Chapter 3
Operating Policies and Procedures

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CAUTION

Bridgewater State College operating policies and procedures are designed to maximize flight safety during solo and dual flight training events: Adherence is mandatory.

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Maintenance and Fuel Servicing Procedures

General
Line service personnel provide services including fueling and oil replenishment. Flight crews can reasonably expect fuel to arrive at their aircraft within ten (10) minutes of the request. *Flight crews are responsible for ensuring that fuel is required and that it is not requested if not needed.* Good judgment, proper pre-flight procedures, and common sense will ensure proper fuel load and an on-time departure.

This section of the manual references National Fire Protection Agency Standard 407, and 14 CFR Part 139.321. Before beginning a fueling operation, the flight crew shall ensure that the aircraft battery master switch and magnetos are in the OFF position. Any source of spark in or near the aircraft or fueler shall be turned off to prevent ignition of fuel vapors generated during the fueling sequence.

WARNING

Fueling operations are NEVER to be conducted with occupants inside the aircraft.

NOTE

The Pilot-In-Command is responsible for ensuring that the aircraft has an adequate supply of fuel, fuel caps have been replaced/secured, and access doors closed before beginning any flight.

Line Maintenance personnel respond to requests for repair or replacement, as appropriate, of any minor aircraft discrepancies. Flight crews can expect a maximum wait time of fifteen (15) minutes when a request is called in.

NOTE

RETURNING flight crews are reminded to properly post-flight the aircraft and immediately inform dispatch of any discrepancies that could delay the next flight. This will allow Dispatch to contact Line MX promptly for possible maintenance action before the next event in that aircraft.

Oil Servicing Procedures

The flight crew is responsible for determining and monitoring the engine oil level at all times. All flight crews shall check the engine oil level prior to any flight or engine start. The oil capacity of the Avco-Lycoming engine Model Number IO-360-L2A engine is 8 quarts, and the engine should not be operated with less than 5 quarts. For extended flights, fill to 7 quarts.

These quantities refer to oil dipstick level readings. The oil filler cap and dipstick are accessible through an access door on the top left side of the engine cowling.

Grade and Viscosity for Temperature Range
The following grades are recommended for the specified temperatures:

Average Ambient OAT	Straight Mineral MIL-L-6082 or SAE J1966	Ashless Dispersant MIL-L-22851 or SAE J1899
ALL TEMPERATURES	NA	SAE 50 OR 20W50
ABOVE 27° C/80°F	60	60
ABOVE 16° C/60°F	50	40 or 50
-1° C/30° F to 32° C/90° F	40	40
-18° C/0° F to 21° C/70° F	30	30, 40, or 20W-40
BELOW -12° **C/10° F**	20	30 or 20W 30
-18° C/0° F to 21° C/70° F	20-W-50	20W-50 or 15W-50
All Temperatures	----	15W-50 or 20W-50

Minimum Altitudes for Training Events

When conducting maneuvers other than those which are ground-based, flight crews shall ensure that at no time the aircraft is operated at an altitude less than 1500' AGL. In the event of an inadvertent loss of control, the additional altitude will allow the flight crew additional time to execute recovery and re-stabilize the aircraft.

NOTE

Flight crews shall be knowledgeable of and adhere to published FAA and BSC altitude limitations when conducting training in practice areas.

Runway Incursion Avoidance

This section of the manual references Advisory Circulars 91-73A *Single Pilot Taxi Operations* and 120-74A *Flight Crew Taxi Operations* and 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 this section makes reference to "flight crews" the procedures and guidelines provided here are applicable to all BSC flight operations. For more detailed information, refer to the ACs noted above.

While the goal of the BSC flight training program is to develop pilot experience gained during actual operations, the FAA recommends and BSC Aviation will follow a more defined and determined approach to training pilots regarding taxi operations. As such, BSC flight crews are provided with training in policies and standard operating procedures (SOPs) as important elements of the overall ground and BSC flight training program.

The intent of SOPs is to direct the attention of BSC flight crews to essential tasks while the aircraft is in motion. Several steps comprise the process by which BSC flight crews can reduce the risk of runway incursions to include:

- **Plan The Route**:
  All BSC flight crews shall plan for movement along the airport surface just as they plan for the various phases of flight.
  - Anticipate taxi routing based on information on the (ATIS), previous experience at that airport, and review of the airport diagram.
  - Where the flight crew is not familiar with the airport layout, time shall be taken to study the airport diagram to increase familiarity.
  - Review NOTAMs for possible changes to taxiway/runway closures
  - Once taxi instructions are received, pre-taxi plans shall be reviewed and updated as necessary.

CAUTION

Flight crews must guard against setting expectations and then receiving different instructions from ATC. Flight crews must follow the clearance or instructions actually received, and not those that they expected.

- **Use of Airport Diagram for Departure and Arrival:**
- All BSC flight crews shall be in possession of a current airport diagram for the airport(s) of departure and arrival, and reference the appropriate diagram for their taxi briefing prior to aircraft movement. Special attention must be paid to any unique or complex intersections along the taxi route.
  - During taxi, flight crews shall reference the airport diagram to ensure that the instructions received from ATC are being followed.

NOTE

All BSC flight crews are required to carry current aeronautical charts during all flight training operations; A type of "*aeronautical chart*" as defined in the AIM is an "*Airport Diagram*."

- **Situational Awareness**
  Flight crews must *always* be aware of their situation relative to other aircraft and vehicle operations. The PIC should know the aircraft's precise location on the airport. At an unfamiliar airport, pilots must take extra care during ground operations.
  - Pilots should use a "continuous loop" process for actively monitoring and updating their progress and location during taxi: Know the aircraft's present location and mentally calculate the next location on the route that will require increased attention.

- Enhance SA 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.
- During low visibility conditions, flight crews should conduct pre-departure checklists only when the aircraft is stopped or while taxiing straight ahead on a taxiway without complex intersections.
- Use all resources available, including directional instruments, airport signs, markings and lighting, and airport diagrams to the fullest extent possible to keep the aircraft on its assigned taxi route.
- Use the compass or heading display as a supplement to visual orientation, or for confirming correct taxiway or runway alignment.
- When approaching an entrance to an active runway, verify compliance with hold short or crossing clearance.

CAUTION

Prior to entering or crossing any runway, BSC flight crews shall scan the full length of the runway for aircraft on final approach, landing roll out, or intersection takeoff. If there is any confusion about the scan results, STOP the aircraft.

CAUTION

DO NOT STOP ON A RUNWAY. If possible, taxi off the runway, and then initiate communications with ATC to regain orientation.

Taxi Into Position and Hold

Pilots must be 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 or landing roll out. Contact ATC at any time there is a concern about a potential conflict.

- If the reason for the TIPH clearance is readily apparent, be prepared for an imminent takeoff clearance.
- If landing traffic is a factor, ATC issuing a TIPH clearance must inform pilots of the closest traffic that is cleared to land, touch-and-go, stop-and-go, or low approach on the same runway. Note the position of the inbound traffic and the elapsed time from the TIPH clearance while waiting for a takeoff clearance.
- ATC should advise of any delay in receiving a takeoff clearance (e.g., "expect delay for wake turbulence") while holding in position. If a flight crew determines that a takeoff clearance is not received within a reasonable time, contact ATC (e.g. Suggested phraseology: (*call sign*) *holding in position* (*runway designator or intersection*). Example: **"760 *Bravo Whiskey holding in position runway 23.*"**

NOTE

FAA accident/incident analysis indicates that TWO MINUTES *or more* elapsed between the time a TPIH instruction was issued and the resulting event (land-over or go-around). Flight crews shall consider the length of time that the aircraft has been holding in position whenever they HAVE NOT been advised of any expected delay to determine when to query ATC.

- **Landing on Intersecting Runways**
  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. ATC must be advised immediately if there is any uncertainty about the ability to comply with any instruction.

CAUTION

At an airport with an operating control tower, never enter a runway without specific authorization. When in doubt, contact ATC.

CAUTION

At any non-controlled airport, listen on the appropriate frequency (CTAF/UNICOM) for inbound aircraft and scan the full length of the runway, including the final approach and departure paths, before entering or crossing. Remember that not all aircraft are radio-equipped.

- 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.

- **Use of Written Taxi Instructions.**
  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 confirm instructions, and reconfirm the taxi route and any restrictions during the taxi operation. Pilots may elect to develop shorthand notations that allow them to clearly record and later recall the taxi instructions.

CAUTION

All BSC flight crews shall write down and confirm all taxi instructions, regardless of the level of complexity, prior to initiating the taxi.

- **ATC/Pilot Communication:** Controllers use standard phraseology and require corresponding standard read-backs and other responses in order to verify that clearances and instructions are understood. BSC flight crews are expected to use proper standard phraseology, speaking clearly and audibly.
  - Maintain a "sterile" cockpit. If necessary, 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. Follow the same procedure on arrival and landing.
  - State aircraft position whenever making initial contact with any controller, regardless of whether the position was previously stated to a different controller.
  - Use standard ATC phraseology at all times.
  - Focus on the instructions – Do NOT perform any non-essential tasks while communicating with ATC.
  - Do NOT accept last-minute turn-off instructions unless the PIC clearly understands the instructions and is certain that he/she can comply.

WARNING

All BSC flight crews shall read back all clearances to enter a specific runway, hold short of a runway, taxi into "position and hold," and all takeoff and landing clearances, including the runway designator.

CAUTION

Anytime the pilot or flight crew becomes uncertain regarding the aircraft's location on the airport movement area, STOP immediately and advise ATC. Request progressive taxi instructions if necessary.

Ground Operations at Non-Towered or Uncontrolled Airports

Flight crews shall exercise increased vigilance at non-towered airports or airports with a closed control tower. The following must be considered when conducting taxi operations at these locations:

- At airports with multiple runways, pilots may choose to utilize these runways regardless of prevailing winds or other traffic considerations.
- Aircraft on IFR flights may conduct approaches to a runway other than the runway in use, and may elect to continue their approach or circle (as appropriate) to the active runway. Approaches may also be conducted to a runway directly opposite the runway in use (e.g. ILS/DME RWY 6 at KPYM with RWY 24 active)
- Ensure that the taxi plan is understood.
- Maintain situational awareness at all times, including the intended taxi route, use of visual cues to maintain the planned route (airport signs, markings, and lighting), monitoring of the appropriate frequency, including (if possible) the approach control frequency to alert them to instrumental flight rules (IFR) traffic inbound to the airport.
- Prior to crossing the hold short line or entering or crossing any runway, flight crews shall scan the full length of the runway, including approach areas. **Do not** engage in any other flight deck/cockpit duties while crossing a runway.
- Announce all ground movement operations and intentions (“taking the active”) on the CTAF, FSS, or UNICOM frequency.

CAUTION

Flight crews shall not line up on the departure runway and hold any longer than absolutely necessary. Once the aircraft crosses the hold short line for takeoff, the PIC shall smoothly and safely expedite the takeoff and continue position reporting, as appropriate.

Touch and Go Operations in Bridgewater State College Aircraft

This section provides flight crews with operational procedures and associated mandatory challenge and response crew call-out procedures for touch-and-go landings in the Cessna 172R. The procedures in this section shall be used at all times during operations in Bridgewater State College aircraft.

CAUTION

Touch and Go operations are PROHIBITED during the first stage of the Private Pilot flight training course. All landings conducted during this stage of training shall be conducted to either a stop and go, or full stop and taxi back.

Transitioning from landing to takeoff in a touch-and-go situation requires the flight crew to adjust flaps, trim, and power prior to rotation. The maneuver is inherently risky because the aircraft is moving at a high ground speed on the runway while the flight crew's attention is divided between aircraft control and the reconfiguration procedure. *Pre-planning is essential to ensure the aircraft has adequate runway to safely perform the maneuver.* Touch-and-go landings are not to be feared, but they must be respected.

Reconfiguration of flaps, trim, and power shall be accomplished using a Challenge/Response (C/R) crew call-out procedure. The following example demonstrates the proper execution of a touch-and-go rollout and takeoff:

FLAPS

Flight crews shall allow the aircraft to slow to an appropriate speed before setting flaps, and will set flaps as follows:

- PF – Calls "SET FLAPS", placing his/her hand in front of flap lever.
- PNF – Responds and Verifies: "FLAPS".
- PF – Calls "FLAPS SET" (as appropriate) and moves the flap lever to the desired position.

TRIM

After flaps have been set to the appropriate takeoff position (if applicable), flight crews will set trim to the takeoff position as follows:

- PF – Calls "TRIM", placing his/her hand at the manual trim wheel.
- PNF – Responds and verifies: "SET TRIM".
- PF – Calls "TRIM SET" and adjusts trim to the takeoff position.

POWER

After setting trim to the takeoff position, flight crews will smoothly adjust throttle to the full forward position as follows:

- PF – Calls "THROTTLE", placing his/her hand behind the throttle control.
- PNF – Responds and verifies: "THROTTLE UP".
- PF – Calls "FULL THROTTLE" and pushes the throttle to the full forward position.

NOTE

During touch-and-go operations, flight crews shall conduct a verification of these items prior to every takeoff.

This procedure is intended to ensure that flight crews function together as a team and maintain situational awareness at all times. Safe operation of the aircraft is always the desired outcome: The previous procedure enhances safety by providing a secondary means (the pilot-not-flying) for identifying possible pilot error or breakdowns in crew resource management.

NOTE

During FAA check rides the pilot applicant should brief the designated pilot examiner regarding the procedures to be used during the flight. Applicants should expect to conduct these procedures as a single pilot and verify their own control positions and movements.

WARNING

**The above listed call-outs are MANDATORY.
Where the PF fails to make the required call-outs, the instructor shall call for an aborted takeoff. The intent is to reinforce the need to work as a crew to verify configuration changes and ensure safety during flight operations.**

WARNING

Stop-and-go operations in the Cessna 172R Skyhawk are permitted on runways with a usable length NOT LESS than 3000'. Operations on runways with less than 3000' usable runway shall be conducted to a full stop - taxi back.

Mid-Air Collision Avoidance

General

This section of the manual is designed to raise awareness and provide procedures that will aid in avoiding a midair collision. *No pilot is invulnerable to an in-flight collision.* The most important guard against such mishaps is knowledge of the limitations of the eye and how to scan effectively for other traffic. Information for this section of the manual is referenced primarily from www.faa.gov under "Midair Collision Avoidance." Most midair collisions occur:

- During weekend daylight hours, in VFR conditions.
- In aircraft engaged in recreational flying.
- At or near uncontrolled airports and at altitudes below 1000' AGL.
- Involved pilots ranging in experience from first solo ride to 20,000-hours.
- Below 3,000' AGL (almost 50% occur below 500' AGL).
- Between aircraft on overtaking or converging flight paths.
- In the traffic pattern, primarily on final approach.

CAUTION

Fully 37% of in-flight collisions occur with a Flight Instructor aboard the aircraft. This is likely due to the CFI assuming the student is performing an adequate scan, and the student assuming the CFI is doing likewise. Scanning on a dual instruction flight must be coordinated and conducted as a crew effort.

Effective Scanning Patterns

AIM 8-1-6(c)(2) refers to the limitations placed on pilot vision by eye physiology. Human visual acuity is affected by numerous factors including:

- Pilot distance from the object.
- Size, shape, and movement of the object.
- Amount of light reflected by the object.
- Object's contrast with the surrounding environment.

Although the human eye can typically capture a visual arc of 200°, unless an object (including another aircraft) is captured within the fovea vision field, it cannot be clearly seen. Visual acuity is best in a central area of about 10 to 15 degrees and decreases steadily toward the periphery of the visual field.

Because the fovea field is relatively small, air traffic detection can be made only by moving the eyes and fixing them on different points in space. Each of these fixes becomes the focal point of a field of vision, a recommended area approximately 10° wide. By fixating on each 10° segment for approximately 1 second, pilots should be able to detect any contrasting or moving object in each area. Scan an area 60° to the left and right, and 10° up and down from the flight path.

NOTE

Focusing is automatic, but changing focus from a nearby object (e.g. instrument panel) to an aircraft one mile away may take two (2) or more seconds.

Develop and use an effective scanning technique. Two basic scan methods have proven effective for most pilots; the "Side to Side" and the "Front to Side" method.

Side-to-side scanning uses normal reading techniques (reading from left to right) and the airplane structure (instrument panel, wing tips) to aid the eyes in focusing from near to far and back again. The scan starts at the far left of the visual area at the wingtip, moves outward toward the horizon, then makes a methodical sweep in 10° areas to the right, across the nose of the aircraft and then to the right horizon, back to the right wingtip, and into the cockpit to review the flight instruments.

Front-to-side scanning begins in the center block of the visual field ahead of the nose of the aircraft, then moves left, focusing each 10° area along the way, and stops when the pilot's visual field reaches the horizon on the left side of the aircraft. The process is then repeated for the right, with the pilot reviewing the instruments as necessary between each scan.

NOTE

A moving target attracts attention and is relatively easy to see. A stationary target or one that is not moving in the aircraft windscreen is very difficult to detect. The FAA indicates that the time to perceive and recognize an aircraft, become aware of a collision potential, and then decide on appropriate action, can vary from as little as (2) to as much as (10) seconds *or more* depending on pilot, type of aircraft, and geometry of the closing situation. Pilots must also consider their *aircraft's* reaction time, as well.

WARNING

If a flight crew elects any evasive maneuver to avoid a collision hazard, the maneuver should be planned (if possible) to maintain visual contact with the other aircraft.

Flight crews are reminded to:

- Make collision avoidance a high priority flight duty.
- Adjust for blind spots caused by aircraft structures (e.g., high vs. low wings, window posts, other pilot's head, etc.). Pilots should always "have their head on a swivel."
- Clean windscreens and side windows during preflight.
- Wear proper eyewear/sunglasses, as appropriate.
- Lower or raise sun visors when appropriate to shade or clear vision.
- Illuminate all available collision avoidance lighting, especially during traffic pattern operations and flight in reduced visibility.
- Monitor communications to maintain situational awareness.
- Keep instructional conversation to a minimum: Cease conversation when other aircraft are reporting on the frequency to determine that aircraft's position relative to your own.
- Maintain an organized cockpit and reduce time spent on flight duties.
- Verify the area is clear before changing the aircraft's flight path or performing a maneuver. When turning in high wing aircraft, raise the inboard wing first, then roll level and check the outboard area, then initiate the turn.
- Use vigilance when operating VFR near a nav-aid. Avoid direct over-flight due to the possibility of other aircraft utilizing the same navigational facility as a fix.
- Make shallow banks to the left and right, if possible, during climbs to clear the area ahead of the nose and to the sides of the aircraft.

Bird/Wildlife Avoidance

Background
This section of the manual references the FAA/USDA Wildlife Strikes To Civil Aircraft in the USA 1990-2007 report (Dolbeer & White, 2008) and associated research.

- Globally, wildlife strikes have resulted in more than 219 fatalities and have destroyed more than 200 aircraft since 1988 (Richardson and West 2000; Thorpe 2003; 2005; Dolbeer, unpublished data).
- The number of strikes annually reported more than quadrupled from 1,759 in 1990 to a record 7,666 in 2007, likely due to several factors: increased awareness of the wildlife strike issue, increase in aircraft operations, increase in populations of hazardous wildlife species, and an increase in the number of strikes (Dolbeer 2000, Dolbeer and Eschenfelder 2003).
- Most bird strikes (51%) occur between July and October; 62% occur during the day; 60% occur during the landing phase (descent, approach, or landing roll); and 37% occur during takeoff and climb.
- Approximately 60% of the bird strikes occurred when the aircraft was at a height of 100' or less AGL, 73% occurred at 500' or less AGL, and 92% occurred at or below 3,000' AGL. Less than 2% occurred above 10,000 feet AGL.
- Gulls (20%), doves/pigeons (14%), raptors (13%), and waterfowl (9%) were the most frequently struck bird groups.
- Wetlands, dredge spoil containment areas, waste-disposal facilities, and wildlife refuges can attract hazardous wildlife.
- Less than 20% of all wildlife strikes involving USA civil aircraft are reported (Cleary et al. 2005, Wright and Dolbeer 2005).

Annual bird strike information is very inaccurate due to the fact that many pilots do not report the incident unless there is damage to the aircraft.

According to Bird Strike Committee USA (2006 Annual Mtg.), a 12-lb Canada goose struck by a150-mph aircraft at lift-off generates the force of a 1,000-lb weight dropped from a height of 10 feet. Although most general aviation aircraft do not take off or land at such speeds, the force generated by a bird strike can be substantial, and result in aircraft damage, passenger injury, or loss of aircraft control.

Bird Avoidance Procedures

- If in doubt about the location of wildlife/birds in close proximity to the runway, DO NOT take off. Ensure the area is clear before initiating the take off roll.

- DO NOT attempt to land through known or reasonably suspected bird traffic. Execute a missed approach or go-around, as appropriate.

- Do not fly beneath flocks of birds. Frightened birds will typically dive, not climb.

- If a bird strike appears imminent, pitch up and attempt to fly above the bird(s).
- Avoid low altitude flight in areas over marshlands, landfills, and lakes.
- Do NOT assume that birds or other wildlife will attempt to avoid a well-lighted aircraft ("deer in the headlights") – turning on available lights to "frighten" wildlife away is NOT an effective strategy for reducing a collision risk. (2006 Annual Mtg, research presentation, Capt. Paul Eschenfelder –Avion Corp.),

General Aviation Controlled Flight Into Terrain (CFIT) Awareness and Avoidance

This section of the manual defines Controlled Flight Into Terrain (CFIT) and highlights the inherent risk that controlled flight into terrain (CFIT) poses for general aviation (GA) pilots, particularly those engaged in flight training operations. The section also includes FAA recommendations for CFIT avoidance, and specific escape procedures to be followed by flight crews to avoid a CFIT situation.

CFIT / Situational Awareness Definitions

Per FAA Advisory Circular 61-134, CFIT is commonly defined as an airworthy aircraft, under the control of a qualified pilot, being flown into terrain (water or obstacles) with inadequate PIC awareness that a collision is imminent.

According to the FAA, GA CFIT accidents account for 17% of all GA fatalities, with over half of the CFIT accidents occurring in IMC. And while a second pilot (e.g. a CFI or student) may make the difference between a safe flight and a CFIT accident, he/she can also distract the PIC unless the crew practices good crew resource management and communication techniques. BSC CFIs and students are encouraged to practice their CRM techniques whenever possible.

CAUTION

BSC operating policies and procedures are designed to maximize flight safety during solo and dual flight training events: Adherence is MANDATORY.

Situational Awareness is the PIC's awareness of what is happening around the aircraft at all times in both the vertical and horizontal plane, including the PIC's ability to project the immediate and upcoming status and position of the aircraft relative to other aircraft and other potential hazards.

Since the Pilot-In-Command is responsible for the safety of the flight crew, passengers, and airplane, he/she must exercise appropriate emergency authority when responding to the situation.

The most important goal for any flight crew is to maintain vertical and horizontal situational awareness in relation to terrain, water, and obstacles.

In accordance with AC 61-134 recommendations, BSC flight crews shall:

- Increase awareness on CFIT accident causal factors, including breakdowns in SRM and CRM.
- Promote a culture of safety within the BSC and larger GA community
- Adhere to BSC policies and procedures for obtaining weather briefings, inspecting equipment, improving single pilot and crew decision-making, and addressing human factors.
- Discuss and eliminate, particularly on solo operations, pressure to complete the flight where continuing may compromise safety.

CFIT Escape Procedure

Although there are common factors that can lead to a CFIT scenario, the primary concern is a loss of situational awareness on the part of the pilot or flight crew. *In any such scenario, the flight crew shall immediately execute the CFIT escape procedure.*

- React immediately if situational awareness is in doubt or has been lost.
- Immediately but smoothly pitch to a V_x climb attitude if possible, V_y if necessary, while simultaneously applying FULL throttle.
- Maintain existing flap configuration unless aircraft performance necessitates a change.
- Continue climbing to the sector safe altitude, or until the flight crew is able to visually verify that the aircraft has cleared any encroaching terrain or obstacle.
- When a safe ground/obstacle clearance exists, reconfigure the aircraft as appropriate for the phase of flight. Notify ATC of any altitude deviations, as appropriate.

Operations in Turbulence

This section of the manual provides guidance on flight in turbulence, and references FAA AC 00-24B. Flight through known turbulence is to be avoided as much as possible. During cruise, areas with known severe turbulence should be circumnavigated. When turbulence or thunderstorms have been reported or observed in the departure or approach area, delay the takeoff or the approach, as necessary. If flight through turbulence is unavoidable, the following procedures are recommended and should be observed, as applicable.

Turbulence Penetration

Before entering an area of known turbulence, secure all loose equipment in the aircraft. All occupants should ensure that their seat belts and shoulder harnesses are fastened and checked for security.

The following procedures are recommended for flight in areas of turbulence:

- **Before Entry**

When possible, advise other pilot/passengers prior to takeoff of anticipated en route turbulence.

- **Airspeed**

The best airspeed and flight configuration to use in severe turbulence is the published maneuvering speed for the aircraft, which affords the best overall protection from inadvertent stall or structural damage. Severe gusts or drafts will cause large and often rapid variations in KIAS. Do not "chase" the airspeed to maintain the recommended speed.

- **Altitude**

Large altitude variations are possible in severe gusts or drafts. Allow altitude to vary by "riding the wave" (provided there is adequate terrain clearance) and try to maintain the desired attitude.

- **Attitude**

Attempt to keep the wings level and maintain desired pitch attitude using the Attitude Indicator. Be prepared for large attitude changes. Avoid sudden large control inputs when making corrections, as this can overstress the airframe.

- **Power**

Adjust the pitch/power to maintain the recommended turbulent air penetration airspeed. Once power is set to maintain the desired airspeed, avoid further power changes. Change the power setting only to prevent extreme airspeed variations.

- **Flaps**

Avoid the use of flaps in an area of known turbulence as long as possible: The airplane can withstand higher gust loads in the clean configuration. Consider a "No-Flap" landing or diverting to an alternate airport if conditions warrant such action.

Turbulence Criteria

The following information is referenced from AIM 7-1-23 regarding turbulence intensity and aircraft reactions. It is provided here to assist BSC flight crews in planning for flying in or around areas of turbulence.

- **LIGHT:** Momentarily causes slight erratic changes in altitude and/or attitude. Turbulence that causes slight, rapid and somewhat rhythmic bumpiness without appreciable changes in altitude or attitude is "Light Chop."
- **MODERATE:** Similar to light turbulence but of greater intensity. Changes in altitude and/or attitude occur but the aircraft remains in positive control at all times. It usually causes variations in indicated airspeed. Conditions causing rapid bumps or jolts without appreciable changes in aircraft altitude or attitude are reported as "Moderate Chop."
- **SEVERE:** Causes large, abrupt changes in altitude and/or attitude, and usually causes large variations in indicated airspeed: The aircraft may be momentarily out of control.
- **EXTREME:** Causes the aircraft to be violently tossed about and is practically impossible to control: May cause structural damage.

Wake Turbulence Avoidance

General
This section of the manual references FAA AC 90-23F Aircraft Wake Turbulence. The vortices from large aircraft pose problems to encountering aircraft, as the wake of the larger aircraft can impose rolling moments that exceed the control authority of the smaller aircraft, with a resultant loss of control.

In the United States, nearly 50 percent of all wake turbulence incidents involved aircraft separated by at least the minimum distance or time that FAA ATC standards require.

Wake Turbulence Facts

- Wingtip vortex strength is governed by weight, speed, and wing shape of the generating aircraft. Vortex characteristics of any given aircraft can also be changed by extension of flaps or other wing configuring devices.
- Vortex strength increases proportionately with increase in aircraft operating weight.
- Most of the energy is within a few feet of the center of each vortex, but pilots should avoid a region within about 100 feet of the vortex core.

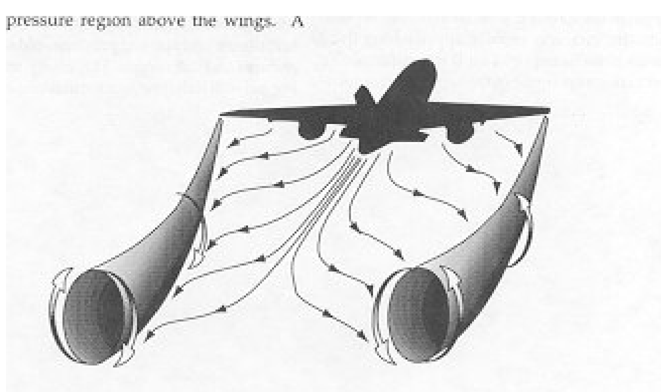

Figure 1-1
AIM 7-1-23

CAUTION

Peak vortex tangential speeds up to almost 300 feet per second have been recorded. The greatest vortex strength occurs when the aircraft is heavy-clean-slow.

- The usual hazard of a wake encounter is associated with induced rolling moments, which exceed the roll control capability of the encountering aircraft. Research demonstrates that counteracting the roll imposed by wake vortex primarily depends on the wingspan and counter-control responsiveness of the encountering aircraft.

- Counter-control is usually effective and induced roll minimal in cases where the wingspan and ailerons of the encountering aircraft extend beyond the rotational flow field of the vortex. Pilots of short wingspan aircraft must be especially alert to vortex encounters.

- Since the vortices are a by-product of wing lift, prior to takeoff or landing, pilots should note the rotation or touchdown point of the preceding aircraft. This will help the pilot visualize the wake location and projected path, and take avoidance precautions.

- Vortices from large aircraft remain spaced a bit less than a wingspan apart drifting with the wind at altitudes greater than a wingspan from the ground.

- Vortices from large and heavy aircraft sink at a rate of several hundred feet per minute, slowing their descent and diminishing in strength with time and distance behind the generating aircraft.

- When the vortices sink close to the ground (within 100 to 200 feet), they tend to move laterally over the ground at a speed of 2 or 3 knots.

- A tailwind can move the vortices of the preceding aircraft forward into the touchdown zone.

- Strong winds help to dissipate vortices faster.

- A crosswind will decrease the lateral movement of the upwind vortex and increase the movement of the downwind vortex. Thus, a light wind with a cross-runway component of 1 to 5 knots (depending on the conditions) could result in the upwind vortex remaining in the touchdown zone for a period of time and hasten the drift of the downwind vortex toward another runway.

CAUTION

The light-quartering tailwind requires maximum caution.

- Engine exhaust velocities, generated by larger jet aircraft during ground operations and initial takeoff roll, dictate the desirability of lighter aircraft awaiting takeoff to hold well back of the runway edge at the taxiway hold line. Also, it is desirable to align the aircraft to face any possible jet engine blast effects.

Vortex Avoidance Procedures
When landing behind an arriving larger aircraft-same runway, stay at or above the larger aircraft's final approach flight path, note the aircraft touchdown point and land beyond it.

NOTE

A large or heavy aircraft stops producing wingtip vortices
when the nose wheel touches down on the runway.

NOTE

For the purposes of Wake Turbulence Separation Minima,
ATC classifies aircraft as Heavy (capable of takeoff weights of more than 255,000 pounds),
Large (maximum certificated takeoff weight of more than 41,000 pounds up to 255,000 pounds),
and Small (41,000 or less).

- When landing behind an arriving larger aircraft-when using a parallel runway that is closer than 2,500 feet, consider possible vortex drift onto your runway. If you have visual contact with the larger aircraft landing on the parallel runway, stay at or above the larger aircraft's flight path and touchdown abeam or beyond its touchdown point.

- When landing behind an arriving larger aircraft-when using a crossing runway, cross above the larger aircraft's flight path.

- When landing behind a departing larger aircraft-same runway, note the larger aircraft's rotation point and land well prior to the rotation point.

- When landing behind a departing larger aircraft-crossing runway, note the larger aircraft's rotation point. If the large aircraft rotates past the intersection, land prior to the intersection. If the large aircraft rotates prior to the intersection, avoid flight below the large aircraft's flight path. Abandon the approach unless a landing is assured well before reaching the intersection.

- When departing behind a departing larger aircraft-same runway, note the larger aircraft's rotation point. Rotate prior to the larger aircraft's rotation point and continue to climb above the larger aircraft's flight path until turning clear of the wake. Avoid subsequent headings that will cross below and behind the aircraft. Be alert for any critical takeoff situation that could lead to a vortex encounter.

- When departing behind a departing larger aircraft-intersection takeoff on the same runway, be alert to adjacent large aircraft operations particularly upwind of your runway. If an intersection takeoff clearance is received, avoid subsequent headings that will cross below a large aircraft's flight path.

NOTE

A three-minute interval will be provided by ATC when a Small aircraft will takeoff from an intersection on the same runway or in the opposite direction on the same runway behind a departing Heavy aircraft.

- Exercise caution when departing or landing after a larger aircraft has executed a low/missed approach or touch and go landing; Vortices settle and move laterally near the ground, creating a potential hazard along the runway and in your flight path.
- During enroute VFR, avoid flight below and behind a larger aircraft's path. If a larger aircraft is observed above on the same track (meeting or overtaking), adjust position laterally, preferably upwind or at least 1000' below.
- A hovering helicopter generates a downwash from its main rotor(s) similar to the "prop wash" of conventional aircraft. However, in forward flight, this energy is transformed into a pair of strong, high-speed trailing vortices similar to wing-tip vortices of a larger fixed-wing aircraft.
- Pilots should avoid helicopter vortices in the same manner as fixed wing aircraft since helicopter forward flight airspeeds are often very low which generate exceptionally strong vortices.

Air Traffic Wake Turbulence Separations

The separation that ATC applies to aircraft operating directly behind a heavy jet at the same altitude or less than 1000' below is as follows:

- Heavy jet behind a heavy jet is 4 miles.
- Small/large aircraft behind a heavy jet is 5 miles.

ATC separation, measured at the time the preceding aircraft is over the landing threshold, is provided to small aircraft as follows:

- Small aircraft landing behind a heavy jet is 6 miles.
- Small aircraft landing behind a large aircraft is 4 miles.

CAUTION

During VFR conditions and when landing behind an arriving large/heavy aircraft, if the pilot reports to ATC that he/she has the "traffic in sight", this is acknowledgement to the controller of pilot's acceptance of responsibility for wake turbulence separation and if traffic permits will issue landing clearance.

During touch and go operations when the pilot reports to ATC that they have the large or heavy category aircraft in sight the pilot will then become responsible for their own wake turbulence separation.

NOTE

Pilots may request a waiver of the 2 or 3 minute interval. This should only by done after careful consideration of the possible wake turbulence effects. Controllers may acknowledge this request as the pilot's acceptance of responsibility for wake turbulence separation and, if traffic permits, issue takeoff clearance.

NOTE

When departing behind an arriving or departing heavy category (including Boeing 757) aircraft, the pilot will not be able to waive the 2 minute hold (full length of runway) or 3 minute hold (from an intersecting or parallel runway with less than 1200' separation). Pilots will be required to hold on the ground until time has expired.

Pilot Legend and Vortex "Bounce"

"There is a small segment of the aviation community that have become convinced that wake vortices may "bounce" up to twice their nominal steady state height (with a 200-foot span aircraft the "bounce" height could reach approximately 200 feet above ground level (AGL)). *This conviction is based on a single unsubstantiated report of an apparent coherent vortical [sic] flow that was seen in the volume scan of a research sensor.* No one can say what conditions cause vortex bouncing, how high they bounce, at what angle they bounce, nor how many times a vortex may bounce. On the other hand, no one can say for certain that vortices never "bounce." Test data have shown that vortices can rise with the air mass in which they are embedded.

Wind shear, particularly, can cause vortex flow field "tilting." Also, ambient thermal lifting and orographic effects (rising terrain or tree lines) can cause a vortex flow field to rise. In view of the foregoing, pilots are reminded that they should be alert at all times for possible wake vortex encounters when conducting approach and landing operations. The pilot has the ultimate responsibility for ensuring appropriate separations and positioning of the aircraft in the terminal area to avoid the wake turbulence created by a preceding aircraft." (Ballough, Dir. Flight Standards Svc., FAA, AC 90-23F, 2/02).

Wind Shear Encounter and Recovery

General
This section of the manual references FAA AC 00-54 Wind Shear Guidance for Pilots, and is intended to provide BSC flight crews with tools to recognize and whenever possible recover from an encounter with wind shear. Wind shear encounters during takeoff may cause a rapid reduction in airspeed, and they require immediate and definitive corrective action.

Terms and Definitions
Wind Shear: Any rapid change in wind direction or velocity
Severe Wind Shear: A rapid change in wind direction or velocity that results in airspeed changes of greater than 15 knots or vertical speed changes of greater than 500 feet per minute.
Increasing Headwind Shear: Wind shear where headwind increase causes an airspeed increase.
Decreasing Headwind Shear: Wind shear where decreasing headwind causes a loss of airspeed.
Increasing Tailwind Shear: Wind shear where a tailwind increase causes a loss in airspeed.
Decreasing Tailwind Shear: Wind shear where a tailwind decrease causes an airspeed increase.

Wind shear recognition is crucial to making a timely recovery decision. The best policy is to avoid areas where wind shear or micro-bursts are likely to develop or occur, such as thunderstorms, virga, or rain showers. Micro-bursts are particularly challenging, because they can occur both in convective areas (e.g. thunderstorms) and in association with even light precipitation.

Recognition of marginal flight path control depends upon the flight crew's assessment of existing conditions. The difficulty is that recognition can be hampered by associated poor weather conditions.

WARNING

Wind shear recognition and recovery must be immediate. FAA research indicates the time available for both recognition and a successful recovery may be less than five (5) seconds.

The recommended recovery procedure should be initiated any time the flight path is threatened below 1,000 feet AGL on takeoff or approach. Indications of marginal flight path control are characterized by single or cumulative uncontrolled changes (positive or negative) in excess of the following values (AC 00-54, p.50):

- 15 knots indicated airspeed.
- 500 feet per minute vertical speed.
- 5 degrees pitch attitude.
- 1 dot displacement of the glide slope.
- 10° variation from nominal heading.
- Unusual power requirements for a significant period of time.

Wind Shear during Takeoff

- Before V_R: Abort the takeoff.
- After V_R with usable runway remaining: Reduce power and land on remaining runway.
- During initial climb:

Pitch: At a normal rate with adjustment as necessary to achieve a V_X target attitude. Smooth and accurate control inputs are required. Control pitch in a smooth and steady manner.

Flight Instruments: The flight crew shall closely and continuously monitor the Attitude Indicator, VSI, and ASI. Use FULL POWER during the initial climb/recovery phase.

Either pilot will call out any deviations from the normal values of airspeed, airspeed trend, rate of climb, pitch, power, and altitude.

The Pilot Not Flying (**PNF**) shall make directive call-outs as appropriate for situational awareness. Clear and concise communication with regard to altitude and airspeed must be communicated (i.e., climbing, descending, accelerating, decelerating).

Configuration: Flight crews should not change the flap, landing gear, or trim position until terrain clearance is assured, unless the aircraft performance is such that the safety of flight is in question and a configuration change is required.

CAUTION

Flight crews must be prepared for multiple encounters due to the possibility of embedded wind shear. Report the encounter to ATC as soon as possible.

Wind Shear during Approach and Landing

Flight Instruments: The PNF will closely and continuously monitor the Attitude Indicator, VSI, ASI, and call out any deviations in the normal indications of approach speed, airspeed trend, rate of descent, pitch, glide slope, and power.

Power and Trim: Avoid large power adjustments or trim changes to correct large speed changes. *Anticipate that a large speed increase is often followed by an equally large airspeed decrease.*

Power Control: Advance to FULL POWER.

Pitch: At a normal rate to achieve a Vx target attitude. Smooth and accurate control inputs are required. Control pitch in a smooth and steady manner.

Flight Instruments: The flight crew shall closely and continuously monitor the Attitude Indicator, VSI, and ASI. The power shall remain at FULL during the recovery procedure.

Either pilot will call out any deviations from the normal values of airspeed, airspeed trend, rate of climb, pitch, power, and altitude.

The PNF will make directive call-outs as appropriate for situational awareness. Clear and concise communication with regard to altitude and airspeed must be communicated (i.e., climbing, descending, accelerating, decelerating).

Configuration: Flight crews should not change the flap, landing gear, or trim position until terrain clearance is assured, unless the aircraft performance is such that the safety of flight is in question and a configuration change is required.

CAUTION

Flight crews must be prepared for multiple encounters due to the possibility of embedded wind shear. Report the encounter to ATC as soon as possible.

Flight Crew Conduct During System Warnings

This section of the manual specifies the mandatory challenge and response call-out procedure for BSC flight crews. This procedure shall be used at all times during operations in Bridgewater State College aircraft.

The following example demonstrates the correct crew coordination procedures for accomplishing required mandatory callouts. Upon recognition of any visual or aural warning system (stall warning horn/light, annunciator light) the PF states the aircraft system associated with the warning. The PNF responds by verifying the aircraft system.

- **PF** – States "Stall Warning Horn".
- **PNF** – Responds and verifies: "Stall Warning Horn".

The flight crew shall elect to:

A. Continue the flight, if the warning is a normal part of the procedure being conducted, or
B. Initiate necessary and appropriate corrective action. If a corrective action is required the flight crew shall use all available resources, as appropriate.

Example:

- **PF** – States: "Stall Warning Horn".
- **PNF** – Responds and verifies: "Stall Warning Horn, Go-Around".
- **PF** – States: "Going Around".

NOTE

While conducting single pilot operations the PF will make all call-outs, and initiate any necessary corrective action.

This procedure is intended to ensure that whenever practical and possible, BSC flight crews function as a well-coordinated team and maintain the situational awareness necessary for safe operation of the aircraft. The procedure has also been designed to enhance safety by providing a secondary means (the pilot not flying) to identify any system irregularities or breakdowns in crew coordination.