C172R Flight Standards Manual

Revision VII
07/13/18

Record of Revision

Version	Date	Comments
VER VI	12/11	
VER VII	7/13/18	Complete reformatting, organization of material, and overhaul of verbiage

List of Effective Pages

Section	Pages	Version	Date
All Sections	All	6	12/11
All Sections	All	7	7/13/18

Cessna 172 Flight Standards Manual

Table of Contents

Chapter 1
Standard Operating Procedure

Table of Contents

Section 1: Introduction

Definitions and Abbreviations

- ≈ - approximately
- AKA – Also Known As
- ASAP –As Soon As Possible
- CFI – BSU Authorized FAA Certificated Flight Instructor (includes CFII and MEI)
- Chair flying (Dry time) – Practicing checklist flows and procedures on the ground in either an aircraft, flight simulation device, or cockpit mock-up. Refer to appropriate training manual(s) regarding restrictions and limitations on use of equipment systems (i.e. Master switch may not be engaged, but flight controls can be moved as needed).
- Checklist – a written reference to verify a procedural flow has been performed correctly and reduce or eliminate procedural errors that result from faulty human memory.
- DA – Decision Altitude
- FAF – Final Approach Fix
- Flow – Execution of checklists and SOPs mainly from memory (with some specific exceptions) where the sequence logically "flows" from one step to the next.
- FPM – Feet per Minute
- IAF – Initial Approach Fix
- IMC –Instrument Meteorological Conditions
- MCA – Minimum Controllable Airspeed
- MDA – Minimum Descent Altitude
- PF – Pilot Flying (pilot manipulating the flight controls)
- PIC – Pilot In Command
- PMF – Pilot Monitoring Flight (pilot actively monitoring the flight but not manipulating the flight controls)
- PUI – Pilot Under Instruction
- SOP – Standard Operating Procedure
- TPA – Traffic Pattern Altitude

Introduction

With very specific exceptions an airplane cannot be operated safely and efficiently by simply reading a checklist. Safe and efficient operations must be conducted at all times, often concurrently and from memory, while minimizing the pilot's "head-down" time in the cockpit and without neglecting any one task.

Standard Operating Procedures (SOP) Concept

SOPs vary in length during execution (i.e. Engine Start or Pre-Landing) and frequency (i.e. the rare occasion when one might perform a Fire In-Flight checklist) and are used throughout this manual.

BSU flight crews are expected to demonstrate knowledge, risk management ability, and skill with SOPs so as to ensure the safe and efficient conduct of all ground and flight operations. Significant time must be spent practicing outside of regularly scheduled training events.

SOPs will have the following properties:

- Capitalized and Italicized: ***ENGINE START PROCEDURE***
- Specific Procedures: Identify steps for a given action and are contained within an outlined box with a gray shaded title.

PROCEDURE NAME
STEP 1..... .....ACTION
STEP 2..... .....ACTION

The "Flow" Procedure Concept

BSU Aviation has adopted the flow concept when conducting various checklists and SOPs. Flow procedures are conducted by pilots prior to review of the checklist. This process and the items from the flow are done by memory and are verified afterward by the PIC executing the checklist. All items contained in the flow can be referenced in Chapter 1, Section 2: Normal Flows and Checklists.

Aircraft Acceptance

- Ensure that the aircraft "can" contains all the necessary paperwork and keys and that the previous Hobbs / Tach times have been filled out.
- Check that no open squawks exist.
- Approaching the aircraft, check that there is no obvious damage.
- It may be advisable to check the fuel quantity and oil level immediately upon arrival to the aircraft, as time could be saved by placing a fuel request right away rather than later in the preflight, and by obtaining oil while inside the building for other tasks.
- If there are any discrepancies, damage or extremely low fuel / oil levels (below required BSU safety minimums), report to Dispatch immediately.

Maintenance Status Check

- Check the Annual Inspection date.
- Check the 100 hr. and the 50 hr. tachometer times.
- Check all avionics, Mode C transponder, altimeter, pitot-static and ELT inspection dates and times.
- Check any applicable Airworthiness Directives.
- Verify that any inspection times, dates and limits have not been / will not be exceeded during the planned flight.
- Check that the GPS database card is present (check inside the can if not installed in the GPS unit).
- Verify VOR check is current if flight will be conducted in IMC.
- Verify all necessary documents are properly completed and present in the aircraft can.
- If there are any doubts about aircraft airworthiness status, contact Dispatch immediately.

NOTE
Prior to conducting any Preflight Inspection items, wing covers must be removed by a CFI, if applicable.

Preflight Inspection

The complete preflight inspection is conducted prior to the first flight of the day and at any PIC changes. Flight crews should inspect the aircraft with the attitude that the aircraft must prove that it is fit to fly, rather than doing so with the assumption that they are going and the airplane "is probably okay."

Execution and Verification
When looking at airplane components and complex assemblies, inspect each component one by one. Look at each individual component in turn, rather than trying to take in the entire assembly all at once. Limit to 3 (three) or 4 (four) individual components inspected before verifying with the checklist.

NOTE
Both the preflight inspection and the walk-around shall be conducted with the checklist in-hand.

Pilot Checklist Responsibility
While it may be necessary to conduct checklist items out of sequence, it is the pilot's responsibility to ensure all checklist items are completed.

Leaving Aircraft Unattended
Secure the plane against movement by installing, at minimum, the tail tie down and/or wheel chocks. Use the parking brake if no tie down location or wheel chocks are available.
It is unacceptable to just "get in and go" when returning to it, either by the PUI who performed the inspection, or by the PIC/CFI who comes out to join the PUI.

NOTE
A walk-around shall be conducted by the flight crew, in accordance with the checklist, whenever the aircraft has been left unattended.

Circuit Breaker Reset Policy

Aircraft incident/accident history shows that resetting a popped circuit breaker may lead to an inadvertent fire, turning a relatively minor problem (loss of a particular electrical circuit) into a major emergency. The following guidance is not to be used as a substitute for sound judgment or manufacturer-approved emergency procedures contained in the appropriate Aircraft Flight Manual.

Pre-Flight Inspection
Do not reset the breaker. Using the proper squawk procedures, notify the Flight Training Coordinator on duty, who will then notify maintenance personnel.

Taxi and/or In-Flight
Do not reset the breaker. Consider whether the affected electrical circuit is necessary for the flight. Determine and select an appropriate course of action to include ATC assistance and diversion to an alternate airport, if needed.

Mixture Ground-Leaning

Mixture shall be leaned during all ground operations to avoid spark plug fouling and associated problems. The following SOP will be used whenever the aircraft will be at idle power on the ground or taxiing for any amount of time.

NOTE
1. When stationary, avoid idling engine below 800-1000 RPM to avoid spark plug fouling. 2. If engine roughness occurs, enrichen the mixture slightly until smooth.

MIXTURE GROUND-LEANING
THROTTLE..... .....1200 RPM *MIXTURE..... .....LEAN UNTIL SLIGHT RISE IN RPM* *THROTTLE..... .....1200 RPM*

Live Aircraft Concept

The Beacon Light switch will remain in the ON position in order to visually confirm if an aircraft on the ramp is “live,” i.e. the electrical system is activated for any reason, and/or engine start could be imminent. The switch will be confirmed in the ON position during the preflight and after shut down.

Section 2: Preflight Inspection

CABIN

HOBBS / TACH ..... RECORDED
AROW ..... CHECK
PARKING BRAKE ..... SET
CONTROL LOCK ..... REMOVE
FIRE EXTINGUISHER ..... GREEN ARC/SECURE
FUEL SELECTOR (feel for detent) ..... L/R/BOTH
FUEL SHUTOFF VALVE ..... VERIFY IN
TRIM WHEEL ..... TAKEOFF
ALT STATIC ..... CHECK
MIXTURE ..... IDLE CUTOFF
THROTTLE ..... IDLE
SWITCHES/ CIRCUIT BREAKERS ..... OFF/NORMAL
IGNITION ..... OFF
BEACON ..... ON
MASTER SWITCH ..... ON
BATTERY VOLTAGE ..... CHECK
LIGHTS / PITOT HEAT ..... ON/CHECK
AVIONICS MASTER ..... ON/LISTEN FOR FAN
FLAPS ..... EXTEND
CO DETECTOR ..... CHECK
ELT SWITCH / LIGHT ..... CHECK
ANNUNCIATOR PANEL / LIGHTS ..... CHECK
FUEL QUANTITY ..... CHECK
SWITCHES/MASTER ..... OFF

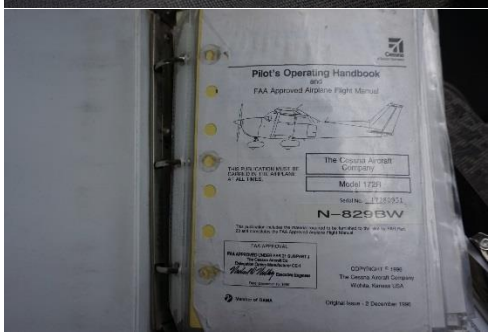
CABIN, Expanded

HOBBS / TACH ..... RECORDED

Record current Hobbs and Tach times and validate against values on the Aircraft Data Sheet. Notify the Flight Training Coordinator on duty of any discrepancy.

AROW.....CHECK

Check the **A**irworthiness Certificate and Aircraft **R**egistration. Verify that the correct and complete Pilot's **O**perating Handbook or Aircraft Flight Manual, **W**eight and balance information, and additional appropriate operations manuals (i.e. Garmin G430 GPS manual) are aboard.



PARKING BRAKE .....SET

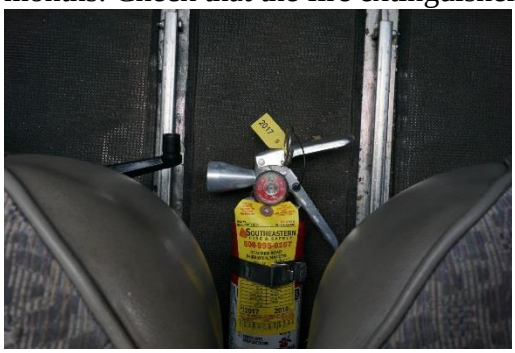
Set the parking brake by pulling out the handle until a clicking sound is heard and then rotating counterclockwise 90º.

CONTROL LOCK ..... REMOVE

Remove control lock using the stem portion and not the warning flag. Secure in aircraft pocket.

FIRE EXTINGUISHER ..... GREEN ARC / SECURE

Check that the fire extinguisher gauge is in the green arc. Verify that the last inspection date is within 12 months. Check that the fire extinguisher is secure and will not move inadvertently.



FUEL SELECTOR (feel for detent)..... L/R/BOTH

Verify that the fuel selector can be moved freely between Left, Right, and BOTH positions. Set fuel selector to the BOTH position ensuring selector is in the detent.

FUEL SHUTOFF VALVE .....VERIFY IN

Verify the fuel shutoff valve is in and secure.

TRIM WHEEL ..... TAKEOFF

Verify that trim wheel moves freely, then set the trim wheel to TAKEOFF. Verify visually.

ALT STATIC .....CHECK

Pull the red ALTERNATE AIR STATIC valve knob to activate. Check for increases on the Airspeed, Altimeter, and Vertical Speed indicators to confirm operation. Push the valve full in to turn it OFF when complete.

MIXTURE ..... IDLE CUTOFF

Verify that the mixture control is in full IDLE CUTOFF position (pulled all the way out).

THROTTLE .....IDLE

Verify that the throttle control is in IDLE position (pulled all the way out).

SWITCHES/CIRCUIT BREAKERS..... OFF/NORMAL
Verify that all electrical switches on the panel under the yoke are off, except the BCN. Check that all circuit breakers are in or disengaged. If disengaged, breakers must be properly placarded. If a circuit breaker is out and not placarded, inform the on-duty Flight Training Coordinator. The airplane is not to be flown until appropriate action is taken and the airplane is cleared for return to service by Maintenance.

IGNITION .....OFF
Verify that the IGNITION SWITCH is in the OFF position. Do not insert the key.

BEACON .....ON

Verify BEACON is ON.

MASTER SWITCH .....ON

Check the electrical system by placing both sides of the red Master Switch in the ON position.

BATTERY VOLTAGE .....CHECK

Verify on the combined DIGITAL CLOCK/OAT/VOLT INDICATOR (for example, 24.0E, implying 24 Volts). If upon arrival to the airplane, the voltage is below 20 Volts with no electrical accessories operating and with the lights OFF, PUI shall inform PIC and the on-duty Flight Training Coordinator.

CAUTION
Ensure that the Avionics Master switch is OFF before turning the battery master switch ON or OFF. This will prevent any inadvertent electrical charge from damaging the avionics equipment when the electrical system is engaged.

LIGHTS/PITOT HEAT .....ON/CHECK

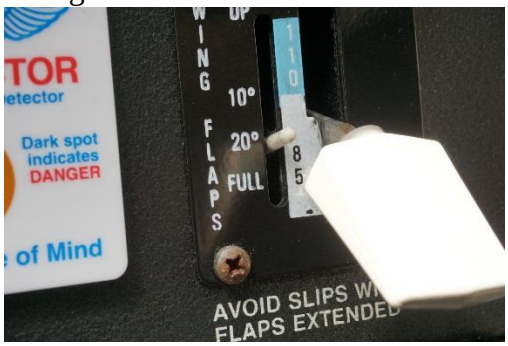
Check exterior and interior lights for proper operation. Turn the lights off immediately after the required checks are completed before continuing with the rest of the preflight. Prior to turning the pitot heat on, ensure pitot cover has been removed and stowed in the baggage compartment. Turn heat ON and,

without delay, verify pitot tube is heating properly by lightly touching the pitot tube. If the tube is warm to touch, the system is working properly. Turn pitot heat switch OFF immediately after.

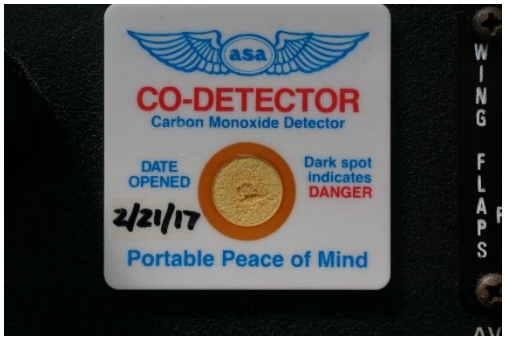
CAUTION
Do NOT operate pitot heat on the ground for more than 30 seconds

AVIONICS MASTER ..... ON/LISTEN FOR FAN
Verify cooling fan is operational by listening for occurrence of fan noise upon turning the switch on. If noise is absent, place hand under the avionics tower to feel for the air flow. Once verified, turn switch off.

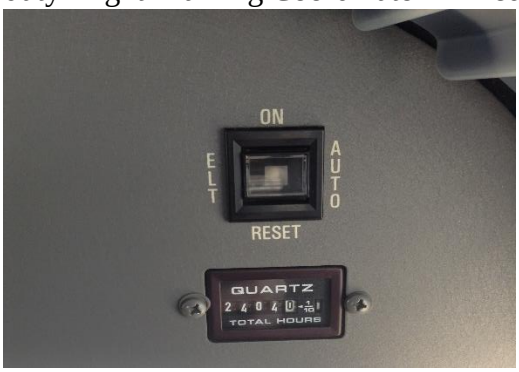
FLAPS ..... EXTEND
Gradually extend flaps and observe indications of smooth uniform operation along with correct number of degrees.



CO DETECTOR ..... CHECK
Check that the carbon monoxide detector is present with normal coloring and has not expired.



ELT SWITCH / LIGHT.....CHECK
Verify that the ELT switch in the cockpit is set to ARM or AUTO but not transmitting and the red light is OFF. If the ELT is transmitting, attempt to turn it off via the ELT switch. Report the activation to on-duty Flight Training Coordinator immediately.



ANNUNCIATOR PANEL / LIGHTS.....CHECK
Test lights by moving switch to the TEST position and verify that all lights should light up. Return it to BRT or DIM position, as appropriate. Check that the VAC and Oil Pressure lights remain lit.

FUEL QUANTITY .....CHECK
Check fuel gauges to confirm that they are operational.

WARNING
Flight crews shall not rely on fuel gauges alone and shall also manually check fuel levels in each tank prior to each flight.

SWITCHES/MASTER.....OFF
Turn both sides of the MASTER SWITCH OFF to prevent the battery from being drained more than necessary.

NOTE
Clean windows and windscreen as necessary with approved cleaning solution and cloth. Do not use unapproved cleaners, or any cleaners containing alcohol or ammonia. If approved aviation windshield cleaner is not available, a solution of water and regular hand or dish soap can be substituted.

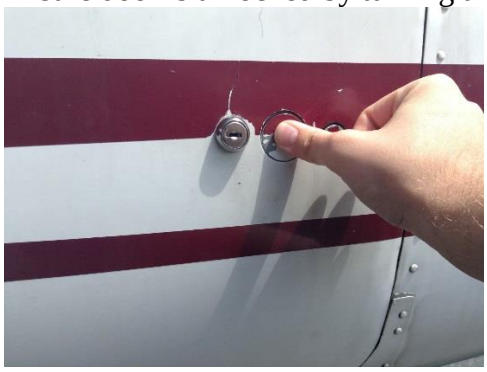
EMPENNAGE

BAGGAGE DOOR.....UNLOCK
ANTENNAS.....CHECK
FUSELAGE.....INSPECT
HORIZONTAL STABILIZER.....INSPECT
GUST LOCK (if installed).....REMOVE
VERTICAL STABILIZER.....INSPECT
CONTROL SURFACES.....INSPECT

EMPENNAGE, Expanded

BAGGAGE DOOR.....UNLOCK

Ensure door is unlocked by turning the key and pushing the larger circular button.



ANTENNAS.....CHECK

Check the base of all external antennas on top of the fuselage to ensure they are mounted securely and free of damage. Also ensure the antennas are not bent.

FUSELAGE ..... INSPECT

Check both sides of the fuselage for damage (i.e. dents, wrinkles, corrosion, etc.).

HORIZONTAL STABILIZER..... INSPECT
Check the leading edge, top and the bottom on both sides for damage.

GUST LOCK (if installed) .....REMOVE
Remove from the vertical stabilizer by releasing the cord from the pipe and gently slide it off ensuring not to damage any areas of the tail section.

VERTICAL STABILIZER..... INSPECT
Check the leading edge, top and the bottom on both sides for damage.

CONTROL SURFACES ..... INSPECT

Examine the elevator and rudder for damage, looseness, freedom of movement, surface condition, hinges, attachment points and all visible connections including the static wicks. For the elevator, check that the trim tab is in neutral position and in agreement with the pitch trim wheel setting in the cockpit. Lift up the elevator and check the underside, including the trim tab connections. Ensure both trim tab castle nuts and safety pins (cotter pins) are secure. For the rudder, do not move the trim tab. A properly set rudder trim tab will normally appear bent.

RIGHT WING

FLAP/AILERON. ..... INSPECT
WING TIP / LIGHTS ..... INSPECT
LEADING EDGE ..... INSPECT
AIR VENTS ..... CHECK
MAIN GEAR ..... INSPECT

RIGHT WING, Expanded

WARNING

Whenever checking the aileron connections, from the underside of the wing, ALWAYS support the aileron firmly with one hand before inserting your fingers into the opening between the aileron and the wing.

FLAP/AILERON ..... INSPECT
Check all hinge points for connections and any visible damage (i.e. dents, cracks). Inspect the flap for damage and excessive play. On the aileron, ensure three (3) counterweights are present and secure. Check the nuts on the aileron and flap activation rods for looseness. Check that the aileron has 2 undamaged static wicks.

WING TIP/LIGHTS..... INSPECT
Check exterior condition. Look for unrepaired cracks and other physical damage.

LEADING EDGE..... INSPECT
Check the leading edge for dents and other damage. Ensure the inspection plates located on the underside of the wing are present and securely fastened.

AIR VENTS.....CHECK
Ensure the air vents are clear of debris. Do not remove filter material.

MAIN GEAR.....CHECK

Inspect the main landing gear components in accordance with the following SOP.

MAIN GEAR INSPECTION	
Gear strut	*SECURE / NO DAMAGE*
Strut housing	*FREE OF CRACKS*
Hub assembly	*SECURE*
All connections	*SECURE*
Brake lines and brake caliper assembly	*NO LEAKS / SECURE*
Brake disk	*NO DAMAGE OR CRACKS*
Brake pad wear	*(**minimum 1/8"** remaining) ACCEPTABLE*
Tire inner sidewall	*NO DAMAGE*
Tire tread wear	*ACCEPTABLE*
Tire outer sidewall	*NO DAMAGE*
Air valve cover	*SECURE*

WARNING

Flight crews shall ground the aircraft if any of the following conditions are present during inspection of the landing gear tires:

1. **Tire displays areas of exposed cord**
2. **Tire clearly lacks visible grooves in the center section of the tire**
3. **Tire displays cuts or gouges of indeterminable depth, or displays cuts/gouges that enter the tire cord structure.**

NOSE	
ENGINE OIL	6-8 QTS
COWLING	INSPECT
AIR FILTER	CHECK
ENGINE COOLING VENTS	INSPECT
ALTERNATOR BELT	INSPECT
PROPELLER/SPINNER	INSPECT
NOSE GEAR/DRAINS	INSPECT
STATIC SOURCE	CHECK

NOSE, Expanded

ENGINE OIL ..... 6-8 QTS

Open the oil door by depressing the circular latch button and lifting up the access door. Visually check inside for any obvious damage / abnormalities. Remove the dipstick by rotating the cap counterclockwise and remove far enough to be able to see oil level **(6 quarts minimum)**. Secure the oil dipstick by rotating the cap clockwise until snug. Do not overtighten the cap. Close the oil door and latch it securely.

COWLING ..... INSPECT
Remove cowl plugs and stow in baggage compartment. Check that the cowling is secure, as indicated by the cowling fasteners being flush against the cowling without protruding significantly. Check that the auxiliary power door is closed and secure.

AIR FILTER ..... CHECK
Inspect the air filter intake for contamination and foreign objects.

ENGINE COOLING VENTS ..... INSPECT
Check the front cowl openings, which comprise the cooling air inlets, for contamination, foreign objects, obstructions and damage. Check the baffle plates and engine cylinder cooling fins inside for the same.

ALTERNATOR BELT..... INSPECT
Check that the alternator belt inside the front cowling is secure by gently tugging on it and ensuring it has little or no play. Inspect the visible portion of the alternator belt for damage (i.e. cracks).

PROPELLER/SPINNER ..... INSPECT
Slowly and gently run the palm of your hand over the propeller blades to check the propeller face, edges, and back for damage. Propeller should be free of nicks, cracks, or spurs. Verify that spinner has no damage and is secure. Any propeller nick that is enough to catch on the hand should be evaluated by maintenance before flight.

NOSE GEAR/DRAINS..... INSPECT
Inspect the main gear components in accordance with the SOP. Check that the vents protruding from the underside of the nose are free from obstructions (debris, ice, snow, etc.).

NOSE GEAR INSPECTION	
Oleo strut extension	*VERIFY ≈ **2 ½ inch***
Strut housing	*FREE OF CRACKS*
Components (steering links, shimmy damper)	*SECURE*
All connections (bolts, nuts, cotter pins)	*SECURE*
Hub assembly	*SECURE*
Tire tread wear	*ACCEPTABLE*
Air valve cover	*SECURE*

WARNING

Flight crews shall ground the aircraft if any of the following conditions are present during inspection of the landing gear tires:

1. **Tire displays areas of exposed cord**
2. **Tire clearly lacks visible grooves in the center section of the tire**
3. **Tire displays cuts or gouges of indeterminable depth, or displays cuts/gouges that enter the tire cord structure.**

STATIC SOURCE.....CHECK

Check that the static port is clean and unobstructed. Do not touch it.

LEFT WING

AIR VENTS ..... CHECK
LEADING EDGE ..... INSPECT
PITOT TUBE ..... CHECK
STALL WARNING HORN ..... CHECK
FUEL VENT ..... CHECK
WING TIP / LIGHTS ..... INSPECT
AILERON / FLAP ..... INSPECT
MAIN GEAR ..... INSPECT

LEFT WING. Expanded

AIR VENTS ..... CHECK
Ensure the air vents are clear of debris. Do not remove filter material.

LEADING EDGE ..... INSPECT
Check the leading edge for dents and other damage. Ensure the inspection plates located on the underside of the wing are present and securely fastened. Check the LANDING and TAXI light assembly for physical damage.

PITOT TUBE ..... CHECK
Check that the pitot tube front opening and drain hole in the rear bottom are clear. Gently touch the pitot tube to ensure that it is secure.

STALL WARNING HORN ..... CHECK
Check that the opening on the leading edge is clear.

FUEL VENT ..... CHECK
Check for obstructions and/or dripping fuel from the vent. Overflow will occur if the fuel cap is loosened.

WING TIP / LIGHTS ..... INSPECT
Check exterior condition. Look for unrepaired cracks and other physical damage.

AILERON / FLAP ..... INSPECT
Check all hinge points for connections and any visible damage (i.e. dents, cracks). Inspect the flap for damage and excessive play. On the aileron, ensure three (3) counterweights are present and secure. Check the nuts on the aileron and flap activation rods for looseness. Check that the aileron has 2 undamaged static wicks.

WARNING

Whenever checking the aileron connections, from the underside of the wing, ALWAYS support the aileron firmly with one hand before inserting your fingers into the opening between the aileron and the wing.

MAIN GEAR..... INSPECT

Inspect the main gear components in accordance with the following SOP.

MAIN GEAR INSPECTION	
Gear strut	*SECURE / NO DAMAGE*
Strut housing	*FREE OF CRACKS*
Hub assembly	*SECURE*
All connections	*SECURE*
Brake lines and brake caliper assembly	*NO LEAKS / SECURE*
Brake disk	*NO DAMAGE OR CRACKS*
Brake pads wear	*(**minimum 1/8"** remaining) ACCEPTABLE*
Tire inner sidewall	*NO DAMAGE*
Tire tread wear	*ACCEPTABLE*
Tire outer sidewall	*NO DAMAGE*
Air valve cover	*SECURE*

WARNING

Flight crews shall ground the aircraft if any of the following conditions are present during inspection of the landing gear tires:

1. **Tire displays areas of exposed cord**
2. **Tire clearly displays visible grooves in the center section of the tire**
3. **Tire displays cuts or gouges of indeterminable depth, or displays cuts/gouges that enter the tire cord structure.**

FUEL

FUEL SUMPS 13
FUEL QUANTITY ..... DIP TO VERIFY
FUEL CAPS..... SECURE

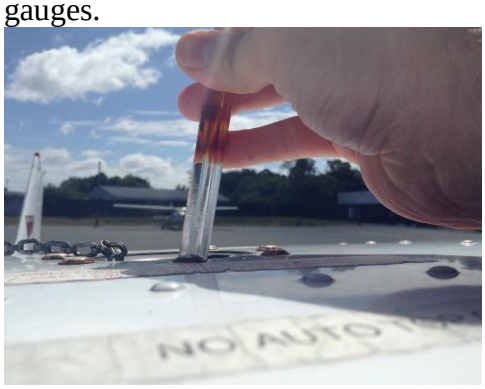
FUEL Expanded

FUEL SUMP.....13

Ensure that the fuel is free of water and contaminants by sumping fuel from the highest point to the lowest point beginning with the sumps nearest the leading edge of the wing and working back leaving the nose sumps last (5 each side, 3 under the nose). Once process is complete, dispose of the sumped fuel in the sump waste container located on the ramp. If the fuel is contaminated report it to the on-duty Flight Training Coordinator.

FUEL QUANTITY .....DIP TO VERIFY

Turn fuel cap counterclockwise to loosen and remove. Place the dipstick into the fuel cap opening and adjust the angle to avoid the rib of the fuel tank. Place thumb over opening of the dipstick and pull stick out enough to read quantity. Once amount has been determined record it in the can and verify with the gauges.



FUEL CAPS ..... SECURE

Ensure that the fuel caps are secure. Validate by turning the cap clockwise until movement stops.

FINAL ITEMS

WING/TAIL TIE DOWNS .....REMOVE
360^0 WALK AROUND ..... COMPLETE
BAGGAGE DOOR..... SECURE/UNLOCKED
PREFLIGHT INSPECTION .....COMPLETE

FINAL ITEMS, Expanded

WING/TAIL TIE DOWNS ..... REMOVE
Remove all tie downs and stow in baggage compartment.

360° WALK AROUND..... COMPLETE
Conduct a complete walk-around just prior to entering the airplane. Pay particular attention to any potentially missed items, such as tie-downs, wheel chocks, unlatched oil/baggage doors, fuel caps or unsecured/foreign objects on the aircraft surfaces and on the ground nearby. If installed, disconnect extension cord from aircraft and stow in baggage compartment.

BAGGAGE DOOR ..... SECURE/UNLOCKED
Ensure that the baggage door is securely latched.

PREFLIGHT INSPECTION ..... COMPLETE
Verify all preflight actions are complete.

Section 3: Normal Flows and Checklist

BEFORE START FLOW		
Briefing	**–**	**SAFETY briefing completed**
Seats and Seatbelts	**–**	**Secure**
Fuel Selector	**–**	**Both**
Fuel Shutoff	**–**	**In**
Switches	**–**	**Set**
Brakes	**–**	**Tested and Set**
Doors	**–**	**Closed and latched**
Before Start Checklist	**–**	**Completed**

BEFORE START FLOW, Expanded

Briefing – Refer to Appendix C for the SAFETY Briefing.
Seats and Seatbelts – Seat is in correct position and height, locking pin in place. All crew and passenger seatbelts are secure per 14 CFR 91.107
Fuel Selector – Set to "Both" feel for the detent.
Fuel Shutoff – Verify fuel shutoff is in and secure.
Switches – Avionics Master Off, Pitot Heat Off, Strobe Off, Nav On, Taxi Off, Landing off, Beacon On, Fuel Pump Off, Master Switch Off
Brakes – Parking Brake released, Brakes tested, ensure no fluid is leaking from the brake housings, Parking Brake set
Doors – Verify both doors closed and latched
Before Start Checklist – Read Before Start Checklist to confirm all flow items completed and verbally announce checklist complete.

BEFORE START

BRIEFING ..... COMPLETE
SEAT/ SEATBELTS ..... SECURED
FUEL SELECTOR ..... VERIFY BOTH
FUEL SHUTOFF ..... VERIFY IN
SWITCHES ..... SET
BRAKES ..... TESTED/SET
DOORS ..... CLOSED/LOCKED
BEFORE START CHECKLIST ..... COMPLETE

ENGINE START FLOW

Mixture – Idle/Cutoff
Throttle – ¼" open
Master Switch – On
Engine Start Procedure

- **Prime – As Required**
- **Propeller Area – Clear**
- **Starter – Engage**
- **Mixture -- Advance**
- **Throttle – 1000 RPM**

Mixture – Lean for taxi
Circuit Breakers – Checked
Gauges – Checked
Engine Start Checklist – Complete

ENGINE START FLOW, Expanded:

Mixture – Idle/Cutoff
Throttle – ¼" open
Master Switch – On
Engine Start Procedure:

- **Prime –** If oil temperature indicates "off the peg", initial start attempt shall be executed without priming engine. Otherwise, prime as required:
  - Priming Procedure
    - Throttle ¼" open
    - Mixture – Full Rich
    - Fuel Pump – On for 2-3 seconds
    - Fuel Pump – Off
    - Mixture – Idle/Cutoff
- **Propeller Area –** Confirm area around aircraft is clear of personnel or obstructions. Crew must verbally announce that the area is clear to the left, center, right and behind. Pilot flying will loudly announce through open window "Clear Prop!" or "Clear!"
- **Starter –** Engage until appropriate and then release starter. Starter shall not be engaged for more than 10 seconds. Allow 20 seconds between start attempts. Maximum 3 attempts.
- **Mixture –** Advance to full rich as engine starts
- **Throttle –** Set to1000 RPM

Mixture – Lean for taxi procedure

- Throttle..... 1200 RPM
- Mixture..... Lean until slight rise in rpm
- Throttle..... 1200 RPM

Circuit Breakers – Confirm all circuit breakers have not been tripped following engine start
Gauges – Confirm ammeter is 0 or charging, vacuum gauge (if applicable) 4.5-5.5", oil pressure is 50-95 PSI (green arc) within 30 seconds, Fuel Quantity accurate, Voltmeter indicating approximately 28 volts
Engine Start Checklist – Read Engine Start Checklist to confirm all flow items completed

ENGINE START

MIXTURE ..... IDLE CUTOFF
THROTTLE ..... 1/4 INCH OPEN
MASTER SWITCH ..... ON
ENGINE START PROCEDURE ..... EXECUTE

MIXTURE ..... LEAN FOR CONDITIONS
CIRCUIT BREAKERS ..... CHECK
GAUGES ..... CHECK
ENGINE START CHECKLIST ..... COMPLETE

CAUTION

Avoid over-priming the engine. Do not allow the fuel pump to continue running with mixture in full rich position after fuel flow indication has stabilized (3-5 seconds).
Consult POH / AFM, Section 4, Normal Procedures.

NOTE

An abnormally high rate of charge indication on the ammeter (≈30 AMP or more) immediately following engine start may indicate that starter did not disengage and is "hung" (still running in conjunction with the engine).
If a depleted battery and electrical accessories do not account for the high rate of charge, and a hung starter is suspected, shutdown the engine and inform the Flight Training Coordinator on-duty.

BEFORE TAXI FLOW

Avionics Master – On
Avionics Set-Up Procedure – Execute
Flight Instrument Set-Up Procedure – Execute
Pre-Taxi/Departure Brief – Execute

Flaps – Up
Lights – Set
Flight Controls – Free and Correct
Before Taxi Checklist – Complete

BEFORE TAXI FLOW, Expanded

Avionics Master – On
Avionics Set-Up Procedure:

- **Audio Panel –** Volumes and squelch set and lights tested
- **Comm 1 –** Set Ground and Tower (Active and STBY)
- **GPS/NAV 1 –** Set for departure/route
- **Comm 2 –** Set ATIS and Dispatch (Active and STBY)
- **Nav 2 –** Set for departure/route if applicable
- **Transponder –** Code set, select ALT.

Flight Instrument Set-Up Procedure:

- **Clock** - operating properly and set to the correct time.
- **Magnetic Compass** - case is full of fluid, card is floating freely, and compass deviation card is legible, indicating a known heading.
- **Airspeed Indicator** - indicates zero.
- **Attitude Indicator** - set for straight and level flight and verify horizon is level
- **Altimeter** - set to the current local altimeter setting and verify within 75' of the local field elevation. If altimeter setting is not available, set to local field elevation.
- **Turn Coordinator** - shows wings level and no warning flag
- **Inclinometer** - ball is centered, case is full of fluid.
- **Heading Indicator** – check against the magnetic compass and set it as appropriate.
- **Vertical Speed Indicator** - note any variations from zero
- **Backup Heading Indicator (if installed)** - set to the compass heading

Pre-Taxi/Departure Brief – Execute (Reference Appendix C)

Flaps – Confirm visually that flaps are retracted indicating 0°
Lights – Confirm NAV and BCN are on, turn on Taxi Light
Flight Controls – Ensure full and proper deflection of all primary flight controls
Before Taxi Checklist – Read Before Taxi Checklist to confirm all flow items completed

BEFORE TAXI

AVIONICS MASTER .....ON
AVIONICS ..... SET
FLIGHT INSTRUMENTS ..... SET
PRE-TAXI/DEPARTURE BRIEF ..... COMPLETE
FLAPS..... UP
LIGHTS ..... AS REQUIRED
FLIGHT CONTROLS .....FREE AND CORRECT
BEFORE TAXI CHECKLIST .....COMPLETE

FLIGHT CONTROLS CHECK

Yoke full forward and hold .....Elevator down
Yoke full left and hold ..... Left aileron up, right aileron down.
Yoke full back and hold .....Ailerons – no change, Elevator up
Yoke full right and hold ..... Left aileron down, right aileron up, Elevator up
Yoke full forward and hold .....Ailerons – no change, Elevator down
Rudder pedal full left ..... Rudder deflects full left
Rudder pedal full right..... Rudder deflects full right

TAXI FLOW

Parking Brake – Release
Brakes – Checked
Flight Instruments – Check

TAXI FLOW, Expanded

Parking Brake – Rotate handle clockwise 90º and push fully in
Brakes – After adding enough power to begin rolling, PF will reduce the power to idle and apply both brakes to evaluate their effectiveness. The PMF will then conduct a similar check immediately after positive exchange of flight controls.
Flight Instruments:

- Magnetic Compass.....Swings freely during turns, indicates known headings
- Attitude Indicator.....Erect/stable within 5 min, ≤ 5° of bank during turns
- Turn Coordinator .....Miniature airplane banks in direction of turns
- Slip/skid Indicator (the ball) .....Moves freely to the OUTSIDE of turns
- Heading Indicator.....Turns freely in direction of turns and indicates known headings

Taxi Checklist – Read Taxi Checklist to confirm all flow items completed

TAXI

PARKING BRAKE .....RELEASE
BRAKES.....TEST
FLIGHT INSTRUMENTS .....CHECK
TAXI CHECKLIST.....COMPLETE

BEFORE TAKEOFF FLOW

Parking Brake – Set
Fuel Selector – Both
Mixture – Full Rich
Oil Temperature – Checked
Throttle – 1800 RPM
Magnetos – Checked Right, then Left, Set Both
Gauges – Checked
Ammeter Load – Tested
Annunciator Panel – Tested, Set
Throttle – Check Idle/1000RPM
Mixture – Leaned for Conditions
Flight Controls – Free and Correct
Before Takeoff Checklist - Complete

BEFORE TAKEOFF FLOW, Expanded

Parking Brake – Rotate 90° counterclockwise and pull aft to set.
Fuel Selector – Both, feel for detent.
Mixture – Advance mixture knob full forward.
Oil Temperature – Checked, at least 75°F prior to initiating throttle increase.
Throttle – 1800 RPM
Magnetos – Move the ignition switch two clicks left and check the right magneto. Allow 2 seconds to stabilize, then observe the RPM drop and evaluate engine smoothness. Return the key to BOTH. Move ignition switch one click left and check the left magneto. Normal RPM drop is ≈ 80 RPM. Maximum allowable RPM drop is 150 RPM. Maximum acceptable difference between magneto drops is 50 RPM.
Gauges – Verify that oil pressure (50-95 PSI) and oil temperature is (100-245°) indicate normal readings. Check that the vacuum gauge indicates between 4.5” and 5.5”, ammeter indicates 0, fuel flow indicator (indicating green, 3-10 GPH), voltmeter indicates approximately 28.
Ammeter Load – All lights on, pitot heat on, observe ammeter while flaps transit from 0° to 10°. Return flaps to 0°. Ammeter should momentarily dip below 0, then return indicating the alternator has picked up the extra load.
Annunciator Panel – Push and hold the annunciator switch (up) to test. Confirm all lights illuminate and flash. Release the test feature and set BRT (Bright) or DIM as appropriate. Confirm every annunciator has extinguished to complete the panel test.
Throttle – Close the throttle completely and observe gauges and tachometer for normal indications. Return the throttle to 1000 RPM.
Mixture – Lean per mixture ground leaning SOP.
Flight Controls – Ensure full and proper deflection of all primary flight controls
Before Takeoff Checklist – Read Before Takeoff Checklist to confirm all flow items completed

BEFORE TAKEOFF

PARKING BRAKE ..... SET
FUEL SELECTOR ..... VERIFY BOTH
MIXTURE ..... FULL RICH
OIL TEMPERATURE / PRESSURE ..... CHECK
THROTTLE ..... 1800 RPM
MAGS (R, then L) ..... CHECKED
GAUGES ..... CHECKED
AMMETER ..... CHECK
ANNUNCIATOR PANEL ..... CHECK/TEST
THROTTLE ..... IDLE/1000 RPM
MIXTURE ..... LEAN FOR CONDITIONS
FLIGHT CONTROLS ..... FREE AND CORRECT
BEFORE TAKEOFF CHECKLIST ..... COMPLETE

TAKEOFF FLOWS

Avionics/Flight Instruments – Set
Transponder - Code set, select ALT.
Flaps – As appropriate
Trim – Set for Takeoff
Ignition – Verify on BOTH
==========
Runway/Final Approach – Clear
Mixture – Full rich
Lights – All on
Takeoff Checklist Complete

TAKEOFF FLOW, Expanded

Avionics/Flight Instruments – Ensure all active/standby COM/NAV frequencies are set, set heading bug, CDI, verify directional gyro and magnetic compass align, and confirm CDI nav select (NAV/GPS).
Transponder - Code set, select ALT.
Flaps – Set 0° or 10° as appropriate.
Trim – Set for Takeoff
Ignition – Verify on BOTH
==========
Runway/Final Approach – Clear
Mixture – Full rich
Lights – All on
Takeoff Checklist – Read Takeoff Checklist to confirm all flow items completed

NOTE

The portion of the takeoff flow PRIOR to the break line should be conducted while holding short of the runway, BEFORE obtaining a clearance to takeoff. The portion of the takeoff flow AFTER the break line is to be done AFTER obtaining a clearance for takeoff, prior to rolling on the runway.

TAKEOFF

AVIONICS/FLIGHT INSTRUMENTS ..... SET
TRANSPONDER ..... CODE, ALT
FLAPS ..... SET ___°
TRIM ..... SET
IGNITION ..... BOTH
==========
RUNWAY/FINAL APPROACH ..... CLEAR
MIXTURE ..... FULL RICH
LIGHTS ..... ALL ON
TAKEOFF CHECKLIST ..... COMPLETE

CLIMB FLOW

Flaps – Up
Mixture – Set
Gauges – Check
Climb Checklist – Complete

CLIMB FLOW, Expanded:

Flaps – Verify that the flaps are fully retracted when it is safe to do so.
Mixture – Set control to full rich (full forward) position. Refer to the POH / AFM for mixture leaning procedures over 3000 MSL feet.
Gauges – Verify that oil pressure and oil temperature indicate normal readings.
Climb Checklist - Read Climb Checklist to confirm all flow items completed

NOTE
Begin the Climb checklist when passing through 500’ AGL.

CLIMB

FLAPS ..... UP
MIXTURE ..... FULL RICH
GAUGES ..... CHECK
CLIMB CHECKLIST .....COMPLETE

CRUISE FLOW

Lights – Set
Throttle – Set ____ RPM
Mixture – Leaned
Checklist – Complete

CRUISE FLOW, Expanded

Lights –

- BEACON and STROBE LIGHTS are ON
  - Note - strobe lights should be turned off in flight when there are adverse reflections from clouds
- LANDING and TAXI LIGHTS ON while remaining within 10 miles of any airport or in areas of reduced visibility.
- NIGHTTIME: Verify that NAV LIGHTS are ON and leave them on if any portion of the flight can potentially occur during the period between sunset and sunrise.

Power – Set throttle for cruise to predetermined RPM setting in accordance with the POH / AFM.
Mixture – When operating below 80% BHP, lean mixture for Max EGT at ***any altitude***. When operating at 80% BHP or higher, lean the mixture for 50°F rich of EGT (Maximum power) only when at altitudes above 3000 feet. When EGT gauge is INOP, use the tachometer to lean mixture, and when an rpm drop is noticed, enrich to achieve max RPM.
Checklist – Read Cruise Checklist to confirm all flow items completed

CRUISE

CRUISE POWER ..... SET
MIXTURE .....LEAN AS APPROPRIATE
LIGHTS ..... AS REQUIRED
CRUISE CHECKLIST.....COMPLETE

DESCENT FLOW

Arrival Briefing – Complete
Throttle/Mixture – Set
Lights – Set
Descent Checklist – Complete

DESCENT FLOW, Expanded

Arrival Briefing – Complete (See Appendix C)
Throttle/Mixture – Set throttle between 1400 – 2000 to achieve a stabilized descent. Enrich mixture to ensure full rich by 1000 FT AGL
Lights – LANDING and TAXI LIGHTS ON when within 10 miles of any airport
Descent Checklist – Read Descent Checklist to confirm all flow items completed

DESCENT

ARRIVAL BRIEFING ..... COMPLETE
THROTTLE/MIXTURE..... SET ____ RPM/ENRICH
LIGHTS ..... ON
DESCENT CHECKLIST.....COMPLETE

BEFORE LANDING FLOW

Fuel Selector – Both
Mixture – Rich
Loose Items – Secure
Seats and Seatbelts – Secure
==========
Flaps – Set ____°
Before Landing Checklist -- Complete

NOTE
The portion of the before landing flow PRIOR to the break line should be conducted no later than midfield downwind. The portion of the before landing flow AFTER the break line is to be done before 500 ft AGL on final approach unless the particular maneuver required a lower altitude for final configuration.

BEFORE LANDING FLOW, Expanded

Fuel Selector – Verify that the fuel selector is on both (feel for the detent).
Mixture – Verify the mixture is in full rich (full forward) position in case of a go-around.
Loose Items – Visually check the cabin to ensure no loose items will interfere with the performance of the crew or the flight controls.
Seats and Seatbelts -- Make sure that seats are locked in place and seatbacks are fully upright and secure. Verify that all occupants have their seatbelts and shoulder harnesses securely fastened.

Flaps – Set flaps to final flap setting no later than 500 ft AGL (unless the particular maneuver requires a lower altitude for final configuration) on final approach per stabilized approach concept.
Before Landing Checklist – Read Before Landing Checklist to confirm all flow items completed

BEFORE LANDING

FUEL SELECTOR ..... BOTH
MIXTURE ..... FULL RICH
LOOSE ITEMS ..... SECURE
SEATS/SEATBELTS ..... SECURE

FLAPS ..... SET ____°
BEFORE LANDING CHECKLIST ..... COMPLETE

AFTER LANDING FLOW

Trim – Adjusted
Flaps – Up
Mixture – Lean
Lights – As required
After Landing Checklist – Complete

AFTER LANDING FLOW, Expanded

Trim – Set the trim wheel to takeoff position.
Flaps – Retract the flaps and visually confirm that the flaps are up.
Mixture – Lean the mixture for taxi.
Lights – Turn the landing light off. Beacon light shall remain ON at all times.

DAYTIME: Turn off strobes. TAXI, BCN, and NAV should be on.
NIGHTTIME: Turn off strobes. TAXI, BCN, and NAV should be on. Use the taxi light as necessary during ground operations, avoid shining your light at other aircraft.

After Landing Checklist – Read after Landing Checklist to confirm all flow items completed

AFTER LANDING

TRIM..... ADJUSTED
FLAPS ..... RETRACT
MIXTURE .....LEAN FOR CONDITIONS
LIGHTS .....AS APPROPRIATE
AFTER LANDING CHECKLIST .....COMPLETE

SHUTDOWN FLOW

Throttle – 800 RPM
Transponder – STBY
Avionics Master – Off
Magnetos - Ground
Mixture – Idle/Cutoff
Magnetos – Off
Switches – Set
Master Switch – Off
Shutdown Checklist – Complete

SHUTDOWN FLOW, Expanded

Throttle – Set throttle to 800 RPM to avoid backfire during the magnetos grounding check.
Transponder – Set the transponder to STBY (STANDBY) mode to discontinue transmitting the squawk.
Avionics Master – Turn switch to OFF to prevent potential damage to the avionics from electrical current surge during shutdown.
Magnetos– Turn the ignition key to off, momentarily, and immediately return it to both. The engine should quit running momentarily, and start running again when the magnetos are restored. If the engine continues running in the off position, a problem exists with magneto grounding.
Mixture – Reduce mixture to idle cutoff (full back) position to shut down the engine.
Magnetos – Once the propeller has stopped turning, the ignition/magnetos may be turned to the off position. Check if the key can be easily removed in either left or right magneto position. Continue to the off position and remove the key.
Switches –Moving from right to left, turn off all electrical switches (except BCN) on the panel below the yoke.
Master Switch – Turn off both sides of the red master switch
Shutdown Checklist – Read Shutdown Checklist to confirm all flow items completed

SHUTDOWN

THROTTLE ..... 800 RPM
TRANSPONDER ..... STBY
AVIONICS MASTER ..... OFF
MAGNETOS ..... GROUND
MIXTURE ..... IDLE CUTOFF
IGNITION SWITCH ..... OFF
SWITCHES/MASTER ..... OFF
PUSHBACK/AIRCRAFT SECURE ..... COMPLETE
HOBBS/TACH ..... RECORD
SHUTDOWN CHECKLIST ..... COMPLETE

After the Shutdown Checklist has been completed, complete the Aircraft Secure SOP:

AIRCRAFT SECURE
Tie downs (3).....*ATTACHED*
Parking Brake.....*SET (if tie-downs unavailable)*
Pitot tube cover.....*INSTALLED*
Cowl plugs.....*INSTALLED*
Extension cord (below 50°F).....*PLUGGED IN*
Hobbs and Tach Times.....*RECORDED*
Squawks.....*RECORDED*
Fuel Used/Remaining.....*RECORDED*
Cabin and Baggage Areas.....*CLEAN*
Personal items.....*REMOVED*
Window(s).....*SECURED*
Cabin and baggage doors.....*SECURED/LOCKED*

Section 3: Emergency and Abnormal Procedures

General

This chapter contains Bridgewater State University procedures for handling various emergencies and abnormalitieswhile operating the C172R Skyhawk. The procedures are based on and in some cases expand on the manufacturer's procedural recommendations, as well as the guidance provided in the AIM.

Use of Emergency Checklists

Emergency checklist flows (other than abnormal flows) shall be accomplished from memory if they are outlined in a red box and verified with the appropriate checklist. Although the completion of tasks will follow a specified sequence, some actions will be performed nearly simultaneously. Time and situation permitting, the accomplished flow tasks shall be verified with the printed checklist in-hand.

Engine Failure / Power Loss

The following section contains checklists and SOPs addressing engine failures in various situations. Not all situations can be predicted or addressed by checklists. In all cases, the AFM guidance and FAA regulations must be followed.

Defined

- Complete engine failure - propeller windmills or even stops if airspeed is extremely low, engine is relatively quiet and develops no power.
- Partial engine failure - engine runs and develops limited power well below prescribed levels
- Loud noises and vibration with apparent total or partial power loss - may indicate a bad, randomly firing magneto, detonation due to incorrect fuel grade, or other mechanical failure

All partial engine failure/power loss situations should be treated as either full or imminent engine failures. A partial engine failure is likely to be followed by a complete failure in a short time period.

In the following procedures, the words "failure" and "power loss", as related to an engine, shall be used interchangeably.

NOTE
1. At low altitudes, any course of action other than a relatively straight descent to a landing may be impossible. Reducing the pitch and an accompanying descent MUST be accepted to maintain best glide airspeed. 2. The steps following this SOP, such as troubleshooting, restart and forced landing/ditching, depend on a particular situation and will be addressed in the individual emergency procedures.

Control Flow for In-Flight Engine Failures

CONTROL FLOW
***A**IRSPEED*.....*BEST GLIDE*
PITCH for Vg.....*MAINTAIN*
TRIM..... *BEST GLIDE PITCH ATTITUDE*
***B**EST FIELD*.....*DIVERT*
DESCENT AT BEST GLIDE.....*MAINTAIN*
SAFE BANK ANGLE (<30º).....*MAINTAIN*
***C**HECKLIST*.....*CONSIDER / EXECUTE*
(evaluate if ground contact is imminent, runway remains, or landing)
FUEL PUMP.....*ON*
FLAPS.....*AS REQUIRED*
***D**ECLARE*.....*EMERGENCY*
ATC / OTHER A/C / 121.5 / TRANSPONDER / ELT.....*AS REQUIRED*

Emergency Descent Procedure

EMERGENCY DESCENT
Is there a fire:
Yes
Engine Fire Memory Items……*Complete*
Flaps…… *0°*
Airspeed……*100 KTS - if fire won't extinguish, increase AS higher than 100 KTS*
Bank…… *.....30-45°*
Forced Landing Checklist……*Complete*
No
Flaps…… *30°*
Bank…… *30-45°*
Pitch……*Set for 85 KTS*

Section 4: Abbreviated and Expanded Emergency Checklists

Engine Failures

DURING TAKEOFF ROLL

THROTTLE ..... IDLE
DIRECTIONAL CONTROL ..... MAINTAIN
BRAKES ..... APPLY
WING FLAPS ..... RETRACT
TAXI ..... OFF RUNWAY

- **IF INADEQUATE RUNWAY AVAILABLE** -

FUEL SHUTOFF VALVE ..... OUT
MIXTURE ..... IDLE CUTOFF
IGNITION SWITCH ..... OFF
MASTER SWITCH ..... OFF
DOORS ..... UNLATCH
ENGINE FAILURE CHECKLIST ..... COMPLETE

DURING TAKEOFF ROLL, Expanded

THROTTLE ..... IDLE
Reduce the throttle to idle immediately once decision to abort has been made.
DIRECTIONAL CONTROL ..... MAINTAIN
Bring the aircraft to a safe stop, preferably on the runway, while avoiding any obstacles.
BRAKES ..... APPLY
Apply maximum effective braking to stop in the shortest possible distance.
WING FLAPS ..... RETRACT
Retract the flaps to aid in aerodynamic braking.
TAXI ..... OFF RUNWAY
Attempt to exit the runway or if unable, stop on the runway.

- **IF INADEQUATE RUNWAY AVAILABLE** -

Evaluate if stopping on the runway is possible.
If any doubt exists, perform the following steps.

FUEL SHUTOFF VALVE ..... OUT
Turn the fuel shutoff valve off (pull fully out).
MIXTURE ..... IDLE CUTOFF
Adjust the mixture to idle cutoff.
IGNITION SWITCH ..... OFF
Turn the ignition key to the off position, which will turn the magnetos off.
MASTER SWITCH ..... OFF
Turn the switch off.
DOORS ..... UNLATCH
Unlatch the doors to ensure a quick evacuation from the aircraft.
ENGINE FAILURE CHECKLIST ..... COMPLETE
Avoid obstacles and verify engine failure checklist complete if able.

IMMEDIATELY AFTER TAKEOFF

- RUNWAY REMAINING -

AIRSPEED ..... BEST GLIDE
THROTTLE ..... IDLE
FLAPS ..... AS REQUIRED
LAND ..... ON REMAINING RUNWAY
BRAKE ..... AS APPROPRIATE
TAXI ..... OFF RUNWAY

- NO RUNWAY REMAINING -

AIRSPEED ..... BEST GLIDE
FUEL SHUTOFF VALVE ..... OUT
MIXTURE ..... IDLE CUTOFF
THROTTLE ..... IDLE
IGNITION SWITCH ..... OFF
FLAPS ..... AS REQUIRED
MASTER SWITCH ..... OFF
DOORS ..... UNLATCH
LAND ..... STRAIGHT AHEAD
ENGINE FAILURE CHECKLIST ..... COMPLETE

IMMEDIATELY AFTER TAKEOFF, Expanded

- RUNWAY REMAINING –

In general, when departing a runway during engine power loss shortly after rotation and during initial climb, a straight ahead landing will be inevitable.

AIRSPEED ..... BEST GLIDE
Achieve and maintain best glide airspeed.

THROTTLE ..... IDLE
Reduce the throttle to idle immediately once decision to abort has been made.

FLAPS ..... AS REQUIRED
Retract the flaps to aid in aerodynamic braking.

LAND ..... ON REMAINING RUNWAY
Land airplane on runway, if possible.

BRAKE ..... AS APPROPRIATE
Apply maximum effective braking to stop in the shortest possible distance.

TAXI ..... OFF RUNWAY
Attempt to exit the runway or if, unable, utilize brakes to stop on the runway considering length and condition.

- NO RUNWAY REMAINING -

Evaluate if stopping on the remaining runway is possible. If any doubt exists, perform the following steps.

AIRSPEED ..... BEST GLIDE
Achieve and maintain best glide airspeed.

FUEL SHUTOFF VALVE ..... OUT
Turn the fuel shutoff valve off (pull fully out).

MIXTURE ..... IDLE CUTOFF
Adjust the mixture to idle cutoff.

THROTTLE .....IDLE
Reduce to idle.
IGNITION SWITCH.....OFF
Turn the ignition key to the off position, which will turn the magnetos off.
FLAPS.....AS REQUIRED
Consider the amount of flap necessary for a safe approach and landing and utilize as required.
MASTER SWITCH.....OFF
Turn the switch off.
DOORS .....UNLATCH
Unlatch the doors before touchdown to facilitate evacuation after aircraft comes to a stop.
LAND .....STRAIGHT AHEAD
Use steering as necessary to avoid any obstacles while bringing aircraft to a stop in shortest possible distance.
ENGINE FAILURE CHECKLIST.....COMPLETE
Verify engine failure checklist complete, as able.

IN-FLIGHT RESTART

AIRSPEED ..... BEST GLIDE
FUEL SELECTOR ..... BOTH
FUEL SHUTOFF VALVE ..... IN
MIXTURE ..... RICH
THROTTLE ..... INCREASE
AUX FUEL PUMP ..... ON
IGNITION ..... CYCLE L/R/BOTH

- **IF PROPELLER NOT WINDMILLING** -

IGNITION ..... START
ENGINE FAILURE CHECKLIST ..... COMPLETE

IN-FLIGHT RESTART, Expanded

AIRSPEED ..... BEST GLIDE
Achieve and maintain best glide airspeed.
FUEL SELECTOR ..... BOTH
Ensure that the fuel selector is on both and securely engaged in the detent.
FUEL SHUTOFF VALVE ..... IN
Ensure that the fuel shutoff valve is on (full in).
MIXTURE ..... RICH
Check that the mixture is full rich (full forward).
THROTTLE ..... INCREASE
Set the throttle to approximately half-way open position, to allow air to enter the engine for possible restart.
AUX FUEL PUMP ..... ON
Turn the fuel pump on immediately and leave it on.
IGNITION ..... CYCLE L / R / BOTH
Try cycling the engine magnetos to eliminate bad magneto as a possible cause for the power loss.

1. Check that both magnetos are on, with the ignition switch on both.
2. Turn the ignition key to the left magneto.
3. If power is not restored, turn the ignition key to the right magneto.
4. If power is not restored, turn the ignition key back to both.

If the engine begins to run with the ignition switch in either L or R position, leave the switch in that position and do not move it again until after flight is terminated.

- **IF PROPELLER NOT WINDMILLING** -

IGNITION ..... START
Crank the engine to allow the engine shaft to turn and the propeller to windmill in order to restart the engine.
If troubleshooting attempts have failed to restore the power, or if time and situation preclude completion of engine troubleshoot, perform the Engine Secure In-Flight Checklist.
ENGINE FAILURE CHECKLIST ..... COMPLETE
Verify engine failure checklist complete, as able.

Off-Airport Landings

The crew should broadcast the situation ("squawk and talk") and enlist support from ATC, BSU dispatch, or other aircraft, as appropriate to the situation.

WARNING
In a situation where a forced landing/ditching is deemed the only available option, the first and only priority is the safety and survivability of the occupants.

FORCED LANDING

SEAT BACKS ..... UPRIGHT
SEAT BELTS ..... SECURE
AIRSPEED ..... BEST GLIDE
SHUTOFF VALVE ..... OFF
MIXTURE ..... IDLE CUTOFF
THROTTLE ..... IDLE
FUEL PUMP ..... OFF
IGNITION SWITCH ..... OFF
FLAPS ..... AS APPROPRIATE
EMERGENCY RADIO CALL/SQUAWK ..... MADE
ELT ..... ACTIVATE
MASTER SWITCH ..... OFF
DOORS ..... UNLATCH
TOUCHDOWN ..... TAIL LOW
BRAKES ..... APPLY HEAVILY
FORCED LANDING CHECKLIST ..... COMPLETE

FORCED LANDING, Expanded

SEAT BACKS ..... UPRIGHT
Ensure seatbacks are in the upright position.
SEAT BELTS ..... SECURE
Ensure that all occupants have secured the seatbelts and shoulder harnesses properly positioned and tightened around their bodies.
AIRSPEED ..... BEST GLIDE
Achieve and maintain best glide airspeed.
SHUTOFF VALVE ..... OFF
Pull the red fuel shutoff valve next to the fuel selector off (full out).
MIXTURE ..... IDLE CUTOFF
Move the mixture to idle cutoff (full out) to cut the fuel supply to the engine.
THROTTLE ..... IDLE
Reduce the throttle to idle (full out).
FUEL PUMP ..... OFF
Turn the fuel pump off.
IGNITION SWITCH ..... OFF
Turn the ignition switch to off.
FLAPS ..... AS APPROPRIATE
Consider the amount of flap necessary for a safe approach and landing.

EMERGENCY RADIO CALL/SQUAWK ..... MADE
At a towered airport, or when in two-way communications with any ATC facility, transmit your emergency to the tower / ATC using accepted terminology (Refer to AIM). Outside of ATC communications, transmit on 121.5, contact other a/c, and set transponder to 7700.
ELT..... ACTIVATE
Activate the ELT with the remote switch on the aircraft panel. Even if electrical power is not available, the ELT can still be activated with the switch.
MASTER SWITCH.....OFF
Once established on final approach, turn both sides of the Master switch off.
Perform the following steps when landing is assured and on short final:
DOORS .....UNLATCH
Unlatch the doors before touchdown, to prevent the doors from getting jammed.
TOUCHDOWN .....TAIL LOW
Ensure nose high and tail low.
BRAKES .....APPLY HEAVILY
Apply maximum effective braking to stop in the shortest possible distance.
FORCED LANDING CHECKLIST .....COMPLETE
Verify forced landing checklist complete, as able.

CAUTION
Even if there appears to be no fire after the aircraft comes to a stop, expedite evacuating the aircraft and obtaining external assistance.

Ditching

WARNING
"AVOID THE FACE OF A SWELL." **From AIM 6-3-3: Ditching Procedures**

Read the Aeronautical Information Manual (AIM) for any flight crew planning to ditch the aircraft.

NOTE
These ditching procedures are based on the best available information and have not been demonstrated in an actual aircraft.

DITCHING

SWELL FACE ..... AVOID

- DETERMINE APPROACH DIRECTION -

LIGHT WINDS ..... PARALLEL TO SWELLS
HIGH WINDS ..... INTO THE WIND
WING FLAPS..... AS APPROPRIATE
POWER.....MIN RATE OF DESCENT (300 FPM)
AIRSPEED .....55 with PWR / 65 with no PWR
DOORS ..... UNLATCH
TOUCHDOWN .....LEVEL ATTITUDE

DITCHING, Expanded

NOTE
Via all available means, notify ATC of the emergency: 1. Use the radio to broadcast: "Mayday-Mayday-Mayday, Tail #, Ditching, Location (include body of water and land reference), # of Souls Aboard" on current frequency (Approach, Tower, etc.) or on 121.5, as appropriate. Continue transmitting and listening for a response as long as time permits. 2. Set transponder to 7700 and IDENT. 3. Engage the remote ELT switch on the instrument panel.

SWELL FACE ..... AVOID
Remember to avoid the face of a swell.

- DETERMINE APPROACH DIRECTION -

LIGHT WINDS..... PARALLEL TO SWELLS
Attempt to land at the top or on the backside of the swell, and select the heading that allows the greatest into-the-wind component.

HIGH WINDS ..... INTO THE WIND
Select approach in accordance with sea direction and swell height and type, as recommended by AIM and POH/AFM. Accept a higher crosswind component and avoid flying approach into a swell system if possible.

WING FLAPS ..... AS APPROPRIATE
Use 20-30° of flaps if power is available. If no power is available, approach with flaps up.

POWER ..... MIN RATE OF DESCENT (300 FPM)
If power is available, use it to maintain minimum descent rate all the way through touchdown.
AIRSPEED .....55 KIAS with PWR / 65 KIAS with no PWR
If power is available, maintain 55 KIAS with the recommended flap settings. If no power is available, maintain 65 KIAS with flaps up.
DOORS .....UNLATCH
Unlatch the doors prior to touchdown.
TOUCHDOWN.....LEVEL ATTITUDE
Maintain a level pitch attitude during landing.

Fires

WARNING
1. If any of the following situations deteriorate and the decision is made to put the aircraft down on the ground as quickly as possible for safety, initiate an emergency descent. This action may be necessary if the fire cannot be controlled. **2. There may be situations where a forced off-airport landing must be considered for the safest outcome for the aircraft occupants.**

NOTE
Remember the acronym PASS when using fire extinguishers: **P**ull pin, **A**im at base of fire, **S**queeze handle, **S**weep back and forth at base

FIRE DURING ENGINE START

IGNITION.....CONTINUE TO CRANK

- IF ENGINE STARTS -

POWER.....1700 RPM
ENGINE.....SHUTDOWN

- IF ENGINE FAILS TO START -

THROTTLE.....FULL OPEN
MIXTURE.....IDLE CUTOFF
STARTER.....CONTINUE CRANKING
SHUTOFF VALVE.....OFF
FUEL PUMP.....OFF
ENGINE.....SECURE
MASTER SWITCH.....OFF
IGNITION SWITCH.....OFF
PARKING BRAKE.....RELEASE
FIRE EXTINGUISHER.....OBTAIN
AIRPLANE.....EVACUATE
FIRE.....EXTINGUISH
FIRE DAMAGE.....INSPECT

DURING ENGINE START, Expanded

IGNITION .....CONTINUE TO CRANK

Turn key to initiate ignition system.

- IF ENGINE STARTS -

If the engine has started and there are signs of engine fire, perform the following steps. Consult POH / AFM.

POWER ..... 1700 RPM

Open throttle to increase RPM and attempt to draw the fire into the engine.

ENGINE .....SHUTDOWN

Move the mixture to idle cutoff (full out). Turn the fuel shutoff valve off (pull full out).

NOTE
Evaluate the results and if the fire is not out within a few seconds, immediately evacuate the aircraft and obtain external assistance

- IF ENGINE FAILS TO START -

If the engine has not started and there are signs of engine fire, perform the following steps. Consult POH/AFM.

THROTTLE .....FULL OPEN
Push throttle to the full forward position.

MIXTURE ..... IDLE CUTOFF
Pull the mixture to idle cutoff (full out).

STARTER .....CONTINUE CRANKING
Turn and hold key in the start position, continuously cranking the engine.

SHUTOFF VALVE.....OFF
Pull the fuel shutoff valve fully out while continuing to crank the starter.

FUEL PUMP .....OFF
Verify the fuel pump is off.

ENGINE..... SECURE
Verify fire has been drawn into the engine and extinguished.

MASTER SWITCH .....OFF
Turn switch to the off position.

IGNITION SWITCH .....OFF
Turn the ignition switch to off.

PARKING BRAKE .....RELEASE
Rotate handle clockwise 45º and push handle in.

FIRE EXTINGUISHER .....OBTAIN
Release extinguisher from holder in plane or retrieve from designated areas.

AIRPLANE……..EVACUATE
Evaluate the results and if the fire is not out within a few seconds, immediately evacuate the aircraft and obtain external assistance.

FIRE .....EXTINGUISH
Pull the pin from the extinguisher and squeeze handle, pointing the hose at the base of the flames until fire is fully extinguished.

FIRE DAMAGE ..... INSPECT
After fire threat has been extinguished, inspect damage and provide damage assessment.

ENGINE FIRE IN-FLIGHT	
MIXTURE	IDLE CUTOFF
SHUTOFF VALVE	OFF
FUEL PUMP	OFF
MASTER SWITCH	OFF
CABIN HEAT and AIR	CLOSED
AIRSPEED	100 KTS
FORCED LANDING	EXECUTE
ENGINE FIRE IN-FLIGHT CHECKLIST	COMPLETE

ENGINE FIRE IN-FLIGHT, Expanded

NOTE
Maintain positive aircraft control while securing the engine and, altitude permitting, preparing for emergency descent.

MIXTURE ..... IDLE CUTOFF
Pull the mixture to idle cutoff.
SHUTOFF VALVE.....OFF
Pull the Fuel Shutoff valve fully out to cut the fuel at the source.
FUEL PUMP .....OFF
Turn the fuel pump off to prevent fuel from entering the engine.
MASTER SWITCH.....OFF
Turn the Master Switch off.
CABIN HEAT and AIR..... CLOSED
To close cabin air and heat (located next to the co-pilot yoke), push center button while moving the knob forward until fully in. Close all the other air vents except for the overhead vents.
AIRSPEED .....100 KTS
Achieve and maintain 100 KTS.
FORCED LANDING..... EXECUTE
Execute Forced Landing Checklist.
ENGINE FIRE IN-FLIGHT CHECKLIST .....COMPLETE
Verify Engine Fire In-Flight Checklist complete, as able.

ELECTRICAL FIRE

MASTER SWITCH ..... OFF
VENTS/CABIN AIR/HEAT ..... CLOSED
FIRE EXTINGUISHER ..... ACTIVATE
AVIONICS MASTER ..... OFF
ALL SWITCHES ..... OFF
WINDOWS ..... OPEN
VENTS/CABIN AIR/HEAT ..... OPEN
MASTER SWITCH ..... ON
CIRCUIT BREAKERS ..... CHECK
RADIO SWITCHES ..... OFF
AVIONICS MASTER SWITCH ..... ON
RADIO/ELECTRICAL SWITCHES ..... ON
ELECTRICAL FIRE CHECKLIST ..... COMPLETE

ELECTRICAL FIRE, Expanded

MASTER SWITCH ..... OFF
Turn the switch off.

VENTS/CABIN AIR/HEAT ..... CLOSED
To close cabin air and heat (located next to the co-pilot yoke), push center button while moving the knob forward until fully in. Close all the other air vents except for the overhead vents.

FIRE EXTINGUISHER ..... ACTIVATE
Release extinguisher from holder in plane. Pull the pin from the extinguisher and squeeze handle, pointing the hose at the base of the flames until fire is fully extinguished.

AVIONICS MASTER ..... OFF
Turn the switch off.

ALL SWITCHES ..... OFF
Turn all electrical switches off.

WINDOWS ..... OPEN
If fire is extinguished, open windows.

VENTS/CABIN AIR/HEAT ..... OPEN
Ventilate the cabin by pushing the center button while moving the knob back until fully out. Open all other air vents.

NOTE

While proceeding through the following items, carefully observe any indications of smoke after turning a particular item on. If smoke is detected, turn the item back off.

MASTER SWITCH ..... ON
Turn the switch to on.

CIRCUIT BREAKERS ..... CHECK
Conduct visual check of all circuit breakers and make note of any that are tripped.

RADIO SWITCHES ..... OFF
Turn radio switches off.

AVIONICS MASTER SWITCH ..... ON
Turn switch to the on position.

RADIO/ELECTRICAL SWITCHES .....ON
Turn radio and electrical switches on, one at a time.
ELECTRICAL FIRE CHECKLIST .....COMPLETE
Verify electrical fire checklist complete, as able.

CABIN FIRE	
MASTER SWITCH	OFF
VENTS/CABIN AIR/HEAT	CLOSED
FIRE EXTINGUISHER	ACTIVATE
VENTS/CABIN AIR/HEAT	OPEN
NEAREST AIRPORT	DIVERT
CABIN FIRE CHECKLIST	COMPLETE

CABIN FIRE, Expanded

MASTER SWITCH ..... OFF
Turn the switch off.

VENTS/CABIN AIR/HEAT ..... CLOSED
Close all cabin heat and air vents to stop the flow of oxygen from entering the cabin and potentially feeding the fire.

FIRE EXTINGUISHER ..... ACTIVATE
Release extinguisher from holder in plane. Pull the pin from the extinguisher and squeeze handle, pointing the hose at the base of the flames until fire is fully extinguished.

VENTS/CABIN AIR/HEAT ..... OPEN
Ventilate the cabin of smoke, fumes, and fire extinguisher discharge once it is determined that the fire is completely extinguished.

NEAREST AIRPORT ..... DIVERT
Immediately divert to the nearest suitable airport.

CABIN FIRE CHECKLIST ..... COMPLETE
Verify cabin fire checklist complete, as able.

NOTE
Remember the acronym PASS when using fire extinguishers: **P**ull pin, **A**im at base of fire, **S**queeze handle, **S**weep back and forth at base

WING FIRE	
LIGHT SWITCHES	OFF
PITOT HEAT SWITCH	OFF
FUEL SELECTOR	OPPOSITE OF FIRE
SLIP	AS APPROPRIATE TO EXTINGUISH
WING FIRE CHECKLIST	COMPLETE

WING FIRE, Expanded

LIGHT SWITCHES ..... OFF
Turn off the landing, taxi, nav, and strobe lights to eliminate source of fire.

PITOT HEAT SWITCH ..... OFF
Turn off the switch.

FUEL SELECTOR ..... OPPOSITE OF FIRE
Change fuel selector valve to opposite wing of the fire.

SLIP ..... AS APPROPRIATE TO EXTINGUISH
Sideslip the airplane to keep the flames away from the cabin and the fuel tank, if possible.

WING FIRE CHECKLIST ..... COMPLETE
Verify wing fire checklist complete, as able.

Section 5: Abbreviated and Expanded Abnormal Checklist

Landing with Flat Tires

FLAT MAIN TIRE	
APPROACH	NORMAL
FLAPS	30°
TOUCHDOWN	GOOD MAIN FIRST
CONTROL PRESSURE	HOLD OFF FLAT
DIRECTIONAL CONTROL	MAINTAIN

FLAT MAIN TIRE, Expanded

NOTE
If a flat tire or tire separation occurs during takeoff and an aborted takeoff is not feasible, land as soon as practical. Transmit aircraft condition and intentions to ATC, Tower, CTAF or UNICOM frequency, as appropriate.

APPROACH ..... NORMAL
Execute the Before Landing Checklist in preparation for the approach. Conduct a normal approach, as appropriate for the conditions.
FLAPS ..... 30°
Set flaps to 30°, as recommended by the POH/AFM.
TOUCHDOWN ..... GOOD MAIN FIRST
If possible, select a runway so that the crosswind comes from the side opposite the defective tire. If no such runway is available, select the runway with the most headwind. Touch down on the runway side opposite the defective tire.
CONTROL PRESSURE ..... HOLD OFF FLAT
If possible, use the aileron to first hold off, then lighten the load on the defective tire by applying the aileron control in the direction of the side opposite the defective tire.
DIRECTIONAL CONTROL ..... MAINTAIN
Taxi as little as possible after landing. Clear the runway, as necessary, communicate with ATC. Do not taxi on a flat tire unless moving the aircraft is necessary for safety.

FLAT NOSE TIRE

APPROACH ..... NORMAL
FLAPS..... AS REQUIRED
TOUCHDOWN .....ON MAINS
CONTROL PRESSURE.....NOSE OFF GROUND
AFTER NOSEWHEEL TOUCHDOWN .....YOKE FULL AFT

FLAT NOSE TIRE, Expanded

NOTE

If a flat tire or tire separation occurs during takeoff and an aborted takeoff is not feasible, land as soon as practical. Transmit aircraft condition and intentions on ATC, Tower, CTAF or UNICOM frequency, as appropriate.

APPROACH ..... NORMAL
Execute the Before Landing Checklist in preparation for the approach. Conduct a normal approach, as appropriate for the conditions.
FLAPS.....AS REQUIRED
Set flaps to 30°, as recommended by the POH/AFM.
TOUCHDOWN..... ON MAINS
Do not allow the nose wheel to come in contact with the ground during touchdown.
CONTROL PRESSURE .....NOSE OFF GROUND
Hold the nose wheel off the ground as long as possible while slowing down.
AFTER NOSEWHEEL TOUCHDOWN ..... YOKE FULL AFT
After the nose wheel touches down, maintain full aft yoke deflection to take weight off the nose wheel.

NOTE

Taxi as little as possible after landing. Clear the runway, as necessary, communicate with ATC and obtain external assistance. Do not taxi on a flat tire unless moving the aircraft is necessary for safety.

Electrical System Malfunctions

WARNING
Do not reset a circuit breaker if it can be avoided. **In all cases, never reset a circuit breaker more than once.**

CAUTION
1. *Whenever electrical failure is experienced in-flight, the system should be considered suspect even if normal operation resumes. The PIC should anticipate further failures and plan accordingly.* 2. *Compass error of as much as 25° may occur when the alternator side of the battery master switch is in the off position.*

EXCESSIVE RATE OF CHARGE

ALTERNATOR ..... OFF
NON-ESSENTIAL EQUIPMENT ..... OFF
BATTERY VOLTAGE ..... MONITOR
FLIGHT ..... DISCONTINUE
EXCESSIVE RATE OF CHARGE CHECKLIST ..... COMPLETE

EXCESSIVE RATE OF CHARGE, EXPANDED

ALTERNATOR .....OFF
Turn the alternator off by moving the left side only of the master switch to the off position.

NON-ESSENTIAL EQUIPMENT .....OFF
Turn off all non-essential equipment to bring the electrical load down to absolute minimum necessary for safe flight. Ensure that the battery side of the master switch remains on.

BATTERY VOLTAGE ..... MONITOR
Monitor battery voltage.

FLIGHT ..... DISCONTINUE
Head to the nearest airport and terminate the flight as soon as practical.

NOTE
1. If in VMC, maintain VFR and divert to the nearest suitable airport to land under VFR. 2. If in IMC, enlist ATC help in determining the nearest VMC/VFR conditions and then divert to exit the IMC as soon as possible.

EXCESSIVE RATE OF CHARGE CHECKLIST .....COMPLETE
Verify excessive rate of charge checklist complete, as able.

LOW VOLTAGE ANNUNCIATOR

AVIONICS MASTER ..... OFF
ALT FLD CIRCUIT BREAKER ..... CHECK IN
MASTER SWITCH ..... OFF
MASTER SWITCH ..... ON
LOW VOLTS ANNUNCIATOR ..... CHECK
AVIONICS MASTER ..... ON

- **IF LOW VOLTS ILLUMINATES AGAIN –**

ALTERNATOR ..... OFF
NON-ESSENTIAL EQUIPMENT ..... OFF
BATTERY VOLTAGE ..... MONITOR
FLIGHT ..... DISCONTINUE
LOW VOLTAGE ANNUNCIATOR CHECKLIST ..... COMPLETE

LOW VOLTAGE ANNUNCIATOR, Expanded

AVIONICS MASTER .....OFF
Turn the avionics master switch off.
ALT FLD CIRCUIT BREAKER ..... CHECK IN
Check the alternator field circuit breaker (labeled ALT FLD) and push it in, if it is deemed necessary for the safety of the flight.
MASTER SWITCH .....OFF
Turn both sides of the master switch to off.
MASTER SWITCH .....ON
After a few seconds, turn both sides of the master switch on.
LOW VOLTS ANNUNCIATOR.....CHECK
Check that the VOLTS light on the annunciator panel is not illuminated. Check the ammeter and voltmeter for normal indications.
AVIONICS MASTER .....ON
Turn master on.

- **IF LOW VOLTS ILLUMINATES AGAIN –**

ALTERNATOR .....OFF
Turn the alternator off, by moving the left side only of the master switch to the off position.
NON-ESSENTIAL EQUIPMENT .....OFF
Turn off all non-essential electrical equipment. Ensure that the battery side of the master switch remains on**.**
BATTERY VOLTAGE ..... MONITOR
Monitor battery voltage.
FLIGHT ..... DISCONTINUE
Head to the nearest airport and terminate the flight as soon as practical.
LOW VOLTAGE ANNUNCIATOR CHECKLIST.....COMPLETE
Verify low voltage annunciator checklist complete, as able.

Vacuum and Instrument Malfunctions

VACUUM SYSTEM FAILURE	
ENGINE RPM	INCREASE
ALTITUDE	DESCEND
VAC GAUGE	MONITOR
MALFUNCTION REPORT	COMPLETE

VACUUM SYSTEM FAILURE, Expanded

ENGINE RPM.....INCREASE
Increase engine RPM, if practical, in order to increase the speed at which the vacuum pump(s) turn(s).

ALTITUDE..... DESCEND
If situation permits, descend to a lower altitude to allow the pumps to produce acceptable vacuum pressure.

VAC GAUGE .....MONITOR
Check the vacuum gauge for an acceptable indication (between 4.5”-5.5” Hg). Monitor secondary instruments and terminate the flight as soon as practical if acceptable indications are not maintained.

MALFUNCTION REPORT .....COMPLETE
If in IMC, report malfunction to appropriate ATC facility.

NOTE

1. If in VMC, maintain VFR and divert to the nearest suitable airport to land under VFR.
2. If in IMC, enlist ATC help in determining the nearest VMC/VFR conditions and then divert to exit the IMC as soon as possible.

PITOT STATIC FAILURE/BLOCKAGE	
PITOT HEAT	ON
ALT STATIC	ON
AIRSPEED CALIBRATION TABLE	CONSULT
MALFUNCTION REPORT	COMPLETE

PITOT STATIC FAILURE/BLOCKAGE, EXPANDED

PITOT HEAT ..... ON

If pitot tube blockage is suspected, especially in visible moisture, turn the pitot heat on.

ALT STATIC ..... ON

Activate the alternate static source by pulling the red valve knob out (labeled "Alt Static Air"). Monitor the instruments to determine if the problem has been corrected.

AIRSPEED CALIBRATION TABLE ..... CONSULT

Refer to the airspeed calibration table located in the POH.

MALFUNCTION REPORT ..... COMPLETE

If in IMC, report malfunction to appropriate ATC facility.

NOTE

1. If in VMC, maintain VFR and divert to the nearest suitable airport to land under VFR.
2. If in IMC, enlist ATC help in determining the nearest VMC/VFR conditions and then divert to exit the IMC as soon as possible.

Chapter 2
Flight Maneuvers

Table of Contents

Section 1: Taxiing

Objective

Flight crews will develop the ability to taxi safely while minimizing the use of brakes and allowing for the possibility of sudden brake failure.

CAUTION
Maximum taxi speed on the BSU ramp shall be limited to 8 knots maximum.

Procedure description

- During the initial movement after engine startup, both pilots shall check brakes prior to commencing further taxiing from a parking space.
- Always minimize the usage of brakes during taxi operations.
- When attempting to slow down, reduce power to idle, then apply brakes, if needed.
- When attempting to turn:
  - Reduce power to idle.
  - Apply full rudder in the direction of turn to engage nose wheel steering
  - If turn radius is insufficient, apply brake pressure on the pedal in the direction of turn.
  - Add enough power to keep the airplane moving while applying the brake.
- Prior to stopping after a turn, straighten the nose wheel by aligning both pedals.
- Always select an appropriate taxi speed (approximately 15 KTS ground speed) which will allow the aircraft to slow to a safe stop without the use of brakes.

CAUTION
When positioning the aircraft for run-up, avoid pointing the airplane into a nearby obstacle or another aircraft on the run-up area in case the brakes fail.

Section 2: Takeoffs

Guidance

- Before executing a takeoff, flight crews must ensure that the final approach and departure runway is clear at both controlled and non-controlled airports.
- Avoid fast taxi turns while entering the runway to prevent any possible fuel system starvation that could lead to engine hesitation or stoppage during takeoff.
- During takeoff, PF's hand shall remain on the throttle at all times in the event an aborted takeoff becomes necessary.
- If a significant crosswind exists (greater than 8 knots), hold the aircraft on the ground slightly longer than normal to ensure a smooth, positive liftoff.
- During gusty wind conditions, climb speeds should be increased by 1/2 the gust factor.
- Turns after takeoff and during traffic pattern operations are limited to a maximum of 30° of bank, unless safety of flight necessitates exceptional maneuvering.

NOTE
The crosswind techniques described below apply to and must be utilized during all types of takeoffs and landings: 1. During ground roll, rudder controls direction of airplane travel while ailerons compensate for crosswind drift. 2. Once airborne, rudder maintains coordination and keeps the ball centered while ailerons are adjusted to maintain a constant ground track ("crabbing" into the wind).

Before any Takeoff

1. At the hold short line, ensure the Before Takeoff and Takeoff checklists are complete.
2. Ensure proper configuration for specified takeoff.
3. Check the windsock indications. Apply full ailerons, as appropriate.
4. Contact the control tower for clearance or make a radio call at uncontrolled airports.

For access to specific takeoffs, use the following links:

- Normal Takeoff
- Short-Field Takeoff
- Soft-Field Takeoff

Normal and Crosswind Takeoff and Climb

Objective

Flight crews will develop the ability to safely conduct a normal and/or crosswind takeoff and climb.

Procedure description

Complete Steps 1-4 (Page 77)

5. Ensure flaps are set to 0°.
6. Taxi onto the runway and maintain alignment with the centerline.
7. Smoothly set full throttle while maintaining directional control and alignment.
8. Ensure that all engine gauges and airspeed indicator show normal indications.
9. At V_R (55 KIAS), apply elevator pressure to establish a V_Y pitch attitude.
10. Once the aircraft becomes airborne, crab into the wind to maintain runway centerline, level the wings and ensure the airplane is coordinated.

Complete after takeoff steps (Page 83)

Short-Field Takeoff and Max Performance Climb

Objective

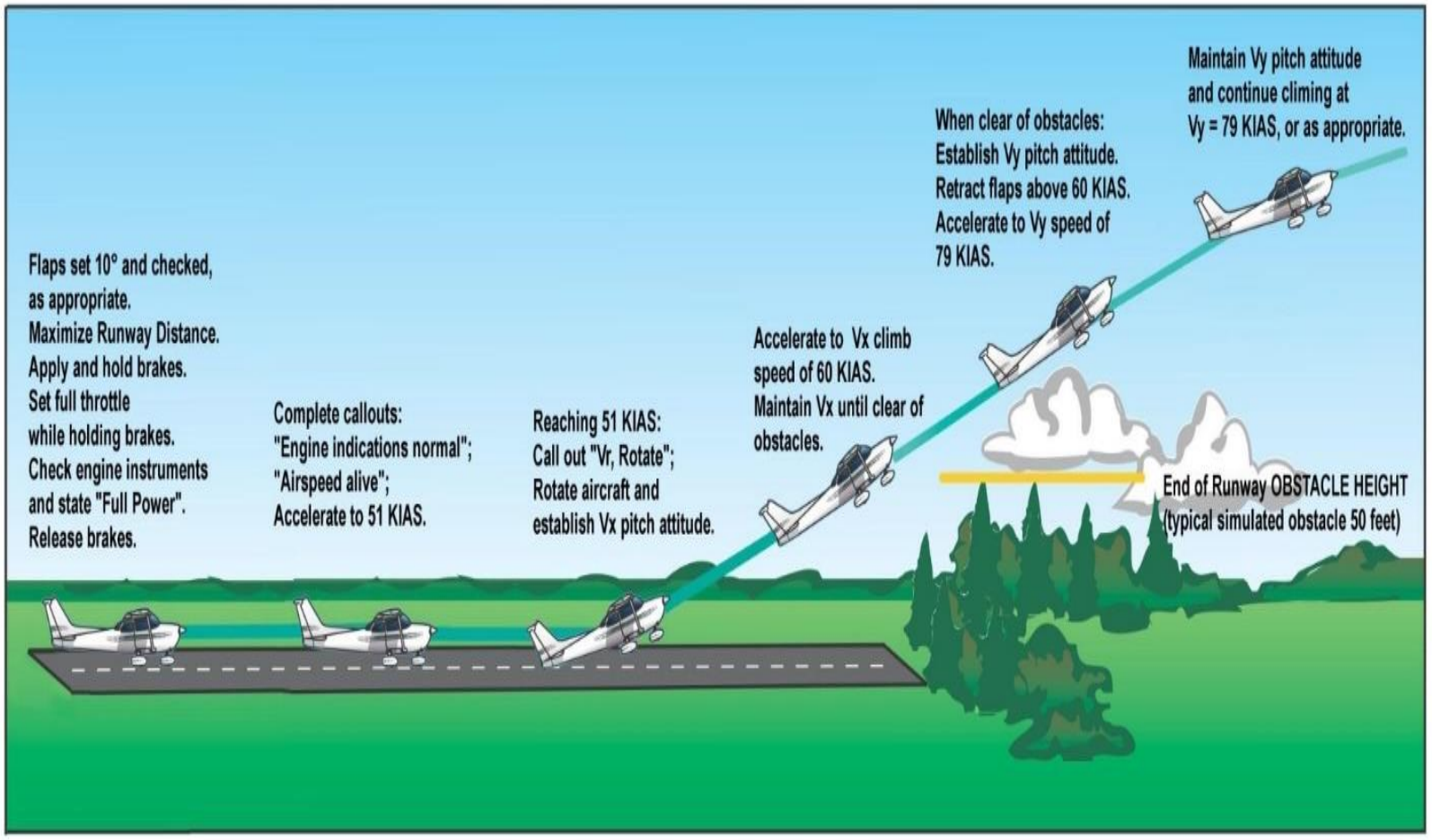
Flight crews will develop the ability to safely conduct a short-field takeoff and maximum performance climb in actual or simulated short-field conditions and with obstacles present.

Procedure description

Complete Steps 1-3 (Page 77)

4. Contact the control tower for a "short delay" or make a radio call at uncontrolled airports.
5. Verify flaps are set to 10° and trim is set for takeoff.
6. Taxi the aircraft into position to utilize all runway available and maintain alignment with the centerline.
7. Apply and hold brakes to prevent aircraft movement.
8. Smoothly set full throttle. Ensure that all engine gauges and airspeed indicator show normal indications.
9. Release the brakes, allowing the aircraft to accelerate.
10. Adjust the aileron pressure as needed and utilize rudder pedal steering to maintain runway centerline.
11. Ensure that the airspeed indicator is indicating normally.
12. Gradually increase elevator control pressure to rotate as appropriate to establish a V_X pitch attitude.
13. Maintain V_X (60 KIAS).
14. Once clear of obstacles, lower the nose to establish a **V_Y** climb attitude and retract flaps.

Complete after takeoff steps (Page 83)



SHORT- FIELD TAKEOFF and Maximum Performance Climb

Soft-Field Takeoff and Climb

Objective

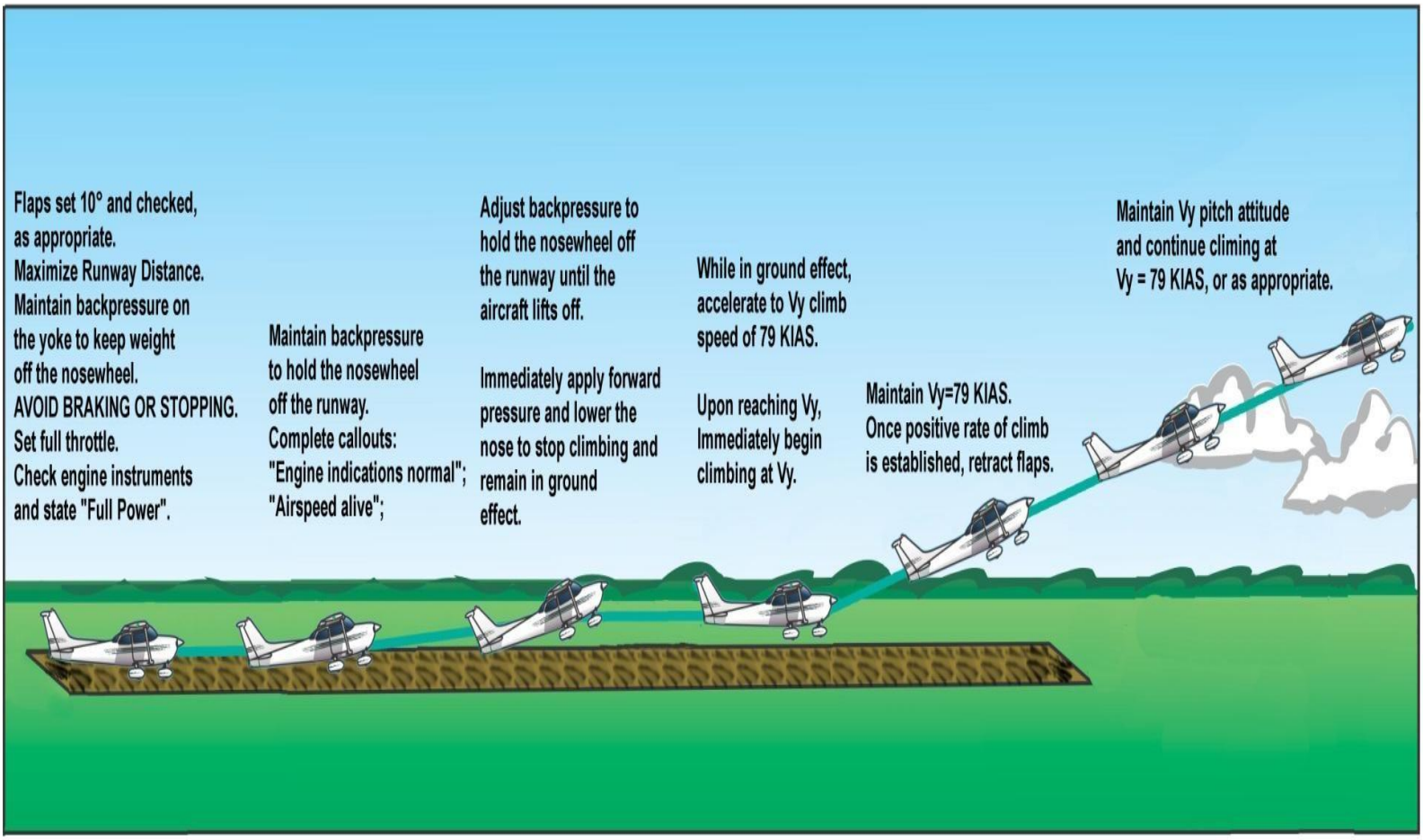
Flight crews will develop the ability to safely conduct a soft-field takeoff in actual or simulated soft-field conditions (mud, snow, slush, grass, etc.), followed by a maximum performance climb, if obstacles are present.

Procedure description

Complete Steps 1-4 (Page 77)

5. Verify flaps are set to 10° and trim is set for takeoff.
6. Hold the yoke full aft while taxiing the aircraft into position on the centerline of the runway.
7. Minimize use of brakes while turning and move your feet off the brakes completely when aligned with the centerline.
8. Smoothly set full throttle. Simultaneously, release some aft yoke pressure as appropriate in order to avoid a tail strike.
9. Ensure that all engine instruments and airspeed indicator are indicating normal.
10. As the aircraft accelerates and the nose comes off the runway, adjust the yoke backpressure to maintain a constant aircraft pitch with the nose wheel just off the ground.
11. As the aircraft leaves the runway, gradually lower the nose to remain in ground effect and accelerate.
12. Initiate a climb when the airspeed reaches V_X (60 KIAS) if obstacles are present, or at V_Y (79 KIAS), if no obstacles present.
13. Once clear of the obstacles, lower the nose to establish a V_Y climb attitude and retract flaps.

Complete after takeoff steps (Page 83)



SOFT- FIELD TAKEOFF (without obstacle)

After any Takeoff

- At 500’ AGL, initiate the Climb checklist, continue climbing, and verify power is set to full.
- At or above 1000’ AGL, smoothly reduce power if remaining in the pattern. If departing the pattern, continue climbing at V_Y (79 KIAS) or cruise climb (90 KIAS), as appropriate.

Section 3: Traffic Pattern Operations

Traffic Pattern

Objective
Flight crews will develop the ability to safely conduct departures, arrivals, and traffic pattern operations.

NOTE
If not remaining in the pattern, depart either straight out, on a 45° ground track in the direction of the traffic pattern, or as instructed by the control tower.

Departure procedures

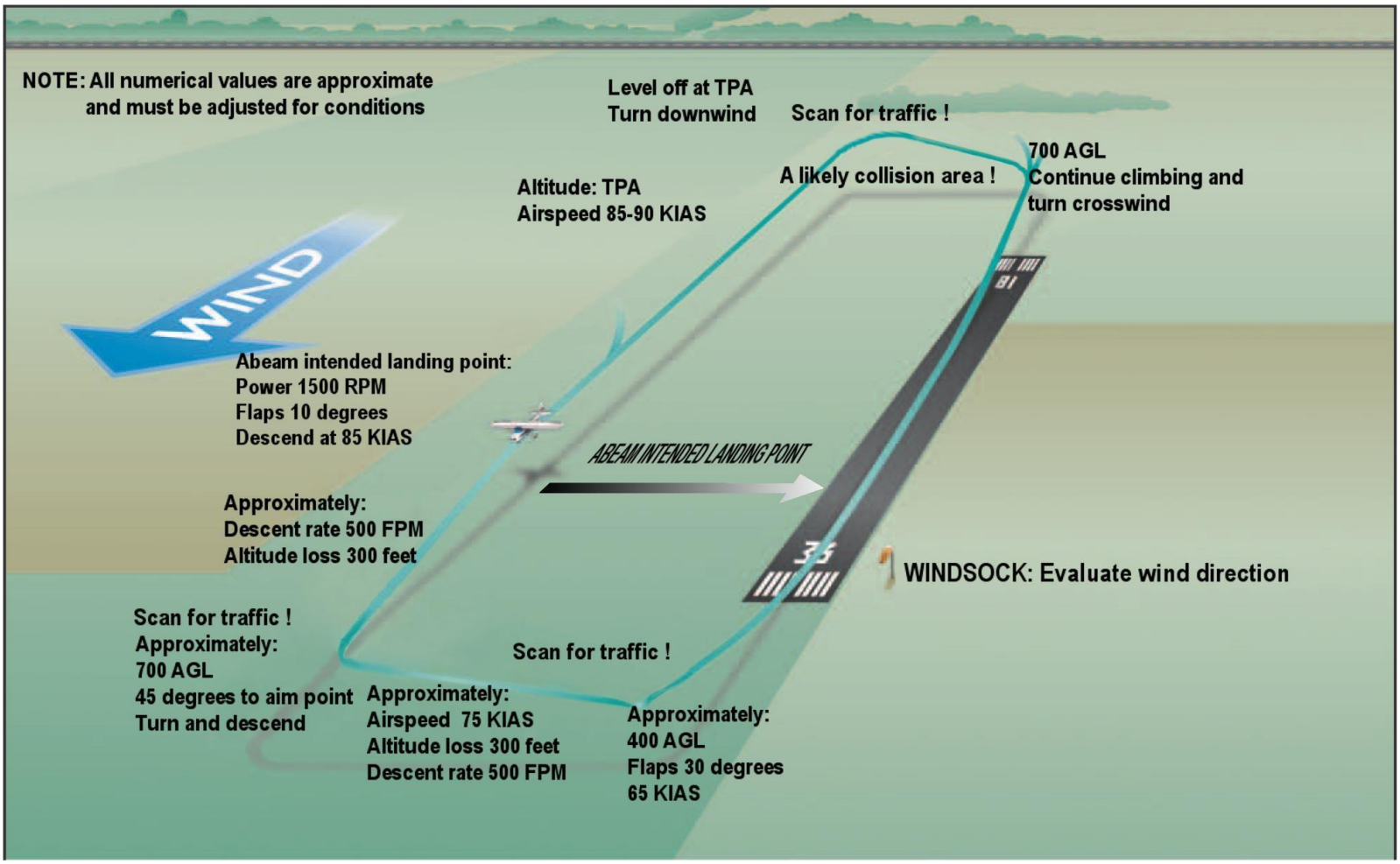
1. Perform the appropriate takeoff procedure as described in the previous section.
2. Continue climbing to TPA at V_Y (79 KIAS).
3. Turn crosswind within 300' of TPA or as instructed by the control tower.
4. While climbing on Crosswind and prior to turning Downwind, maintain extra vigilance for other aircraft in the traffic pattern. Momentarily reduce the pitch attitude if necessary to visually clear the area.
5. Upon reaching TPA, and if remaining in the traffic pattern, turn Downwind and set the power to maintain 90 KIAS (≈ 1900 RPM). Continue at step 3 of the Arrival procedures.

Arrival procedures

1. Once the active runway has been determined, establish the airplane on 45° entry to the middle point of the Downwind or as otherwise instructed by the control tower.
2. No further than 1 mile prior to reaching the Downwind, establish TPA and slow down to 90 KIAS (≈ 1900 RPM).
3. At or just prior to downwind midfield, perform "Before Landing" checklist and verify complete.
4. Abeam the intended landing point, reduce the power to ≈1500 RPM and, when below 110 KIAS, extend flaps to 10°. Begin a ≈ 500 FPM descent and maintain ≈ 85 KIAS.
5. At 45° to the intended landing point, or as directed by the control tower, turn Base.
6. Ensure the airspeed is below V_{FE} (85 KIAS) and set flaps to 20°. Maintain ≈ 75 KIAS.
7. Visually clear the final approach and opposite Base before turning Final.
8. On Final, set full flaps and maintain 65 KIAS, adding ½ the gust factor, as appropriate.

NOTE
Approaching in either crosswind, strong gusty wind or high wind, consider using less than full flaps**.** If crabbing into the wind, consider holding the crab angle until arriving over the runway. Taking the crab out with the rudder by aligning with the runway centerline (wing-low method) will result in an aerodynamic slip and immediate drag increase, and may result in excessive sink rate. This will require a large power addition to maintain airspeed and descent rate.

NOTE
Aircraft must remain within power-off gliding distance unless traffic dictates otherwise.



STANDARD TRAFFIC PATTERN

Touch-and-Go / Stop-and-Go

Objective

Flight crews will develop the ability to safely transition into takeoff configuration immediately after landing and execute an appropriate takeoff procedure.

CAUTION
Intentional Touch-and-Go operations are prohibited after a simulated engine failure approach (power-off approach) which results in landing on a runway, excluding the need for a go-around to ensure safety of flight.

Procedure description

1. Ensure that the appropriate ATC clearance is issued or, for uncontrolled airports, radio call is made.
2. Once on the runway, maintain positive control at all times as the aircraft rolls down the runway (for a touch-and-go) or comes to a complete stop (for a stop-and-go).
3. Ensure adequate runway distance and obstacle clearance remains for type of operation planned.
4. Set flaps to 10° and trim to "takeoff".
5. Smoothly add full power, check and verify engine instruments indicate normally.
6. Execute takeoff.

WARNING
Terminate Touch-and-Go / Stop-and-Go operation and abort takeoff if insufficient runway remains, the aircraft is not properly configured for takeoff, or positive aircraft control is lost.

NOTE
1. The term "positive control" means that the pilot is immediately correcting for and maintaining centerline with proper crosswind controls established and slowing down to a safe speed where the necessary transition steps to takeoff can be made. 2. All landings during the first stage of the Private Pilot Course are to be accomplished to a full-stop-taxi-back only if the runway of intended use is less than 3000 feet or the particular lesson dictates otherwise.

Low Approach

Objective
Flight crews will develop the ability and judgment to intentionally discontinue a visual or instrument approach and execute a rejected landing / go-around procedure.

Procedure description
1. If on a simulated instrument or visual approach at a controlled airport, ensure that the flight crew understands the action(s) required by ATC immediately following the low approach.
2. If on a simulated instrument approach at an uncontrolled airport, ensure that the intentions are transmitted on the appropriate frequency throughout the approach.
3. Plan and establish a stabilized approach to the runway, with the intention of not touching down. Reference AOM chapter 8 for guidance.
4. Upon reaching the "Missed Approach Point," or prior to arrival at the runway while in visual conditions, execute a go-around procedure as described in this manual.
5. Contact the control tower or make a radio call at uncontrolled airports.
6. Verify the appropriate checklists are complete.

Section 4: Landings

For any Landing

1. Select the appropriate final flap setting based on the wind conditions and available runway.

NOTE
For reduced flap settings due to wind conditions, account for the increased landing distance requirements and ensure adequate runway distance is available.

2. Adjust the final approach speed by adding ½ the gust factor to the appropriate final approach speed.
3. Determine a touchdown point within the usable landing portion of the runway which will allow for adequate braking distance. Then, pick an aiming point which will allow the aircraft to arrive at the runway with enough distance to flare and touchdown at the predetermined touchdown point.
4. Ensure that the aircraft is on a stabilized approach with a final flap setting prior to reaching 500' AGL. Reference AOM chapter 8 for guidance.
5. Crab into the wind to remain on extended runway centerline throughout the entire final approach phase.

CAUTION
Use of proper crosswind correction without drift will result in the airplane touching down aligned with and over the runway centerline while banking slightly, on the upwind main gear first, followed by the downwind gear. The bank angle may also appear to be steeper than it actually is but it must be accepted.

6. Coordinate pitch and power so as to maintain the desired approach angle resulting in a smooth landing within the designated area.
7. Upon arrival at the aiming point, smoothly reduce throttle and apply sufficient back pressure on the yoke to "roundout" and maintain minimal height above the runway while dissipating excess airspeed.
8. After the round out, "flare" by further increasing back pressure on the yoke to increase pitch attitude setting up for a touchdown on the main landing gear.
9. Touchdown at minimum controllable airspeed to reduce ground roll.

For access to specific landings, use the following links:

- Normal Landing
- Short-Field Landing
- Soft-Field Landing
- 180° Power-Off Accuracy Landing
- Go-Around/Rejected Landing

Normal and Crosswind Approach and Landing

Objective

Flight crews will develop the ability to safely and accurately execute approach, landing and rollout, under both normal and crosswind conditions.

Procedure description

Complete Steps 1-6 (page 88)

7. Maintain final approach speed of 65 KIAS, or as appropriate for wind conditions.
8. During flare, slow the aircraft descent rate by simultaneously increasing the pitch and smoothly reducing the power to idle, while holding the established crosswind correction so that the aircraft touches down smoothly onto the runway.
9. Adjust back pressure on the yoke throughout the landing roll to allow for gentle touchdown of the nose wheel.
10. During the landing roll, increase crosswind correction inputs to account for decreased control effectiveness as the airspeed decreases.
11. Maintain the aircraft's longitudinal axis with the centerline, and slow the aircraft by applying the brakes as necessary.
12. Slow the aircraft to a safe taxi speed and taxi off the runway as soon as practical or as directed by ATC.

Short-Field Approach and Landing

Objective

Flight crews will develop the ability to safely and accurately execute a short-field, maximum performance approach and landing in actual or simulated short-field conditions and with actual or simulated obstacles present.

Procedure description

Complete Steps 1-6 (page 88)

7. Maintain a final approach speed of 61 KIAS, or as appropriate for wind conditions.
8. Maintain a steeper than normal angle of descent toward the aiming point to simulate obstacle clearance.
9. Upon arrival at the aiming point, increasing the pitch and smoothly reducing the power to idle, while holding the established crosswind correction so that the aircraft touches down smoothly onto the runway.

NOTE
While flaring, the aircraft will potentially reach MCA sooner than normal due to the reduced approach speed and the flare may need to be adjusted accordingly.

10. Immediately after touchdown, raise the flaps to 0°. Continue applying back pressure to the yoke, increasing elevator pressure as the aircraft slows down. Apply maximum braking without locking up the wheels.

NOTE
The term “maximum braking” means maximum available braking which results in the aircraft coming to as rapid of a stop as practical, while remaining under positive control without locking the brakes and damaging or blowing a tire. If the pilot inadvertently locks up a tire, or starts skidding, release the brake pressure *entirely*, then smoothly reapply maximum braking.

11. Slow the aircraft to a safe taxi speed and taxi off the runway as soon as practical or as directed by ATC.

Soft-Field Approach and Landing

Objective

Flight crews will develop the ability to safely and accurately execute a soft-field approach and landing in actual or simulated soft-field conditions (mud, snow, slush, grass, etc.)

Procedure description

Complete Steps 1-6 (page 88)

7. Maintain a final approach speed of 62 KIAS.
8. Maintain a normal descent path to the desired touchdown point in the first 1,000 feet or 1/3rd of the runway, whichever is less.
9. Smoothly reduce power to idle.
10. Upon entering ground effect, level out and hold the airplane off the runway until reaching MCA.
11. Add an audible amount of power (~50-100 RPM) in the flare just before touchdown in order to soften the landing.

CAUTION
Avoid closing the throttle too early or too rapidly during flare, as it will likely result in an immediate increase in the rate of descent and a hard landing.

12. Immediately after touchdown, continue applying backpressure to the yoke and adjust the rudder pressure to maintain centerline.
13. Increase elevator backpressure to prevent the nose wheel from touching down.
14. As the nose wheel touches down, the yoke should remain fully aft to take as much weight as possible off the nose wheel.
15. Slow the aircraft to a safe taxi speed and taxi off the runway as soon as practical or as directed by ATC.

180° Power-Off Accuracy Approach and Landing

Objective

Flight crews will develop the ability to conduct an accurate power-off approach from downwind abeam the selected landing point, while becoming familiar with aircraft glide characteristics under a simulated engine failure scenario.

Procedure description

Complete Steps 1-5 (page 88)

6. Ask for a short approach by contacting the control tower for clearance or making a radio call at uncontrolled airports, ensuring it will not disrupt the flow of traffic.
7. Select a touchdown point no more than 1/3rd or 1000' down the landing runway, whichever is less.
8. Abeam the intended touchdown point on the Downwind, reduce power to idle.
9. Set flaps 10° and establish appropriate glide airspeed.
10. After turning Base, evaluate the glide angle and adjust aircraft ground track as necessary to ensure the desired point on the runway is reached.
11. Apply flaps and utilize slips as necessary to adjust rate of descent.
12. Once clear of any obstacles, increase pitch as necessary so that aircraft touches down smoothly, in a positive pitch attitude on the main gear on the designated touchdown point.
13. Upon touchdown, brake as necessary and slow to taxi speed. Taxi off the runway as soon as practical or as directed by ATC.

NOTE
Student Pilots/Private Pilots practicing this maneuver during simulated emergency approach and landing to a runway, need only to touchdown safely on the runway with the ability to stop safely before the runway departure end.

Go-Around / Rejected Landing

Objective

Flight crews will develop the ability to reach a timely go-around decision and smoothly execute a rejected landing / go-around procedure, transitioning from a descent in landing configuration into a maximum performance climb.

Procedure description

1. Once the decision has been made to initiate a go-around simultaneously establish a level pitch attitude and smoothly apply full power.
2. Establish a positive rate of climb and when above 60 KIAS and clear of obstacles, lower the nose to establish a V_Y pitch attitude and retract flaps from 30° to 20° and then 20° to 10°.

NOTE
During a go-around, flight crews should use V_X climb airspeed and flaps at 10° if obstacle clearance is required and remain in this configuration until all obstacles have been cleared.

3. When aircraft is under control and safely established in a V_Y (79 KIAS) climb, transmit go-around intentions. Retract last 10° flaps.
4. If no aircraft is on the runway or departing, climb straight over the runway and maintain a ground track along the runway extended centerline.
5. If an aircraft is on the runway or taking off, alter course to the right, or as directed by the control tower, while keeping the departing aircraft in sight.

CAUTION
Flight crews are cautioned about altering course toward a parallel runway unless authorized to do so, due to the possibility of midair conflicts with other aircraft.

6. Continue climbing to TPA, or as otherwise instructed by ATC.
7. Perform the Climb Checklist as soon as practical.

Section 5: Pre-Maneuver Information

Transitioning to and from practice area or between maneuvers

Flight crews may establish airspeeds between 100 to 110 KIAS while transiting to or from the practice areas or between maneuvers, conditions permitting (i.e. turbulence, traffic, airspace, etc.).

Guidance for Better Maneuver Execution

- Incorporate realistic and effective scenarios when executing various maneuvers (i.e. power-off stall during landing or approach to landing, etc.) in order to aid in retention.
- The aircraft should be trimmed for straight and level flight at the correct airspeed between conducting maneuvers.

Before any Maneuver

- Complete the Pre-Maneuver Checklist
- Conduct clearing turns and scan for traffic
- Select a suitable field in case of emergency
- Report position with a radio call
- Establish a proper altitude for maneuver and trim the aircraft
- Select a prominent visual reference point for the maneuver
- Brief passengers, if applicable

Checklists and Callout during Maneuvers

As described in this manual, flight crews shall execute appropriate checklists and perform the required callouts during all operations. Refer to Appendix D.

Pre-Maneuver Checklist Flow

Objective

Flight crews will use this procedure to prepare the aircraft for training maneuvers while remaining in positive control of the aircraft and maintaining strict vigilance for traffic at all times.

NOTE
If multiple maneuvers are conducted in sequence, verify the checklist is complete during all subsequent maneuvers.

Flow description

1. Select an altitude that will allow for the maneuver to be recovered above the minimum specified altitude.
2. Ensure that the doors and windows are secured.
3. Ensure seatbelts and harnesses are securely fastened and any baggage is secured.
4. Verify the fuel selector is on both.
5. Ensure the mixture is leaned for conditions. (Refer to POH/AFM 4-27 and 4-28 for guidance)
6. Set power to the Practice Area setting (≈2100 RPM**)**.
7. Verify that all external lighting is turned on for maximum visibility.
8. Verify the magneto switch is set to both.
9. Verify that all engine indications are normal.
10. Verify that the flow has been completed by verbally announcing “Pre-Maneuver Checklist complete.”

CAUTION
Conducting the Pre-Maneuver Checklist during clearing turns is PROHIBITED.

Clearing Turns

Objective
Flight crews will conduct clearing turns in order to "see and be seen", while retaining positive control of the aircraft and dedicating their undivided attention to scanning for traffic.

Procedure description

1. Pick a visual reference off of the left wing. Entering a medium banked left turn, execute a 90° heading change and roll out on the visual reference.
2. During the turn continuously scan the area above, below, and ahead of the aircraft.
3. Repeat the process to the right, thereby returning to the original heading.

NOTE
One continuous left or right 180° turn will also suffice as a clearing turn if the flight crew wishes to reverse direction

4. Once the flight crew determines that the area is sufficiently clear the maneuver may be started.

Section 6: Slow Flight, Stalls and Spin Awareness

CAUTION
The minimum altitude during any portion of these maneuvers is 1,500' AGL unless otherwise stated.

NOTE
1. Imminent Stall: Buffeting, stall warning horn, or rapid decay of control effectiveness (whichever occurs first); the aircraft is approaching a stall. 2. Full Stall: A sudden loss of control effectiveness, excessive sink rate, or sudden decrease in pitch attitude; the aircraft has stalled.

Maneuvering During Slow Flight

Clean/Specified Configuration

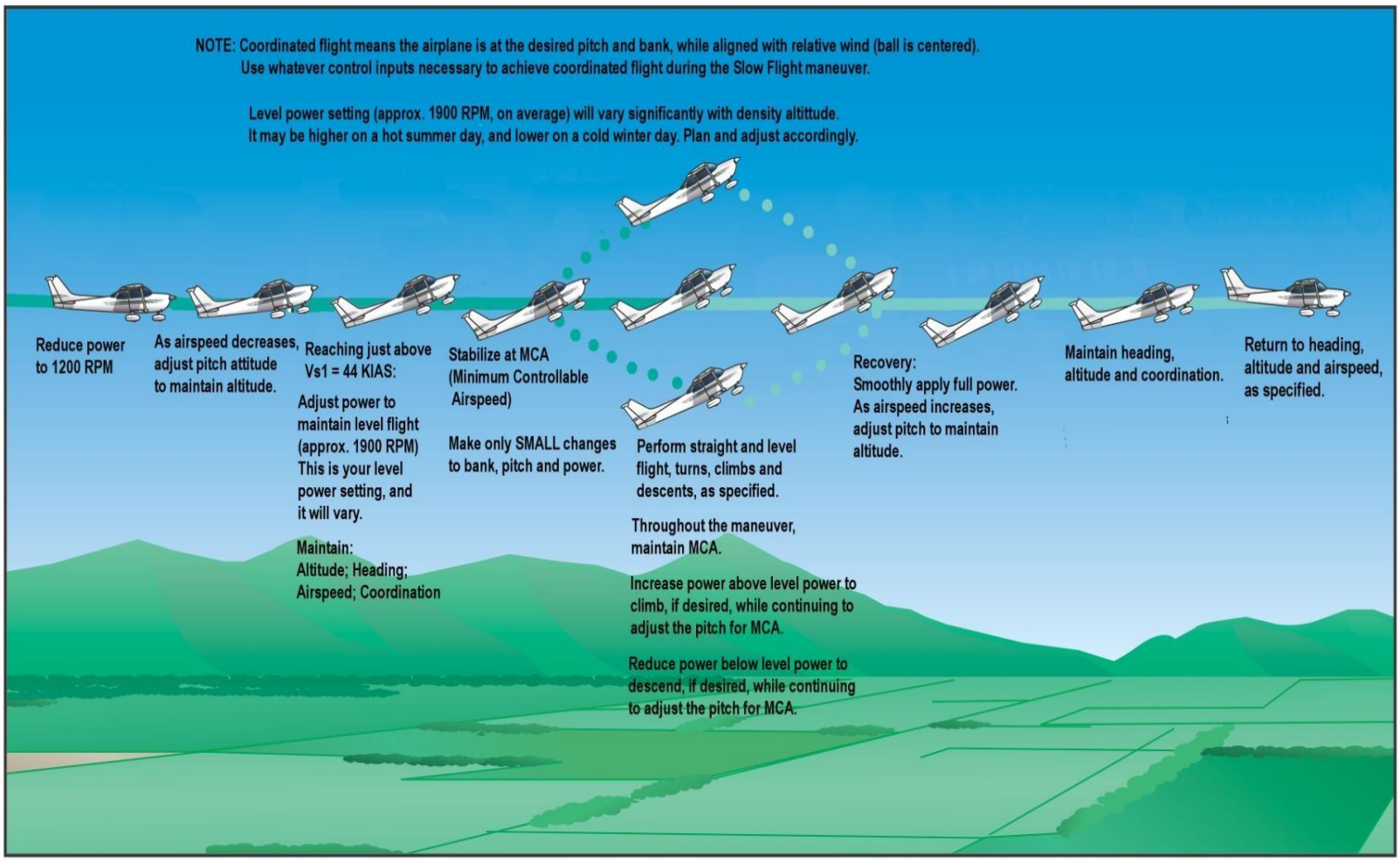
Objective

Flight crews will develop the ability to recognize changes in aircraft flight characteristics and control effectiveness at critically slow airspeeds in the clean configuration (i.e. takeoff, departure, etc.). This maneuver will be conducted while maintaining positive control of the aircraft, altitudes, and headings, as specified.

Procedure description

Complete "Before any Maneuver" actions (page 94)

1. Set throttle to 1200 RPM.
2. Maintain altitude by smoothly increasing back pressure. Trim the aircraft as appropriate.
3. Approaching 5-10 KTS above V_{MCA}/ V_{S1} (44 KIAS), smoothly increase the power to ≈ 1700 RPM
4. Maintain airspeed and altitude by adjusting pitch and power so as to avoid any stall indication.
    a. If a stall indication is noticed, recognize and correct it by decreasing the angle of attack, and adding power to maintain altitude. Select a higher target airspeed if necessary to avoid repeated stall warning indications.
5. Perform straight-and-level flight, turns, climbs, and descents using specified bank angles while maintaining flight at minimum airspeed +5-10 KTS.
6. Recover the maneuver by smoothly applying full power, adjusting pitch to maintain the desired altitude as airspeed increases, and trimming the aircraft as necessary to maintain heading and altitude.
7. Resume normal cruise or transition cruise flight.



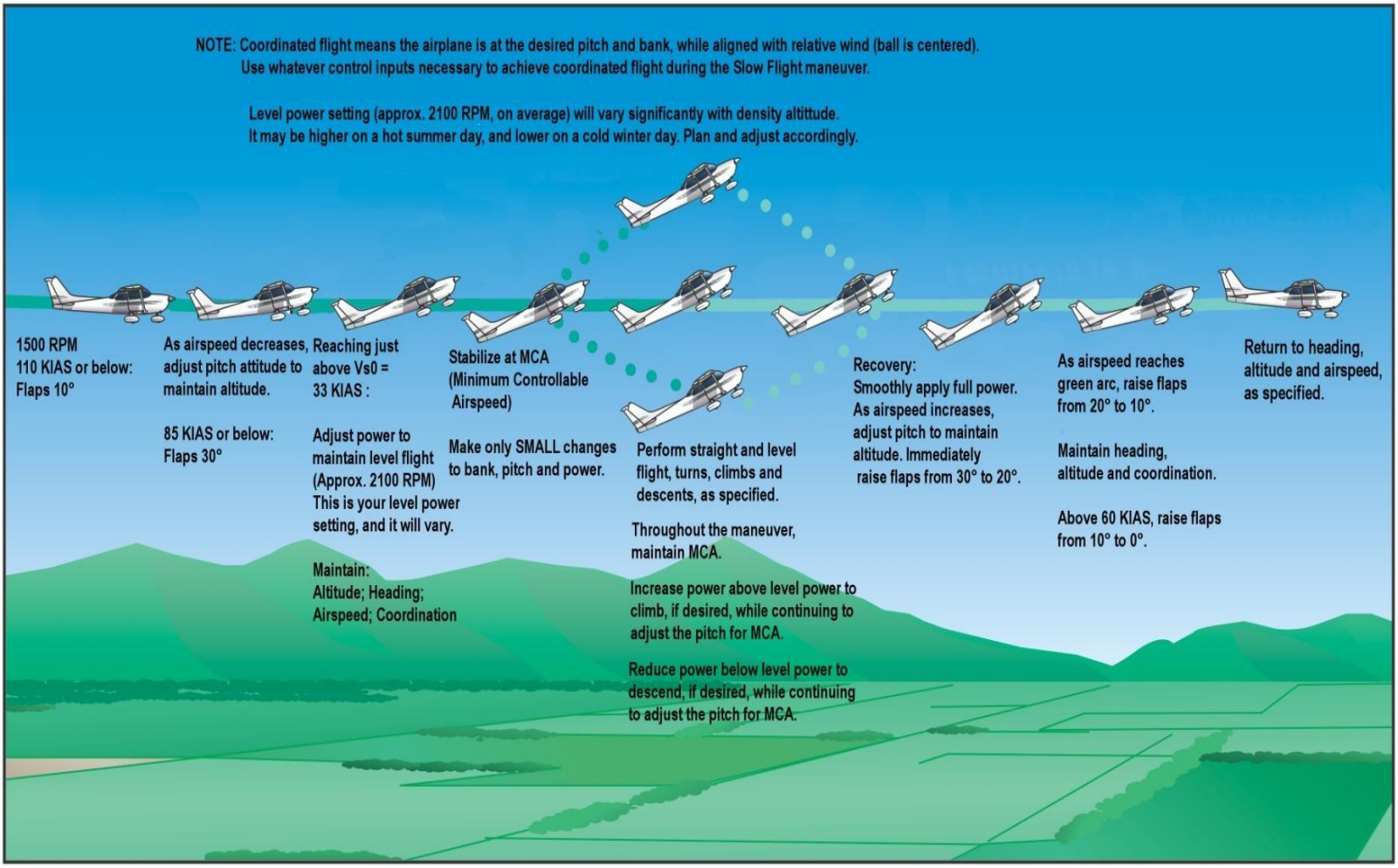
SLOW FLIGHT - Clean Configuration

Maneuvering During Slow Flight
Approach/Landing Configuration

Objective
Flight crews will develop the ability to recognize changes in the aircraft flight characteristics and control effectiveness at critically slow airspeeds in landing configuration. This maneuver will be conducted while maintaining positive control of the aircraft, altitudes, and headings, as specified.

Procedures description
Complete "Before any Maneuver" actions (page 94)

1. Set the throttle to 1500 RPM.
2. Maintain altitude by smoothly increasing back pressure. Trim the aircraft as appropriate.
3. Verify below 110 KIAS, set flaps to 10°.
4. Verify below V_{FE} (85 KIAS), add flaps in increments to 30°.
5. Approaching 10 KTS above V_{MCA}/ V_{S0} (33 KIAS), smoothly increase the power to ≈ 2100 RPM.
6. Maintain airspeed and altitude by adjusting pitch and power.
7. If a stall indication is noticed, recognize and correct it by decreasing the angle of attack, and adding power to maintain altitude. Select a higher target airspeed if necessary to avoid repeated stall warning indications.
8. Perform straight-and-level flight, turns, climbs, and descents using specified bank angles while maintaining flight at minimum airspeed +10 KTS.
9. Recover the maneuver by smoothly and simultaneously reducing angle of attack, applying full power, and immediately bringing flaps to 20°.
10. As the airplane accelerates through 60 KIAS retract flaps to 10°.
11. Accelerating through 65 KIAS retract flaps to 0°.
12. Resume normal cruise or transition cruise flight.



SLOW FLIGHT - Landing Configuration

Power-On Stall

Take-off and departure stall in clean configuration

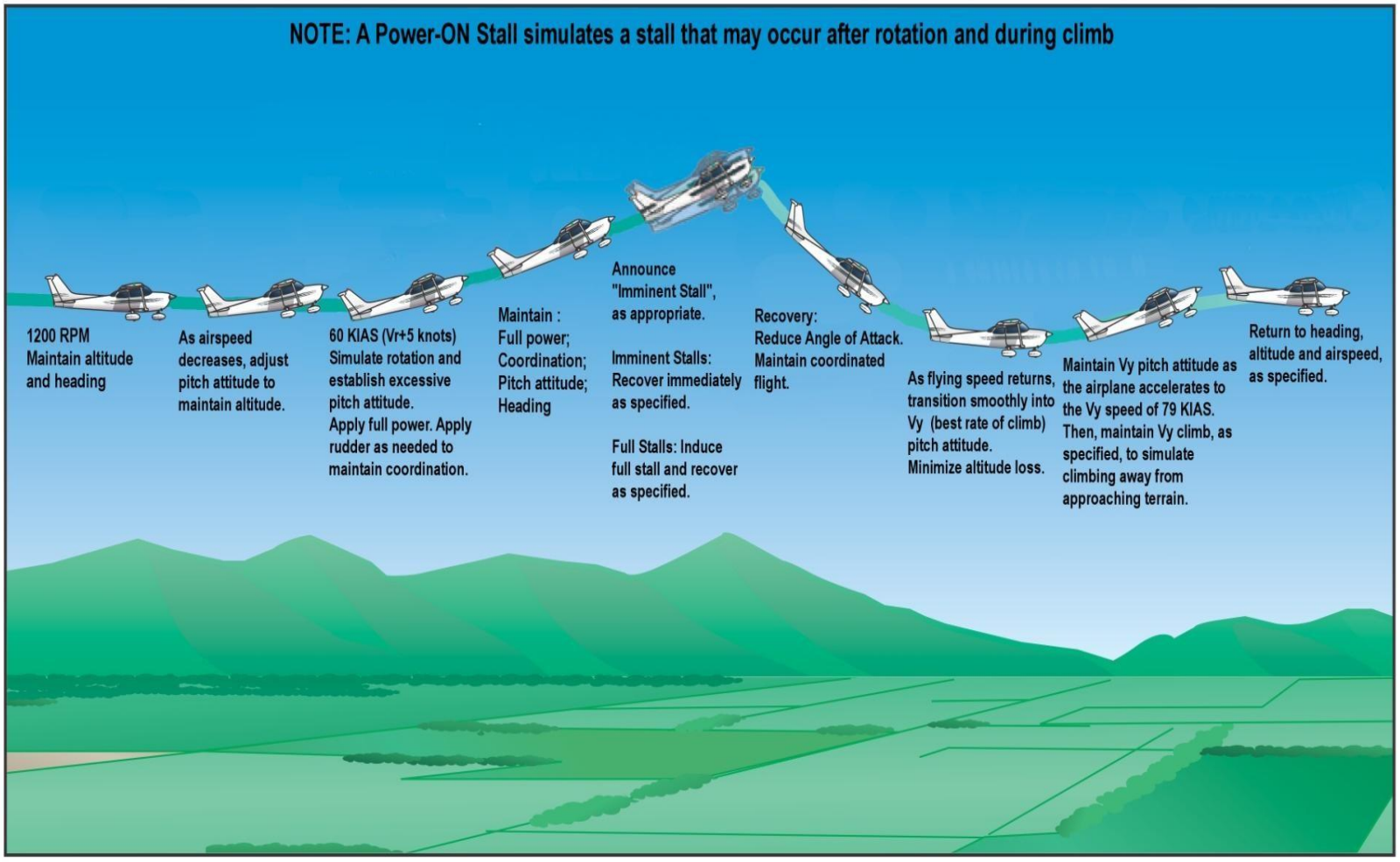
Objective

Flight crews will develop the ability to recognize changes in the aircraft flight characteristics and control effectiveness as the stall approaches in the power-on (take-off and departure) configuration, as well as make prompt and effective recovery either before the stall occurs (imminent stall recovery) or after the stall occurs (full stall recovery).

Procedure description

Complete "Before any Maneuver" actions (page 94)

1. Set throttle to 1200 RPM.
2. Approaching V_R + 10 (65 KIAS), smoothly increase the power to full takeoff and climb power.
3. Pitch up to simulate over-rotation and excessive climb pitch attitude (≈ 15° nose up pitch).
4. Do not continue pitching up excessively above what is required to slowly decrease airspeed.
5. Maintain original heading or set no more than 20° bank, left or right, as specified.
6. Recover from imminent stall or from full stall, as specified.
7. Initiate a recovery by decreasing the angle of attack. If appropriate, level the wings.
8. Once the aircraft is no longer stalled, pitch for V_Y to climb away from terrain.
9. Resume normal cruise or transition cruise flight



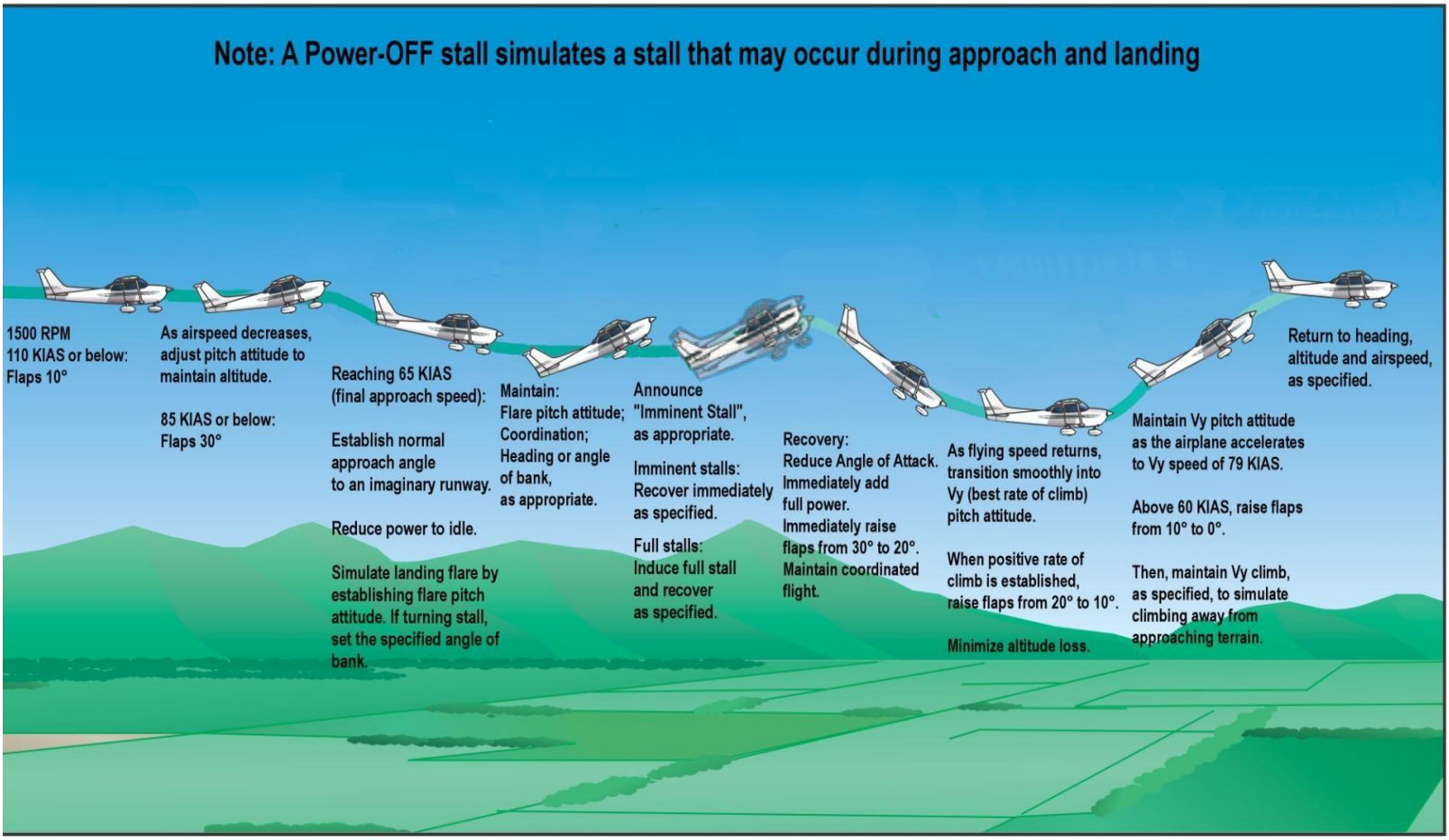
Power - ON Stall

Power-Off Stall
Approach and Landing Stall

Objective
Flight crews will develop the ability to recognize changes in the aircraft flight characteristics and control effectiveness as the stall approaches in the power-off (landing) configuration, as well as make prompt and effective recovery either before the stall occurs (imminent stall recovery) or after the stall occurs (full stall recovery).

Procedures description
Complete "Before any Maneuver actions (page 28)

1. Set the throttle to 1500 RPM.
2. Maintain altitude by smoothly increasing back pressure. Trim the aircraft, as appropriate.
3. Verify below 110 KIAS, set flaps to 10°.
4. Verify below V_{FE} (85 KIAS), add flaps in increments to 30°.
5. At 65 KIAS, establish a stabilized normal landing approach attitude to a simulated runway and smoothly reduce throttle to idle to begin simulating landing flare.
6. Maintain original heading or set no more than 20° bank, left or right, as specified.
7. Simulate excessive landing flare pitch attitude by bringing the nose above the horizon, maintaining altitude during flare as airspeed decreases.
8. Recover from imminent stall or full stall, as specified.
9. Initiate a recovery by smoothly and simultaneously decreasing the angle of attack, applying full power, leveling the wings, if appropriate, and immediately retracting flaps to 20°.
10. Once the aircraft is no longer stalled, pitch for V_Y to climb away from terrain.
11. As the airplane accelerates through 60 KIAS, retract flaps to 10°.
12. Accelerating through 65 KIAS, retract flaps to 0°.
13. Resume normal cruise or transition cruise flight.



Power - OFF stall

Accelerated Stall

Objective

Flight crews will develop the ability to recognize, avoid, and recover from situations leading to accelerated stalls while developing practical knowledge that demonstrates the relationship between increasing stall speed and increasing aircraft load factor.

Procedure description

Complete "Before any Maneuver" actions (page 94)

1. Ensure recovery above 3000 feet AGL.
2. Set the throttle to 1500 RPM.
3. Maintain altitude by smoothly increasing back pressure. Trim the aircraft as appropriate.
4. As the airspeed approaches 85 KIAS, smoothly reduce the throttle to idle and establish a coordinated turn at 45° bank in the direction specified.
5. Smoothly and firmly apply back pressure to maintain altitude.
6. At the first indication of a stall, initiate the recovery by reducing the pitch attitude, smoothly and simultaneously applying full power, and leveling the wings. Stall indication should occur within 90° of the initial heading.
7. Establish a V_Y pitch attitude.
8. Resume normal cruise or transition cruise flight.

Elevator Trim Stall

Objective

Flight crews will develop the ability to recognize, avoid, and recover from situations leading to elevator trim stalls, while developing practical knowledge that demonstrates how elevator trim set for approach airspeeds at low power settings can lead to an inadvertent stall should a high power setting be applied.

Procedure description

Complete "Before any Maneuver" actions (page 28)

1. Set the throttle to 1500 RPM.
2. Maintain altitude by smoothly increasing back pressure. Trim the aircraft, as appropriate.
3. Verify below 110 KIAS, set flaps to 10°.
4. Verify below V_{FE} (85 KIAS), add flaps in increments to 30°.
5. At 65 KIAS, establish a stabilized normal landing approach to a simulated runway.
6. Smoothly reduce throttle to idle and adjust the trim to maintain a descent at 65 KIAS.
7. Simulate an improper go-around by applying full power and allowing the pitch attitude to increase above the normal climb attitude while not applying sufficient forward elevator pressure to compensate for the trim.
8. At the first indication of a stall, initiate the recovery by reducing the pitch attitude, smoothly and simultaneously applying full power, leveling the wings, adjusting trim as necessary, and immediately retracting flaps to 20°.
9. Establish a V_Y pitch attitude.
10. Re-trim the airplane by first making large adjustments during the recovery in order to decrease large adverse trim forces and then making fine adjustments once appropriate pitch has been established.
11. As the airplane accelerates through 60 KIAS, retract flaps to 10°.
12. Accelerating through 65 KIAS, retract flaps to 0°.
13. Resume normal cruise or transition cruise flight.

Crossed-Control Stall

Objective

Flight crews will develop the ability to recognize, avoid and recover from situations leading to crossed-control stalls, while developing practical knowledge that demonstrates how the improper application of rudder and aileron can result in an unrecoverable situation close to the ground.

Procedure description

Complete "Before any Maneuver" actions (page 94)

1. Set the throttle to 1500 RPM.
2. Maintain altitude by smoothly increasing back pressure. Trim the aircraft as appropriate.
3. Establish a stabilized descent at 75 KIAS.

WARNING
Do not use flaps for this demonstration.

4. Smoothly reduce throttle to idle.
5. Initiate a 30° bank in either direction, simulating a turn from the Base to Final in the traffic pattern.
6. During the turn, apply excessive rudder in the direction of the turn, opposite aileron pressure to maintain the bank angle, and back elevator pressure to prevent the nose from lowering, inducing a stall.
7. At the first indication of a stall, initiate the recovery by reducing the pitch attitude, reducing rudder pressure, smoothly and simultaneously applying full power, and leveling the wings.
8. Establish a V_Y pitch attitude.
9. Resume normal cruise or transition cruise flight.

Secondary Stall

Objective

Flight crews will develop the ability to recognize, avoid, and recover from situations leading to secondary stalls while developing practical knowledge that demonstrates how rushed stall recovery can result in a second stall which delays the overall recovery.

Procedure description

Complete "Before any Maneuver" actions (page 94)

1. Set the throttle to 1500 RPM.
2. Maintain altitude by smoothly increasing back pressure. Trim the aircraft as appropriate.
3. Verify below 110 KIAS, set flaps to 10°.
4. Verify below V_{FE} (85 KIAS), add flaps in increments to 30°.
5. At 65 KIAS, establish a stabilized normal landing approach to a simulated runway, and smoothly reduce throttle to idle.
6. Increase back pressure, bringing the nose to the horizon.
7. Once the aircraft has fully stalled, reduce the aircraft pitch attitude. Do not add power.
8. Add excessive back pressure to induce another (secondary) full stall.
9. Once fully stalled, initiate a recovery by smoothly and simultaneously decreasing the angle of attack, applying full power, leveling the wings, if appropriate, and immediately retracting flaps to 20°.
10. Establish a V_Y pitch attitude.
11. As the airplane accelerates through 60 KIAS, retract flaps to 10°.
12. Passing through 65 KIAS retract flaps to 0°.
13. Resume normal cruise or transition cruise flight.

Spin Awareness

Spin avoidance and recovery only

WARNING
1. **The Cessna C172R Skyhawk is certified for spins ONLY when loaded in Utility Category in accordance with the AFM.** 2. **Intentional spins outside of CFI or other authorized training are prohibited.** 3. **The following guidance is for general, unintentional spin recovery only. It is not to be practiced or demonstrated in the actual aircraft outside of specifically authorized training.**

Objective

Flight crews will develop knowledge regarding situations where unintentional spins may occur and the procedures for recovery from such unintentional spins.

NOTE
Use the PARE acronym: **P**ower to idle, **A**ilerons neutral, **R**udder in the opposite direction, **E**levator forward to break the stall and then back to stop the descent.

Procedure description

1. Reduce power to idle.
2. Place and maintain ailerons in the neutral position.
3. Apply and hold full rudder in the direction opposite of rotation.
4. If direction of rotation cannot be determined visually, use the turn coordinator miniature airplane to determine the direction of spin.
5. Just after the rudder reaches the stop, push the yoke briskly forward far enough to break the stall. Once stall is broken, pull the yoke back to arrest the descent.
6. Hold these control inputs in their respective positions until rotation stops.
7. As rotation stops, neutralize rudder.
8. Ensure recovery from the dive is below V_{NE}.
9. Avoid abrupt control movement during dive recovery so as to not exceed the positive load factor limitation of the aircraft.

Spins for Training Purposes
CFI training only, with prior approval

WARNING
1. The spin maneuver entry must be initiated no lower than 4,000' AGL for one (1) turn spins, with an additional 1,000' AGL for each additional turn in the spin. **2. The spin maneuver recovery, including the pullout from the resulting dive and return to straight and level flight, must be accomplished no lower than 3,000' AGL.**

Objective
CFI applicants will develop instructional knowledge regarding situations where unintentional spins may occur and procedures for demonstration spin entry and recovery.

Procedure description

Complete "Before any Maneuver" actions (page 94)

1. Ensure all maneuver requirements and aircraft limitations have been met.
2. Enter the spin by inducing a power-off stall with flaps up:
    a. Steadily add back pressure to slow toward stall speed.
    b. As the aircraft approaches stall speed, establish a cross-controlled situation by applying and holding full rudder in the direction of the desired spin and opposite aileron to maintain wings level.
    c. Continue adding back pressure until full aft elevator is reached.
    d. An optional small power addition at the stall break will ensure a positive spin entry.
    e. Due to the aircraft design a left spin entry will be much easier to achieve than a right spin entry.
3. To enter a spin by inducing a power-on stall, flaps up:
    a. Steadily add back pressure to slow toward stall speed
    b. As the aircraft approaches stall speed, establish a cross-controlled situation by applying and holding full rudder in the direction of the desired spin and opposite aileron to maintain wings level.
    c. Continue adding back pressure until full aft elevator is reached.
4. As the aircraft enters the spin:
    a. Reduce power to idle and neutralize ailerons, but continue holding full aft elevator and full rudder in the direction of the spin as long as a spin is desired.
    b. Monitor airspeed indicator to guard against a spiral dive and resultant high recovery airspeed and load factor.
5. When the desired number of spin turns has been accomplished, initiate recovery as specified above.

Section 7: Performance Maneuvers

CAUTION
The minimum altitude during any portion of this maneuver is 1,500' AGL unless otherwise stated.

Steep Turns

Objective

Flight crews will develop the ability to turn the airplane at steep angles of bank, while maintaining altitude, coordination and division of attention between the primary outside visual references and secondary aircraft supporting instruments.

Procedure description

Complete "Before any Maneuver" actions (page 94)

1. Configure the aircraft for straight-and-level flight at 95 KIAS (≈1900 RPM).

WARNING
Remain below actual V_A for the aircraft weight at all times to avoid exceeding aircraft load limits.

2. Smoothly roll the aircraft into a level coordinated left turn.
3. Rolling through 30° of bank, smoothly increase the throttle to ≈ 2200 RPM in order to maintain entry airspeed. Continue increasing bank to 45° (Private) or 50° (Commercial).
4. Maintain a constant bank angle, altitude, and airspeed during the turn by using back pressure and trim, as appropriate.
5. Smoothly initiate the rollout ≈ ½ the bank angle prior to the desired rollout heading.
6. During the rollout, reduce the elevator pressure used to maintain altitude during the turn.
7. Repeat steps 3 through 7 to complete a 360° turn to the right.
8. Resume normal cruise or transition cruise flight.

Chandelles

Objective

Flight crews will develop the ability to conduct a chandelle using primarily visual references and minimum instrument references, utilizing maximum aircraft performance under given atmospheric conditions, and demonstrating mastery of the aircraft.

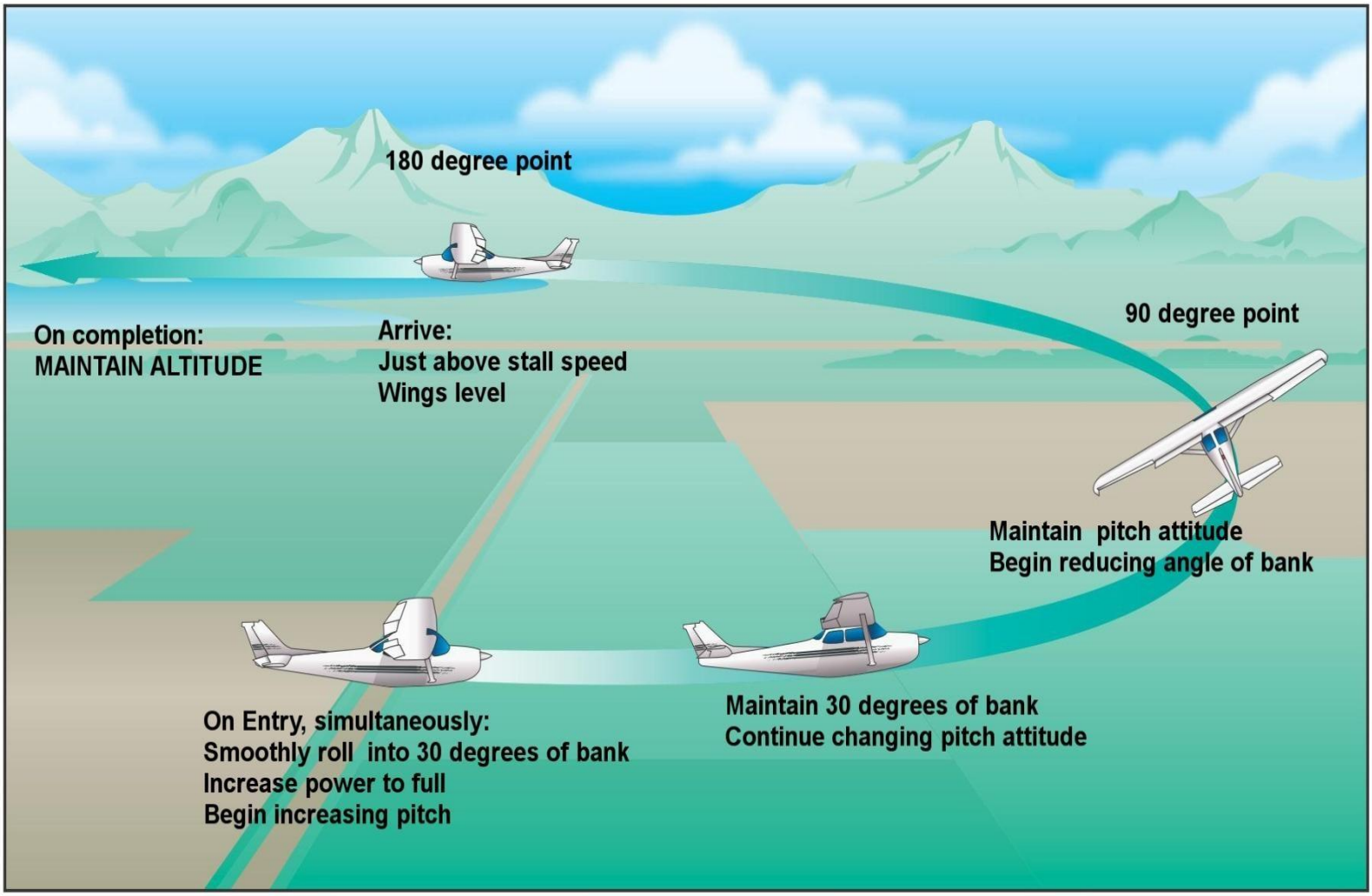
Procedure description

Complete "Before any Maneuver actions (page 94)

1. Establish the aircraft in level cruise flight at 105 KIAS (≈ 2000-2100 RPM).
2. Select a prominent visual reference point off of both wing tips.
3. Enter a coordinated 30° bank turn.
4. Once turn is established, smoothly increase throttle to full power.
5. Gradually and smoothly increase the pitch attitude so as to arrive at max pitch attitude by the 90° point while maintaining a constant bank.
6. After passing the 90° point, increase back pressure to maintain pitch attitude and slowly reduce bank angle to reach V_{MCA} and wings level at the 180° point.

NOTE
An increase in rudder pressure may be necessary to maintain coordination while airspeed decreases.

7. At the 180° point maintain V_{MCA} until asked to recover.
8. Repeat steps 2-9 in the opposite direction.
9. Resume normal cruise or transition cruise flight with a minimum loss of altitude.


180 degree point
On completion:
MAINTAIN ALTITUDE
Arrive:
Just above stall speed
Wings level
90 degree point
Maintain pitch attitude
Begin reducing angle of bank
On Entry, simultaneously:
Smoothly roll into 30 degrees of bank
Increase power to full
Begin increasing pitch
Maintain 30 degrees of bank
Continue changing pitch attitude

Lazy Eights

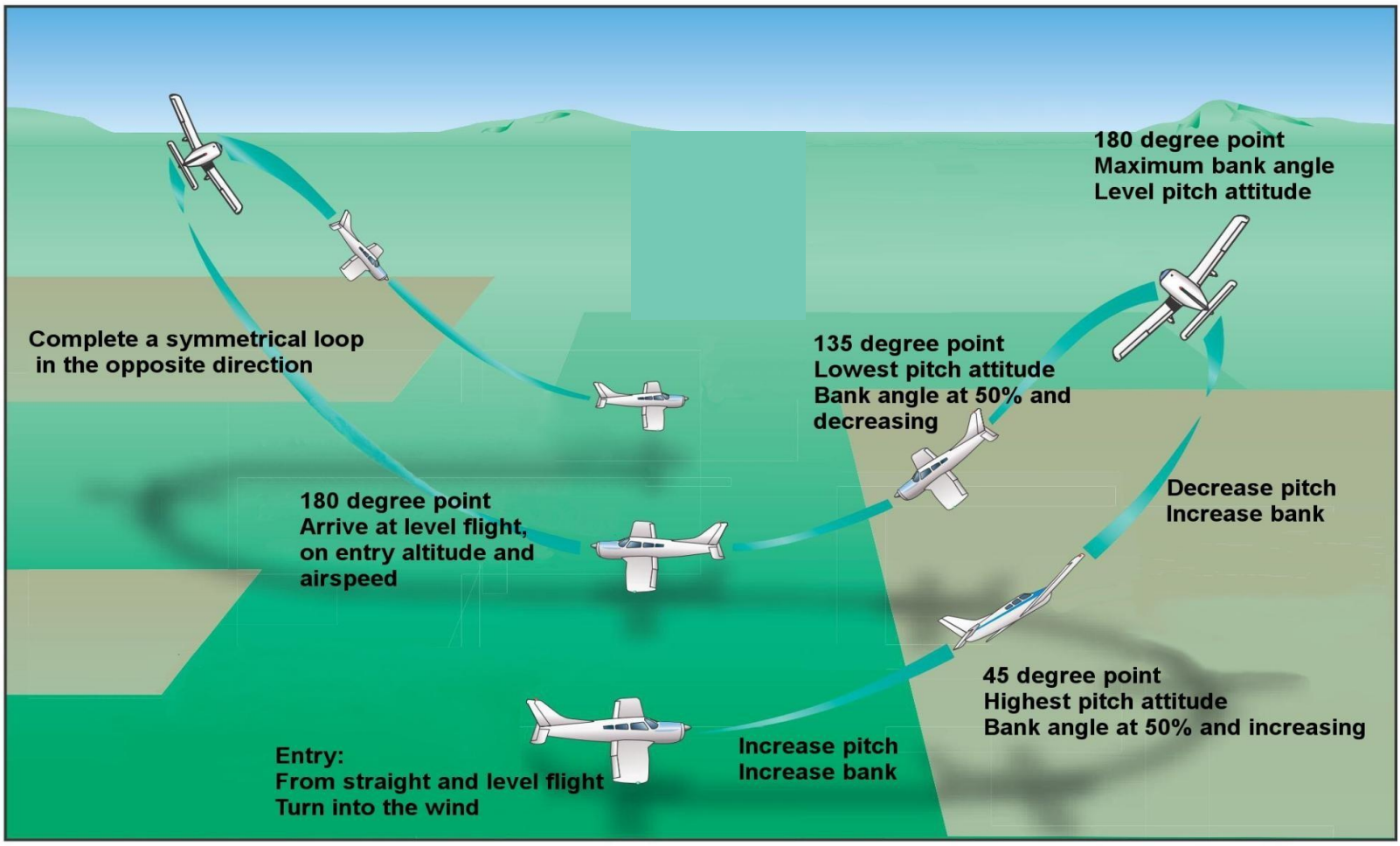
Objective

Flight crews will develop the ability to conduct lazy eights using primarily visual references with minimum reference to instruments, utilizing maximum aircraft performance under given atmospheric conditions, and demonstrating mastery of the aircraft.

Procedure description

Complete "Before any Maneuver" actions (page 94)

1. Establish the aircraft in level cruise flight at 105 KIAS (≈2000-2100 RPM).
2. Select prominent visual references on or near the horizon at the 45°, 90°, and 135° points.
3. Initiate a coordinated, gradual climbing turn in the direction of the 90° reference point.
4. From original heading to 45° visual reference point:
    a. Pitch increases toward max
    b. Bank increases toward ≈ 15°
    c. Pitch increases at a rate approximately two times more rapidly than the bank
5. Upon arriving at 45° visual reference point:
    a. Maximum pitch up attitude
    b. Bank angle ≈ 15°, which is ½ of the maximum bank angle
6. From 45° to 90° visual reference point:
    a. Bank angle continues to increase toward max ≈ 30°
    b. Pitch starts to decrease toward level
7. Upon arriving at 90° visual reference point:
    a. Level pitch attitude
    b. Airspeed just above stall speed
    c. Maximum bank angle of ≈ 30°
8. From 90° to 135° visual reference point:
    a. Pitch decreases below level
    b. Bank decreases toward ≈ 15°
    c. Positive elevator input is required to prevent pitch from becoming too low, as the aircraft wants to continue descending
    d. Positive aileron input is required to maintain specified bank angles
9. Upon arriving at 135° visual reference point:
    a. Lowest pitch down attitude
    b. Bank angle ≈ 15°, which is ½ of the maximum bank angle
10. From 135° to 180° visual reference point:
    a. Pitch increases toward level
    b. Bank decreases toward 0°
11. Arriving at 180° visual reference point:
    a. Straight and level flight at the original entry altitude and airspeed
12. Execute a laterally and vertically symmetrical turn in the opposite direction.
13. On completion of the second symmetrical lazy eight, resume normal cruise or transition cruise flight, as specified.


180 degree point
Maximum bank angle
Level pitch attitude
Complete a symmetrical loop
in the opposite direction
135 degree point
Lowest pitch attitude
Bank angle at 50% and
decreasing
Decrease pitch
Increase bank
180 degree point
Arrive at level flight,
on entry altitude and
airspeed
45 degree point
Highest pitch attitude
Bank angle at 50% and increasing
Entry:
From straight and level flight
Turn into the wind
Increase pitch
Increase bank

Steep Spirals

Objective

Flight crews will develop the ability to plan and conduct a steep spiral, while correcting for wind drift, as well as to recognize the value of a steep spiral as a tool to rapidly decrease altitude while remaining over a desired point in a power-off gliding configuration.

Procedure description

Complete "Before any Maneuver actions (page 94)

1. Select an altitude that allows for performing a series of at least (3) 360° turns with recovery from the maneuver no lower than 1500' AGL.
2. Select a prominent reference point on the ground over which the steep spiral will be conducted.
3. Enter the maneuver on Downwind and near the reference point at 75 KIAS (1700 RPM).
4. Once abeam the point, smoothly reduce throttle to idle.
5. Begin a steep banked turn (not to exceed 60º), as appropriate, to maintain a constant radius from the specified point.
6. During the turns, maintain a constant airspeed of 75 KIAS.
7. Ensure that during each 360° turn, the engine is cleared by smoothly advancing the throttle while heading into the wind and then reducing the throttle back to idle.
8. After completing (3) turns, terminate the maneuver by applying full power and returning to cruise flight on the original heading, or as specified.

Section 8: Ground Reference Maneuvers

For All Ground Reference Maneuvers

- Determine terrain elevation by referencing charts and nearby airports.
- Other than for 8's on Pylons, plan to enter the maneuver at 1,000' AGL.
- Establish the aircraft in level cruise flight at no less than 90 KIAS (≈1900 RPM)
- Determine wind direction.
    - Consider the winds reported at an airport nearest to the area where the maneuver is conducted or other appropriate resources.
    - Observe wind indications on the surrounding terrain, such as ripples on the water, smoke stacks, waving flags, etc.
- Always pick a suitable reference point in the vicinity of an area where an emergency approach to landing can be executed.

NOTE
When selecting a practice area, flight crews will comply with minimum safe altitudes, consider the possibility of a necessary emergency landing, and consider the impact of their aircraft's noise, appearance, and public perception regarding low-altitude maneuvering within the surrounding area.

Rectangular Course

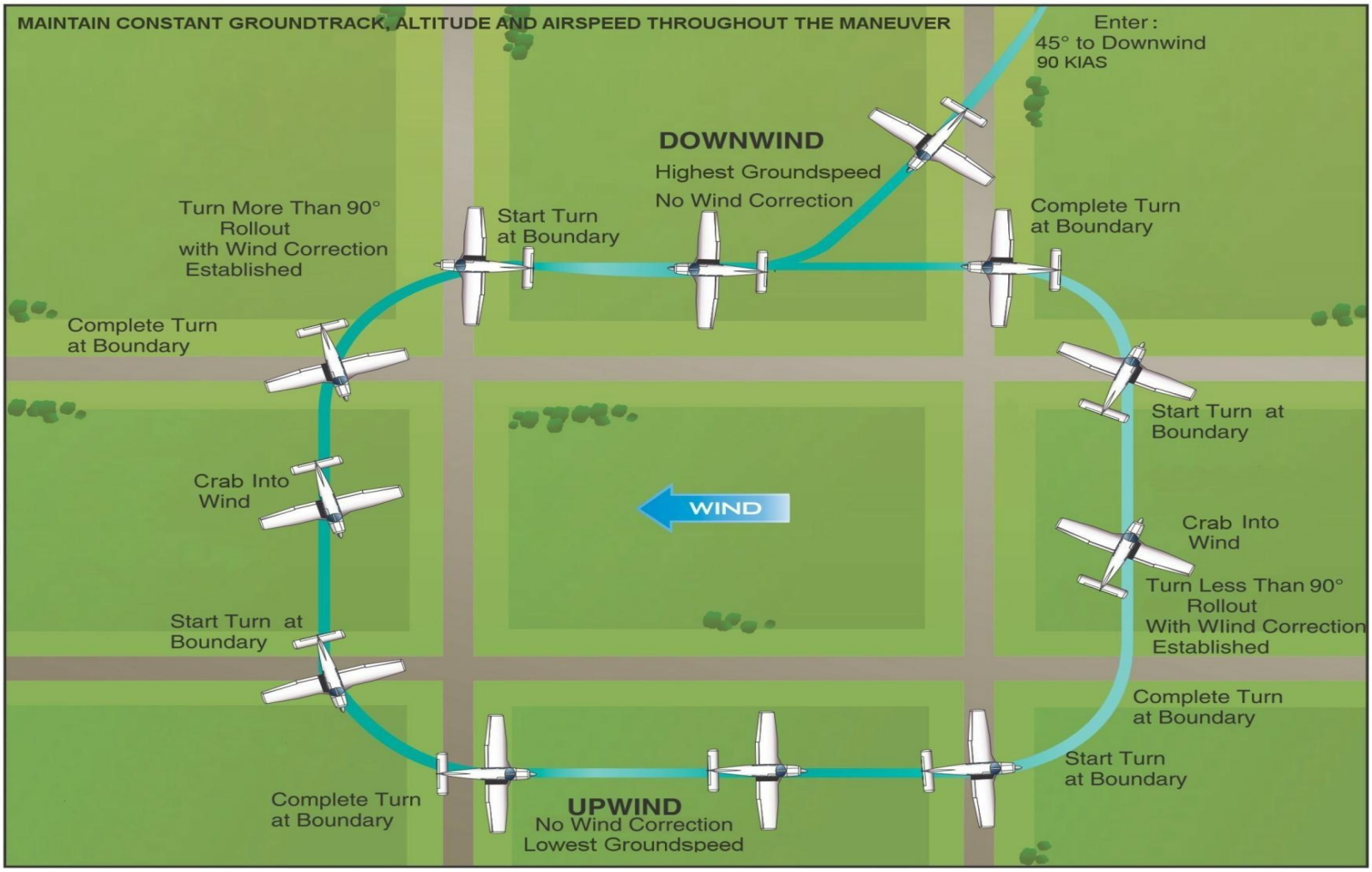
Objective

Flight crews will develop the ability to plan and conduct a rectangular course while correcting for wind drift, maintaining a constant ground track, keeping situational/positional and traffic awareness, as well as being able to relate the applicable rectangular course concepts to traffic pattern operations.

Procedures description

Complete "Before any Maneuver" actions (page 94)
Complete "For All Ground Reference Maneuvers" (page 117)

1. Select a prominent rectangular area surrounded by four identifiable borders that approximates a typical traffic pattern.
2. The rectangle should be approximately parallel to the wind direction.
3. Establish an entry heading at 45° to the Downwind of the selected field.
4. Upon turning onto the Downwind, establish the appropriate wind correction (crab angle) to maintain a uniform distance of ≈ ½ mile from the field boundaries on each leg.
5. As the aircraft reaches the next field boundary, initiate a turn so as to roll wings level ≈ ½ mile from and adjacent to the field boundary.
6. Vary bank angle and rollout heading according to the strength and relative direction of the wind to maintain a constant distance during the turns and constant track along the field boundaries.
7. The maneuver is complete after one circuit has been completed, with the aircraft departing on the Downwind.
8. Initiate a climb to an appropriate altitude, as instructed.
9. Resume normal cruise or transition cruise flight.



RECTANGULAR COURSE

S-Turns across a Road

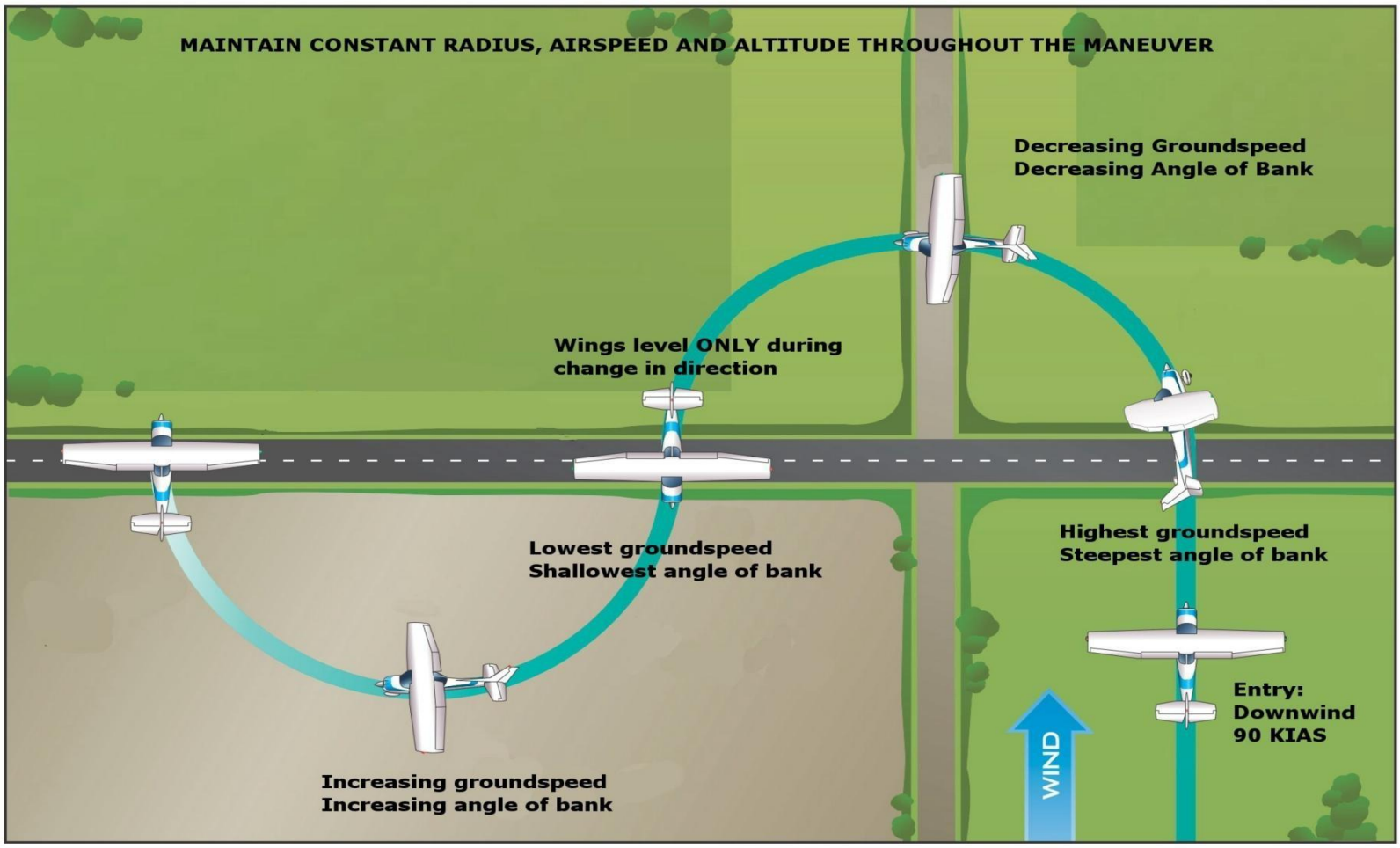
Objective

Flight crews will develop the ability to plan and conduct S-turns across a road while correcting for wind drift, maintaining a constant ground track, and keeping situational/positional and traffic awareness.

Procedure description

Complete "Before any Maneuver" actions (page 94)
Complete "For All Ground Reference Maneuvers" (page 117)

1. Select a road or other straight-line reference, running approximately perpendicular to the wind.
2. Enter on Downwind, perpendicular to the selected reference line.
3. At the entry point directly over the reference line, while heading downwind:
    a. Initiate a coordinated constant radius (½ mile) turn to the left.
    b. Maintain this constant ground track by modifying the bank angle in relation to groundspeed, but do not exceed 30° of bank.
    c. Plan to complete the turn so as to arrive wings level just as aircraft crosses over the reference line, heading upwind.
4. At the intermediate point directly over the reference line, heading upwind:
    a. Initiate a coordinated constant radius (½ mile) turn to the right.
    b. Maintain this constant ground track by modifying the bank angle in relation to groundspeed, not to exceed 30° of bank.
    c. Plan to complete the turn as to arrive wings level just as aircraft crosses over the reference line, heading downwind.
5. Exit the maneuver upon crossing the road after completing the two turns.
6. Initiate a climb to an appropriate altitude, as instructed.
7. Resume normal cruise or transition cruise flight.



S-turns across a road

Turns around a Point

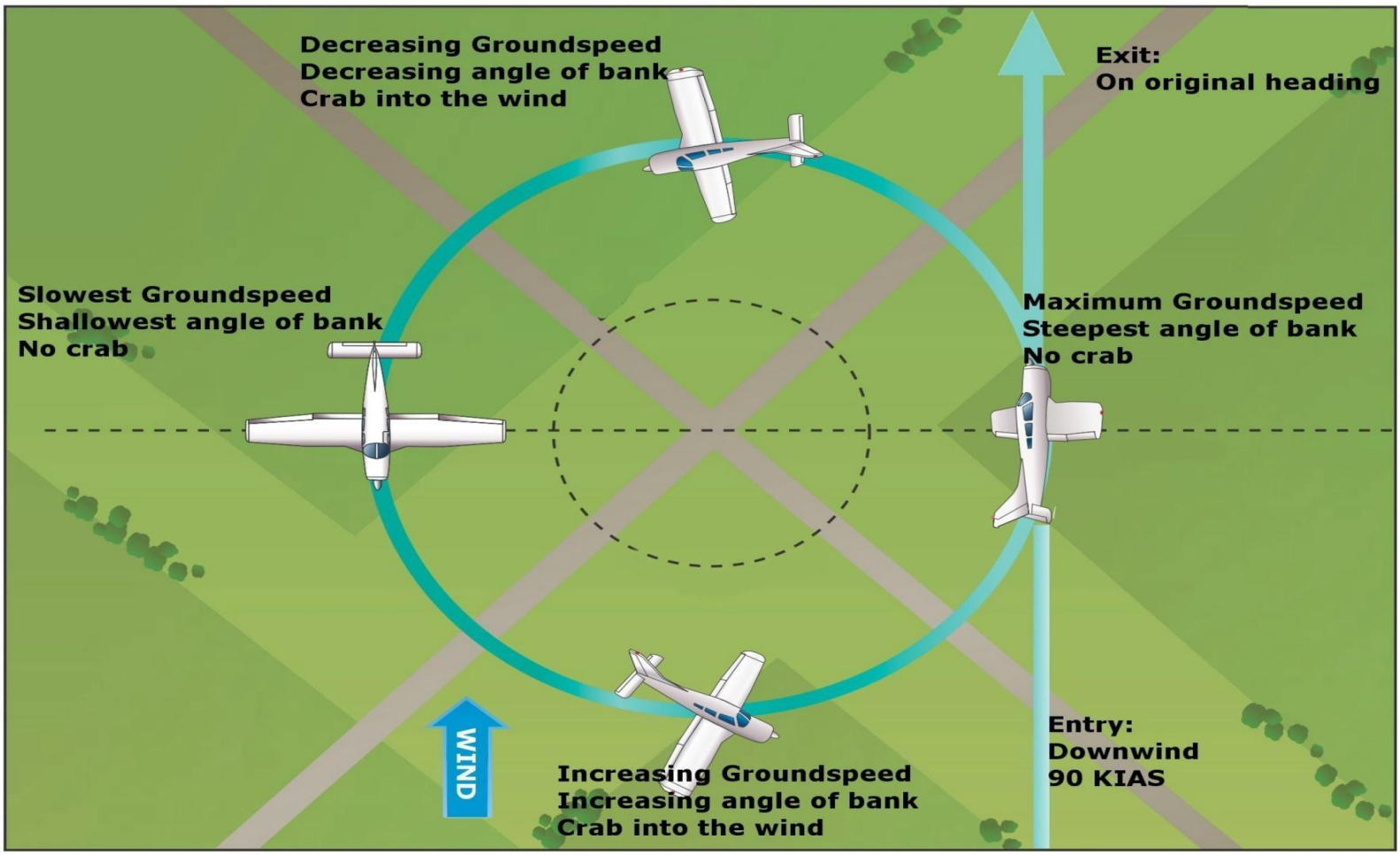
Objective

Flight crews will develop the ability to plan and conduct turns around a point while correcting for wind drift, maintaining a constant ground track, and keeping situational/positional and traffic awareness.

Procedure description

Complete "Before any Maneuver" actions (page 94)
Complete "For All Ground Reference Maneuvers" (page 117)

1. Select a prominent visual ground reference point.
2. Enter the maneuver on the Downwind directly abeam ≈ ½ mile from the reference point.
3. Pick a visual reference on the horizon ahead of the aircraft.
4. Maintain this constant ground track by modifying the bank angle in relation to groundspeed. Do not exceed 30° of bank.
5. Exit the maneuver on the original entry horizon reference and heading, upon one complete 360° turn, or as specified.
6. Initiate a climb to an appropriate altitude, as instructed.
7. Resume normal cruise or transition cruise flight.



Turns around a point

Eights on Pylons

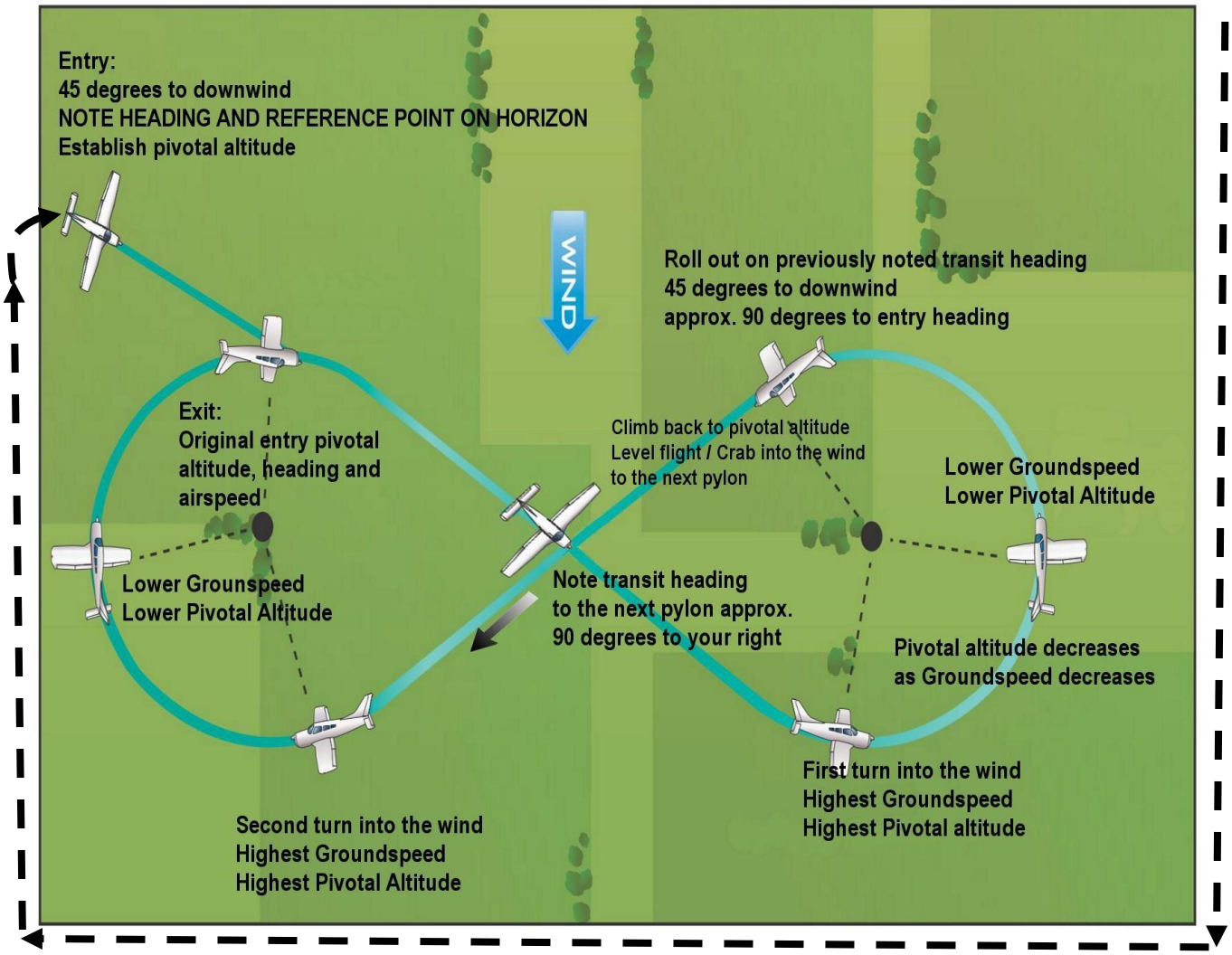
Objective

Flight crews will develop the ability to plan and conduct eights on pylons while adjusting for the effects of the wind on the groundspeed, referencing the selected points on the ground, and keeping situational / positional and traffic awareness.

Procedure description

Complete "Before any Maneuver" actions (page 94)
Complete "For All Ground Reference Maneuvers" (page 117)

1. Select two appropriate ground reference points (pylons) perpendicular to the wind.
2. The pylons should allow for ≈15 seconds of cruise flight between them.
3. The recommended entry procedure is as follows:
    a. Enter on Downwind with the 1st pylon to the right
    b. Turn into a right Crosswind after passing the 1st pylon
    c. Time for 15-20 seconds to choose 2nd pylon to the right. Visually ensure adequate distance between the selected pylons
    d. Once passed the 2nd pylon, turn the right to intercept the 45º angle to the Downwind and cut between the two selected pylons.
4. Ensure the aircraft in level cruise flight at 95-100 KIAS (≈2000 RPM), at the appropriate pivotal altitude (Reference Appendix F).
5. As the airplane's left wing tip aligns with the pylon, establish a bank angle as necessary to keep the airplane's lateral axis on the pylon (≈30°- 40° bank).
6. Maintain pivotal altitude by adjusting pitch and bank to keep the pylon on the lateral axis.
7. Roll out of the turn on the opposite 45° to the downwind.
8. Maintain level flight at 95-100 KIAS and at the pivotal altitude between pylons, using an appropriate wind correction (crab) angle, as necessary.
9. Enter the turn to the right around the second pylon.
10. Continue the second turn to roll out on the initial entry heading, returning to entry pivotal altitude, heading, and airspeed and exiting the maneuver.
11. Climb to an appropriate altitude, as instructed.
12. Resume normal cruise or transition cruise flight.


Entry:
45 degrees to downwind
NOTE HEADING AND REFERENCE POINT ON HORIZON
Establish pivotal altitude
WIND
Roll out on previously noted transit heading
45 degrees to downwind
approx. 90 degrees to entry heading
Exit:
Original entry pivotal
altitude, heading and
airspeed
Climb back to pivotal altitude
Level flight / Crab into the wind
to the next pylon
Lower Groundspeed
Lower Pivotal Altitude
Lower Grounspeed
Lower Pivotal Altitude
Note transit heading
to the next pylon approx.
90 degrees to your right
Pivotal altitude decreases
as Groundspeed decreases
First turn into the wind
Highest Groundspeed
Highest Pivotal altitude
Second turn into the wind
Highest Groundspeed
Highest Pivotal Altitude

Section 9:Cross-Country Procedures

Departure and En-Route Procedures (VFR)

Objective

Flight crews will be able to plan and conduct a cross-country departure and correctly establish the aircraft on a cross-country route using pilotage and dead reckoning as the primary means of navigation.

Procedures description

1. Upon departure, the time should be recorded in the appropriate box on the navigation log.
2. Prior to reaching 500’ AGL, ensure the timer has been started.
3. Conduct a traffic pattern departure as specified earlier in this section.
4. Once the aircraft has departed the traffic pattern, intercept the planned course.
5. Verify position on the course line with the appropriate and current chart in-hand.
6. Once established on the course line, maintain the planned compass heading unless required otherwise by ATC and/or to account for changing conditions.
7. When able, contact the Flight Service Station (FSS) and activate (open) the previously filed flight plan.
8. Level off at the predetermined altitude and complete appropriate checklist items.
9. Establish the aircraft’s position in relationship to first checkpoint using:
    a. Pilotage and dead reckoning
    b. Radio navigation
10. Complete a groundspeed (GS) check and determine ETA.
    a. Compare the planned time at the current checkpoint to the actual elapsed time
11. Contact the appropriate Approach Control facility (ATC) and obtain radar services (if available).
12. Maintain course by the use of pilotage, dead reckoning, and radio navigation.
    a. Follow a pre-planned course by reference to landmarks and demonstrate use of available airborne electronic navigation systems.
    b. Identify landmarks by relating surface features to chart symbols and locate the aircraft’s position.
    c. Navigate by means of pre-computed headings, groundspeeds, and elapsed time.
    d. Intercept and track a given course, radial, or bearing, as appropriate.
13. Record and correct any differences between preflight groundspeed and heading calculations to those determined en-route.
14. Recognize and describe the indication of station or waypoint passage when using navigation systems, if appropriate, and be able to recognize signal loss and take appropriate action.

Diversion Procedures

Objective

Flight crews will develop be able to plan and accurately execute a diversion to an alternate airport using pilotage and dead reckoning as the primary means of navigation.

Procedures description

1. Determine the aircraft's present position and select a suitable alternate airport.
2. Estimate the approximate heading to the selected alternate or use electronic navigation system(s), as specified, and turn to that heading. Note time and start the timer as the turn begins.
3. Adjust aircraft altitude as necessary to account for obstacles, airspace, or the VFR cruising altitude rule (Reference 14 CFR 91.159).
4. Plot a course to the desired alternate on the appropriate sectional chart and/or electronic navigation system, as specified, and determine the precise heading and distance to the selected alternate.
5. Establish the aircraft on the precise heading if different from the original estimated heading.
6. Using the distance calculated along with a groundspeed estimate, calculate ETA and required fuel.
7. Contact ATC and/or FSS, as appropriate, to amend the current flight plan with the new destination.
8. When providing the ETE (estimated time en-route) to ATC/FSS, take into account the elapsed time in order to provide the most precise estimate possible.
9. Utilize the FSS to obtain NOTAMs and other pertinent information for the diversion airport.
10. Upon arrival and landing at the appropriate alternate, contact the FSS and close the flight plan, if applicable.

Lost Procedures

Objective

Flight crews will be able to recognize the need for, and conduct, efficient lost procedures, while selecting the best course of action to be followed and maintaining positive aircraft control and situational awareness.

Procedures description

1. Climb to a higher altitude, if able, to attain a better visual.
2. Circle over the present position by referencing a prominent landmark.
3. Use a shallow to medium bank to minimize workload.
4. Conserve fuel by utilizing an appropriate power and mixture setting.
5. Maintain an appropriate airspeed while circling.
6. Check your position:
    a. Utilize navigational charts and airborne electronic navigation system to assist in determining aircraft position.
7. If still unable to determine the position of the aircraft, contact the appropriate FSS or ATC facility for assistance.
8. If unable to determine the appropriate ATC frequencies or to establish contact, transmit on the emergency frequency (121.5) stating approximate last known location and request assistance.

NOTE
Remember and use the 5 C's: Climb, Circle, Conserve, Check and Call

Section 10: Instrument Maneuvers and Procedures

Recovery from Unusual Flight Attitudes

NOTE
Although the recovery procedures listed here occur in sequence, recovery from unusual flight attitudes requires that the listed actions be made nearly simultaneously.

WARNING
Unusual attitude training in actual instrument meteorological conditions is PROHIBITED.

Objective
Flight crews will develop the ability to recognize, evaluate, and correct unusual flight attitude situations and recover in a timely manner by returning the aircraft to straight and level flight under positive control.

Nose-High Unusual Attitude Procedure Description

The primary concern in recovery from nose-high unusual attitude is avoiding a stall.

1. Immediately apply forward elevator pressure to achieve a level pitch attitude.
2. Immediately apply full power.
3. Only after the angle of attack is reduced and power added, level the wings using visual references, if available, as well as the turn coordinator.
4. Do not initially rely on the vacuum instruments as they may have malfunctioned and/or tumbled.
5. With wings level, monitor altimeter and vertical speed indicator for needle reversals.
    a. As the needles momentarily stop and reverse their trends, you are passing through approximate level pitch attitude.
6. As the aircraft stabilizes, continue to crosscheck visual references and the available flight instruments to maintain a level flight attitude.
7. Confirm the indications of the attitude and heading indicators against visual references (if available) the other flight instruments to determine accuracy.
8. Re-establish appropriate power setting to maintain straight and level flight at 100 KIAS (≈2100 RPM).

Nose-Low Unusual Attitude Procedure Description

The primary concern in recovery from nose-low unusual attitude is avoiding a steep descending spiral, resulting in excessive descent rates and exceeding aircraft structural limitations.

1. Immediately reduce power to idle.
2. Immediately level the wings using visual references (if available) as well as the turn coordinator.
3. After the wings have been leveled and power reduced, smoothly apply back elevator pressure to achieve a level pitch attitude.
    a. Adjust elevator pressure in order to remain within safe airspeed and load factor limits.
4. With wings level, monitor altimeter and vertical speed indicator for needle reversals.
    a. As the needles momentarily stop and reverse their trends, you are passing through approximate level pitch attitude.

5. As the aircraft stabilizes, continue to crosscheck the available flight instruments to maintain a level flight attitude.
6. Re-establish appropriate power setting to maintain straight and level flight at 100 KIAS (≈2100 RPM).

Timed Turns

Objective
Flight crews will develop the ability to correctly execute turns to headings using a time reference and the magnetic compass as the only available directional resources.

Procedure Description

1. Establish straight and level flight.
    a. Crosscheck the ASI, ALT, TC, and magnetic compass
    b. Set the stabilizer trim for "hands off" flying
    c. Prepare the time reference that will be used (timer, watch, ac clock, etc.)
2. Determine the direction of the upcoming turn.
    a. Remember that the typical aviation fluid-filled magnetic compass card reads the opposite of the actual direction of turns
    b. Use any normally indicating compass card reference (OBS, HDG, etc) if confusion exists, to confirm the direction of the upcoming turn
3. Reference the magnetic compass for heading, then determine the difference, in degrees, between the current heading and the desired heading
4. Calculate the needed time, in seconds, to turn to the desired heading
    a. Divide the difference in degrees by 3 for a standard rate turn of 3° per second

NOTE
Proper timing requires a standard rate turn of 3° per second. Start the time and then roll into a standard rate turn for a specified amount of time and heading change (i.e. turning right from 270° to 090° = 180° desired heading change; 180°/ 3 = 60 seconds at standard rate, 3° per second turn).

5. Note the time / start the timer, then smoothly roll into standard rate turn in the desired direction using coordinated aileron and rudder and using the TC for bank reference.
6. After the calculated time has elapsed initiate a smooth roll out using coordinated aileron and rudder. Attempt to roll out at the same rate as the initial roll in.
7. Once the aircraft returns to straight-and-level flight, allow the magnetic compass to settle.
8. Once the compass card has stabilized, confirm the desired heading is achieved, and make small adjustments, if any.
    a. Since the typical aviation compass card reads backwards, it is easiest to visualize the desired heading mark on the compass card as the airplane.
    b. For small heading corrections of 10° or less, you can "fly" the desired heading mark on the compass card toward the heading reference line on the compass glass, using very small bank angle (≈5° or less).
    c. Make only momentary and slight bank changes when making small heading corrections, as even a 3 second turn at standard rate will change the heading approx. 10°.

Compass Turns

Objective
Flight crews will develop the ability to correctly turn using the magnetic compass and the knowledge of aircraft positional latitude as the only directional references.

Procedure description

1. Establish straight and level flight.
    a. Crosscheck the ASI, ALT, TC, and magnetic compass
    b. Set the stabilizer trim for "hands off" flying
2. Reference the magnetic compass for heading, then determine the desired heading.
3. Determine the direction of the upcoming turn.
    a. Remember that the typical aviation fluid-filled magnetic compass card reads the opposite of the actual direction of turns
    b. Use any normally indicating compass card reference (OBS, HDG, etc) if confusion exists, to confirm the direction of the upcoming turn
4. Determine the amount of overshoot or undershoot needed for the desired heading (reference the examples and the illustration below)
    a. Determine current positional latitude (e.g. 40° North)
    b. When turning to the heading of North, UNDERSHOOT by degrees of latitude, plus lead by ½ the bank angle
    c. When turning to the heading of South, OVERSHOOT by degrees of latitude, and also lead by ½ the bank angle
    d. When turning to the headings of East or West, there is no lag so no additional overshoot or undershoot is required, except lead by ½ the bank angle.
    e. Remember UNOS ("undershoot north, overshoot south") and OSUN ("overshoot south, undershoot north") memory aids
    f. For headings between N, E, S and W, interpolate the amount of overshoot/undershoot required.
    g. It is easiest to use previously memorized amounts of overshoot or undershoot for your specific latitude and airplane (refer to the illustration below as an example)
        i. In advance, interpolate and memorize the overshoot/undershoot values for each possible heading in 30° increments (i.e. 000,030,060 etc. degrees)
        ii. Round it to the nearest 5° for ease of memorization
5. Reference heading on the compass and initiate a turn in the desired direction using coordinated ailerons and rudder and the TC to establish a standard rate turn.

NOTE
Most aviation fluid compasses have a bank limitation of 18°. When conducting compass turns flight crews must take this into account and attempt to maintain standard rate bank angles, regardless of weather conditions.

6. Roll out on the previously determined compass heading value, and allow the compass to stabilize while maintaining straight and level flight
7. Once the compass card has stabilized, confirm the desired heading is achieved, and make small adjustments, if any.

8. Since the typical aviation compass card reads backwards, it is easiest to visualize the desired heading mark on the compass card as the airplane.
    a. For small heading corrections of 10° or less, you can "fly" the desired heading mark on the compass card toward the heading reference line on the compass glass, using very small bank angle (≈5° or less).
    b. Make only momentary and slight bank changes when making small heading corrections, as even a 3 second turn at standard rate will change the heading approx. 10°.

NOTE
To determine the bank angle necessary to maintain standard rate (3° per second) turn, for any given TAS, take 15% of the TAS (knots) value, or 13% of TAS (MPH) value, using one of the following: 1. **Formulas:** a. TAS (knots) x 0.15 = Angle of Bank for Standard rate, 3° per second turn b. TAS (MPH) x 0.10 + 5° = Angle of Bank for Standard rate, 3° per second turn OR 2. **Mental math:** a. Divide TAS in knots by 10, then add half the answer b. Divide TAS in MPH by 10, then add 1/3 the answer

Examples

- For TAS of 100 KTAS = 115 MPH:
    - **Formulas:**
        - 100 KTAS x 0.15 = 15°
        - 115 MPH x 0.13 = 15°

Or

    - **Mental math:**
        - 100 KTAS /10=10, 10/2=5, 10+5=15°
        - 115 MPH / 10 ≈ 11.5, 11.5/3 ≈ 3.8, 11.5 +3.8=15°

- Turn to a cardinal heading:
    - Left turn from heading 120° to heading of North (360°) at 42° Latitude N, using standard rate turn at 100 KTAS (115 MPH TAS)
    - From notes above, angle of bank required to maintain standard rate at 100 KTAS is 15°
    - Since turning LEFT, compass values will be higher than 360° for undershoot
    - Undershoot heading of 360 by 42°, and lead by ½ bank angle, so:
        - (HDG 360°) + (Undershoot of 42°) = (HDG 042°)
        - Lead by ½ bank angle of 15°, so lead by 7°
        - (HDG 042°)+(7° lead) = HDG 049° ≈ HDG 050° (round to the nearest 5° for simplicity)
    - So turning LEFT from HDG 120° to the desired HDG of 360°, roll out when the compass first indicates 050°
- Turn to intermediate heading:
    - Left turn from heading 120° to a NE heading of 030°, at 42° Latitude N, using standard rate turn at 100 KTAS (115 MPH TAS)
    - From notes above, angle of bank required to maintain standard rate at 100 KTAS is 15°
    - Since turning LEFT, compass values will be higher than 030° for undershoot

        - However, we will not use the full latitude value, since we are turning toward a NE heading, and not N, so we have to interpolate
    - Since 42° undershoot would be required for N (360°), and none for E (090°), we have to interpolate for 030°
        - 30° out of 90° (total between N and E) is 2/3 of the way between no undershoot (at E) and maximum undershoot (at N), so we need 2/3 of the total undershoot value
        - 42° undershoot x 2/3 is 28°
        - For HDG of 030°, then, undershoot would be 28°
    - Undershoot heading of 030° by 28°, and lead by ½ bank angle, so:
        - (HDG 030°) + (Undershoot of 28°) = (HDG 058°)
        - Lead by ½ bank angle of 15°, so lead by 7°
        - (HDG 058°)+(7° lead) = HDG 065° ≈ HDG 065° (round to the nearest 5° for simplicity)
    - So, turning LEFT from HDG 120° to the desired HDG of 030°, roll out when the compass first indicates 065°

VOR Intercepting and Tracking

Objective

Flight crews will develop the ability to track and intercept desired VOR radials inbound and outbound.

Procedure description

1. Ensure that the directional gyro is aligned with the magnetic compass.
2. Tune and identify the desired VOR facility on the appropriate NAV receiver.
3. The Morse code identifier of the facilities shall be confirmed by using an appropriate chart
4. Set the Omni-Bearing Selector (OBS) to indicate a centered CDI with a TO or FROM indication, as appropriate, to determine aircraft position.
5. Determine aircraft distance from the facility using all available electronic navigation systems.
    a. Appropriately certified GPS may be used in lieu of DME for distance from the station information.
6. Ensure that, if using a combination GPS/VOR receiver with a shared OBS dial, the OBS dial is connected to the VOR receiver.
7. Set OBS to appropriate/specified inbound or outbound radial
8. Turn parallel to the new radial to determine direction and scale of deflection.
9. Determine the initial intercept angle considering the distance from the facility, distance from the present course to the new course, CDI deflection, and winds.
    a. Intercept angle should be no less than 20° and no more than 90°.
10. Turn to the desired heading and monitor the selected intercept angle.
    a. If the CDI does not indicate progress towards the desired course in an appropriate time, verify that the aircraft is on the desired intercept heading and correct if necessary.
11. Once the CDI starts to center, initiate a turn to the desired inbound/outbound course heading so as to not fly through the desired course.
    a. Anticipate the necessary wind correction angle and establish it as soon as practical.
12. Once established on the desired radial, track the course inbound/outbound, as appropriate, by maintaining the appropriate aircraft heading, accounting for prevailing winds.
    a. Use bracketing technique to determine the actual wind correction angle while tracking the desired radial.
    b. Monitor the CDI at all times. Should the CDI show a deflection to the left or the right of course, a re-intercept angle of between 10° and 30° should be applied to the aircraft heading to return the aircraft to the proper course track.
13. Once the aircraft is established on the desired course with appropriate wind correction, note the reference heading.

DME ARCs

Objective

Flight crews will develop the ability to plan and execute a DME arc, while maintaining situational and positional awareness and positive aircraft control at all times.

Procedure description

1. Ensure that the directional gyro is aligned with the magnetic compass.
2. Tune and identify the desired VOR facility that will be used to fly the DME arc in the appropriate NAV receiver.
3. NAV 2 may be used as a standby/backup source for the same VOR, another VOR or navigational/approach facility, as appropriate.
    a. If not being used as a backup, set OBS 2 to the approach course to be intercepted upon completion of the arc or as required.
4. The Morse code identifier of the facilities in both NAV 1 and NAV 2 shall be confirmed by using an appropriate chart.
5. Once the facility has been tuned and identified, determine aircraft distance from the facility using all available electronic navigation systems.
    a. Appropriately certified GPS may be used in lieu of DME for distance information
    b. Ensure that, if using a combination GPS/VOR receiver with a shared OBS dial, the OBS dial is connected to the VOR receiver.
6. Track inbound or outbound on the specified radial, or follow vectors provided by ATC.
7. Estimate the distance when the turn onto the arc will be initiated based on groundspeed.
    a. In a C172R, 0.5 NM is a close approximation at normal cruising speeds if approaching on a 90° intercept.
8. When reaching the desired arc intercept distance, start a standard rate turn in the direction of the arc rotation.
    a. The new heading to intercept the arc depends directly on the present VOR radial where the aircraft is located, not on the aircraft heading, which may or may not correspond to the radial.
    b. If tracking directly TO or FROM the VOR, where the aircraft heading corresponds to the radial, use a 90 degree heading change to the present aircraft heading/station bearing.
    c. If being vectored, where the aircraft heading has no relation to the radial the aircraft is on:
        i. Determine the actual radial the aircraft is on at the desired arc intercept distance (10.5 DME in the above example) by centering the appropriate CDI just prior to reaching the distance.
        ii. Turn to a new heading that is 90° to the radial determined in the previous step, regardless of the present aircraft heading.
9. Twist the CDI used to fly the arc 10° in the direction of the arc.
10. When the CDI centers on the OBS display, turn the aircraft 10° in the direction of the arc, and twist the CDI 10° further to the next radial to be crossed along the arc, so that the needle continues to center as the arc progresses.
    a. If desired distance is not maintained due to wind/pilot input, delay the turn or initiate a turn sooner in the appropriate direction to reestablish the desired distance.

i. If larger corrections are necessary, turn in 5-10° increments towards/away from the station, to correct for wind drift to/from the station.

11. Continue to twist the CDI to the next setting each time it centers in order to maintain positional awareness while making heading and distance corrections.
12. Repeat steps 10 and 11 above until reaching the lead-in radial (if published) or until arriving at approximately 3–5° prior to the selected approach course, at which point a turn will be made until the CDI centers and the aircraft intercepts the inbound approach course.

Holding

Objective

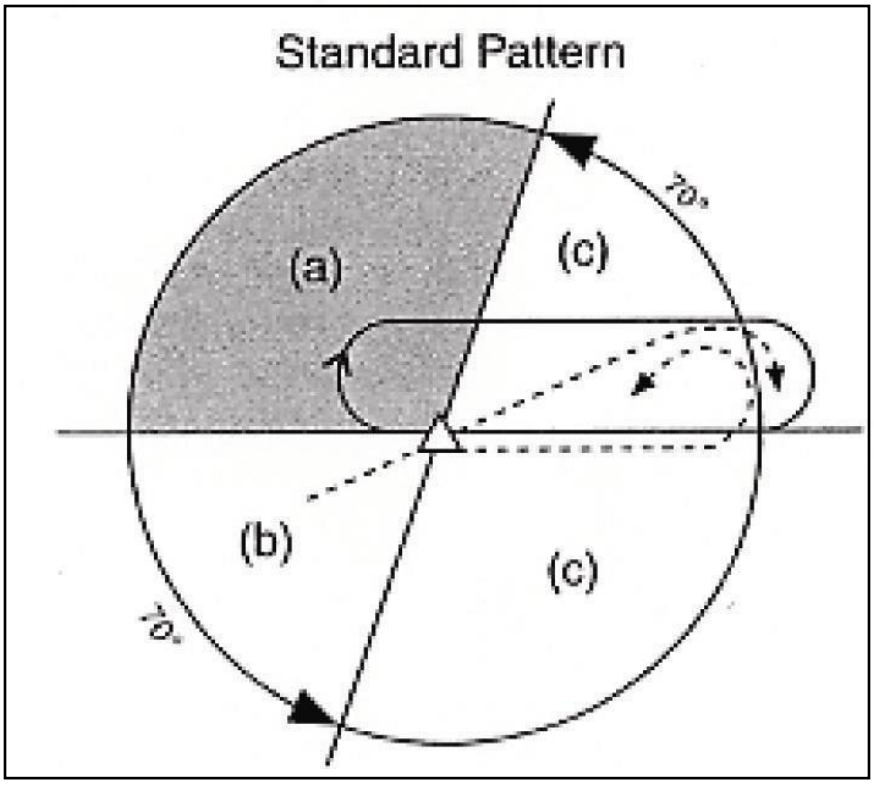
Flight crews will develop the ability to plan and execute an appropriate hold entry and procedure, while maintaining situational awareness and positive aircraft control.

CAUTION
1. *It is common for ATC not to issue EFC (Expect Further Clearance) times to training aircraft practicing instrument procedures in VFR conditions.* 2. *BSU flight crews will be alert to a clearance limit that does not include an EFC time when operating under an IFR clearance and request the EFC prior to entering the hold.*

Procedure description

1. Reduce speed to 90 KIAS (≈ 1900 RPM) when three (3) minutes or less prior to:
    a. A clearance limit when no clearance beyond the fix has been received, or
    b. An assigned / requested holding fix.
2. Determine the entry to be performed prior to reaching the fix, which shall comply with the FAA recommended procedures. Refer to AIM 5-3-8 for FAA recommended procedures.
3. If no instructions are received and no holding pattern is charted, plan to enter a standard hold on the inbound track upon reaching the clearance limit.
4. Determine the procedure to fly after the entry, paying particular attention to:
    a. Direction of turns during and after the entry once established in the hold.
    b. Time or distance used to determine the outbound / inbound legs.
    c. Estimated wind direction and speed and the resultant estimated wind correction.
5. When in the hold plan to fly the inbound leg as one of the following:
    a. One (1) minute for altitudes at or below 14,000’ MSL.
    b. The appropriate charted distance if DME is used.
    c. Time or distance assigned by ATC.
6. Report to ATC the time, altitude, and location of the fix when reaching the hold.
7. When holding at a VOR / VORTAC, begin the turn to the outbound leg at the first complete reversal of the “TO / FROM” indicator on the OBS.
8. Begin the outbound leg timing abeam the fix, or if unable to determine abeam, after rolling wings level.
9. Correct for winds in order to achieve the desired holding ground track and timing of the inbound leg.
    a. On the outbound leg, triple the inbound drift correction and increase or reduce the timing to achieve the desired inbound leg timing.
10. Immediately advise ATC of any abnormal situations (i.e. turbulence, icing) that would require the aircraft to depart the holding pattern.
11. Contact ATC when desiring to leave the hold or when EFC has been reached and further clearance / instruction has not been received.
12. After completing the holding procedure, leave the hold as instructed by ATC.
13. Report time, position, and altitude when leaving the hold.
14. Resume the appropriate cruise airspeed as instructed or requested.

NOTE
While entry into a hold shall be one of the FAA recommended entries below, flight crews should keep in mind that the main priority in holding is to remain on the holding side and to follow ATC instructions.



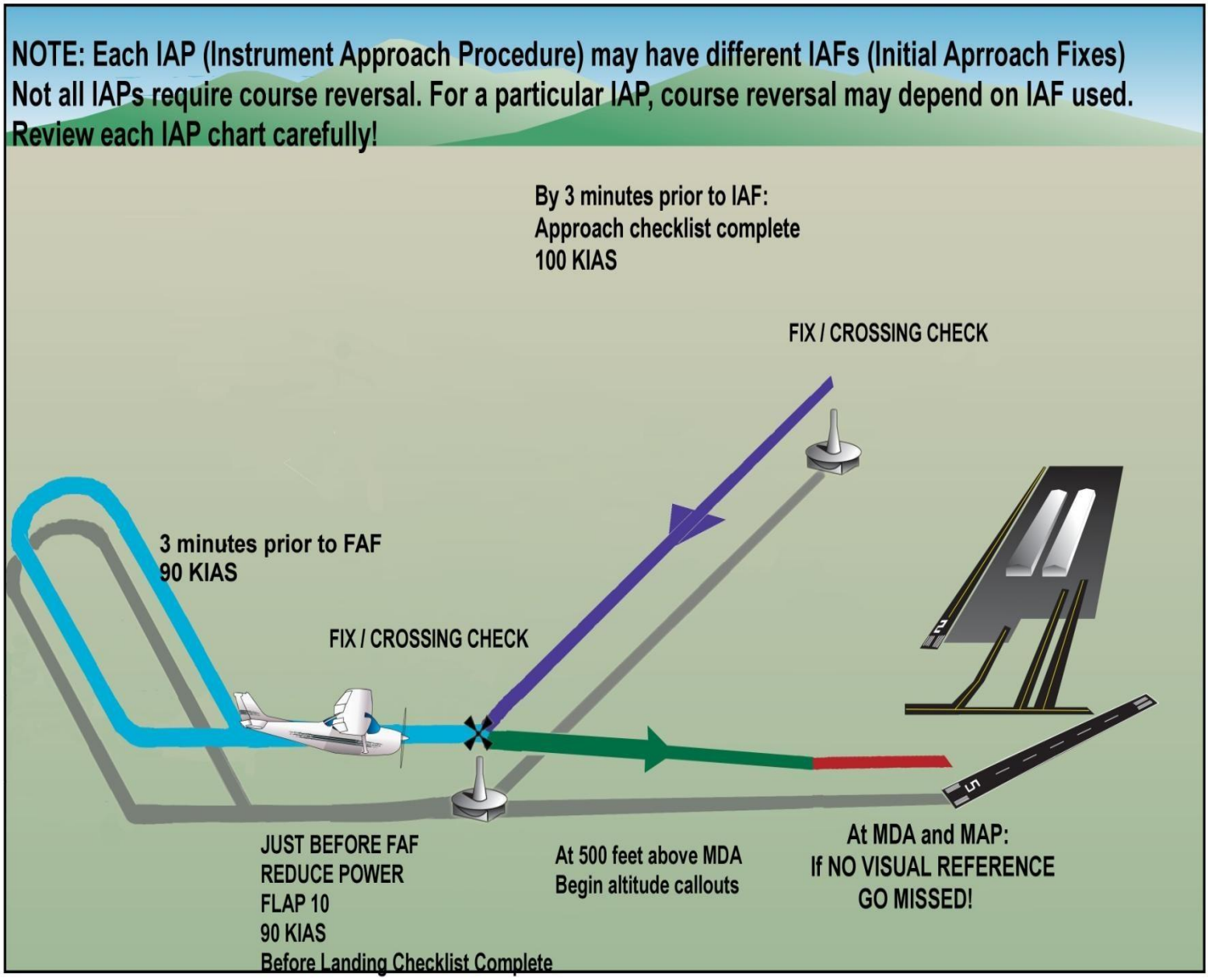
Non-Precision Approach

Objective

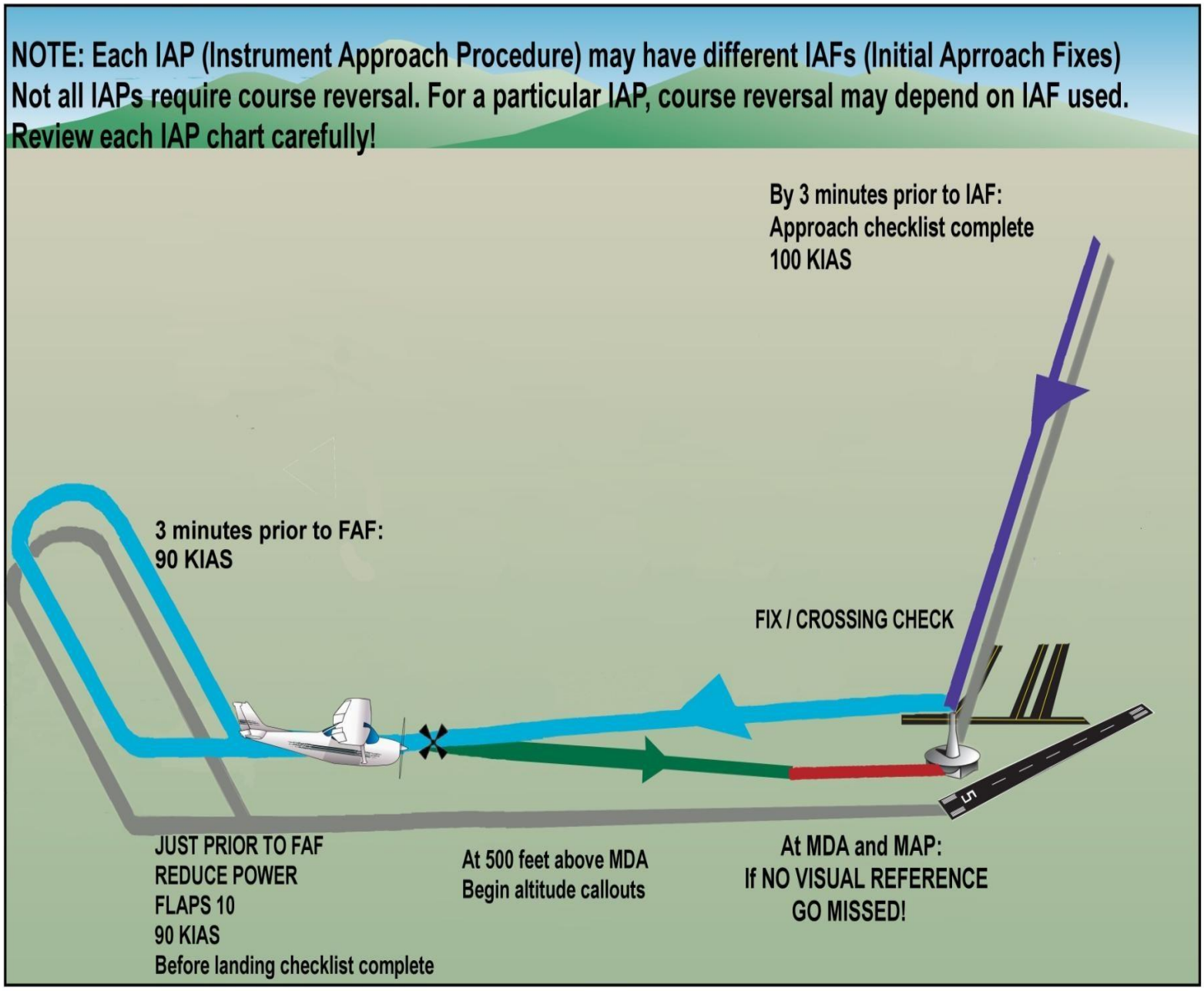
Flight crews will develop the ability to conduct a non-precision approach by establishing the aircraft on the approach and maintaining the course down to published minimums, while executing appropriate procedures, callouts and flows.

Procedure description

1. Prior to being established on the approach, tune, identify and confirm operational status of all airplane and ground equipment necessary for the approach.
2. Brief the approach and complete/verify the descent checklist prior to IAF or prior to intercepting the final approach course.
3. If a procedure turn is to be executed, consider distance and groundspeed when selecting the amount of time to fly outbound (2 min is recommended, unless otherwise dictated by conditions / ATC).
4. Slow to 100 KIAS by establishing ≈ 2100 RPM, 2 NM prior to:
    a. IAF, if full approach procedure.
    b. Procedure turn INBOUND, if executing a procedure turn.
    c. Final approach course intercept, if being radar vectored.
5. Slow down to 90 KIAS by establishing ≈ 2000 RPM 2 NM prior to FAF.
    a. Approaching 1 NM prior to FAF:
    b. Flaps 10°.
6. Perform before landing checklist.
7. Descending from FAF, maintain 90 KIAS (≈ 1700 RPM) planning to arrive at MDA prior to MAP. Do not exceed 1000 FPM during descent.
8. Note the altitude and time/distance, when crossing waypoints / stepdown fixes (if any).
    a. Level off by maintaining 90 KIAS (≈ 2100 RPM) to comply with stepdown fix altitude restrictions, if any.
    b. Re-establish descent after passing the stepdown fix at or above the minimum altitude.
9. Ensure aircraft is fully stabilized by 1000’ above MDA.
10. Execute a normal landing or a missed approach, in accordance with FAR 91.175 requirements.



Non-Precision Approach (off airport navaid)



Non Precision Approach (on airport navaid)

Precision and Precision-Like Approach

Objective

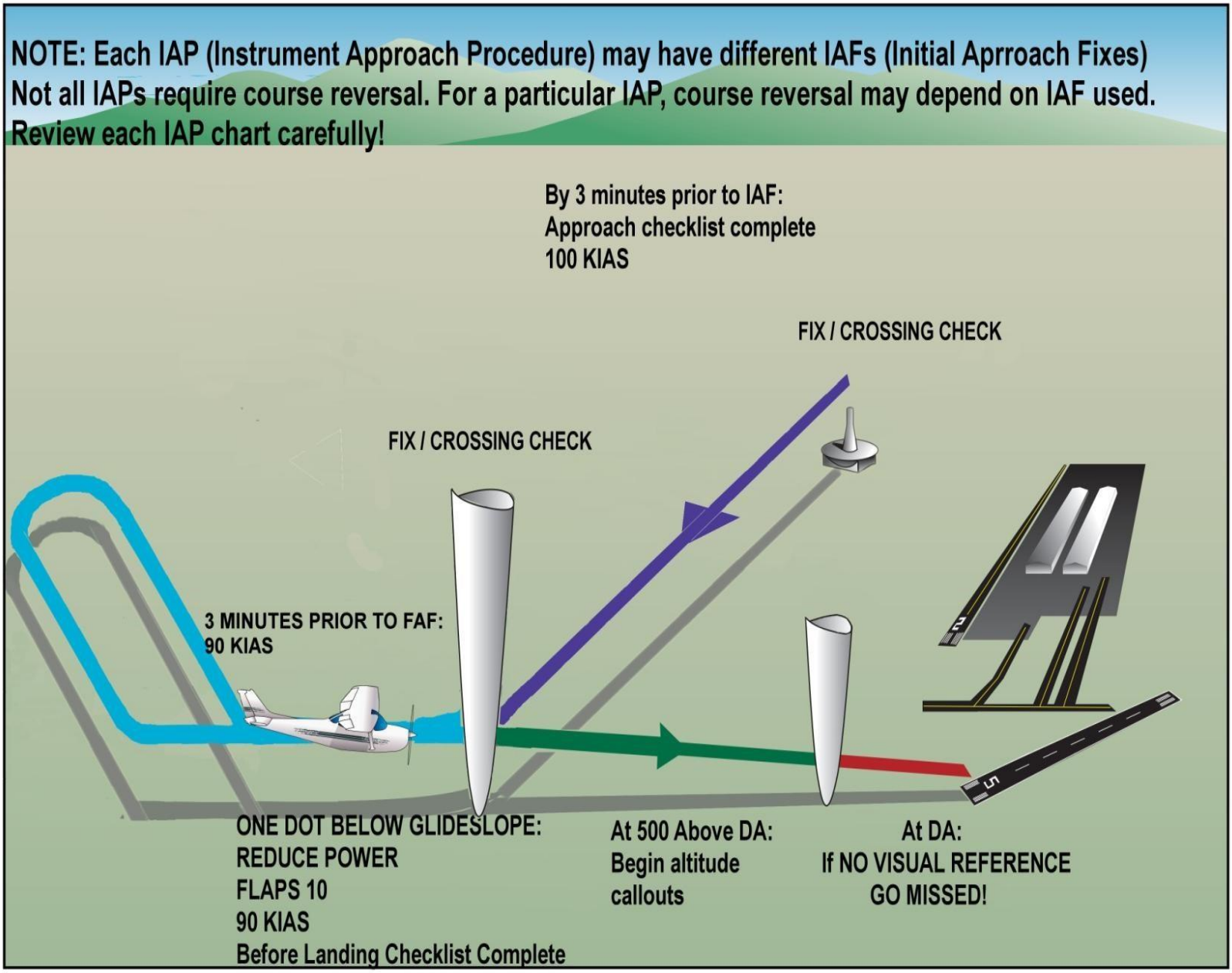
Flight crews will develop the ability to conduct a precision or a precision-like approach by establishing the aircraft on the approach and maintaining the prescribed glideslope / glide path down to published minimums while executing appropriate procedures, callouts, and flows.

Procedure description

1. Prior to being established on the approach, tune, identify, and confirm operational status of all airplane and ground equipment necessary for the approach.
2. Brief the approach and complete/verify the descent checklist prior to IAF or prior to intercepting the final approach course.
3. If a procedure turn is to be executed, consider distance and groundspeed when selecting the amount of time to fly outbound (2 min is recommended, unless otherwise dictated by conditions / ATC).
4. Slow to 100 KIAS (≈ 2100 RPM) 2 NM prior to:
    a. IAF, if full approach procedure.
    b. Procedure turn inbound, if executing a procedure turn.
    c. Final approach course intercept, if being radar vectored.
5. Slow down to 90 KIAS (≈ 2000 RPM) 2 NM prior to FAF.
6. Approaching 1 NM prior to glideslope / glide path intercept (one dot below glideslope needle and established on final approach course):
    a. Flaps 10°.
    b. Perform before landing checklist.
7. On glideslope / glide path, maintain 90 KIAS (≈ 1700 RPM) and vary descent rate with power to remain on the glideslope / glide path
8. Consider the winds and the resulting ground speed when evaluating the necessary descent rate to hold the glide path.

NOTE
1. You may estimate the necessary descent rate using the following formula: a. Groundspeed x 5.3 = Descent rate (FPM) to remain on 3 degree glideslope b. i.e.: GS at 90 KTS = (90 x 5.3) = 477 FPM 2. Or Estimate by using half your ground speed and add a zero: a. i.e. GS at 90 KTS = ½ of 90 = 450 FPM

9. Ensure aircraft is fully stabilized by 1000’ above DA.
10. Execute a normal landing or a missed approach, in accordance with FAR 91.175 requirements.



Precision approach (ILS)

Missed Approach

NOTE
For missed approaches initiated prior to reaching the MAP (Missed Approach Point), unless otherwise cleared by ATC, continue flying the published approach course to the MAP at or above the MDA, DA, or DH before turning. If the missed approach occurs from a circling approach, make an initial climbing turn toward the landing runway, and then maneuver to intercept the missed approach course.

WARNING
When transitioning between VMC and IMC, such as breaking out of IMC at minimums, going visual, then re-entering IMC again serious sensory illusions can occur. An attempt to rapidly switch back and forth between visual and instrument references can disorient a pilot. A focused and rapid instrument crosscheck is necessary to safely carry out the procedure. Once committed to a missed approach in IMC, focus on instruments and ignore the outside visual cues to mitigate the effects of sensory illusions.

Objective

Flight crews will develop the ability to recognize conditions requiring a missed approach and will execute appropriate procedures, callouts and flows accordingly.

Procedure description

1. Ensure that the missed approach procedure is briefed prior to commencing any instrument approach procedure.
2. When it is determined that for any reason a missed approach is required, the PF / PIC will execute the missed approach immediately.
3. Initiate a climb by applying fully power. If positional awareness is lost or direction of turns is uncertain, do not hesitate to ask ATC for a vector.
4. Immediately retract flaps from 30° to 20°.
5. Establish a positive V_Y climb attitude (≈ 4 degree nose-up pitch on AI) and cross-check VSI and altimeter for climb indications.
6. Once established in a positive climb and above 60 KIAS, retract flaps from 20° to 10°.
7. Confirm above 65 KIAS, then retract flaps 10° to 0°, re-trim as necessary.
8. When positive aircraft control is established and verified, transmit the missed approach intentions on the radio, as appropriate.
9. At 500’ AGL, transition to cruise climb (≈ 90 KIAS), or as appropriate (attempt to maintain at least a 500 FPM climb).
10. While climbing, follow the published missed approach procedure, or as otherwise instructed by ATC.
11. Perform the Climb Checklist and verify complete as soon as practical.

Circling Approach

Objective

Flight crews will develop the ability to plan for and conduct a circling approach when executed as a part of an instrument approach procedure, where the approach runway differs from the landing runway, thus necessitating a circling maneuver.

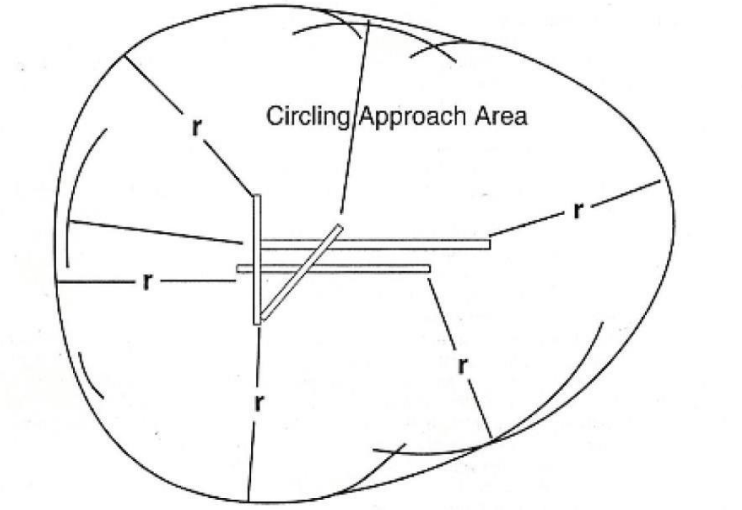
Procedure description

1. Include the anticipated circling direction and relevant airport information in the approach brief.
2. Fly the instrument approach procedure as outlined earlier in this chapter and as instructed by ATC.
3. Plan the circling approach so as to remain within the circling approach area as appropriate for the approach category of the aircraft being flown (see the diagram below and reference current AIM).
4. Initiate a turn in the appropriate direction and maintain visual contact with the runway of intended landing and fly no lower than the published circling minimums.
5. When the aircraft is in a position to execute a landing, configure the aircraft as appropriate and initiate a descent for the landing.

Circling Approach Area Radii

Approach Category	Radius (Miles)
A	1.3
B	1.5
C	1.7
D	2.3
E	4.5

Radi (r) defining size of areas, vary with the approach category



Appendices

Table of Contents

APPENDIX A
Flow Procedures Reference Guide

Before Start Flow

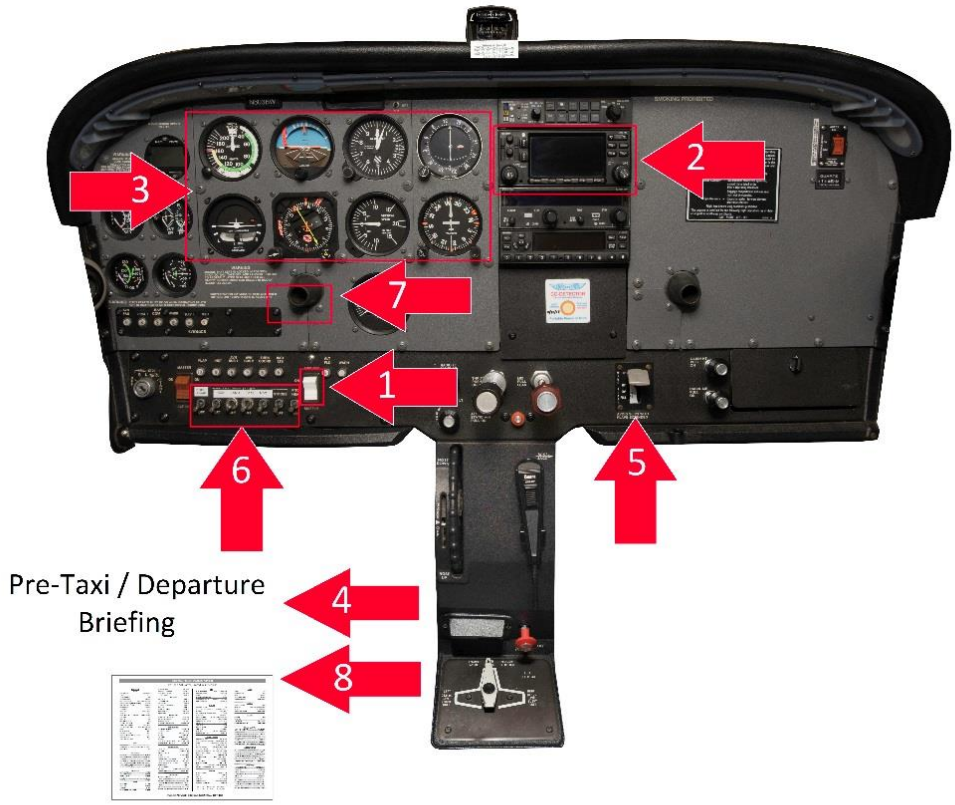
1. Briefing – SAFETY briefing completed
2. Seats and Seatbelts – Secure
3. Fuel Selector – Both
4. Fuel Shutoff – In
5. Switches – Set
6. Brakes – Tested and Set
7. Doors – Closed and latched
8. Before Start Checklist – Completed

Engine Start Flow

1. Mixture – Idle/Cutoff
2. Throttle – ¼” open
3. Master Switch – On
   Engine Start Procedure
4. Prime – As Required
5. Propeller Area – Clear
6. Starter – Engage
7. Mixture -- Advance
8. Throttle – 1000 RPM
9. Mixture – Lean for taxi
10. Circuit Breakers – Checked
11. Gauges – Checked
12. Engine Start Checklist – Complete

Before Taxi Flow

1. Avionics Master – On
2. Avionics Set-Up Procedure – Execute
3. Flight Instrument Set-Up Procedure – Execute
4. Pre-Taxi/Departure Brief – Execute
5. Flaps – Up
6. Lights – Set
7. Flight Controls – Free and Correct
8. Before Taxi Checklist – Complete



Taxi Flow

1. Parking Brake – Release
2. Brakes – Checked
3. Flight Instruments – Check

Before Takeoff Flow

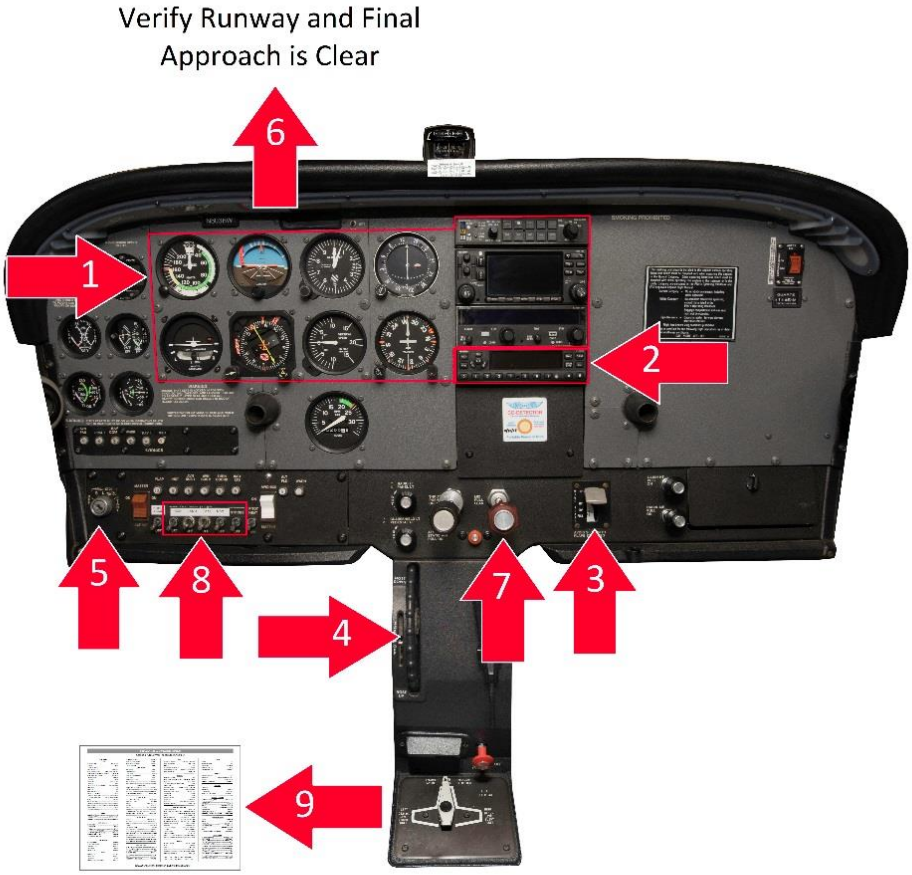
1. Parking Brake – Set
2. Fuel Selector – Both
3. Mixture – Full Rich
4. Oil Temperature – Checked
5. Throttle – 1800 RPM
6. Magnetos – Checked Right, then Left, Set Both
7. Gauges – Checked
8. Ammeter Load – Tested
9. Annunciator Panel – Tested, Set
10. Throttle – Check Idle/1000RPM (In expanded look at the gauges)
11. Mixture – Leaned for Conditions
12. Flight Controls – Free and Correct
13. Before Takeoff Checklist - Complete

Takeoff Flow

1. Avionics/Flight Instruments – Set
2. Transponder - Code set, select ALT.
3. Flaps – As appropriate
4. Trim – Set for Takeoff
5. Ignition – Verify on BOTH

(After takeoff clearance received)

6. Runway/Final Approach – Clear
7. Mixture – Full rich
8. Lights – All on
9. Takeoff Checklist Complete



Climb Flow

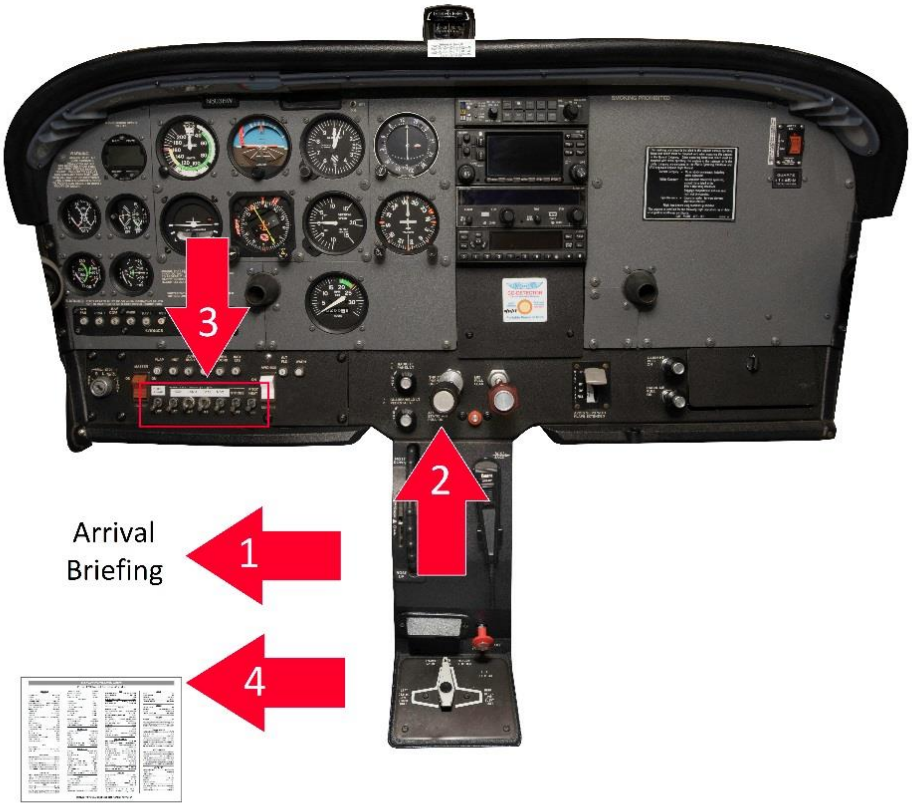
1. Flaps – Up
2. Mixture – Set
3. Gauges – Check
4. Climb Checklist – Complete

Cruise Flow

1. Lights – Set
2. Throttle – Set ____ RPM
3. Mixture – Leaned
4. Checklist – Complete

Descent Flow

1. Arrival Briefing – Complete
2. Throttle/Mixture – Set
3. Lights – Set
4. Descent Checklist – Complete

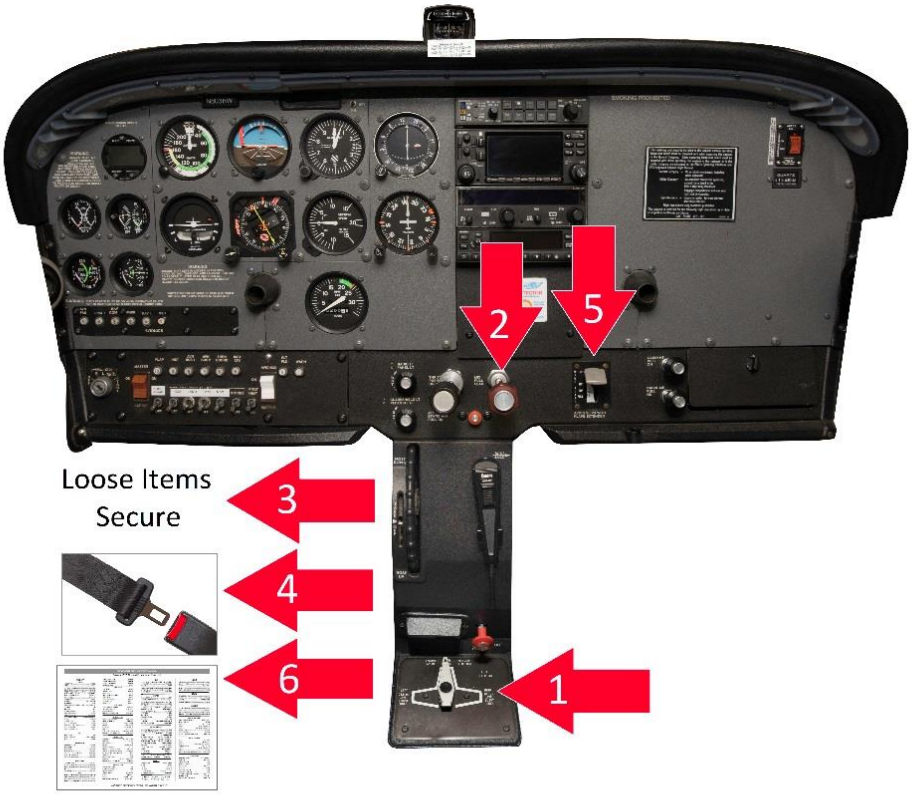


Before Landing Flow

1. Fuel Selector – Both
2. Mixture – Rich
3. Loose Items – Secure
4. Seats and Seatbelts – Secure

==========

5. Flaps – Set ____°
6. Before Landing Checklist – Complete



After Landing Flow

1. Trim – Adjusted
2. Flaps – Up
3. Mixture – Lean
4. Lights – As required
5. After Landing Checklist – Complete

Shutdown Flow

1. Throttle – 800 RPM
2. Transponder – STBY
3. Avionics Master – Off
4. Magnetos - Ground
5. Mixture – Idle/Cutoff
6. Magnetos – Off
7. Switches – Set
8. Master Switch – Off
9. Shutdown Checklist – Complete

APPENDIX B
Maneuver Quick Reference Guide

Takeoffs

Normal Takeoff

- Flaps - 0° and check trim set for takeoff
- Set full power
- Rotate at V_R (55 KIAS)
- Climb at V_Y (79 KIAS)
- Maintain wind correction
- Climb checklist at 500’ AGL

Short Field Takeoff

- Flaps - 10° and check trim set for takeoff
- Utilize all available runway
- Hold brakes, set full power, and check instruments
- Release brakes
- Rotate as appropriate
- Climb at V_X (60 KIAS) until clear of obstacles
- Lower the nose to establish V_Y (79 KIAS) pitch attitude
- Retract flaps from 10° to 0°
- Climb checklist at 500’ AGL

Soft Field Takeoff

- Flaps - 10° and check trim set for takeoff
- Yoke full aft
- On runway centerline - set full power
- Maintain constant pitch attitude
- Rotate as appropriate
- Maintain aircraft in ground effect
- Exit ground effect at appropriate climb airspeed
- Continue climb out at Vy (79 KIAS) and retract flaps
- Climb checklists at 500’ AGL

Landings

Traffic Pattern

- Closed traffic - Crosswind at TPA minus 300' or as instructed by ATC
- Arriving from outside of traffic pattern - TPA by 1 mile out, 90 KIAS (≈1900 RPM)
- Downwind leg – 90 KIAS (≈1900RPM based on density alt)
- Midfield – "Before Landing" checklist
- Abeam landing point – ≈1500 RPM, flaps 10°, 85 KIAS
- Base leg – flaps 20°, 75 KIAS
- Final approach leg – flaps full, 65 KIAS (or as appropriate)

Normal Landing

- Final approach leg – flaps full, 65 KIAS (or as appropriate)
- In the flare reduce throttle to idle and increase pitch
- Touchdown within 400 (Private) or 200 (Commercial) feet of specified point
- Maintain directional control

Short Field Landing

- Select aiming point and touchdown point
- Final approach leg – flaps full, 61 KIAS (or as appropriate)
- Reduce throttle to idle and flare slightly earlier than normal
- Touchdown within 200 (Private) or 100 (Commercial) feet of specified point
- Retract flaps, apply back pressure to the yoke, apply maximum (safe) braking in order to minimize ground roll
- Maintain directional control

Soft Field Landing

- Final approach leg – flaps full, 62 KIAS (or as appropriate)
- Reduce throttle to idle and increase pitch to remain level in ground effect
- Add an audible amount of power (≈100 RPM) in the flare to soften the landing
- Touchdown softly in the first 1,000 feet or 1/3 of the runway, whichever is less
- Keep the nose wheel off the ground as long as possible
- Minimize braking and maintain forward movement to avoid stopping

180° Power-Off Accuracy Landing

- Appropriate ATC clearance received
- Select touchdown point
- Position on downwind, 1000'AGL, abeam touchdown point: power to idle, flaps 10°
- Establish appropriate glide airspeed and evaluate wind strength and direction
- When appropriate, turn base: evaluate ground track and glide path
- Apply flaps and utilize slips to adjust descent rate while maintaining appropriate glide speed
- Touchdown no more than 200 ft. beyond landing point (Commercial Pilot) or safely on runway (Private Pilot)

Go Around/Rejected Landing

- Cram – Full power, level the pitch, retract flaps from 30° to 20° immediately
- Climb – Ease into a climb, check for positive rate visually and on ALT/VSI, then retract flaps 20° to 10°
- Clean – Clear of obstacles and above 60 KIAS, flaps from 10° to 0° and pitch for Vy (79 KTS)
- Call – announce go-around on radio
- Checklist – verify the appropriate checklist flows (Airspeed? Flaps?)

GO-AROUND
POWER (MIXTURE / THROTTLE ..... FULL FORWARD *FLAPS (if full) .....RETRACT to 20°* *POSITIVE RATE OF CLIMB .....FLAPS 20° to 10°* *IF OBSTACLES (until clear) ..... CLIMB AT V_X (60 KIAS) / FLAPS 10°* *FLAPS (above 60 KIAS and clear of obstacles) ..... 10° to 0° (up)* *AIRSPEED (once clear of obstacles)..... V_Y (79 KIAS)* *CLIMB CHECKLIST……EXECUTE*

Slow Flight, Stalls, and Spin Awareness

Slow Flight Clean

- Select and maintain heading and altitude above 1500' AGL
- Throttle ≈ 1200 RPM
- Approaching 5-10 KTS above MCA/Vs1(44 KIAS) – throttle ≈ 2000 RPM
- Maintain MCA, avoiding any stall indication
- Maneuver as assigned
- When prompted, recover – full power, adjust pitch, maintain heading and altitude

Slow Flight Dirty

- Select and maintain heading and altitude above 1500' AGL
- Throttle ≈ 1500 RPM
- Verify below 110 KIAS – set flaps from 0° to 10°
- Verify below 85 KIAS – add flaps in increments to 30°
- Approaching 5-10 KTS above MCA – throttle ≈ 2100 RPM
- Maintain MCA, avoiding any stall indication
- Maneuver as assigned
- When prompted, recover – full power, flaps to 20° immediately, maintain heading and altitude
- Accelerating through 60 KIAS – retract flaps from 20° to 10°
- Passing 65 KIAS – retract flaps from 10° to 0°

Power On Stall

- Select and maintain heading and altitude above 1500' AGL
- Throttle ≈ 1200 RPM
- Pitch for V_R +10 KIAS (65 KIAS)
- At 65 KIAS, add full power and simulate over rotation and climb pitch (≈15° nose-up)
- Maintain heading or set angle of bank, as specified (up to 20°)
- Maintain pitch and induce imminent or full stall, as specified
- Recover from full or imminent stall by reducing angle of attack and simulate climbing away from approaching terrain once no longer stalled
- Maintain coordination

Power Off Stall

- Select and maintain heading and altitude above 1500' AGL
- Throttle ≈1500 RPM
- Verify below 110 KIAS – flaps 10°
- Verify below 85 KIAS – flaps in increments to 30°
- 65 KIAS - establish normal descent to a simulated runway
- Reduce power to idle
- Maintain heading or set angle of bank, as specified (up to 20°)
- Increase pitch to flare pitch attitude (≈5° nose-up)
- Hold flare pitch attitude and induce imminent or full stall, as specified

- Recover from full or imminent stall by applying full power, reducing angle of attack and simulate climbing away from approaching terrain once no longer stalled; level wings if appropriate
- Retract flaps immediately from 30° to 20°
- Accelerating through 60 KIAS – retract flaps from 20° to 10°
- Passing 65 KIAS – retract flaps from 10° to 0°

Accelerated Stall

- Select and maintain heading and altitude above 3000' AGL
- Throttle≈ 1500 RPM
- At 85 KIAS – throttle to idle, 45° of bank, and maintain altitude
- Induce an imminent stall within 90° of heading change
- Recover from imminent stall by applying full power, reducing angle of attack and execute a V_Y climb

Elevator Trim Stall

- Select and maintain heading and altitude above 1500' AGL
- Set up for a power-off stall (see previous)
- At 65 KIAS – power to idle and trim for hands-off descent
- Once stabilized, add full power
- Allow pitch attitude to increase above normal climb
- Recover from imminent stall by applying full power, reducing angle of attack and execute a V_Y climb
- Accelerating through 60 KIAS – retract flaps from 20° to 10°
- Passing 65 KIAS – retract flaps from 10° to 0°

Crossed-Control Stall

- Select and maintain heading and altitude above 1500' AGL
- Power ≈1500 RPM
- At 75 KIAS – establish stabilized descent, reduce throttle to idle
- Initiate a 30° bank turn – use excessive rudder into the turn and opposite aileron to maintain 30° of bank
- Add backpressure to induce imminent stall
- Recover from imminent stall by applying full power, reducing angle of attack and execute a V_Y climb

Secondary Stall

- Select and maintain heading and altitude above 1500' AGL
- Set up for a power-off stall (see previous)
- Complete a power-off stall entry to a stall
- On recovery, reduce the angle of attack but do not add power
- Pitch up excessively to enter a secondary stall
- Recover from imminent stall by applying full power, reducing angle of attack and execute a V_Y climb
- Accelerating through 60 KIAS – retract flaps from 20° to 10°

- Passing 65 KIAS – retract flaps from 10° to 0°

Spin Recovery

- P – power to idle
- A – ailerons neutral
- R – rudder opposite of rotation
- E – elevator forward then back to stop descent

Spin Set Up

- Confirm flaps up and loose items secure
- Induce a power-off stall – power idle, back pressure
  - A slight power addition during stall break may assist spin entry
- Apply and hold rudder in the desired spin direction
- Maintain opposite aileron pressure to maintain wings level as stall occurs
- Maintain elevator full aft
- When spin occurs, reduce power to idle and neutralize ailerons
- Hold pro-spin elevator and rudder inputs for the desired number of spin turns
- Return to straight and level flight must be accomplished no lower than 3000’ AGL

Performance Maneuvers

Steep Turns

- Throttle ≈ 1900 RPM
- Maintain 95 KIAS and entry altitude
- Smoothly roll into a coordinated left turn
- Passing 30° of bank, add power to ≈ 2200 RPM
- Complete 360° turn, maintain 45° bank (Private), 50° bank (Commercial)
- Initiate rollout ≈ ½ the bank angle prior to initial heading
- Immediately transit into the right turn with no level flight in-between
- Repeat previous steps for a turn to the right
- Upon completion of the turn, resume normal cruise

Chandelles

- Straight and level cruise at 105 KIAS (≈ 2000-2100 RPM)
- Pick a reference point off both wing tips
- Roll into 30° bank
- Add full power
- Pitch up smoothly to arrive at max. pitch attitude by 90° point
- Begin rollout to arrive to wings level by 180° point while maintaining pitch attitude with airspeed just above a stall
- Execute a chandelle in the opposite direction, or as specified
- Resume normal cruise at the new altitude and heading

Lazy 8s

- Straight and level cruise at 105 KIAS (≈ 2000-2100 RPM)
- Pick a 45°, 90°, and 135° point
- Start a smooth and coordinated climbing turn towards the 45° point
- At 45° point – ≈15° bank and max. pitch-up (≈15° nose-up)
- At 90° point – ≈ 30° bank, level pitch, and airspeed just above stall
- At 135° point – ≈15° bank and lowest pitch-down (≈15° nose-down)
- At 180° point – straight and level flight, original entry altitude and airspeed
- Execute symmetrical turn in the opposite direction
- Resume normal cruise

Steep Spirals

- Determine wind direction and terrain elevation
- Pick visual reference point on the ground
- Select and altitude that will allow for three full turns before reaching 1500’ AGL
- Establish and maintain 75 KIAS (≈1700 RPM)
- Enter on the Downwind
- Abeam point on the ground – set idle power and bank as appropriate to remain over the point (60° maximum)
- Vary bank angle for constant ground track
- Clear the engine each turn upwind
- After three turns – rollout on the original heading
- Recover before 1,500’ AGL

Ground Reference Maneuvers

Rectangular Course

- Determine wind direction and terrain elevation
- Select a suitable rectangular field parallel with the wind
- Maintain 90 KIAS (≈1900 RPM) and 600'-1,000' AGL
- Enter 45° to Downwind
- Roll out on Downwind ≈ ½ mile from the field boundary
- Start turns abeam the next field boundary
- Vary rate of turn as to maintain constant radius
- Crab into the wind to maintain a constant ground track from field boundaries
- Complete one circuit around the field
- Exit on the downwind
- Resume normal cruise

S-Turns across A Road

- Determine wind direction and terrain elevation
- Select a suitable straight line reference / road perpendicular to the wind
- Maintain 90 KIAS (≈1900 RPM) and 600'-1,000' AGL
- Enter on Downwind, perpendicular to the road
- Vary the bank angle to achieve a constant ground track ≈ ½ mile radius half-circle to follow over the ground
- Wings level over the road only
- Repeat previous steps in the opposite direction
- Exit on the downwind upon completion of the second half-circle
- Resume normal cruise

Turns around a Point

- Determine wind direction and terrain elevation
- Select a suitable ground reference point
- Maintain 90 KIAS (≈1900 RPM) and 600'-1,000' AGL
- Enter on Downwind
- Begin a smooth coordinated turn to the left when abeam the reference point
- Vary the bank angle to achieve a constant ground track ≈ ½ mile radius circle to follow over the ground
- Exit on the downwind after completing one turn
- Resume normal cruise

8'S on Pylons

- Determine wind direction and terrain elevation
- Select two suitable pylons (≈ 15 seconds apart in level flight) in line with each other perpendicular to the wind
- Complete box pattern around points
- Attain appropriate pivotal altitude
- Maintain 95-100 KIAS (≈ 2000 RPM)
- Establish on 45° to the downwind toward the first pylon
- Abeam the first pylon, turn left with a constant bank (≈30-40°) to place the pylon on the lateral axis
- Maintain the pylon on the lateral axis by varying pivotal altitude
- On the opposite 45° to downwind (after completing the first turn) fly straight to the next pylon and crab into the wind to maintain proper ground track and maintain pivotal altitude
- Abeam the second pylon, turn right as previously described
- Exit on the 45° to downwind on the original pivotal altitude, heading, and airspeed

Cross Country Procedures

Departure and En-Route Procedures (VFR)

- Set timer and record takeoff time in appropriate box on the navigation log
- Conduct a traffic pattern departure
- Intercept planned course and verify with appropriate chart
- Level off at altitude, complete appropriate checklists
- Verify position using pilotage, dead reckoning and radio navigation
- Calculate groundspeed and determine ETA
- Obtain radar services if available
- Maintain course by use of pilotage, dead reckoning, and radio navigation
- Note any discrepancies in groundspeed or headings

Diversion Procedures

- Determine position and suitable alternate
- Turn to approximate heading and set timer
- Adjust altitude as necessary
- Plot course to alternate – calculate time, fuel, distance, and exact heading
- Contact appropriate facility to amend flight plan
- Close flight plan once at alternate airport

Lost Procedures

- CLIMB: If at low altitudes, climb to obtain a better view of landmarks
- CIRCLE: Do not continue flying in some random direction if lost
- CONSERVE: Conserve fuel by pulling back on power while circling, maintain 85-90 KIAS
- CHECK: Check your position using pilotage and any available electronic navigation systems.
- CALL: If unable to determine your position, call the nearest ATC facility or FSS if in radar environment, call the radar facility first (Approach, Center)

Instrument Maneuvers and Procedures

Recovery from Unusual Flight Attitudes

Nose High

- Immediately reduce angle of attack
- Immediately add full power
- Level the wings
- Monitor visual references as well as the altimeter and vertical speed indicator for trend reversal
- Maintain level flight attitude
- When stabilized:
    - Adjust pitch and power to maintain straight and level and ≈ 100 KIAS

Nose Down

- Immediately reduce power
- Immediately level the wings
- Once wings are level, smoothly apply back pressure
- Monitor visual references as well as the altimeter and vertical speed indicator for trend reversal
- Maintain level flight attitude
- When stabilized:
    - Adjust pitch and power to maintain straight and level and ≈ 100 KIAS

Timed Turns

- Stabilize in level flight
- Determine the direction of the upcoming turn
- Determine the difference between current and desired heading
- Divide it by 3 to obtain the needed time, in seconds
- Start timer, then roll into a standard rate turn
- Remember : TIME, ROLL IN
- Reaching the elapsed time, as previously determined, roll out
- Remember: TIME, ROLL OUT

Compass Turns

- Stabilize in level flight
- Determine the direction of the upcoming turn
- Determine the desired amount, in degrees, of overshoot or undershoot, if any
- Memorize the references for YOUR latitude and airplane
- Remember:
- OSUN “Overshoot south, undershoot north”
- UNOS – “Undershoot north, overshoot south”
- Roll into a standard rate turn
- Do not exceed ≈ 18° of bank due to compass limitations
- Roll out on the previously determined heading value, then make small adjustments
- Remember:
    - The heading mark (on the compass card) is the airplane
    - “Fly it” in the direction of the course line (the reference line on compass glass) using slight bank of ≈5° or less

VOR Intercepting and Track

- Tune and identify the VOR on the appropriate receiver. Confirm with chart
- Twist the OBS to the desired radial to determine aircraft position
  - If DME information is desired, use DME or GPS
- Input desired radial to track
- Select intercept angle as appropriate for winds and distance from station
- Turn to the desired intercept heading
- Anticipate the wind and establish wind correction early
- Bracket to determine wind correction angle and heading

DME ARC

- Tune and identify the VOR on the appropriate receiver. Confirm with chart
- Set up both NAV receivers (if installed) for the arc and the approach
- Estimate the lead distance and initial heading to initiate turn onto the arc
- Turn to the desired initial heading when reaching the appropriate lead distance
- Twist the OBS used to fly the arc in 10 degree increments
- Turn in 10 degree increments to remain on the arc
- Compensate for wind
- Do not overshoot the desired radial to be intercepted inbound / outbound to the VOR
- Monitor approach course CDI as required

Holding

- When 3 min or less to holding fix / clearance limit
  - 90 KIAS (≈ 1900 RPM)
  - Holding entry determined
  - Holding procedure determined (turns, time or distance, wind correction)
  - EFC time obtained
- Report entering the hold to ATC
- To avoid forgetting critical items, use T's memory aid
  - (Turn, Twist, Time, Throttle, Talk)
- While in the hold
  - Triple the inbound leg wind correction angle on outbound leg
  - Adjust outbound leg timing to achieve desired inbound leg timing
  - If EFC time is reached with no ATC contact, query ATC
- Report leaving the hold to ATC

Non Precision Approach

- 2 NM Prior to IAF / PT Turn inbound / Intercepting final approach course (if vectored)
  - Approach brief complete
  - Descent checklist complete
  - 100 KIAS (≈ 2100 RPM)
- 2 NM prior to FAF:
  - 90 KIAS (≈ 2000 RPM)
- Just prior to FAF:
  - Flaps 10°

  - Before landing checklist flows complete
  - Descent at 90 KIAS (≈ 1700 RPM)
- 500 - 1000 FPM
- By 500’ above MDA – stabilized

Precision Approach

- 2 NM prior to IAF / PT inbound / Intercepting final approach course (if vectored):
  - Approach brief complete
  - Descent checklist flows complete
  - 100 KIAS (≈ 2100 RPM)
- 2 NM prior to FAF (Glide slope intercept):
  - 90 KIAS (≈ 2000 RPM)
- Glideslope intercept (1 dot low):
  - Flaps 10°
  - Before landing checklist complete
  - Descent at 90 KIAS (≈ 1700 RPM) on the glideslope
- By 500’ above DA – stabilized

Missed Approach

- When it is determined that for any reason a missed approach is required, the PF / PIC will execute the missed approach immediately. Execute the go-around procedures (see previous)
- Add full power and initiate climb
- Immediately retract flaps 30° to 20°
- Establish V_Y climb
- Accelerating through 60 KIAS – retract flaps from 20° to 10°
- Passing 65 KIAS – retract flaps from 10° to 0°
- AT 500’ AGL, establish cruise climb at 90 KTS
- Press the suspend key on the GPS as appropriate
- Follow published missed or as otherwise instructed by ATC

Circling Approach

- Determine landing runway prior to executing IAP as instructed by ATC, or as appropriate for conditions at a non-towered airport
- Determine circling radius to remain within the obstacle protected area
- Initiate a turn in appropriate direction and maintain visual contact
- Maintain prescribed distance and altitude
- Configure aircraft appropriately to execute a descent and landing
- If missed approach is executed while circling, make initial turn toward the selected runway

APPENDIX C
Briefings

SAFETY Briefing:

- **S**eatbelts fastened for taxi, takeoff and landing
- **S**houlder harness fastened for takeoff and landing
- **S**eat position adjusted and locked in place

- **A**ir vents (location and operation)
- **A**ll environmental controls (discussed)
- **A**ction in case of any passenger discomfort

- **F**ire extinguisher (location and operation)

- **E**xit doors (how to secure; how to open)
- **E**mergency evacuation plan
- **E**mergency/survival kit (location and contents)

- **T**raffic (scanning, spotting, notifying pilot)
- **T**alking (sterile cockpit expectations)

- **Y**our questions (speak up!)

Departure Briefing

- Who is PIC? Who is pilot flying?
- _____ (type of takeoff) on runway_____
- _____ (distance) _____ (dry/wet/ice/grass/paved)
- Rotate speed_____ kts / climbout speed_____kts
- Departure direction_____
- ODPs/SIDs/noise abatement
- Sterile cockpit (<1000 feet/critical phases of flight)
- Exchange of flight controls (3-way verbal/visual check)
- EMERGENCY PROCEDURES
    - On runway: throttle to idle, maintain directional control, brake, taxi off runway, call
    - Airborne (runway remaining): land, throttle idle, directional control, brake, taxi off, call
    - Airborne (no runway): under_____ ft. make shallow turns to land at suitable area.
    - Above_____ ft. make shallow turns to (l/r) back to the airport, checklist.
- "If you see anything unsafe let me know and I'll do the same"
- "Did I miss anything? Do you have any questions?"

Arrival Briefing

- Arrival airport ATIS or Weather (if no ATIS)
    - Set Altimeter
- Relevant NOTAMS
- Determine pattern altitude

- Avionics – Set for arrival
- Planned arrival runway – Usable length and condition
- Planned runway exit point and taxi route
- Instrument Approach Briefing (If appropriate)

APPROACH BRIEF
APPROACH PROCEDURE..... CONFIRM CORRECT
COMM / NAV / PCL Frequencies .....SET and IDENT
GPS status, RAIM and OBS Coupling .....REVIEW and SET
Final approach course .....REVIEW AND SET
MSA and TDZ elevation ..... REVIEW
FAF Altitude and MDA / DA ..... REVIEW
Time from FAF to MAP (if applicable)..... REVIEW
Missed Approach Point / Procedure ..... …REVIEW

Departure Brief

Who is PIC? Who is pilot flying?

_____ (type of takeoff) on runway_____

_____ (distance) _____ (dry/wet/ice/grass/paved)

Rotate speed_____ kts / climbout speed_____kts

Departure direction_____

ODPs/SIDs/noise abatement
Sterile cockpit (<1000 feet/critical phases of flight)
Exchange of flight controls (3-way verbal/visual check)

EMERGENCY PROCEDURES
on runway: throttle to idle, maintain directional control, brake, taxi off runway, call
airborne (runway remaining): land, throttle idle, directional control, brake, taxi off, call
airborne (no runway): under_____ ft. make shallow turns to land at suitable area.
Above_____ ft. make shallow turns to (l/r) back to the airport, checklist.

"If you see anything unsafe let me know and I'll do the same"
"did I miss anything? Do you have any questions?"

LANDING BRIEF
A-ATIS (at landing airport or nearby airport)
B-briefing (runway, type of landing, distance, condition, wind correction, side of runway to taxi off, go around plan, any other information
C-checklist (descent and before landing checklist complete

Passenger SAFETY Briefing

N_____

S	Seat belts fastened for taxi, takeoff, landing. Shoulder harnesses fastened for takeoff, landing. Seat position adjusted and locked in place.
A	Air vents (*location and operation*). All environmental controls (*discussed*). Action in case of any passenger discomfort.
F	Fire extinguisher (*location and operation*)
E	Exit doors (*how to secure; how to open*) Emergency evacuation plan. Emergency/survival kit (*location and contents*). Equipment (*location and operation*).
T	Traffic (*scanning, spotting, notifying pilot*). Talking (*"sterile cockpit" expectations*).
Y	Your questions? (*Speak up!*)

APPENDIX D
Standard Callouts

Training flights

During normal training events the PF/PUI will be operating as a single pilot, and will make the standard callouts indicated below.

Non-training flights / Urgent situations / Emergencies

During non-training flights, as well as during urgent or emergency situations, flight crews will use crew resource management to achieve the best possible outcome. The PIC will designate the pilot who will make all required callouts.

All Operations

Pilot action:	**Pilot calls out:**
Prior to performing any checklist: ⌖ Verify the correct checklist is about to be performed. ⌖ Example: ○ Verify the correct checklist is about to be performed prior to execution of Before Engine Start Checklist.	"[Appropriate name] Checklist" Example: "Before Engine Start Checklist"
On completion of any checklist: ⌖ Verify that all items on the appropriate checklist are complete. ⌖ Example: ○ Verify that all items on the Before Engine Start Checklist are complete.	"[Appropriate name] Checklist Complete" Example: "Before Engine Start Checklist Complete
During aircraft control exchanges on the ground and in the air: ⌖ Use three-way positive control exchange technique.	Pilot relinquishing controls: "Your controls" Pilot accepting controls: "My controls" Pilot relinquishing controls: "Your controls"

When deferring a checklist item to be performed at a later time (avoid whenever possible) ⌖ State which item has been deferred during the flow ⌖ When appropriate, perform the deferred items. ⌖ Verify checklist is complete. ⌖ Example: ○ PF decides to defer flap deployment while completing the rest of the flow. ○ PF defers checklist completion. ○ PF deploys flaps when appropriate. ○ PF verifies the checklist is complete.	"[Item name] deferred" "[Item name] [action performed]" "[Checklist name] checklist complete" Example: "Flaps deferred" "Flaps are down" "Before landing checklist complete"
After the PUI receives specific altitude /heading/airspeed instructions from the CFI / PIC: ⌖ State the new altitude, heading and airspeed, as appropriate. ⌖ Example: ○ The CFI instructs the PUI to climb to 3,500' MSL and simultaneously make a right turn to the heading of 060°. The PUI confirms the instruction.	"Climb/descend [new altitude], left/right turn to [new heading], maintain [new airspeed] Example: CFI: "Make a right climbing turn to 3500, heading 060" PUI responds: "Climb to 3500, right to 060"

Ground Operations

Pilot action:	Pilot calls out:
Prior to engaging engine starter: ⊕ Clear the area to the left, center, right and behind. ⊕ Open the window and announce intention to start the engine. ⊕ Listen for any response while continuing to visually clear propeller and aircraft area.	"Left / center / right / behind is clear" Announce loud and clear: "Clear prop!"
Prior to moving aircraft from a parked position: ⊕ Clear the area to the left, center, and right	"Taxi area is clear"
Prior to turning, crossing an intersection or a runway: ⊕ Clear the area to the left, center, and right. ⊕ If crossing a runway at a controlled airport, verify cleared to cross.	"Left, center, right is clear". "Cleared to cross runway [##specific runway]."
Prior to any takeoff: ⊕ Verify trim is set for takeoff. ⊕ Verify flaps are set for takeoff.	"Trim set for takeoff" " Flaps set to [actual degrees] "
Prior to taking a runway for departure: ⊕ Verify there is no aircraft on final approach or on the runway of intended use. ⊕ Verify on the correct runway. (i.e. RWY 32)	"Final approach is clear, runway is clear" "32 on the paint, 32 on the heading, 32 on the compass"
After takeoff power has been applied: ⊕ Verify full power is being developed. ⊕ Check that engine instruments are normal. ⊕ Check that airspeed indicator is functioning.	"Power indications normal" "Engine instruments normal" "Airspeed alive"
Upon reaching V_R: ⊕ Check airspeed and rotate.	"[State actual rotation airspeed], rotate"

Prior to retracting flaps on the ground: ⊕ The PF will place a hand on the flap lever after positively identifying it. ⊕ The PF will retract the flaps.	PF: "Flaps identified" PF: "Flaps set to [actual degrees]" or "Flaps up"

Flight Operations

Pilot action:	Pilot calls out:
After rotation: ⊕ Verify positive climb rate is being achieved.	"Positive rate"
After takeoff with simulated or actual obstacles: ⊕ Retract flaps as specified in the appropriate procedure.	"Clear of obstacles, flaps up"
Prior to making a turn in the traffic pattern: ⊕ Verify the area is clear in the direction of the turn as well as opposite the turn.	"Left and right clear"
Prior to turning on final approach in the traffic pattern: ⊕ Verify there is no aircraft on final approach or opposite base.	"Final approach clear, opposite base clear"
Any time on final, if a go-around is warranted: ⊕ PF/PUI will initiate an immediate go-around when situation requires or when prompted to do so by PMF/CFI.	PF/PUI Initiated go-around situation: PF/PUI: "Going around" PMF/CFI: "Roger" PMF/CFI initiated go-around situation: PMF/CFI: "Go-around"
Prior to performing any maneuvers: ⊕ Verify pre-maneuver checklist items complete. ⊕ Verify clearing turns complete.	"Pre-maneuver checklist complete" "Clearing turns complete"

Instrument Procedures

Pilot action:	Pilot calls out:
On precision (or precision-like) approach: ⊕ Note when the localizer / CDI needle starts moving, indicating positive course guidance. ⊕ Note when the glideslope needle starts moving, indicating positive vertical guidance. ⊕ Note when glideslope needle passes through last dot approaching desired glideslope intercept.	"Localizer (or CDI) alive" "Glideslope alive" "Glideslope – 1 dot"
On non-precision approach: ⊕ Note when the appropriate needle begins indicating positive course guidance. ⊕ Note when CDI passes through last dot approaching desired course intercept. ⊕ Approx. ½ mile from FAF.	"Localizer (or CDI) Alive" "CDI - 1 dot" "FAF – half mile"
On any instrument approach: ⊕ When at 500 feet above DA/MDA ⊕ When at 200 feet above DA/MDA ⊕ When at 100 feet above DA/MDA ⊕ When at DA/MDA and/or MAP o When 91.175 requirements are met, continue the approach. o Otherwise, execute missed approach.	"500 above" "200 above" "100 above" "At DA/MDA" and/or "At MAP" "Approach lights" and/or "Going visual" "Going missed"
Deviations during an instrument approach: ⊕ Localizer / CDI - off by ½ scale; Glideslope – off by 1 dot; ⊕ Airspeed +/-10 knots or more of the desired KIAS; ⊕ Vertical speed in excess of 1,000 FPM below 1,000' AGL; ⊕ In situations where the above callouts are made by the PMF, the PF must respond as follows:	"Localizer (or CDI) – half scale " "Glideslope – 1 dot" "Airspeed is [state actual value]" "Vertical speed is [state actual value]" PMF: "[states the deviation, as above]" PF: "Correcting" and/or "Going Missed"

En route operations: ⊕ Note when passing within 1000' of the desired level-off altitude during climbs and descents. ○ Example 1: While climbing through 2,000' MSL to 3,000' MSL ○ Example 2: While descending through 4,000' MSL to 3,000' MSL	"[Altitude passing through] to [Level-off altitude], 1000' to go" Example 1: "2000 to 3000, 1000 to go" Example 2: "4000 to 3000, 1000 to go"

APPENDIX E
Inoperative Equipment Decision

Introduction

This chapter references FAA Advisory Circular (AC) AC 91-67 and appropriate FARs. Federal Aviation Regulations require that all equipment, as installed on an aircraft in compliance with Airworthiness Standards and the Operating Rules, must be operative.

Either of these options allows the operator and/or PIC to conduct operations with certain inoperative equipment and instruments. Refer to FAA Advisory Circular (AC) AC 91-67 for more information outside of this manual.

NOTE
Bridgewater State University does not operate the Cessna 172 with an MEL. Apply the "No MEL" decision sequence from this chapter (based on FAR 91.213(d)) when determining BSU C172R airworthiness with inoperative equipment.

No MEL Decision Sequence

The flow chart depicts the sequence of events a flight crew should follow when inoperative equipment is discovered, and the flight will be conducted under 14 CFR 91.213(d). For example, during a preflight inspection for a VFR day cross-country flight, the flight crew discovers that the NAV #2 unit is inoperative.

- The first action the flight crew must take is to see if the aircraft's equipment list or kinds of operation equipment list require the NAV #2 unit as stated in 14 CFR 91.213(d)(2)(ii). If NAV #2 is required in the equipment list, the aircraft is not airworthy, and maintenance is required before operating the aircraft. In this example, NAV #2 is not a required instrument or piece of equipment.

- The next action is to check the airworthiness regulation under which the aircraft was certificated to determine if NAV #2 is part of the VFR day type certificate (14 CFR 91.213(d)(2)(i)). If NAV #2 is required as part of the VFR day type certification, the aircraft is not airworthy, and maintenance is required before operating the aircraft. In this example, NAV #2 is not a required instrument or piece of equipment. This action, depending on the aircraft, may require additional research into 14 CFR Part 23 or CAR Part 3.

- The next action is to check if NAV #2 is required by an Airworthiness Directive (AD). This would be accomplished by checking the aircraft's maintenance logs to see if NAV #2 was installed as a result of an AD. However, it may be necessary for the pilot to consult a qualified maintenance person to determine AD compliance. If an AD requires NAV #2 to be operative, the aircraft is not airworthy, and maintenance is required before operating the aircraft. In this example, NAV #2 is not a required instrument or piece of equipment.

- The next step is to determine if NAV #2 is required by 14 CFR 91.215, 91.205, or 91.207. This can be accomplished by checking the appropriate sections in the Federal Aviation Regulations, or by consulting a maintenance technician. If any of those regulations require NAV #2 to be

operative, the aircraft is not airworthy, and maintenance is required before operating the aircraft. In this example, NAV #2 is not a required instrument or piece of equipment.

- Having completed the above steps, the final step is to ensure that NAV #2 is either removed from the aircraft, as per 14 CFR 91.213(d)(3)(i), or deactivated, as per 14 CFR 91.213(d)(3)(ii). The person removing or deactivating the NAV #2 unit must be appropriately certificated, must placard it inoperative in the appropriate location, and record the event in an appropriate record.

- Having completed the above stated process, the flight crew must then make a final determination to confirm that the inoperative instrument / equipment does not constitute a hazard under the anticipated operational conditions before departure.

No MEL Decision Sequence Flow Chart

The following flowchart is designed to provide guidance to a flight crew that recognizes inoperative instruments or equipment during the preflight inspection.

Does the aircraft's equipment list or kinds of operation equipment list require the equipment?
14 CFR 91.213(d)(2)(ii)
→ If **YES**, the aircraft is un-airworthy and maintenance is required **before the flight can depart.**

↓

If NO, is the equipment required by the Type Certificate requirements prescribed in the airworthiness certification regulations?
14 CFR 91.213(d)(2)(i)
→ If **YES**, the aircraft is un-airworthy and maintenance is required **before the flight can depart.**

↓

If NO, is the equipment required by Airworthiness Directive?
14 CFR 91.213(d)(2)(iv)
→ If **YES**, the aircraft is un-airworthy and maintenance is required **before the flight can depart.**

↓

If NO, is the equipment required by 91.205, or any other rule of this part for the specific kind of flight operation being conducted?
14 CFR 91.213(d)(2)(iii)
→ If **YES**, the aircraft is un-airworthy and maintenance is required **before the flight can depart.**

↓

If NO, the inoperative equipment must be removed from the aircraft or deactivated and placarded as inoperative, and recorded in accordance with
14 CFR 43.
14 CFR 91.213(d)(2)(i)&(ii)

↓

The pilot shall make a final determination to confirm that the inoperative instrument/equipment does not constitute a hazard under the anticipated operational conditions before departure.

Kinds of Operation Equipment List

The following equipment list identifies the systems and equipment upon which type certification for each kind of operation was based.

The equipment listed in the following table must be installed and operable for flight unless: an alternate procedure is provided in the basic FAA-Approved Airplane Flight Manual for the inoperative state of the listed equipment and the flight crew complies with all limitations.

Kinds of Operation Equipment List

System and/or Component	Kind Of Operation			
	Day VMC	Night VMC	Day IMC	Night IMC
Placards and Markings				
IFR Day and Night Limitations Placard	1	1	1	1
Air Condition				
Cabin Heat System	1	1	1	1
Communications				
Static Discharge Wicks	0	0	10	10
NAV/COM Installation With GS	1	1	1	1
Audio/Intercom/Marker Beacon Installation	1	1	1	1
Basic Avionics (Used with #1 NAV/COM)	1	1	1	1
Electrical Power				
Alternator, 28 Volt 60 Amp	1	1	1	1
Battery, 24 Volt, 12.75 A.H. Manifold Type	1	1	1	1
Equipment and Furnishing				
Seat Belt and Shoulder Harness, Inertia Reel, Pilot and Front Passenger	2	2	2	2
Seat Belt and Shoulder Harness, Inertia Reel, Rear Seat	1	1	1	1
Padded Glareshield	1	1	1	1
Baggage Retaining Net	1	1	1	1
Auxiliary Fuel Pump	1	1	1	1

Indicating/Recording System				
Clock/OAT Indicator, Digital	1	1	1	1
Hour Recorder "Hobbs Time"	1	1	1	1
Annunciator	1	1	1	1
Stall Warning Indicator–Pneumatic	1	1	1	1
Landing Gear				
Wheel Brake and Tire (Main)	2	2	2	2
Wheel Brake and Tire (Nose)	1	1	1	1
Lights				
Flashing Beacon Light on Vertical Fin Tip	1	1	1	1
Strobe Light Installation on Wing Tips	0	1	1	1
Landing and Taxi Light Installation on Wings	0	1	1	1
Navigation				
Indicator, Airspeed	1	1	1	1
Alternate Static Air Source	1	1	1	1
Altimeter	1	1	1	1
Magnetic Compass	1	1	1	1
Directional Gyro	0	1	1	1
Attitude Indicator	0	1	1	1
Turn Coordinator	0	1	1	1
Vertical Speed Indicator	0	0	1	1
GPS Installation	0	0	1	1
Mode C Transponder	1	1	1	1
Vacuum (if installed)				
Vacuum System	1	1	1	1
Vacuum Gage/Ammeter	1	1	1	1
Low Vacuum Warning Light	1	1	1	1

Deferral of Maintenance Discrepancies

In some cases, an item may be found to be inoperative which is not required for certain kinds of operations. The items required for certain types of operations can be found in the Bridgewater State University Flight Standards Manual, Chapter 4 – Kinds of Operation Equipment List.
The discrepancy will be noted in the MX Corrective Action column of the aircraft log sheet. As with all discrepancies, the aircraft is not airworthy and shall not be released for flight until there is a balancing entry in the MX Corrective Action column.
For an item deferred in accordance with the Kinds of Operation Equipment List (KOEL), the balancing entry should read:

"DEFERRED for maintenance on ___/___/___ per Maintenance _____."

The mechanic signing off on the deferral shall sign the signature line to complete the balancing entry.

To accommodate the requirement for signing off the eventual repair, the deferral will be restated in the "Deferred Item" and "Deferred Action Taken" columns of the Deferred Items List. The Corrective Action column may be left unsigned until such time as the repair of the deferred item is complete, provided all flights are conducted in accordance with the BSU KOEL.
The Additional Actions column will be used to document additional actions taken as part of the deferral, such as when items are deactivated and placarded inoperative per 91.213 d(3).
Deferred items will also be tracked on the Fleet Status Board as well as in Flight Schedule Pro. Deferred Items will normally be repaired at the next scheduled inspection (50 hour, 100 hour, etc.). If additional time is needed to affect a repair or replacement, the item may be re-deferred one (1) additional time by maintenance personnel; however, after an item has been re-deferred, it must be repaired or replaced at the next scheduled inspection. It may not be re-deferred more than once without a repair or replacement.

APPENDIX F
Pivotal Altitude Calculation

Method 1: Using the formula

PIVOTAL ALTITUDE = GROUNDSPEED (KNOTS) SQUARED, then divide by 11.3
Using the formula will result in the following table.

GROUNDSPEED		APPROXIMATE PIVOTAL ALTITUDE
KNOTS	MPH	
87	100	670
91	105	735
96	110	810
100	115	885
104	120	960
109	125	1050
113	130	1130

Speed vs. pivotal altitude.

Method 2: Simplified rules of thumb

"110 by 11" ---> 110 kts Groundspeed implies 1,100' pivotal altitude, or
"100 gets 900" ---> 100 kts Groundspeed implies 900 feet pivotal altitude, then +/- 5 kts Groundspeed change equals +/- 100 feet pivotal altitude change

KNOTS GROUNDSPEED	PIVOTAL ALTITUDE FEET AGL
85	600
90	700
95	800
100	**900**
105	1000
110	**1100**
115	1200

APPENDIX G
Instrument Pattern A & B

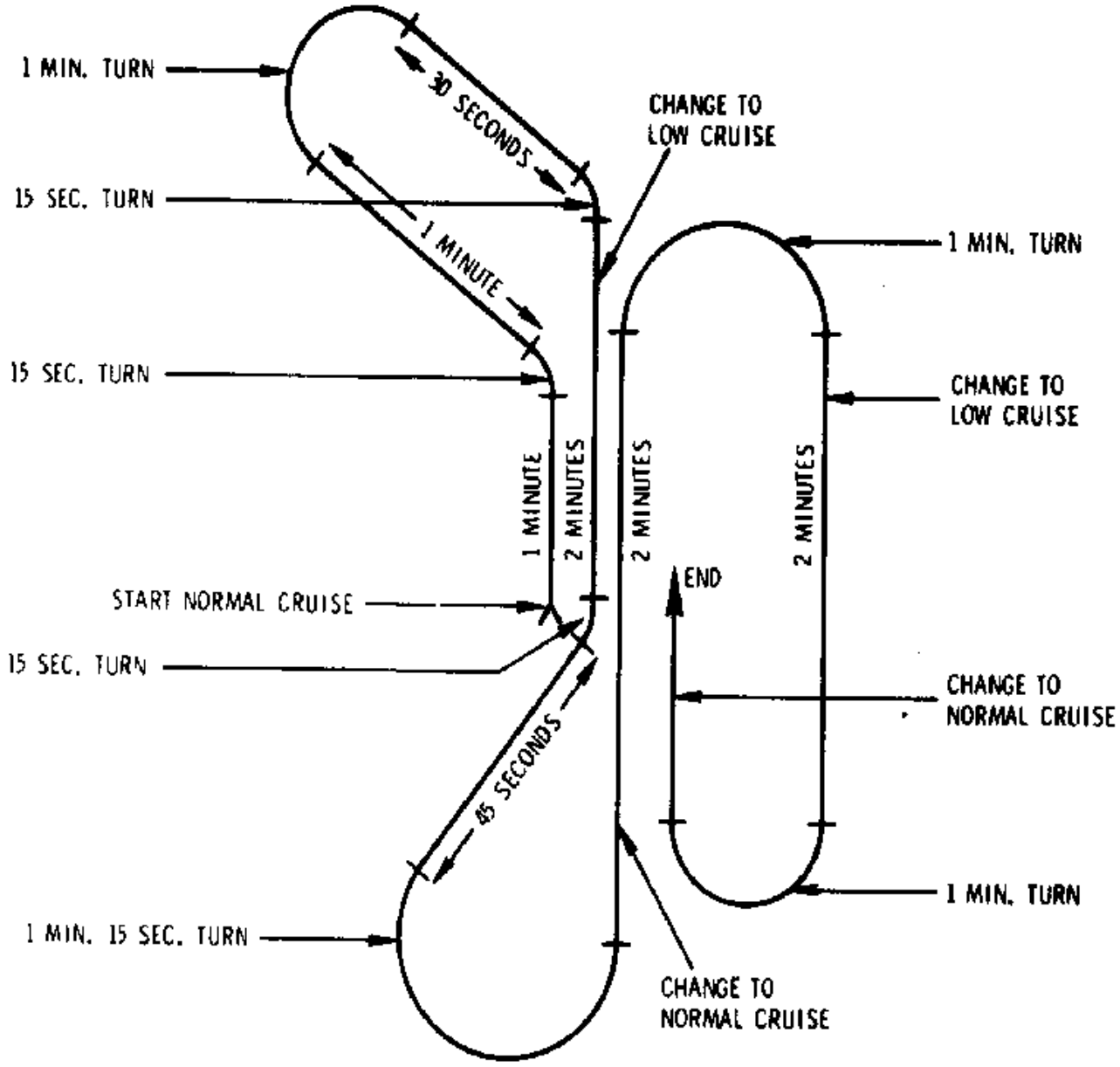
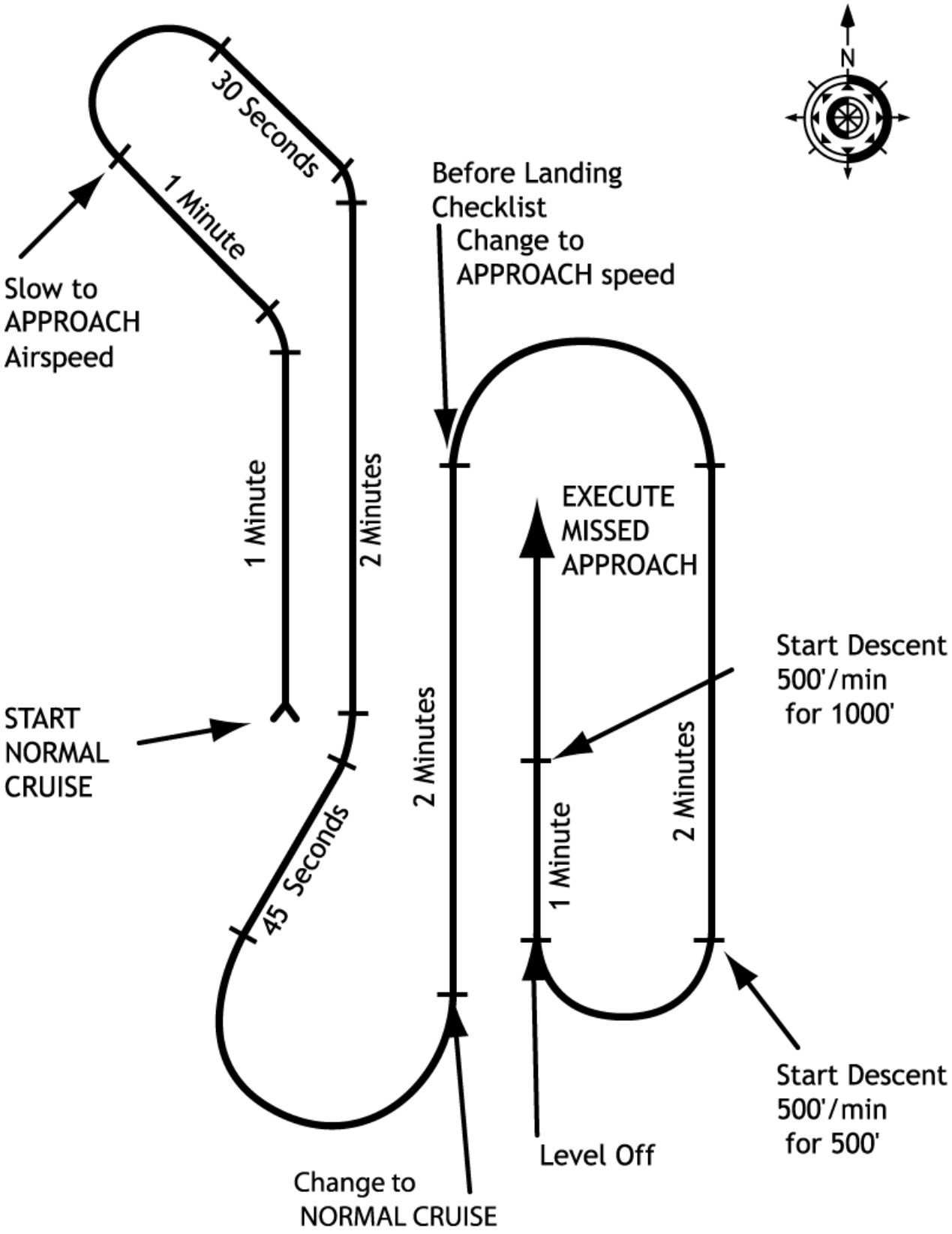


FIGURE 1. Pattern "A".


N
30 Seconds
1 Minute
Slow to
APPROACH
Airspeed
1 Minute
2 Minutes
START
NORMAL
CRUISE
45 Seconds
2 Minutes
Change to
NORMAL CRUISE
Before Landing
Checklist
Change to
APPROACH speed
EXECUTE
MISSED
APPROACH
Start Descent
500'/min
for 1000'
1 Minute
2 Minutes
Level Off
Start Descent
500'/min
for 500'

References and Performance Standards obtained from the following:

FAR / AIM
FAA Private Pilot Airman Certification Standards
FAA Commercial Pilot Airman Certification Standards
FAA Flight Instructor Pilot Practical Test Standards
FAA Instrument Rating Airman Certification Standards
FAA Airplane Flying Handbook
FAA Instrument Flying Handbook
FAA Instrument Procedures Handbook
Cessna C172R Skyhawk Pilot Information Manual