should be:

a. Emphasized during the certification and proficiency training of all pilots;

b. Emphasized and used during all phases of flight, including ground operations; and,

c. Evaluated during the flight review of all certificated pilots (refer to part 61, § 61.56).

7. APPENDICES TO THIS AC. Appendix 1 of this AC contains SOP items and Best Practices that are very similar to SOPs/Best Practices currently in use in the air carrier segment of the industry, and has been modified for single-pilot operations. Appendix 2 contains an SOP Template for Ground Operations and the Prevention of Runway Incursions, and Appendix 3 contains "Sample Procedures for Taxi -- Departure and Arrival." These appendices are not directive or prescriptive in nature and do not represent a rigid FAA view of best practices. SOPs may vary among aircraft and operators and may change over time. Operators and individuals may use the information contained in the appendices to integrate the basic tenets into their aircraft-specific, route-specific, and equipment-specific operations and checklists. They are shown to denote how the SOPs and best practices can be integrated into the context of specific flight operations.

8. SINGLE-PILOT 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 pilots cope more effectively with current airport conditions during taxi operations. All pilots will benefit from this guidance, which is grouped into five major categories: Planning, Situational Awareness, Use of Written Taxi Instructions, ATC/Pilot Communication, and Taxiing.

b. Planning.

(1) Thorough planning for taxi operations is essential for a safe operation. Pilots should plan for the airport surface movement portion of the flight just as they plan for the other phases of flight. Planning for taxi operations should be an integral part of the pilot's flight planning process and should be completed in two main phases:

(a) First, pilots should anticipate airport surface movements by conducting pre-taxi or pre-landing planning based on information on the automatic terminal information service (ATIS), on previous experience at that airport, and review of the airport diagram.

(b) Second, once taxi instructions are received, the pre-taxi plans should be reviewed and updated as necessary.

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

(2) The following guidance should be used by pilots as a self-check:

(a) How familiar are you with the airport? Have you flown out of or into the airport recently? Have there been changes made at the airport recently? Remember to review the latest

Notices to Airmen (NOTAM) for both the departure and arrival airports for information concerning construction and/or taxiway/runway closures.

(b) Pilots should take some time and study the airport layout. An airport diagram should be readily available for use by the pilot (see following NOTE on Use Of Airport Diagrams). Pre-taxi plans should focus on the departure airport, and pre-landing plans should focus on the arrival airport. The expected taxi route should be checked against the airport diagram or taxi chart, and special attention paid to any unique or complex intersections along the taxi route. Pilots should identify critical times and locations on the taxi route (e.g., 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).

NOTE: Use of Airport Diagrams

Under parts 121, 125, and 135, there are explicit requirements for either the use or availability of “Aeronautical Charts.” A type of “Aeronautical Chart” as defined in the AIM is an “Airport Diagram.” Parts 125 and 135 [§§ 125.215 and 135.83] require “pertinent aeronautical charts” to be accessible to the pilot at the pilot station, and to be used by the pilots. Part 121, §121.549 requires “Aeronautical Charts” to be available on the aircraft; however, many operators require “Airport Diagrams” to be available for use by pilots.

While there may be many views regarding the use of “Airport Diagrams” during taxi operations, the FAA believes that following the aircraft’s progress on the airport diagram to be sure that the instructions received from ATC are being followed is one of the key procedures in reducing runway incursions. This procedure is of particular importance at a time when it is easy to allow oneself to be distracted by outside events. Finally, from a safety argument, the use of “Airport Diagrams” during taxi operations makes perfect sense and should be the SOP for all pilots.

(c) Pilots should plan the timing and execution of aircraft checklists and company communications at the appropriate times. When planning these tasks, they 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 possible during low visibility operations, pilots should conduct pre-departure checklists only when the aircraft is stopped or while taxiing straight ahead on a taxiway without complex intersections.

c. Situational Awareness.

(1) When conducting taxi operations, pilots 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 airport. The pilot should know the aircraft’s precise location on the airport. Sometimes, this is a challenge, especially at an unfamiliar airport, if the airport layout and taxi routes are complex, or the visibility is poor. It is important for the pilot to:

- (a) Understand and follow ATC instructions and clearances;
- (b) Have an airport diagram available for use; and

I (c) Know and use all of the visual aids available at the airport, such as the signs, markings, and lighting.

(2) Pilots 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 (e.g., a turn onto another taxiway, an intersecting runway, or any other transition points). **All available resources should be used (heading indicators, airport diagrams, airport signs, markings, lighting, and air traffic control – ground and/or tower) to keep the aircraft on its assigned taxi route.**

(a) Situational awareness is enhanced by monitoring ATC instructions/clearances issued to other aircraft. Pilots should be especially vigilant if another aircraft is on frequency that has a similar call sign. Care should be taken to not inadvertently execute a clearance/instruction for another aircraft.

(b) Prior to entering or crossing any runway, pilots should scan the full length of the runway and scan for aircraft on final approach or landing roll out. If there is any confusion about the scan results, the pilot should stop taxiing the aircraft.

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

(c) Pilots should be especially vigilant when instructed to taxi into “position and hold,” particularly at night or during periods of reduced visibility. They should scan the full length of the runway and scan for aircraft on final approach or landing roll out when taxiing onto a runway either at the end of the runway or at an intersection. **ATC should be contacted anytime there is a concern about a potential conflict.**

1 In instances where the pilot has been instructed to taxi into “position and hold” and has been advised of a reason/condition (wake turbulence, traffic on an intersecting runway, etc.) or the reason/condition is clearly visible (another aircraft that has landed on or is taking off on the same runway), and the reason/condition is satisfied, the pilot should expect an imminent takeoff clearance, unless advised of a delay.

2 If landing traffic is a factor, the tower is required to inform pilots of the closest traffic that is cleared to land, touch-and-go, stop-and-go, or unrestricted low approach on the same runway when clearing them to taxi into “position and hold.” Pilots should take care to note the position of that traffic and be especially aware of the elapsed time from the “position and hold” clearance while waiting for the takeoff clearance.

3 ATC should advise pilots of any delay in receiving their takeoff clearance (e.g., “expect delay for wake turbulence”) while holding in position. If a takeoff clearance is not received within a reasonable time after clearance to “position and hold,” ATC should be contacted. Suggested phraseology: (*call sign*) *holding in position (runway designator or intersection)*. For example, “*American 234 holding in position runway 24L,*” or “*American 234 holding in position runway 24L at Bravo.*”

NOTE: FAA analysis of accidents and incidents involving aircraft holding in position indicate that TWO MINUTES or more elapsed between the time the instruction was issued to “position and hold” and the resulting event (e.g., landover or go-around). Pilots should consider the length of time that they have been holding in position whenever they HAVE NOT been advised of any expected delay to determine when it is appropriate to query the controller.

(d) Pilots should use extra caution when directed to taxi on a runway during reduced visibility conditions.

(e) Pilots should 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. Pilots 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. ATC should be advised immediately if there is any uncertainty about the ability to comply with any of their instructions.

CAUTIONS:

- 1. After landing, when you are on a 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.**
- 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. At an airport with an operating air traffic control tower, never enter a runway without specific authorization. When in doubt, contact ATC.**
- 4. At a non-towered airport or at an airport where the control tower is closed, listen on the appropriate frequency (Common Traffic Advisory Frequency (CTAF)) for inbound aircraft information and scan the full length of the runway, including the final approach and departure paths, before entering or crossing the runway. Remember that not all aircraft are radio-equipped.**

(f) After landing and exiting the runway, nonessential communications and nonessential pilot actions should not be initiated until clear (on the inbound [terminal] side) of all runways.

d. Use of Written Taxi Instructions. At many airports, taxi instructions can be very complex, involving numerous turns and transitions, as well as runway crossing and hold short instructions. During complex airport 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 airport surface operations:

(1) For use as a reference for reading back the instructions to ATC; and

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

NOTE: While written taxi instructions are a good operating technique, common sense and flexibility should be used in determining the need for them at a specific airport. For example, if the departure runway is very near the aircraft parking location, or if the taxi route has been used numerous times in the previous days, it may only be necessary to record the basic elements of the taxi clearance. However, when the taxi instructions are complex or the pilot is unfamiliar with the airport layout, a detailed 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. ATC/Pilot Communication. The primary way the pilot and ATC communicate is by voice. The safety and efficiency of taxi operations at airports with operating control towers depend on this "communication loop." Controllers use standard phraseology and require readbacks and other responses from the pilot in order to verify that clearances and instructions are understood. In order to complete the "communication loop," the controllers must also clearly understand the pilot's readback and other responses. Pilots can help enhance the controller's understanding by responding appropriately and using standard phraseology. Regulatory requirements, the AIM, approved flight training programs, and operational manuals provide information for pilots on standard ATC phraseology and communications requirements. Some of the most important guidelines that contribute to clear and accurate communications are included here. Pilots should:

(1) Maintain a "sterile" cockpit. Pilots must be able to focus on their duties without being distracted by non-flight related matters unrelated to the safe and proper operation of the aircraft. When operating an aircraft that does not have a door between the flight deck and the passenger compartment, the pilot may need to ask passengers to refrain from unnecessary conversation from the time the pre-taxi preparations begin until the time the aircraft is clear of

the terminal area and at cruising altitude. The same procedure should be followed on arrival, from the time landing preparations begin until the aircraft is safely stopped at the terminal.

(2) State their position whenever making initial contact with any tower or ground controller, regardless of whether they have previously stated their position to a different controller.

(3) Use standard ATC phraseology at all times in order to facilitate clear and concise ATC/pilot communications.

(4) Focus on what ATC is instructing. Pilots should not perform any non-essential tasks while communicating with ATC.

(5) Read back all clearances/instructions to enter a specific runway, hold short of a runway, and taxi into "position and hold," including the runway designator.

(a) Pilots should not merely acknowledge the ATC instructions or clearances to enter a specific runway, hold short of a runway, and taxi into "position and hold" by using their call sign and saying "Roger" or "Wilco." Instead, they should read back the entire instruction or clearance including the runway designator.

(b) Air traffic controllers are required to obtain from the pilot a readback of all runway hold short instructions.

(6) Actively monitor the assigned tower frequency or the CTAF for potential conflicts involving their runway when holding in position for takeoff and when on final approach.

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

(8) Clarify any misunderstanding or confusion concerning ATC instructions or clearances.

f. 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 airport diagram should be available for use by the pilot.

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

(3) When approaching an entrance to an active runway, pilots should verify compliance with hold short or crossing clearance.

(4) Low visibility conditions increase the challenge of safely moving the aircraft on the airport surface. Although visibility is technically designated as “low” when the runway visual range (RVR) falls below 1,200 feet, visibility along the taxi route may be considerably less than the runway visibility. All resources available should be used, including heading indicators, airport signs, markings and lighting, and airport diagrams to the fullest extent possible in order to keep the aircraft on its assigned taxi route. Pilots should perform heads down tasks (e.g., programming the FMS, calculating takeoff data) while the aircraft is stopped.

(5) Anytime the pilot becomes uncertain as to the aircraft’s location on the airport movement area, stop the aircraft and immediately advise ATC. If necessary, he/she should request progressive taxi instructions. Pilots 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.

(6) When cleared to takeoff, or to cross a runway, or when exiting a runway, the pilot should do so in a timely manner. ATC should be informed of any anticipated delay.

(7) Some cockpit displays of traffic information (CDTI) (such as some implementations of the Traffic Alert and Collision Avoidance System (TCAS)) have the capability and sufficient resolution to enable the display of traffic behind an aircraft. When pilots are holding in position, they should consider displaying traffic landing behind them to increase their awareness of the traffic situation.

(8) When holding in position at night, pilots should consider lining up slightly to the left or right of centerline (approximately 3 feet) to better enable a landing aircraft to visually differentiate the holding aircraft from runway lights.

(9) Last-minute turnoff instructions from the tower should not be accepted unless the pilot clearly understands the instructions and is certain that he/she can comply.

(10) After landing, pilots should not exit onto another runway without ATC authorization.

9. AIRPORT SURFACE OPERATIONS AT NON-TOWERED AIRPORTS AND AIRPORTS WHEN THE TOWER IS CLOSED.

NOTE: For more information about operations at non-towered airports, refer to the current versions of AC 90-42 and AC 90-66. Also, reference Runway Incursion Prevention Best Practices presented in Appendix 1 of this AC.

a. General. The absence of an operating ATC tower creates a need for increased vigilance on the part of pilots operating at those airports. There are also specific communications procedures that differ from those used at towered airports. As is the case at towered airports,

planning, clear communications, and enhanced situational awareness during airport surface operations will reduce the potential for surface incidents at airports without an operating control tower. This section focuses on those aspects of airport surface operations that are unique to airports without an operating control tower and will not be repeated in such detail as the information covered in other sections of this AC. The guidance in the rest of the AC should be followed, but when operating at an airport without an operating control tower, also consider the following:

b. Planning. Along with the guidance in paragraph 8 above, the following should be considered when operating at an airport without an operating control tower. Pilots should:

(1) Familiarize themselves with the local traffic pattern. Pilots should remember that not all airports use a standard traffic pattern and that the pattern altitude should be checked.

CAUTION: During calm or nearly calm wind conditions, be aware that flight operations may occur at more than one runway at the airport. Also, aircraft may be using an instrument approach procedure to runways other than the runway in use for visual flight rules (VFR) operations. The instrument approach runway may intersect the VFR runway. It is also possible that an instrument arrival may be made to the opposite end of the runway from which a takeoff is being made.

(2) Be sure that the taxi plan is understood.

c. Situational Awareness. While maintaining situational awareness is important in all circumstances, it is particularly important when operating at an airport without an operating control tower. To achieve situational awareness, pilots should be fully aware of their intended taxi route and be able to follow the planned route correctly. Without ATC to verbally tell pilots where they should taxi and where and when to stop, they must rely on visual cues to maintain situational awareness and maintain their planned taxi route. These visual cues include airport signs, markings, and lighting, together with the airport diagram. Other things to consider that can help pilots maintain situational awareness while operating at an airport without an operating control tower include:

(1) Monitor the appropriate frequency. Pilots should listen to what the pilots of other aircraft on the frequency are saying.

(2) If possible, pilots should monitor the approach control frequency to alert them to instrumental flight rules (IFR) traffic inbound to the airport.

(3) Prior to crossing the hold short line or entering or crossing any runway, pilots should scan the full length of the runway, including approach areas. **Do not** engage in any other flightdeck/cockpit duties while crossing a runway. Full attention must be given to crossing and clearing the runway.

(4) Pilots should use exterior lighting to make their aircraft more conspicuous to other pilots. Use of exterior lighting is discussed further in paragraph 10 below.

d. Communication and Aeronautical Data. Communication rules and guidelines and aeronautical data for operations at airports without an operating control tower differ from those applicable at towered airports. Various regulations, the AIM, approved pilot training programs, and operational procedure manuals provide information to the pilot on standard phraseology, communication, and data requirements.

(1) **Before Taxi.** Pilots should verify that:

(a) Current aeronautical data for the airport is obtained, including the operating hours and status of the control tower; and

(b) Airport communication facilities or aids are monitored, i.e., CTAF, flight service station (FSS), or Unicom frequency.

(2) **Taxi for Departure.** Pilots should:

(a) Monitor the CTAF, FSS, or Unicom frequency.

NOTE: Pilots of departing aircraft should monitor/communicate on the appropriate frequency from engine start, during taxi, and until 10 miles from the airport unless appropriate regulations, local procedures, or operations specifications require otherwise.

(b) Announce all ground movement operations on the CTAF, FSS, or Unicom frequency.

(3) **Taking the Runway.** Pilots should:

(a) Announce their intention to take the runway prior to taking the runway.

(b) Announce their intention to takeoff on the CTAF, FSS, or Unicom frequency.

(c) Not line up on the departure runway and hold any longer than absolutely necessary.

(d) Always state the name of the airport at the beginning and end of the radio transmission.

CAUTION: Some aircraft operating at airports without operating control towers may not be equipped with a radio. Pilots must remain alert for them.

10. 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 airport 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 adherence to the guidelines in this AC are voluntary and aircraft equipment varies, pilots are cautioned not to rely solely on the status of an aircraft's lights to determine the intentions of the pilot(s) of the other aircraft. Additionally, pilots must remember to comply with operating limitations on the aircraft's lighting systems.

b. Exterior Lights. To the extent possible and consistent with aircraft equipment, operating limitations, and pilot procedures, pilots should 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, if available.** To signal intent to other pilots, consider turning on the taxi light when the aircraft is moving or intending to move on the ground, and turning it off when stopped, yielding, or as a consideration to other pilots or ground personnel. 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.

CAUTION: Pilots should consider any adverse effects to safety that illuminating the forward facing lights will have on the vision of other pilots or ground personnel during runway crossings.

(4) **Entering the Departure Runway for Takeoff.** When entering a runway after being cleared for takeoff, or when taxiing into position and hold, pilots should make their aircraft more conspicuous to aircraft on final behind them and to ATC by turning on lights **(except landing lights)** that highlight the aircraft's silhouette. Strobe lights should not be illuminated if they will adversely affect the vision of other pilots.

NOTE: The SOP of turning on landing lights when takeoff clearance is received is a signal to other pilots, ATC, and ground personnel that the aircraft is moving down the runway for takeoff.

(5) Takeoff. Landing lights should be turned on when takeoff clearance is received, or when commencing takeoff roll at an airport without an operating control tower.

11. SUMMARY.

a. Taxi operations require constant vigilance on the part of pilots. Pilots need 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. Pilots must pay particularly close attention to instructions from ATC and must insist on correct readback and hearback. Additionally, pilots should pay close attention to readback and hearback between ATC and other aircraft. Any ambiguity or uncertainty should be promptly resolved by clarification with ATC. When clear of an active runway, pilots should be prepared to stop in position to resolve any questions about position on the airport or clearance from ATC.

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

/s/ John M. Allen, for
James J. Ballough
Director, Flight Standards Service

APPENDIX 1

Runway Incursion Prevention Introduction

The Philosophy of Using Standard Operating Procedures (SOP) for Runway Incursion Prevention

SOPs provide a structure that helps to decrease the probability of human error and capture errors before they result in a runway incursion. By applying SOPs to surface operations, pilots can reduce the probability of a runway incursion by increasing and maintaining situational awareness. Situational awareness is a continuous process of attentiveness and surveillance.

Situational awareness includes knowing:

- The location of the aircraft
- Weather
- Traffic
- The clearance from Air Traffic Control (ATC)
- All other factors that affect the safety of the flight

The SOPs contained in this document are designed to help pilots use all available resources to detect and correct errors – both their own, pilots of other aircraft, and air traffic controllers – before they result in a runway incursion. Implementation of these SOPs is a low-cost action with a potential for a high return in a reduction of incidents.

Standard Operating Procedures

1. Pilots should give themselves a pre-taxi/departure briefing that includes the expected taxi route and restrictions.
2. After taxi clearance has been received, determine the runway assigned, any restrictions, and the taxi route. If in doubt, seek clarification from ATC.
4. Observe “sterile cockpit,” especially while taxiing.
5. Have the airport diagram out, available, and in use.
6. Fixed navigation lights (red, green, and white) must be on whenever the airplane is in motion.
7. Monitor the appropriate tower frequency when anticipating a clearance to cross or taxi onto an active runway.

8. When approaching an entrance to an active runway, verify compliance with hold short or crossing clearance. Discontinue other tasks (e.g., Flight Management System (FMS) programming, Airborne Communications Addressing and Reporting System (ACARS), company radio calls, etc.).
9. Prior to crossing or taxiing onto any runway visually scan the runway and approach area.
10. Read back all clearances/instructions to enter a specific runway, hold short of a runway, and taxi into “position and hold,” including the runway designator.

NOTE: Do not merely acknowledge the foregoing instructions/clearances by using your call sign and saying “Roger” or “Wilco.” Instead, read back the entire instruction/clearance including the runway designator.

11. When entering a runway after being cleared for takeoff, or when taxiing into position and hold, make your aircraft more conspicuous to aircraft on final behind you and to ATC by turning on lights **(except landing lights)** that highlight your aircraft’s silhouette.
12. Be especially vigilant when instructed to taxi into “position and hold,” particularly at night or during periods of reduced visibility. Scan the full length of the runway and scan for aircraft on final approach when taxiing onto a runway either at the end of the runway or at an intersection. Contact ATC anytime you have a concern about a potential conflict.
 - a. In instances where you have been instructed to taxi into “position and hold” and have been advised of a reason/condition (wake turbulence, traffic on an intersecting runway, etc.) or the reason/condition is clearly visible (another aircraft that has landed on or is taking off on the same runway), and the reason/condition is satisfied, you should expect an imminent takeoff clearance, unless advised of a delay.
 - b. If landing traffic is a factor, the tower is required to inform you of the closest traffic that is cleared to land, touch-and-go, stop-and-go, or unrestricted low approach on the same runway when clearing you to taxi into “position and hold.” Take care to note the position of that traffic and be especially aware of the elapsed time from the “position and hold” clearance while waiting for the takeoff clearance.
 - c. ATC should advise you of any delay in receiving your takeoff clearance (e.g., “expect delay for wake turbulence”) while holding in position. If a takeoff clearance is not received within a reasonable time after clearance to “position and hold,” contact ATC. Suggested phraseology: *(call sign) holding in position (runway designator or intersection)*. For example, **“American 234 holding in position runway 24L”** or **“American 234 holding in position runway 24L at Bravo.”**

NOTE: FAA analysis of accidents and incidents involving aircraft holding in position indicate that TWO MINUTES or more elapsed between the time the instruction was issued to “position and hold” and the resulting event (e.g., landover or go-around). Pilots should consider the length of time that they

have been holding in position whenever they HAVE NOT been advised of any expected delay to determine when it's appropriate to query the controller.

13. To signal intent to aircraft downfield, **turn on landing lights when cleared for takeoff.**
14. As part of your approach checklist, review the airport diagram and anticipated taxi route.

CAUTION

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

Recommended Practices and Techniques

1. State your position whenever making initial contact with any tower or ground controller, regardless of whether you have previously stated your position to a different controller.
2. Write down non-standard or complex taxi instructions.
3. To signal intent to other pilots, consider turning on the taxi light when the aircraft is moving or intending to move on the ground, and turning it off when stopped, yielding, or as a consideration to other pilots or ground personnel.
4. At night, use edge lights to distinguish between taxiways (blue) and runways (white).
5. Minimize “heads-down” activities, such as entering data into the FMS, while the aircraft is moving.
6. When visually scanning the runway and approach area, mentally confirm scan results (e.g., “clear right,” “clear left”).
7. When holding in position for takeoff, actively monitor the assigned tower frequency or the Common Traffic Advisory Frequency (CTAF) for potential conflicts involving your runway.
8. If unsure of position and on a runway, immediately clear the runway and notify ATC. Always notify ATC if you are unsure of your position; consider requesting “progressive taxi.”
9. When taxi visibility is low, pilots should perform heads down tasks (e.g., programming the FMS, calculating takeoff data) while the aircraft is stopped.
10. To confirm proper runway or taxiway selection, verify that the compass heading approximately matches the runway heading and taxiway orientation.

11. Some cockpit displays of traffic information (such as some implementations of Traffic Alert and Collision Avoidance System (TCAS)) have the capability and sufficient resolution to enable the display of traffic behind you. When holding in position, consider displaying traffic landing behind you to increase your awareness of the traffic situation.
12. When holding in position at night, consider lining up slightly to the left or right of centerline (approximately 3 feet) to better enable a landing aircraft to visually differentiate the holding aircraft from runway lights.
13. When on final approach, actively monitor the assigned tower frequency (or CTAF) for potential conflicts involving your runway.
14. Do not accept last minute turnoff instructions from the tower unless you clearly understand the instructions and are certain that you can comply.

APPENDIX 2

Standard Operating Procedures (SOP) Template for Ground Operations and the Prevention of Runway Incursions

A manual or section of a manual that serves as the pilot's guide to SOPs may double as a training guide. The contents should be clear and comprehensive. This template includes topics that industry and the Federal Aviation Administration (FAA) have selected as useful for developing effective SOPs for operations on the ground and on approach with an emphasis in the prevention of runway incursions. It does not include every topic that might apply, such as those that apply to special operating authority or new technology (such as Extended Range Operations with Two-Engine Airplanes (ETOPS), Precision Runway Monitor (PRM), Surface Movement Guidance System (SMGS), and required navigation performance (RNP)).

- Captain's authority
- Use of automation
 - The operator's automation philosophy
 - Specific guidance in selection of appropriate levels of automation
 - Autopilot/flight director mode control inputs
 - Flight Management System (FMS) inputs
- Checklist philosophy
 - Policies and procedures (who calls for, who reads, who does)
 - Format and terminology
 - Type of checklist
 - Challenge-Do-Verify
 - Do-Verify
 - Walk-around
- Checklists
 - Safety check – power on
 - Originating/receiving
 - Before start
 - After start
 - Before takeoff
 - Preliminary landing
 - Landing
 - After landing
 - Parking and securing
 - Emergency procedures
 - Non-normal/abnormal procedures

- Communications
 - Who handles radios
 - Primary language used
 - Air Traffic Control (ATC)
 - On the flightdeck
 - Keeping both pilots in the loop
 - Company radio procedures
 - Flightdeck to cabin signals
 - Passenger briefing
 - Cabin to flightdeck signals
 - Procedure to review/crosscheck clearances
 - Cross or hold short of a runway
 - Taxi into position and hold
 - Takeoff
 - Land

- Briefings
 - Controlled Flight Into Terrain (CFIT) risk consideration
 - Special airport qualifications
 - Special security considerations
 - Temperature considerations
 - Before taxi
 - Before takeoff
 - Descent/approach/missed approach

- Flightdeck access
 - Onground/in-flight
 - Jumpseat
 - Access signals, keys

- Flightdeck discipline
 - Sterile cockpit – in-flight and on the ground
 - Maintaining outside vigilance
 - Transfer of control
 - Additional duties
 - Flight kits
 - Special security equipment
 - Headsets/speakers
 - Boom mikes/handsets
 - Maps/approach charts
 - Meals

- Boarding passengers/cargo
 - Special security considerations
 - Carry-on baggage
 - Exit row seating

- Hazardous materials
- Prisoners/escorted persons
- Guns onboard
- Count/load

- Pushback/powerback

- Taxiing
 - Single engine
 - All engines
 - Contaminated Runways
 - Ice
 - Snow
 - Water
 - Slush
 - Prevention of runway incursions
 - Use of airport diagram
 - Crew confirmation of taxi clearance
 - Visually clear final approach path and the runway before crossing or taking any active runway
 - Complex intersections, airfield construction, and “hot spots”

- Crew Resource Management (CRM)
 - Crew briefings
 - Flight attendants
 - Flightcrew

- Weight and balance/cargo loading
 - Who is responsible for loading cargo, and securing cargo
 - Who prepares the weight and balance data form; who checks it
 - Copy to crew

- Flightdeck/cabin crew coordination
 - Boarding
 - Ready to taxi
 - Cabin emergency
 - Prior to takeoff/landing

- Approach philosophy
 - Precision approaches preferred
 - Stabilized approaches standard
 - Use of navigation aids
 - FMS/autopilot
 - Use, and when to discontinue use
 - Approach gates
 - Limits for stabilized approaches

- Use of radio altimeter
- Briefing for expected runway prior to beginning approach
- Go-arounds:
 - Plan to go around
 - Change plan to land when visual, if stabilized
- Individual approach type
 - All types, including engine-out
- For each approach
 - Profile
 - Flap/gear extension
 - Callouts
 - Procedures
- Go-around/missed approach
 - When stabilized approach gates are missed
 - Procedure
 - Callouts
 - Clean-up profile
- Landing
 - Actions and callouts
 - Configuration for conditions
 - Visual approach
 - Low visibility
 - Contaminated runway
 - Close-in turns
 - Crosswind
 - Rejected
 - Transfer of control after first officer landing
 - Anticipated landing runway and taxiway exit designation and direction of turn to the first hold short point

APPENDIX 3

Sample Procedures for Taxi – Departure and Arrival

**Readback all runway crossing, hold short, and taxi into position and hold instructions.*

Before starting engines -

Airport Diagram.....Review and keep available

Engine start -

Rotating beaconON

Engine start checklist..... Complete

Before taxi -

Taxi clearance Noted/Readback*

Airport Diagram.....Review and keep available

Navigation lights.....ON

Taxi light (night operations)ON

Taxi -

Ground Frequency Monitor

Taxiway intersectionsIf in doubt, verify cleared

Runway crossingsIf in doubt, verify cleared

Before crossing a runway -

Runway surface..... Scan for conflicting traffic

Approach/departure endsScan for approaching traffic

Crossing runway -

ExpediteUntil entire aircraft clear of runway holding position markings

Arrival at active runway -

Hold short of runway holding position markings

Ready for takeoff Advise tower

Entering active runway for takeoff -

Takeoff clearance..... Received and Readback

Runway surface..... Scan for conflicting traffic

Approach/departure endsScan for approaching traffic

Strobes/logo lightsOn

Takeoff..... Light on -- Expedite when cleared

Non-towered airports:

Announce taxi intentions on Common Traffic Advisory Frequency (CTAF)/Unicom

Do a 360-degree scan for inbound and non-radio aircraft before entering runway

In range/descent (10 nautical miles (NM) out and at or below 10,000 for turboprop and jet aircraft) -

Airport Diagram.....Review and keep available
Landing/Strobe/logo lights.....On

Exiting runway -

Taxi instructions/hold shorts..... Noted/Readback*
ExpediteUntil your aircraft is clear of runway holding position markings

Taxi after landing -

Taxi clearanceReceived
Taxiway intersectionsIf in doubt, verify cleared
Runway crossingsIf in doubt, verify cleared

Before crossing a runway -

Runway surface..... Scan for conflicting traffic
Approach/departure endsScan for approaching traffic

Crossing runway -

ExpediteUntil entire aircraft clear of runway holding position markings

Arrival at parking -

Shut-down checklist