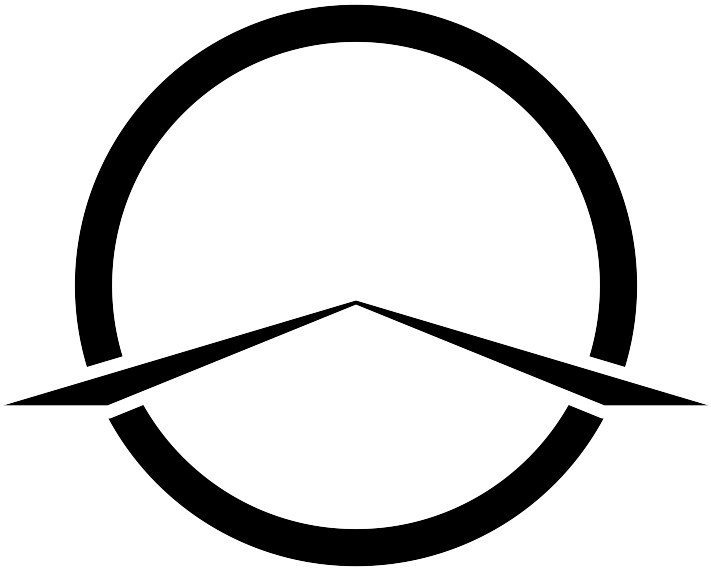


C172 STANDARD OPERATING PROCEDURES

TABLE OF CONTENTS

LIST OF CHANGES

Complete change history of this document can be found in the repository.
https://github.com/ProStandards/c172-sop

V3.2 Mar 2022
Renamed Introduction to Safety
Replaced before takeoff check list to and below the line with run-up checklist and before takeoff checklist
Approach section added.

V3.1 Mar 2022
Transponder operations added to before taxi checklist

V3.0 Mar 2022
Updated table of contents
Upset recovery procedures
Aircraft limitations
Fuel selector LEFT or RIGHT on shutdown checklist
Updated verbiage for annunciators on after start and before takeoff

V2.5 Feb 2022
Maintenance Status added to First Flight of the Day
Takeoff duties
Threat and Error Management

V2.4 16 Feb 2022
Updated Checklist
Updated after landing flow
Operational philosophy clarified with checklist duties
Taxi - duties and management

V2.3 30 Jan 2022
Introduction - Workload Management

V2.2 22 Jan 2022
Before Start - Added Master Switch
Added Landings Section
    Added Go-Around Procedures
Added Cruise Maneuvers Section
    Added Pre-Maneuver Flow
    Cruise Checklist Complete

V2.0 20 Dec 2021
Pro Standards Brand
Revision date format
Introduction - Areas of Vulnerability
Before Taxi - Flight Instruments Typo
Before Taxi - Bugs removed from checklist
Before Taxi - Departure changed to Takeoff

Decent - Arrival changed to Approach
Decent - Errors corrected in checklist

SAFETY

OPERATIONAL PHILOSOPHY

This checklist and the operation of the Cessna C172 is designed to meet the standards of professional aviation. The intent in to prepare pilots to the highest possible standards of aviation and professionalism.

The general philosophy is DO-VERIFY method of checklists. This means all the items are completed from memory prior to doing the checklist. Then the items are verified using the checklist.

There are two categories of items, Tasks and Flows. Tasks are items to be completed by the pilot as soon as practical, in any order. Tasks are often more complex and require more attention than Flows. Tasks are all completed prior to doing the flow. Flows are quick patterns to change the configuration of the aircraft.

Once all tasks and flows are completed, the checklist can be preformed.

Checklists should always be performed in the following order:

Memory Items
Quick Reference Items
Emergency Checklist
Abnormal Checklist
Normal Checklist

When operating as a crew the PM (pilot monitoring) should conduct the checklists, to allow the PF (pilot flying) to maintain focus on flight path management. The PF should verify the tasks are complete, perform the appropriate flow, then call for the checklist from the PM.

When in the training environment the student will complete the checklist. To develop crew communication skills the student will verbalize the single pilot items and the instructor will verbalize the PF items.

AREAS OF VULNERABILITY

Areas of vulnerability are times during flight which deviations are most likely to occur and require prioritization of flight path management. During Areas of Vulnerability all non-critical tasks should be deferred until the aircraft is in a stable condition.

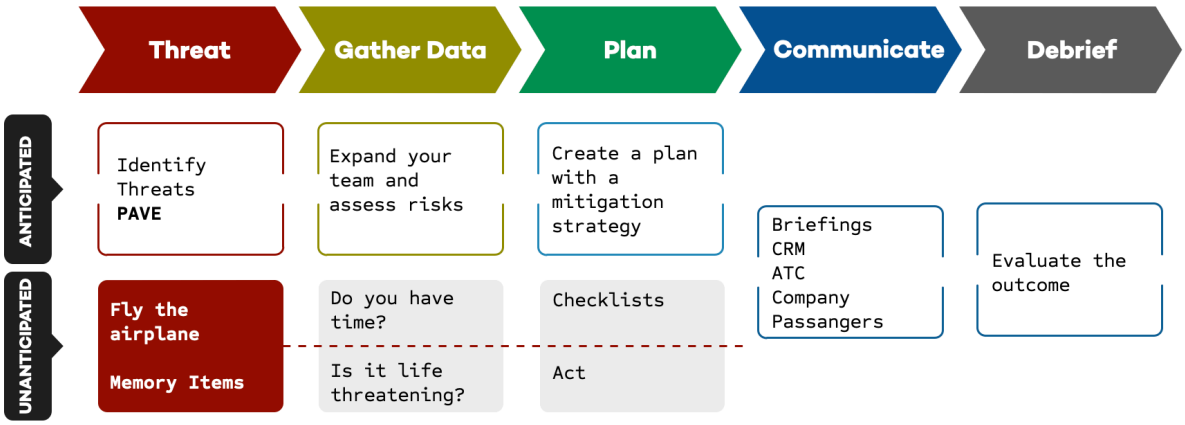
Areas of Vulnerability:
- Taxi
- Takeoff
- Within 100’ of level off
- Landing
- Crossing Runways
- Steril Cockpit

THREAT AND ERROR MANAGEMENT

A threat is factor or condition that could result in an incident or accident.

An error is a mistake or slip by the pilot that could result in a deviation, incident or accident.

A risk is a threat that has been identified, briefed and considered in the pilot's plan



Aeronautical Decision Making

Aeronautical Decision Making (ADM) is the term used to describe the Threat Model. ADM has the following key comports:

Identify threats
Gather data
Plan / Act
Communicate
Debrief

Identify Threats

The most important skill in threat identification is situational awareness (SA). Without situational awareness anticipating, detecting, briefing and mitigating threats is impossible. Situational awareness is the ability to identify cause and effect in the environment you are operating in. SA applies to the entirety of the environment and not just inside the cockpit. Developing SA takes experience, time and dedication to threat and error management.

As a place to start developing situation awareness, the FAA has given us risk identification models such as PAVE and 5Ps.

Pilot(s) - recency, proficiency, skill level, experience, IMSAFE
Aircraft - airworthiness, deferred maintenance items, suitability for the operation

En**V**ironment - weather, airspace, complex airports, aircraft congestion
External pressure - company, passengers, pilot motivations

Illness
Medication
Stress
Alcohol
Fatigue
Emotional Health

Anticipated threats are those that have been briefed by the PF. Unanticipated threats have not been briefed.

Gather Data

Once the threat has been identified, the PIC needs to collect information to better understand the risk being presented to the completion of the flight. We gather data by using crew resource management and single-pilot recourse management. Effectively expanding your team as the PIC is critical for the ADM process.

Inside the plane
Pilot monitoring or Instructor
Passangers
Aircraft Database
iPad Database
Company Manuals

Outside the plane
Air Traffic Control
Company
Flight Service Stations

Once information has been collected the PIC should conduct a risk analysis do formulate a plan of action. It is important to consider information bias when gathering data and conducting the risk analysis. Information bias finding data that supports the decision that you prefer to make instead of the decision that needs to be made.

Use the risk assessment matrix to analyze the severity of accepting the threat that has been presented. Consider the probability of the occurrence and the severity of the consequences if it occurred.

If the level of risk is acceptable to the PIC they can continue to the next step.

Plan
With all available information, the pilot can formulate a mitigation strategy to operate the aircraft in relation to the threat that is present. A decision must be made to continue the mission or not. If the mission is safe to continue, use the mitigation strategy to make a plan of action for operating the rest of the flight.

Communicate
In a single-pilot environment, the pilot should communicate their plan and intentions with ATC, passengers and company as necessary.

When operating with two pilots it is critical to create a shared mental model of the plan with the other pilot. Both pilots should understand the mission, means to accomplish the mission and the mediation strategy for the encounter threats. This includes delegating PF and PM duties as necessary.

Debrief
Once the threat has been resolved and in a low area of vulnerability, the decision making process should be evaluated and suggest ways to improve the ADM skills in the future.

No Time Threats

No Time Threats require immediate pilot action to preserve life and property. No time threats include but are not limited to:

Fire
Smoke
Medical Emergency
Engine Failure below 1,000 feet AGL

After encountering an unanticipated threat the PF must fly the airplane. The flight path must be stabilized before proceeding with the TaEM model.

Fly the airplane
Memory Items
Establish PF/PM

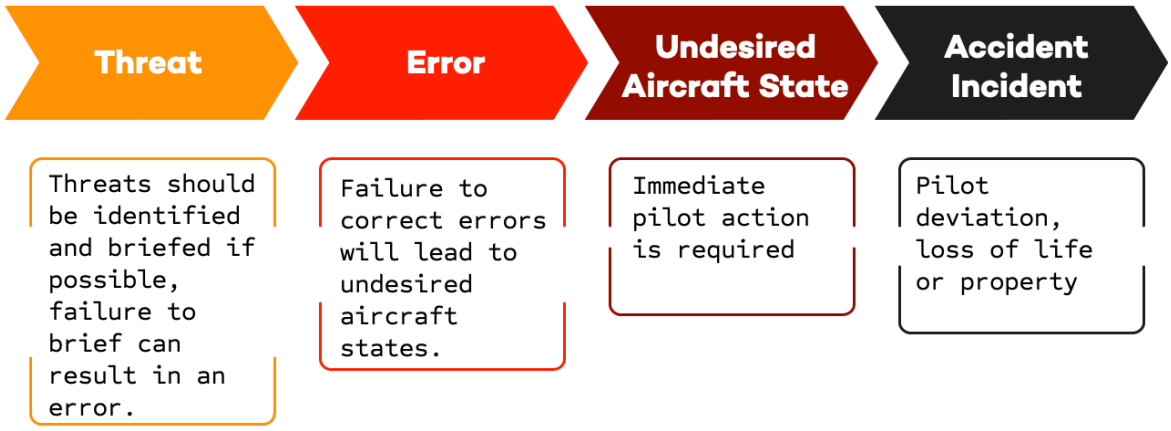
Act
This is what you train for. Use your pilot skills to get the plane on the ground as safely and as quickly as possible.

Communicate
If time permits make your intentions know and squawk the appropriate emergency code.

Debrief
Once the threat has been resolved and in a low area of vulnerability, the decision making process should be evaluated and suggest ways to improve the ADM skills in the future.

Errors

An error occurs when a threat is not mitigated or a threat is introduced by the pilot. The model below show progressive development of threats in to aircraft accidents or incidents.



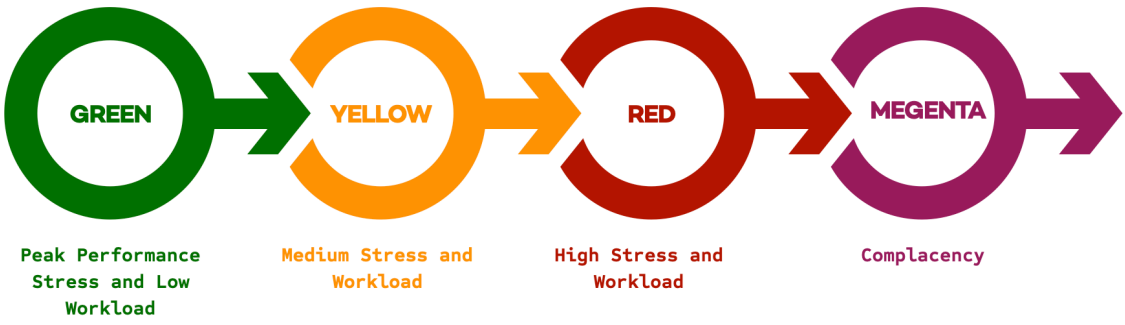
The primary means for preventing threats is by briefing. However, if a threat occurs the PIC must be well-trained and proficient in their skills to prevent errors form developing. These skills include: general piloting, workload management, checklist usage, aircraft knowledge, workload management, CRM/SRM, and ADM.

If an error occurs the PIC must recognize and correct it immediately. Failure to do so will result in an undesired aircraft state.

Failure to correct an undesired aircraft state may result in an accident or incident. The PIC must be able to recognize this situations early and correct them.

WORKLOAD MANAGMENT

The majority of aviation accidents are caused by degradation in situational awareness from being oversaturated. It is important for a pilot to be able to identify when they have become saturated and communicate with instructor or crew member.



Green level is an appropriate amount of stress that encourages peak performance. The pilot is able to stay ahead of the airplane with situational awareness and task management.

Yellow level is when the pilot begins to be task saturated, often in the areas of vulnerability, and is no longer easily able to divide attention between tasks. The pilot may miss signals from the environment, degrading situational awareness.

Red is when the pilot is no longer able to complete the required tasks for safe flight path management. At this point the pilot needs to stop, slow down, think, and prioritize tasks. Continuing without task prioritization will most likely result in a pilot deviation or accident.

Magenta is when the pilot does not have a high workload but is missing environmental signals due to complacency. The pilot needs to recognize the distractions and prioritize tasks for safe flight path management.

LIMITATIONS

KINDS OF OPERATIONS LIMITS [POH 2-9] [GI 275 PART 23 AML STC 2.26]

	VFR	IFR
Day	Approved	Approved
Night	Approved	Approved

Flight into known icing is prohibited.

GI 275 ADAHRS requires GPS and ADC to be operational for IFR Flight.

Equipment	Number Installed	VFR	IFR
GI 275 ADI	1	1	1
GMU 11 or 44B Magnetometer	1	0	1
GI 275 HSI	1	0	1
Magnetic Compass	1	1	1
GPS	1	0	1
ADC	1	0	1

GI 275 Backup Battery Charge

	VFR	IFR
	Approved	Approved
	Approved	Minimum back up time must be no less than 30 minutes. Refer to the battery status and information found in the battery menu. (Menu → Systems → Battery)
	Prohibited	Prohibited

IFR PROHIBITED REGIONS [GI 275 PART 23 AML STC 2.2]		
Maximum Lattitude	**Longitude**	
North of 72°N	All	
South of 70°S	All	
North of 65°N	75°W	120°W
North of 70°N	70°W	128°W
North of 70°N	85°E	114°E
South of 55°N	120°E	165°E
North of 65°N	75°W	120°W
IFR operations prohibited in magnetic variation is greater than 99.9° East or West		

TAXI LIMITATION

Maximum Taxi Speed 20 Knots on Dry pavement and 10 KTS on contaminated surfaces.

AIRSPEED LIMITATION [POH2-4]

V	SPEED	KCAS	KIAS	REMARKS
V_{NE}	Never Exceed Sped	158	160	Do not exceed this speed in any operation
V_{NO}	Maximum Structural Cruising Speed	126	128	Do not exceed this speed except in smooth air, and then only with caution.
V_A	Maneuvering Speed: 2300 lbs 1950 lbs 1600lbs	 96 88 80	 97 89 80	Do not make full or abrupt control movements above this speed.
V_{FE}	Maximum Flap Extended Speed	86	85	Do not exceed this speed with flaps down.
V_{WINDOW}	Maximum Window Open Speed	158	160	Do not exceed this speed with windows open.

POWER PLANT LIMITATION [POH2-5]

		MInimum	Maximum
Engine Manufacturer	Avco Lycoming		
Engine Model Number	O-320-H2AD		
Engine Operating Limits for Takeoff and Continuous Operations			
	Maximum Power		160 BHP
	Maximum Engine Speed		2700 RPM
	Full Throttle Static Range	2280 RPM	2400 RPM
	Maximum Oil Temperature		118° C
	Oil Pressure	25 PSI	100 PSI
Propeller Manufacturer	McCauley Accessory Division		
Propeller Model Number	1C160/DTM7557		
Propeller Diameter		74 Inches	75 Inches

POWER PLANT INSTRUMENT MARKINGS [POH2-6]

INSTRUMENT	RED LINE	GREEN ARC	YELLOW ARC	RED LINE
	MINUMUM LIMIT	NORMAL OPERATING	CAUTION RANGE	MAXIMUM LIMIT
Tachometer	-	2200 - 2700 RPM	-	2700 RPM
Oil Temperature	-	100° - 245° F	-	245° F
Oil Pressure	25 psi	60 - 90 psi	-	100 psi

WEIGHT LIMITS [POH2-6]

NORMAL CATEGORY			
Maximum Takeoff Weight	2300 lbs		
Maximum Landing Weight	2300 lbs		
Maximum Weight in Baggage Compartment			
	Baggage Area 1	120 lbs	82 -108 inches
	Baggage Area 2	50 lbs	108 - 142 inches
	Baggage Area Total	120 lbs	
UTILITY CATEGORY			
Maximum Takeoff Weight	2000 lbs		
Maximum Landing Weight	2000 lbs		
Maximum Weight in Baggage Compartment	Must not be occupied		
Rear Seats	Must not be occupied		

CENTER OF GRAVITY LIMITS [POH2-7]

NORMAL CATEGORY			
Center of Gravity Range			
	Forward	35.0 inches	0 lbs
	Forward	35.0 inches	1950 lbs
	Forward	38.5 inches	2300 lbs
	Aft	47.3	0 lbs
	Aft	47.3	2300 lbs
Reference Datum	Lower Portion of the front face of firewall		
UTILITY CATEGORY			
Center of Gravity Range			
	Forward	35.0 inches	0 lbs
	Forward	35.0 inches	1950 lbs
	Aft	40.5	0 lbs
	Aft	40.5	2300 lbs
Reference Datum	Lower Portion of the front face of firewall		

MANEUVER LIMITS [POH2-7] [GI 275 PART 23 AML STC 2.5]

Normal Category

This airplane is certificated in both the normal and utility category. The normal category is applicable to aircraft intended for non-aerobatic operations. These include any maneuvers incidental to normal flying, stalls (except whip stalls), lazy eights, chandelles, and turns in which the angle of bank is not more than 60°. Aerobatic maneuvers, including spins, are not approved.

If aerobatic maneuvers are being performed, the GI 275 attitude solution may become unreliable and should not be used as an attitude reference during the maneuvers.

Utility Category

The airplane is not designed for purely aerobatic flight. However, in the acquisition of various certificates such a commercial pilot and light instructor, certain maneuvers are required by the FAA. All of these maneuvers are permitted in this airplane when operated in the utility category.

In the utility category, the baggage compartment and rear seat must not be occupied. No aerobatic maneuvers are approved except chandelles, lazy eights, steep turns, spins, and stalls (except whip stalls)

Intentional spins with flaps extended are prohibited.

Maneuver	Recommended Entry Speed
Chandelles	90 KIAS (PS)
Lazy Eights	90 KIAS (PS)
Steep Turns	90 KIAS (PS)
Spins	65 KIAS (PS)
Stalls	65 KIAS (PS)

FLIGHT FACTOR LOAD LIMITS [POH2-8]

NORMAL CATEGORY	**Flight Load Factor Gross Weight - 2300 lbs**	
	Positive	Negative
Flaps Up	+3.8g	-1.52g
Flaps Down	+3.0g	-
UTILITY CATEGORY	**Flight Load Factor Gross Weight - 2300 lbs**	
	Positive	Negative
Flaps Up	+3.8g	-1.52g
Flaps Down	+3.0g	-
The design load factors are 150% of the above, and in all cases, the structure meets or exceeds the design loads.		

FUEL LIMITATION [POH 2-9]

	LEFT	RIGHT	TOTAL
Total Fuel	21.5	21.5	43
Usable Fuel	20	20	40
Unusable Fuel	1.5	1.5	3
Approved Fuel Grades			
100LL	Blue		
100	Green		

To ensure maximum fuel capacity when refueling, place the fuel selector valve in either the LEFT or RIGHT position to prevent cross-feeding.

Takeoff and land with the fuel selector valve handle in the BOTH position.

MINIMUM SOFTWARE LIMITATION [GI 275 PART 23 AML STC 2.1]

Component	Identification	Software Version
GI 275	Multi-Function Instrument	2.40

NAVIGATION ANGLE [GI 275 PART 23 AML STC 2.4]

The Magnetic/True Navigation Angle (as selected in the MENU → SYSTEM → UNITS Page) must match the navigation angle selected on all interfaced GPS/SBAS navigators. If this is not done the navigation deviations will not be accurate.

ADAHRS NORMAL OPERATING MODE [GI 275 PART 23 AML STC 2.5]

The ADAHRS integrity monitoring uses GPS data and air data. Since the internal ADC provides full time air data, the only required external input is from an approved and installed GPS.

PRIMARY FLIGHT INSTRUMENTS [GI 275 PART 23 AML STC 2.8]

Use of QFE altimeter settings is prohibited.

SYNTHETIC VISION [GI 275 PART 23 AML STC 2.10]

The synthetic vision presentation must not be used as the sole reference for aircraft control (without reference to the primary flight instruments).

The synthetic vision presentation must not be used as the sole reference for navigation or obstacle/terrain/traffic avoidance.

MOVING MAP [GI 275 PART 23 AML STC 2.11] [GI 275 PART 23 AML STC 2.18]

The GI 275 Map page (ownship position relative to map features) must not be used as the primary or sole means of navigation or course guidance.

The GI 275 Map page shall not be used as the sole basis for ground maneuvering. The zoomed-in Map page does not comply with the FAA requirements and is not certified as an airport moving map display (AMMD).

Map page use is limited to airport surface orientation to improve flight crew situational awareness during ground operations.

TERREIN [GI 275 PART 23 AML STC 2.13] [GI 275 PART 23 AML STC 2.14]

Maneuvers and navigation must not be based solely on the display of terrain, obstacles, or wires on the moving map terrain displays.

Terrain/TAWS alerts must be inhibited when landing at an airport that is not in the airport database unless the airport can be designated as a user airport (GTN Navigator only).

TRAFFIC [GI 275 PART 23 AML STC 2.16]

The display of traffic is intended as an aid to visual acquisition and must not be used as the sole basis for maneuvering the aircraft to avoid traffic.

SERVICE REQUIRED [GI 275 PART 23 AML STC 2.23]

It is prohibited to initiate flight when a “Service Required” advisory is present on the ADI or EIS display.

DATABASE UPDATE [GI 275 PART 23 AML STC 2.23]

Database updates via USB or wireless transfers must be done while the aircraft is on the ground and stationary. In-flight database transfers or updates are inhibited in flight.

FIRST FLIGHT OF THE DAY

FIRST FLIGHT OF THE DAY

TASKS

MAINTENANCE STATUS

Determine the if it is safe to apply power to the aircraft.

If maintenance is in control of the aircraft, or there is an inoperative item, applying power could damage the aircraft or cause injury to persons.

To determine if it is safe to apply power check the following:

1. **DO NOT OPERATE tag on the throttle**
2. **Aircraft Status by scanning the QR code**
3. **Open Mechanical Irregularities Reported**

If any of the three items are found it is not safe to operate the aircraft.

PASSENGER BRIEFING

The PIC is responsible for briefing the passengers aboard the aircraft. The following briefing items are required:

Smoking
Location of exits
Use of safety belts
Location and use of flotation devices
Location of survival equipment
Location of fire extinguisher
Sterile Cockpit

Example: *“This is a non smoking flight. Safety belts are required for taxi, takeoff and landing. Use them by inserting the metal fitting into the buckle. Lift the latch to release. There are three exits on the airplane. Two front doors, lift the handle to open the door, and the aft baggage compartment door. (If required) There are life jackets in the baggage compartment. Place them over your head and tighten the buckle. There is a fire extinguisher in between the front seats. Pull the pin and aim at the fire in a sweeping movement. During taxi, takeoff, climb and landing we will keep talking to essential items only to prevent distraction.”*

CREW BRIEFING

The First Flight of the Day crew briefing is meant to establish positive communication for crew members. The following items should be briefed:

Establish the PIC
Positive transfer of flight controls
Emergency operation duties and responsibilities

Example (Student Pilot): *“I will be acting as PIC of the flight, however final authority will be with the instructor. We will use the three-step method to transfer flight controls. Initiated by saying ‘my flight controls’ verified by ‘your flight controls’ and confirmed by saying ‘your flight controls.’ During an emergency the pilot flying will continue flying while the pilot monitoring does the flow items and emergency checklist. Once the checklist is complete we can transfer controls if necessary.”*

AIRWORTHINESS ACCEPTANCE

FAR 91.7 - The PIC is responsible for determining whether the aircraft is in a condition safe for flight. The PIC should begin by checking the aircraft status to verify the inspections are current, and the hobbs and tach time match.

Use the AVIATED acronym to check for the following inspections:

Annual
VOR Check (if required)
100 Hour
Altimeter and Pitot Static System
Transponder
ELT
Airworthiness Directives.

Additionally, The PIC should ensure the required documents are onboard the aircraft using the ARROWPC acronym.

The documents include:

Airworthiness Certificate
Registration (Federal)
Radio Operators Permit (International Operations)
Operating Limitations
Weight and Balance Data
Placards
Compass Card

The pilots documents are also required for airworthiness.

These documents include:

Pilot Certificate
Current Medical
Government Issued Photo ID
Corrective Lenses (if required)
Flashlight

iPad with current data and at least 80% charge
Backup Battery suitable to charge the iPad
Current Standard Operating Procedures
Current Checklist

When using an iPad as primary means of aeronautical data you are required to have backup data in the event of iPad failure. Current GPS database, which includes a current SafeTaxi data base is sufficient for VFR.

IFR operations require a second chart data base. This can be a second iPad or iPhone with a current database or paper copies for the departure destination and alternates.

The PIC should, by means of external inspection verify the required equipment of 91.205 are operational. If there is any inoperative equipment, the PIC should verify the deferral of the equipment is completed in accordance with 91.213(d) and does not interfere with the safety of flight.

PREFLIGHT

FAR 91.103 - The following items are required preflight action:

Runway Lengths
Takeoff and Landing Distances
Fuel Requirements
IFR Alternates
Weather Reports and Forecasts
ATC Delays

The PIC should also be familiar with all available information including NOTAMs.

An external inspection of the aircraft should be completed in accordance with the POH before each flight.

FLOWS

NOT APPLICABLE

CHECKLISTS

ITEM	SINGLE PILOT RESPONSE	PM RESPONSE	PF RESPONSE
	“First Flight of The Day Checklist”		
PASSENGER / CREW BRIEF	“COMPLETE”	“COMPLETE”	-
AIRWORTHINESS ACCEPTANCE	“COMPLETE”	“COMPLETE”	“COMPLETE”
PREFLIGHT	“COMPLETE”	“COMPLETE”	“COMPLETE”
	“First Flight of The Day Checklist complete”		

BEFORE START

BEFORE START

TASKS

Fasten safety belts and shoulder harnesses.

If there are sustained temperatures below 0º C, reference cold weather operations.

Batter Master Switch as necessary for before start operations

FLOWS

1. Battery Master Switch - On
2. Fuel Selector - Both
3. Trim - Takeoff
4. Mixture - Set
    1. Rich below 3,000 MSL, or
    2. Above 3,000 MSL the mixture should be leaned one inch of travel.
5. Interior Lights - Set
    1. During daytime operations the interior lights should be turned off and the brightness adjusted on the GPS and electronic instruments. During nighttime operations the dome light, GPS and electronic flight instruments should be adjusted to the lowest visible level. This will promote night vision. As your eyes adapt you will be able to dim the lights more.
6. Exterior Lights - Set
    1. The Nav light should remain on for all operations to indicate the application of power to the aircraft. Additionally, the Nav light should remain on during flight to power the ADS-B out. The Beacon should be turned on prior to starting the engine. The taxi light is used to indicate movement on the surface. Prior to taxing the light should be turn on and once the aircraft is stopped (run-up or waiting clearance) the light should be turned off. Finally, the taxi light should be turned off to indicate giving way to another aircraft an taxiway intersections. The strobe light should only be used when on the runway. When crossing a runway all the external lights should be turned on.
7. Carburetor Heat - Off
8. Circuit Breakers - Checked
    1. Verify all are in
9. Avionics Switch - Off
10. Prime - As Required
    1. Check the oil temperature gauge prior to priming the aircraft. If the gauge is indicating in the green no prime is required for start. If the oil temperature is below the green use three strokes of the primer. Insure the primer is locked when complete.

CHECKLISTS

ITEM	SINGLE PILOT RESPONSE	PM RESPONSE	PF RESPONSE
	“Before Start Checklist”		
SEAT-BELTS	“CHECKED”	“CHECKED”	“CHECKED”
FUEL SELECTOR	“BOTH”	“BOTH”	-
TRIM	“TAKEOFF”	“TAKEOFF”	-
MIXTURE	“SET”	“SET”	-
EXTERIOR / INTERIOR LIGHTS	“SET”	“SET”	
CARBURETOR HEAT	“OFF”	“OFF”	-
CIRCUIT BREAKERS	“CHECKED”	“CHECKED”	-
AVIONICS SWITCH	“OFF”	“OFF”	-
	“Before Start Checklist complete”		

ENGINE START

ENGINE START

TASKS

Visually and audibly clear the area to ensure it is safe to start the engine. Look for any movement, people or vehicles in the area.

DO NOT START IF THE FUEL TRUCK IS AT AN ADJACENT AIRPLANE.

FLOWS

1. Brakes - Hold
2. Ignition Switch - turn to start, release when engine begins to fire.
3. Throttle - Adjust RPM to 1000
4. Engine instruments - Oil pressure should indicate at least 25 PSI and be rising.
5. Ammeter - Verify charging
6. Annunciators - Review displays for any abnormal warning, caution, or advisory indications. Ensure the standby batter is sufficiently charger on the GI 275 ADI and HSI per the Limitations Section
7. Mixture - Lean one inch for taxi
8. Flaps - Set flaps to the up position or 10 for soft field takeoff
9. Avionics Switch - On
10. Establish crew and passenger communications.

CHECKLISTS

ITEM	SINGLE PILOT RESPONSE	PM RESPONSE	PF RESPONSE
	“After Start Checklist”		
ENGINE INSTRUMENTS	“CHECKED”	“CHECKED”	-
AMMETER	“CHECKED”	“CHECKED”	-
ANNUNCIATORS	“CHECKED”	“CHECKED”	-
MIXTURE	“LEANED”	“LEANED”	-
	“After Start Checklist complete”		

ABNORMAL START

BEFORE TAXI

BEFORE TAXI

TASKS

DEPATURE BRIEFING

Copy the ATIS / ASOS in preparation for the departure briefing.

The Departure Briefing should have the following information:

Weather

Brief the current weather, any associated hazards and implications on flight. Key items include wind, visibility, clouds, altimeter setting and low level wind shear.

Departure Procedures

Starting at the aircrafts present location, brief taxi route, hot spots, takeoff distance, runway lengths, emergency procedures on departure, and departure procedures.

NOTAMS

Review any NOTAMS effecting the departure.

Threats

Brief the greatest threats to the departure. Examples include, IFR conditions, CFIT, traffic congestion, LLWS and unfamiliar or complex procedures. Discuss ways to mitigate the threats.

Distractions to the pilot should also be considered. Distractions focus primarily on the pilot and human factors such a passengers and doing a sunset flight or tour.

Example: *“Information BRAVO is current, Skies are clear, altimeter is 29.92 and there is a five knot crosswind from the left. We are at transient parking, we will taxi via HOTEL and ALPHA to runway 28R using cation for hotspot three. 28R is 4,598 feet long with a displaced threshold. We require 1,200 feet for takeoff. If there are any critical abnormalities, caution or warning messages on takeoff roll we will abort, stop the aircraft and assess the situation. Clearing the runway if possible. After takeoff, if there is an engine failure or fire will will do the appropriate memory item, followed by the checklist and plan to land off field. We are departing straight out to 3,500 feet. Our greatest on departure is traffic congestion in the pattern and incoming traffic from the coast. We will mitigate the threats by keeping our eyes outside and scanning for traffic.”*

FLIGHT PLAN

The PF should build the flight plan in the GPS. If a clearance is associated with the departure procedures ensure that the procedure in built in the navigation system. After entering the appropriate waypoints the PF should verify the route on the map page. This will ensure there are no erroneous fixes entered. The PM or Instructor will verify the fixes.

The PF should build the VNAV profile by entering the cruise altitude after the top of climb and entering patter altitude 1NM prior to the destination airport, for decent planning. For IFR flights the departure, arrival and approach procedures will contain VNAV information. The PF should enter the cruising altitude and verify the VNAV restorations match with a current instrument procedure chart.

The PF should also verify all LRUs are operational for every flight. For IFR flights the PF should ensure WAAS, RAIM or EPU will be available depending on the type of operations being conducted.

Once the flight plan has been built and verified the PF should bug the flight instruments in accordance with the departure plan. This should include heading, airspeed and altitude.

FLIGHT INSTRUMENTS

Magnetic Compass - Ensure that the compass is visible and the case is full of fluid.

Airspeed - Should indicate zero with no head wind and match the ADI.

GI 275 ADI - Ensure the altimeter is set and within 75 feet of field elevations. Verify that attitude, heading, altitude, and airspeed are displayed normally on the ADI

Set Synthetic Vision as desired.

Verify that no yellow or red battery icon is displayed on the ADI. If a yellow icon is present, verify the battery's remaining capacity via SOP procedures.

Altimeter - Set the current altimeter setting and verify it is within 75 feet of airport elevation. This should be within 100 feet of the GI 275 ADI.

Turn Coordinator - Wings level, ball centered with no DC flag. The operation of the gyro can be checked on taxi.

GI 275 HSI - Choose the appropriate CDI source for navigation. If desired, select the map mode and set the range for taxi. Check for any advisory messages.

For IFR aircraft, verify that no yellow or red battery icon is displayed on the primary or standby ADI. If a yellow icon is present, verify the battery's remaining capacity is more than 30 minutes.

VSI - Should indicate zero. If note zero, not the zero point.

COMS / NAVS

COM 1 should be used to communicate with ATC for any instructions (Clearance, Ground, Tower, Approach, etc.) COM 2 should be used for advisory communications only (ATIS, ASOS, FBO, etc.)

Set the next frequency to be used in the Active portion of the radio and the next to be used in standby.

COM 1 Active - Ground / Standby - Tower
COM 2 Active - Guard 121.5 / Standby - Arrival ATIS

NAV should be set in the order of use for departure to include active and standby.

When making changes to COMs or NAVs, think ahead and enter the next appropriate frequency in the standby position when available.

Transponder

The transponder should be set to VFR, appropriate discrete code as assigned by ATC or issued in an IFR clearance.

Various airports may require different transponder operation modes. ATIS will indicate if special operational modes are required.

The transponder should be set to ALT for taxi and flight operations, unless otherwise requested by ATC.

FLOWS

NOT APPLICABLE

CHECKLISTS

ITEM	SINGLE PILOT RESPONSE	PM RESPONSE	PF RESPONSE
	“Before Taxi Checklist”		
DEPARTURE BRIEFING	“COMPLETE”	“COMPLETE”	-
FLIGHT INSTRUMENTS	“CHECKED”	“CHECKED”	-
ALTIMETER	“__.__ SET”	“__.__ ”	“SET”
COMS / NAVS	“SET”	“SET”	-
TRANSPONDER	“SET”	“SET”	-
	“Before Taxi Checklist complete”		

TAXI

The PF will taxi the airplane with no other duties or distractions while the aircraft is moving. During single pilot or training operations, the PF should stop the aircraft before going heads down for any reason. It is permissible for the PM to perform tasks while the PF is taxing such as programing radios or navigation.

The PF should prioritize flight path management on the ground over checklists. The aircraft should be stopped or in a low area of vulnerability if the PF is to conduct checklists single pilot.

Perform a brake check before beginning taxi.

Instrument Flight Deck Check

OVERVIEW
Check the flight instruments and systems to verify the aircraft is suitable for IFR flight.

OBJECTIVE
The pilot demonstrates satisfactory knowledge, risk management, and skills associated with conducting a preflight check on the airplane's instruments necessary for an IFR flight.

PROCEDURE
1. Verify the flight instruments, COMs and NAVs per Before Taxi Tasks.
2. Verify that the Magnetic Compass, HSI and turn coordinator move freely during taxi turns.
3. Verify the Magnetic Compass compared to a known heading. This is typically done aligning on the runway during the heading check.

COMMON ERRORS
Operating with inoperative equipment.
Operating with outdated navigation publications or databases.

COMPLETION STANDARDS
Perform preflight inspection by following the SOP procedures and determine that the airplane is in a condition for safe instrument flight.

RUN-UP

RUN-UP

TASKS

Turnoff the taxi light when parked to indicate to surrounding aircraft that you have no intention of movement.

For engine run-up, position the aircraft into the wind if possible. This will provide maximum engine cooling while parked.

Monitor tower frequency or CTAF in the run-up area or approaching the hold short lines. Tune the next frequency to be used in the standby position.

FLOWS

1. Brakes - Hold
2. Flight Control Check - preform a box check to make sure no items in the cockpit are inhibiting the flight controls. Note iPad and kneeboard position.
3. Fuel Selector - Both
4. Trim - Set to the takeoff indication
5. Mixture - Rich
6. Throttle - 1700 RPM
7. Mixture - Adjust for density altitude above 3,000 to achieve peak RPM.
8. Magneto Check - Turn the ignition key to the R portion (2 clicks) and verify a drop in RPM of no more than 125. Return the key to BOTH. Turn the ignition key to the L portion (1 clicks) and verify a drop in RPM of no more than 125. The maxi difference should be 75 RPM. Verify the key is back in the BOTH position.

NOTE

A rough running engine during a magneto check indicates led build up and deposits on the spark plugs. This is most often caused by insufficient leaning during taxi. In some instances the magnetos can fail. This is often indicated by the engine dying during the magneto check or excessive drops of 500 RPM or more. To resolve fouled spark plugs, lean the mixture for peak RMP and increase the throttle to full power for one minute. After this procedure attempt a magneto check again. If it fails again return to parking and call maintenance.

9. Ammeter - Check alternator is charging. You can increase the load by turning on lights and pitot heat to verify the alternators ability to charge.
10. Oil Pressure - Green
11. Oil Temperature - Green
12. Annunciators - Review displays for any abnormal warning, caution, or advisory indications.
13. Carburetor Heat Check - Apply carburetor heat and note a drop in RPM. Leave the Carburetor heat applied for Idle check.
14. Throttle - Full idle, verify the engine continues to run above 600 RPM. Close the carburetor heat.

CHECKLIST

ITEM	SINGLE PILOT RESPONSE	PM RESPONSE	PF RESPONSE
	“Run-up Checklist”		
FLIGHT CONTROLS	“CHECKED”	“CHECKED”	-
FUEL SELECTOR	“BOTH”	“BOTH”	-
TRIM	“TAKEOFF”	“TAKEOFF”	-
RUN-UP	“COMPLETE”	“COMPLETE”	-
MIXTURE	“SET”	“SET”	-
	“Run-up Checklist complete”		

BEFORE TAKEOFF

BEFORE TAKEOFF

TASKS

Verify the flight instruments have no red x's, no flags and are configured for departure. This includes: airspeed bug, altitude bug, heading bug, CDI setting.

Verify that the MAG/TRUE navigation angle selection on the GI 275 and any interfaced navigators match.

Ensure NAV frequencies are tuned, active and standby, and the GPS is programmed accordingly.

Flaps should be confirmed or set for the appropriate takeoff configuration.

Doors must be closed during run-up and takeoff. It is permissible to have the windows open for run-up and takeoff.

If departing into IMC conditions, turn the pitot heat on before takeoff.

Bugs

The flight instrument bugs should be set for departure.

Airspeed bug - Set for the appropriate climb speed
Altitude bug - Set for level off altitude
Heading bug - Set for the departure runway

FLOWS

CHECKLISTS

ITEM	SINGLE PILOT RESPONSE	PM RESPONSE	PF RESPONSE
	“Before Takeoff Checklist”		
BUGS	“AIRSPEED ___ KNOTS, ALTITUDE ____ FEET, HEADING BUG SET FOR RUNWAY ___, NO FLAGS”	“SET”	“AIRSPEED ___ KNOTS, ALTITUDE ____ FEET, HEADING BUG SET FOR RUNWAY ___, NO FLAGS” **>>INSTRUCTOR ONLY** “SET”
COMS / NAVS	“SET”	“SET”	-
TANSPONDER	“SET”	“SET”	-
MIXTURE	“TAKEOFF”	“TAKEOFF”	-
PF/PM FLAPS	“UP” or "10°”	“UP” or "10°"	“CONFIRMED”
ANNUNCIATORS	“CHECKED”	“CHECKED”	-
ENGINE INSTURMENTS	“CHECKED”	“CHECKED”	-
AMMETER	“CHECKED”	“CHECKED”	-
DOORS / WINDOWS	“CLOSED”	“CLOSED”	-
	“Before Takeoff Checklist Complete”		

TAKEOFF

TAKEOFF

TASKS

Verify the correct runway with a runway sign or marking. Both pilots will confirm the correct runway. One pilot will confirm the runway by making a radio call to include the planed runway. The pilot that does not make the radio call confirms the runway by stating:

> **“Runway _____ confirmed.”**

Once aligned with the runway verify the heading bug is set for the departure runway.

> **PF: “Heading checked.”**
> **PM: “Checked.”**

FLOWS

Prior to crossing the runway threshold:

1. Lights - Set (All lights are on)
2. Mixture - Set for takeoff
3. Transponder - Verify altitude mode

CHECKLISTS

Not Applicable

CLIMB

CLIMB

TASKS

Flap Retraction

Flap retraction should be done at a safe altitude, at or above V_y. A safe altitude is 500 - 1,000 ft AGL. Below 500 ft AGL the pilot should be prepared for engine failure. Leaving the flaps extended above 1,000 ft could hinder climb performance.

Leaning

The mixture should be leaned above 3,000 MSL. Leaning technique for the climb provides a rough estimate before the fuel can be leaned precisely in cruise. At 3,000 MSL lean the mixture one inch travel or three rotations. Continue leaning one rotation per 1,000 ft

Lights

Leave all light on when climbing in busy areas with high traffic volume, to aid in collision avoidance. Otherwise, the Taxi and Landing lights can be turned off. The Strobe, Nav, and Rotating Beacon are required.

Pitot Heat should be used while in visible moisture.

FLOWS

AT 3,000 MSL

1. Mixture - Lean three rotations
2. Lights - Taxi and landing light off or leave on in congested airspace.
3. Pitot Heat - On in visible moisture.

CHECKLISTS

ITEM	SINGLE PILOT RESPONSE	PM RESPONSE	PF RESPONSE
	“Climb Checklist”		
FLAPS	“UP”	“UP"	“CONFIRMED”
MIXTURE	“LEANED”	“LEANED”	-
LIGHTS	“SET”	“SET”	-
PITOT HEAT	“SET”	“SET”	-
	“Climb Checklist complete”		

CRUISE

CRUISE

TASKS

Cruise Power & Leaning

Cruise leaning procedures should be in accordance with the POH using the performance data in Section 5.

Without EGT or CHT indicators, we can suggesting using RMP as an indication.

Set the appropriate power setting from the POH. Slowly lean the mixture until there is a slight drop in cruise RPM. Increase the mixture three turns after the drop in RPM. This will result in a rich of peak lean.

At the top of climb the fuel should be compared to the anticipated or planned fuel. Balance the fuel tanks if necessary.

It is recommended to monitor guard on 121.5 while in cruise flight.

FLOWS

1. Power - Verify cruise power is being produced within the planned parameters.
2. Lights - For high traffic volume areas leave all lights on. Otherwise, turn off the taxi and landing light.

CHECKLISTS

ITEM	SINGLE PILOT RESPONSE	PM RESPONSE	PF RESPONSE
	“Cruise Checklist”		
POWER	“SET”	“SET”	-
MIXTURE	“LEANED”	“LEANED”	-
LIGHTS	“SET”	“SET”	-
	“Cruise Checklist complete”		

UPSET RECOVERY

OVERVIEW

Loss of Control In-flight is the leading cause of fatalities in modern aviation. The objective is to train pilots to be proficient at upset identification and simply recovery.

An upset is:
1. Any flight condition not usually experienced in normal or training operations
2. Pitch greater than 25° nose up
3. Pitch greater than 10° nose down
4. Bank angle greater than 60°
5. Inappropriate airspeed
6. Approaching stall

PROCEDURE

1. PF **“UPSET”**
2. Push
3. Roll
4. Thrust
5. Stablize

Step One - Recognize
Situational Awareness before recovery
Cross check flight instruments to confirm
Call out “UPSET”
Assess the energy state of the aircraft
Initiating the recovery is the primary objection - not troubleshooting why the upset occurred

Step Two - Push
Unload the aircraft
Apply smooth and deliberate controls
Reduce AOA
Maintain until the stall has been broken
Don’t push too much - about 0.5g “light in the seat”

Step Three - Roll
After stall has been recovered from
Roll to wings level without adding elevator
Remain unloaded until the roll is complete
If the elevator is ineffective roll the plan to induce nose down pitch

Step Four - Thrust
Use thrust as required - Can be dynamic during the recovery
Full throttle may be necessary for recovery
Adding thrust will cause a pitch up moment

Step Five - Stabilize
Return to a normal flight path and configuration
Use TEAM model

COMMON ERRORS
Failure to seek assistance or declare an emergency in a deteriorating situation.
Distractions, loss of situational awareness, or improper task management.
Failure to interpret flight instruments.
Failure to unload the wings in recovering from high G situations.
Exceeding the operating envelope during the recovery.

COMPLETION STANDARDS
Use proper instrument cross-check and interpretation to identify an unusual attitude (including both nose-high and nose-low), and apply the appropriate pitch, bank, and power corrections, in the correct sequence, to return to a stabilized level flight attitude.

LOSS OF RELIABLE AIRSPEED

OVERVIEW

Loss of reliable airspeed can be very difficult to detect. Delay in detection will result in pilot induced loss of control in-flight. The airspeed indicator is malfunctioning due to instrument icing, blocking or system malfunction.

The GI 275 ADI will indicate yellow IAS miscompare or magenta ground indication if the ADC fails.

It is imperative that the pilot be familiar with control-performance methods.

Performance	Pitch	Bank	Power
Straight & Level 80 KIAS	4° UP	0°	2200 RPM
Straight & Level 90 KIAS	2° UP	0°	2400 RPM
Straight & Level 100 KIAS	2° UP	0°	2600 RPM
Vy Climb	5° UP	0°	Max
Vx Climb	7° UP	0°	Max
Descent 90 KIAS	0°	0°	2000 RPM

PROCEDURE

1. Remove the erroneous airspeed from the instrument scan
2. Reference standby or groundspeed indications
3. Declare an emergency with ATC if in IMC
4. Maintain VMC if possible

COMMON ERRORS

Failure to maintain airplane control.
Distractions, loss of situational awareness, or improper task management.

COMPLETION STANDARDS

Demonstrate CRM/SRM and aircraft control.

MANEUVERS

MANEUVERS

Pre-Maneuver Flow

OVERVIEW
The Pre-Maneuver Flow should be done prior to each maneuver conducted. Use the CARE acronym to complete this task.

OBJECTIVE
The objective is to stabilize the aircraft in a safe environment appropriate to the maneuver being conducted.

PROCEDURE
1. **C**learing Turns
    1. Look for traffic under the raised wing
    2. Two 90° turns in opposite directions
    3. One 180° turn
2. **A**ttitude
    1. Ensure you are at the proper altitude and airspeed for the maneuver
    2. Note your altitude, airspeed and heading for the maneuver
3. **R**adio Call
    1. Announce your intentions for maneuvering on the appropriate frequency (122.75)
    2. Include tail number, locations, altitude and intentions.
4. **E**mergency Landing
    1. Brief emergency landing scenarios in the event of an engine failure.
    2. Determine the best location for an emergency landing.

COMMON ERRORS
Failure to complete the pre-maneuver flow prior to each maneuver.
Failure to divide attention and scan for traffic.
Failure to complete two 90° turns or a 180° turn

COMPLETION STANDARDS
The student successfully manages the flight path while performing the tasks of this maneuver.

PERFORMANCE MANEUVERS

Steep Turns

OVERVIEW
The airplane is turned using a constant angle of bank (45° for Private, 50° for Commercial) while maintaining a constant altitude and airspeed. Rollout should be to a predetermined heading.

OBJECTIVE
To teach the student to turn the airplane at steep angles of bank while maintaining altitude and controlling overbanking tendencies, simultaneously dividing attention inside and outside the cockpit.

PROCEDURE
1. Complete the Pre-Maneuver Flow
2. Configure at 90 KIAS and no less than 1,500 feet AGL
3. Choose a visual reference point to begin on and roll out of the steep turn on.
4. Roll the plane left or right as desired to 45° (PVT) or 50° (COM) degrees of bank with coordination of rudder and aileron.
5. Rolling through 30° degrees of bank add 100RPM and back pressure on the elevator to counter the loss of vertical lift during the maneuver.
6. Maintain altitude, airspeed and bank angle with coordinated use of the flight controls.
7. Adjust power as required.
8. Plan to roll out on the desire visual reference point.
9. Use 1/2 your bank angle to lead the roll out.
10. Remove any power, trim or back pressure applied during the maneuver.

Private minimum of one 360° turn as directed by the instructor
Commercial complete one 360° turn followed immediately by the opposite direction turn.

COMMON ERRORS
Failure to divide attention between airplane control and orientation.
Collision hazards, to include aircraft and terrain.
Low altitude maneuvering including stall, spin, or CFIT.
Distractions, improper task management, loss of situational awareness, or disorientation.
Failure to maintain coordinated flight.

COMPLETION STANDARDS
PA.V.A.S5 Maintain the entry altitude ±100 feet, airspeed ±10 knots, bank ±5°, and roll out on the entry heading ±10°.
CA.V.A.S5 Maintain the entry altitude ±100 feet, airspeed ±10 knots, bank ±5°, and roll out on the entry heading ±10°.

Chandelles

Lazy Eights

Steep Spirals

LOW SPEED MANEUVERS

Slow Flight

OVERVIEW
After clearing turns are completed the airplane is maneuvered at an airspeed approximately 10 knots above the stall speed for the specified configuration at which the stall horn does not sound. The maneuver should be accomplished in straight flight, turns up to 30° of bank, climbs and descents using various configurations.

OBJECTIVE
To teach the student to recognize changes in airplane flight characteristics and control effectiveness at critically slow airspeeds in various configurations while maintaining positive airplane control at all times.

Altitude for this maneuver must be above 1,500’ AGL.

PROCEDURE
1. Complete the Pre-Maneuver Flow
2. Apply carburetor heat and set 1700 RPM
3. Extend flaps on schedule to 30°
4. Maintain heading and altitude while slowing to an airspeed approximately 10 kts above stall speed for the specified configuration.
5. Add power to 2200 RPM to maintain airspeed 10 KTS above stall speed. The stall warning horn should not sound during this maneuver.
6. Perform climbing, descending and turning flight as directed by the instructor.
7. Recover by applying max power and adjusting pitch to maintain altitude while accelerating
8. Retract the flaps on schedule
9. Resume normal cruise

COMMON ERRORS
Inadvertent slow flight and flight with a stall warning, which could lead to loss of control.
Failure to maintain coordinated flight.
Distractions, loss of situational awareness, or improper task management.
Failure to establish specified configuration.
Improper entry technique.
Failure to establish and maintain the specified airspeed.
Excessive variations of altitude and heading when a constant altitude and heading are specified.
Uncoordinated use of flight controls.
Improper correction for torque effect.
Improper trim technique.
Unintentional stalls.
Inappropriate removal of hand from throttles.

COMPLETION STANDARDS
PA.VII.A.S5 Maintain the specified altitude, ±100 feet; specified heading, ±10°; airspeed, +10/-0 knots; and specified angle of bank, ±10°.
CA.VII.A.S5 Maintain the specified altitude, ±50 feet; specified heading, ±10°; airspeed, +5/-0 knots; and specified angle of bank, ±5°

Power-Off Stalls

OVERVIEW
The

OBJECTIVE
To

PROCEDURE
1. Complete the Pre-Maneuver Flow
2.

COMMON ERRORS
PA.V.A.R1

COMPLETION STANDARDS
PA.V.A.S5 Maintain

Power-On Stalls

OVERVIEW
The

OBJECTIVE
To

PROCEDURE
1. Complete the Pre-Maneuver Flow
2.

COMMON ERRORS
PA.V.A.R1

COMPLETION STANDARDS
PA.V.A.S5 Maintain

Accelerated Stalls

Secondary Stalls

Trim Stalls

Cross-Controlled Stalls

Spins

GROUND REFERENCE MANEUVERS

Turns Around a Point

S Turns

Rectangular Course

Eights on Pylons

DESCENT

DESCENT

TASKS

Weather

Copy the appropriate weather for the destination airport.

Flight Plan

Once copying the weather you can anticipate the landing runway and procedures. Update the GPS flight plan with any changes to approach and arrival procedures.

COMS / NAVS

COM 1 should be used to communicate with ATC for any instructions (Clearance, Ground, Tower, Approach, etc.) COM 2 should be used for advisory communications only (ATIS, ASOS, FBO, etc.)

Set the next frequency to be used in the Active portion of the radio and the next to be used in standby.

COM 1 Active - Tower / Standby - Ground
COM 2 Active - Arrival ATIS / Standby - FBO if needed

NAV should be set in the order of use for arrival to include active and standby.

When making changes to COMs or NAVs, think ahead and enter the next appropriate frequency in the standby position when available.

Arrival Briefing

An arrival **WANT** briefing should be completed prior to beginning the initial decent.

Weather

Review the weather information identifying any threats. Set the current altimeter setting.

Arrival Procedures

From your current position, brief the arrival until the aircraft is parked. This includes: decent/arrival procedures, approach procedures, traffic pattern procedures, missed approach or go-around procedures, landing runway information, taxi routing, and parking.

NOTAMS

Review any NOTAMS effecting the departure.

Threats

Brief the greatest threats to the arrival. Examples include, IFR conditions, CFIT, traffic congestion, LLWS and unfamiliar or complex procedures. Discuss ways to mitigate the threats.

VFR Example: "*Information Whiskey is current, wind is 180 at 10 knots, which is a strong left crosswind for runway 28L. Skies are clear and the altimeter is 30.07. Currently, we are 3,500 over Torrey Pines, we will contact tower and request touch and goes, then follow tower's instructions inbound. Most likely this will be south of Mount Soledad to join the left traffic pattern at 1,400ft. It will be a short field landing on 28L that has 4,589 feet of available runway. If we have to go around it will be full power flaps to 20. After landing we will continue in the pattern. The only NOTAM is 28R is closed. High volume of VFR is the largest threat. We will mitigate this by looking outside and using proper scanning techniques."*

IFR Example: *"Information Charlie…*

FLOWS

1. Fuel Selector - Both
2. Mixture - Enrich the mixture one turn per 1,000 feet of decent. Set the mixture full rich below 3,000 feet. If landing above 3,000 feet, enrich the mixture one turn per 1,000 feet until reaching traffic pattern altitude.
3. Lights - All lights on for decent and landing.
4. Seatbelts - Checked on for landing.

CHECKLISTS

ITEM	SINGLE PILOT RESPONSE	PM RESPONSE	PF RESPONSE
	“Descent Checklist”		
APPROACH BRIEFING	“COMPLETE”	“COMPLETE”	-
FUEL SELECTOR	“BOTH”	“BOTH”	-
MIXTURE	“SET”	“SET”	-
LIGHTS	“SET”	“SET”	
COMS / NAVS	“SET”	“SET”	
ALTIMETER	“__.__”	“__.__”	“SET”
SEAT-BELTS	“CHECKED”	“CHECKED”	“CHECKED”
	“Descent Checklist complete”		

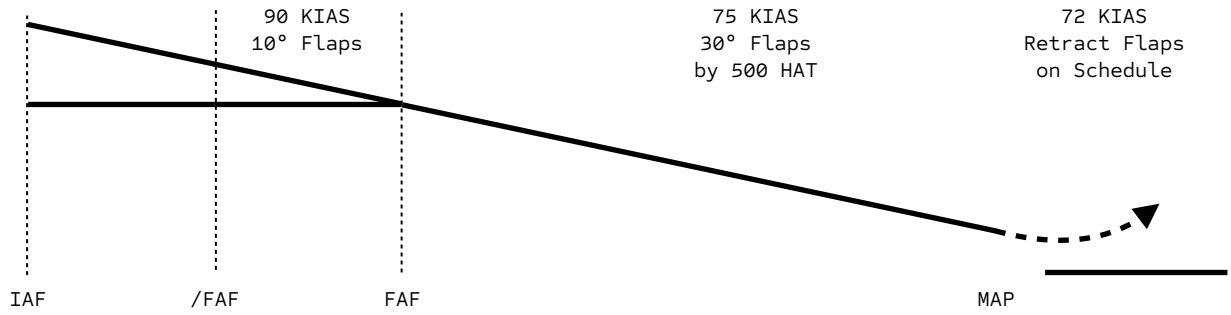
APPROACHES

APPROACHES

Approaches with Vertical Guidance are recommend, when available.

Observe strict adherence to standard callout procedures. Any doubt as to the approach's success must lead to a go-around.

The controls should be guarded throughout all phases of approach, landing and rollout.



Approach Deviation Callouts

The Pilot Monitoring is responsible for monitoring all phases of the approach and must call out any observed discrepancies or divisions.

The pilot monitoring announces the deviation, the pilot flying immediately corrects the deviation and announces **"CORRECTING."** The pilot monitoring verifies the appropriate corrective actions and announces any further deviations.

CALLOUT	DEVIATION
"SINK RATE"	Descent rate of more than 1,000 FPM
"COURSE"	CDI deviation greater than one dot
"GLIDE PATH"	Glide Path deviation greater than one dot
"SPEED"	Above target speed +10 KIAS Below target speed - 5 KIAS Below V_{REF}
"BANK"	Bank angle in excess of 25°
"PITCH"	Pitch angle ±5° of established pitch
"_____ FAILED"	Any flight instrument malfunction
"UNSTABLE GO-AROUND"	Unstable approach

Approach Without FMS

When it is not possible to conduct the approach, or the procedures is not loaded in the navigation database, use the following guidelines:

1. Reset all NAV radios and courses prior to descent
2. Start the approach with Green LOC or VOR selected as the primary navigation source
3. Adjust the CDI course selector as necessary
4. Manually tune frequencies and courses as necessary during the approach

Approach Minima

Set the approach minima as follows:

MINIMA	FMS SETTING
DA	Set the DA in BARO MINS
MDA	Round the approach minimums up to the nearest 100ft. Set in BARO MINS and Altitude Selector
CIRCLING	Set the circling minimums, but never less than 1,000ft above airport elevation, in the BARO MINS and Altitude Selector

Stabilized Approach Criteria

A stabilized approach is characterized by a constant angle, constant rate of descent approach profile ending near the touchdown point. An approach that meets the parameters described below provides the best opportunity for a stable approach. Pilots must meet the stabilized approach criteria with the conditions listed by 500 feet hight above touch down or a go-around is mandatory.

By the Final Approach Fix

1. Airspeed no greater than 110 KIAS
2. Flaps 10°
3. On lateral and vertical profile
4. Sink rate no greater than 1,000 FPM, unless otherwise briefed
5. Descent checklist is complete

By 500 ft Above Touchdown Zone

1. Airspeed established within the airspeed bug
2. Power is not idle

Temperature Compensation

Barometric altimeters are calibrated to indicate true altitude only under ISA conditions of temperature and sea level pressure. RNAV approaches (except LPV) use Baro-VNAV; therefore the vertical path is affected by temperature. When the temperature is colder than ISA, the generated vertical path is shallower than published, placing the aircraft closer to the terrain. When the temperature is warmer, the generated glidepath is steeper than published. Temperature Compensation (TEMP COMP) corrects the aircraft vertical path back to the correct true altitude and approach angle for non-standard temperatures.

Pilots must apply temperature compensation when the airport temperature is outside the operational temperature limitation in the remarks section on the instrument approach chart.

It is recommend for pilots to apply temperature compensation during cold weather operations with terrain in the vicinity of the airport.

Pilots are required to advise ATC when intending to apply temperature compensation. Provide the amount of correction required on initial contact, or as soon as practical, for the intermediate segment (initial intercept altitude) and the published missed approach holding point.

Example:
“N1640E REQUIRES 9,400 FT AT ADANE, 9,400 FT AT DRAKE FOR COLD WEATHER OPERATIONS.”

Instrument Approach Procedures

Approach with Vertical Guidance

RNAV Approach Setup

1. Load the correct approach for the intended procedure from the best suited initial approach fix. Verify the WAAS channel if applicable.
2. Verify the correct waypoints and altitudes are loaded.
3. Set the BARO Minimums.

RNAV Approach Minima

The 200ft ceilings or published, which ever is higher is required for the RNAV approach. These minimum are not required to begin the approach.

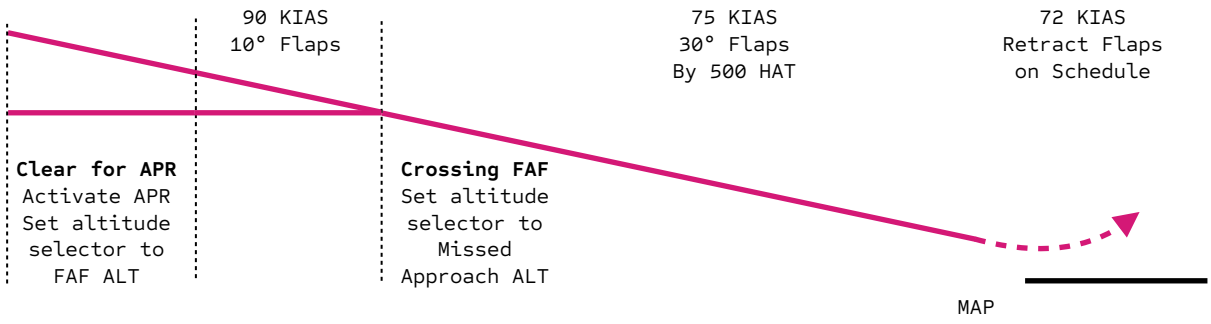
After passing the FAF, the crew may continue to DH if RVR drops below minimums. At DH, the pilot must have required visual reference.

Contingency Plan

When the ability to see or trust the FMS generated navigation course is compromised, it is imperative to have a simple plan.

• Initially, maintain current heading.
• Steer away from terrain.
• Ask ATC for heading and altitude, or climb to MSA. Consider declaring an emergency.
• Consider use of ground-based NAVAIDs.

RNAV Profile



ILS Approach Setup

1. Verify the localizer frequency for the intended runway is active on NAV radio page.
2. Verify the final approach course is set.

3. Set the BARO Minimums.

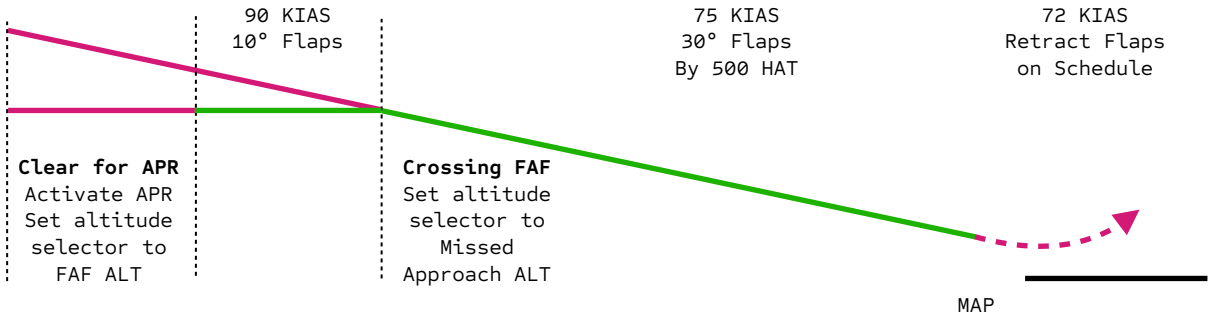
Initially, it is preferable to descend on the approach using VNAV. This ensures compliance with altitude constraints. Before passing the FAF, the navigation source should be localizer (LOC) and glide slope (GS).

ILS Approach Minima

The 200ft ceilings or published, which ever is higher is required for the ILS CAT I approach. These minimum are not required to begin the approach.

After passing the FAF, the crew may continue to DH if RVR drops below minimums. At DH, the pilot must have required visual reference.

ILS Profile



Approach with Vertical Guidance Actions and Callouts

ITEM	SINGLE PILOT RESPONSE	PM RESPONSE	PF RESPONSE
Preparing for APR	Complete descent checklist		
Activate APR	-	Silently verify	-
ATC cleared APR	-	-	Set altitude selector to final approach fix altitude.
Positive course and glide path movement	**“Course Alive” “Path Alive”**	**“Course Alive” “Path Alive”**	**“Roger”**
	By FAF		
Correct Nav Source	Silently verify CDI		
90 KIAS / Flaps 10°	**“Flaps 10°”**	-	**“Flaps 10°”**
	At FAF		
FAF Altitude	Silently very you are crossing the FAF at the appropriate altitude on the glideslope.		
FAF	**“Final Approach Fix, Missed Approach Altitude _____”**	**“Final Approach Fix, Missed Approach Altitude _____”**	Set altitude selector to missed approach altitude.
GS intercept	-	-	Begin descent to DA on glide slope
75 KIAS / Flaps 20°	**“Flaps 20°”**	-	**“Flaps 20°”**
75 KIAS / Flaps 30°	**“Flaps 30°”**	-	**“Flaps 30°”**
500’ HAT	**“Stabilized Cleared to Land”**	**“Stabilized Cleared to Land”**	**“Roger”**
If Unstable	**“Unstable, Missed Approach”**	**“Unstable, Missed Approach”**	**“Roger”** Initiate missed approach procedure.
	Minimums		
Runway in Sight	**“Runway in Sight”**	**“Runway in Sight”** If in sight before the PF	**“Runway in Sight”** Continue for landing

ITEM	SINGLE PILOT RESPONSE	PM RESPONSE	PF RESPONSE
Approach Lights only in sight	**“Approach Lights, Continue”**	**“Approach Lights, Continue”** If in sight before the PF	**“Roger”** Descent to 100’ above TDZE
No visual reference	**“Missed Approach”**	**“Missed Approach”**	**“Missed Approach”** Initiate missed approach procedure.

COMMON ERRORS

1. Failure to have essential knowledge of the information on the instrument approach procedure chart.
2. Incorrect communications procedures or noncompliance with ATC clearances.
3. Failure to accomplish checklist items.
4. Faulty basic instrument flying technique.
5. Inappropriate application of DH/DA.

COMPLETION STANDARDS

1. Maintain altitude ±100 feet, selected heading ±10°, airspeed ±10 knots, and accurately track radials, courses, and bearings, prior to beginning the final approach segment.
2. Maintain a stabilized final approach from the Final Approach Fix (FAF) to DA/DH allowing no more than ¾-scale deflection of either the vertical or lateral guidance indications and maintain the desired airspeed ±10 knots.
3. Maintain a stabilized visual flight path from the DA/DH to the runway aiming point where a normal landing may be accomplished within the touchdown zone.

Approach Without Vertical Guidance

The procedures presented herein are applicable to VOR, GPS (GNSS), and RNAV approaches.

All approaches may be flown using the FMS as a primary source of navigation, however the gray preview needles must be available. If the gray preview needles are not available the CDI must be LOC / VOR in green needles.

When a final path descent angle is defined on a non-precision approach, the use of VGP is recommended.

Fly the intermediate approach conventionally, using HDG or NAV mode. Start the deceleration segment approaching the airport in radar vectors or using own navigation. Plan to have flaps 10° when on the heading to intercept the final approach track.

When cleared for the approach set the altitude selector to the approach minima. The pilot should use cation to meet intermediate crossing restrictions, such as the final approach fix.

FMS DATABASE

The approach procedure to be flown must be retrieved from the FMS database. A thorough verification of all waypoints, tracks, distances, glide path angles, altitude constraints, and threshold crossing altitudes must be verified and cross-checked during the approach briefings.

VECTORS TO FINAL

When on vectors to final approach, using the FMS as a primary source of navigation, the following applies:

1. Use HDG lateral mode and FPA or V / S vertical mode until cleared to intercept the final
2. approach course.
3. On downwind leg, use the ACT VECTORS prompt to extend the final approach presentation.
4. Arm LNAV through the APP or NAV button, only when cleared to intercept the final approach course.

Approach Setup

1. Load the correct approach for the intended procedure. Verify the LOC frequency is tuned on NAV radio page.
2. Verify the correct waypoints and altitudes are loaded.
3. Set the BARO Minimums.

Initially, it is preferable to descend on the approach using VNAV. This ensures compliance with altitude constraints. Before passing the FAF, the navigation source should be FMS with gray preview needles or localizer (LOC).

When cleared for the approach the altitude selector should be set to the approach minima. Use VNAV until the final approach fix, then flow the VGP if available, otherwise step downs will be required until reaching MDA.

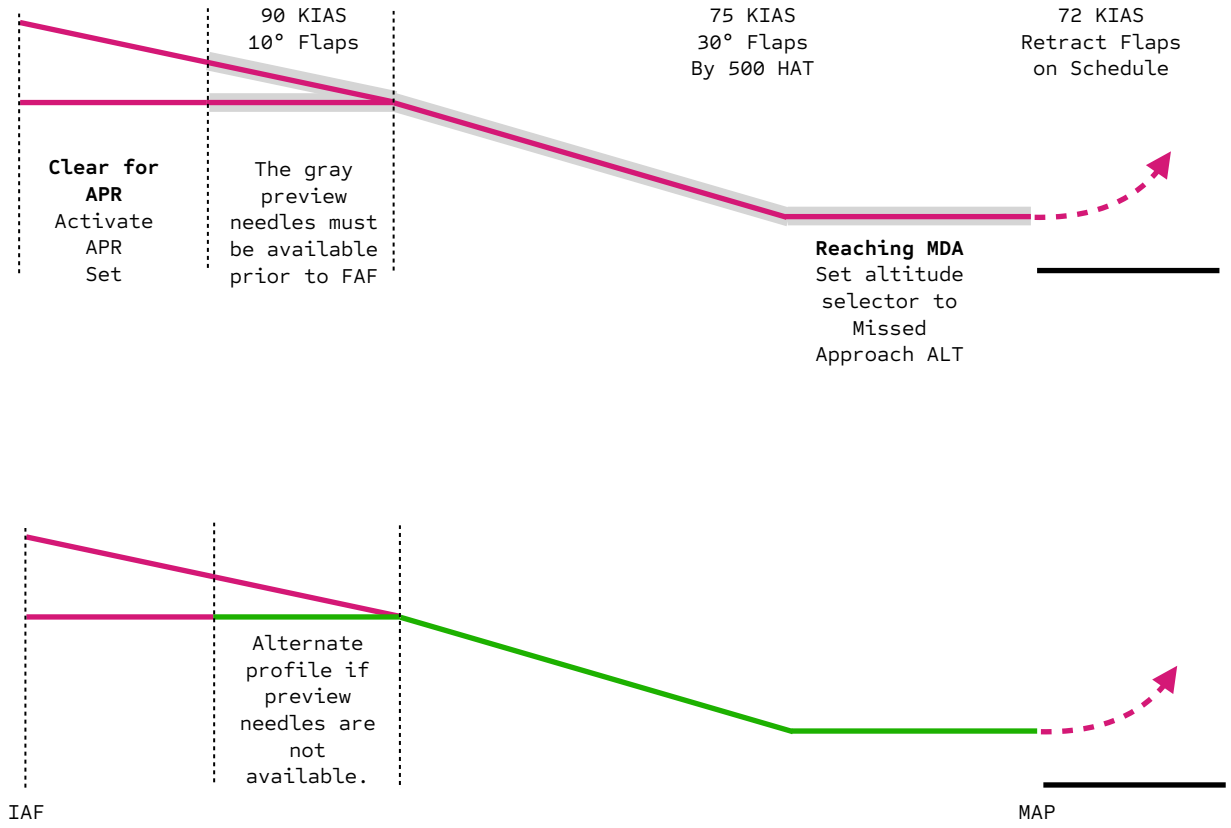
It is imperative the pilot does not descend below the MDA. Special emphasis is added by using the altitude selector to bug minimums.

Approach Minima

The 200ft ceilings or published, which ever is higher is required for the LOC approach. These minimum are not required to begin the approach.

After passing the FAF, the crew may continue to DH if RVR drops below minimums. At DH, the pilot must have required visual reference.

Approach Profiles



Approach without Vertical Guidance Actions and Callouts

ITEM	SINGLE PILOT RESPONSE	PM RESPONSE	PF RESPONSE
Preparing for APR	Complete descent checklist		
Activate APR	-	Silently verify	-
ATC cleared APR	-	-	Set altitude selector to approach minimum altitude.
Positive course and glide path movement	**“Course Alive” “Path Alive”**	**“Course Alive” “Path Alive”**	**“Roger”**
	By FAF		
Correct Nav Source	Silently verify CDI		
90 KIAS / Flaps 10°	**“Flaps 10°”**	-	**“Flaps 10°”**
	At FAF		
FAF Altitude	Silently very you are crossing the FAF at the appropriate altitude.		
75 KIAS / Flaps 20°	**“Flaps 20°”**	-	**“Flaps 20°”**
75 KIAS / Flaps 30°	**“Flaps 30°”**	-	**“Flaps 30°”**
500’ HAT	**“Stabilized Cleared to Land”**	**“Stabilized Cleared to Land”**	**“Roger”**
If Unstable	**“Unstable, Missed Approach”**	**“Unstable, Missed Approach”**	**“Roger”** Initiate missed approach procedure.
	Minimums		
Runway in Sight	**“Runway in Sight”**	**“Runway in Sight”** If in sight before the PF	**“Runway in Sight”** Continue for landing
Approach Lights only in sight	**“Approach Lights, Continue”**	**“Approach Lights, Continue”** If in sight before the PF	**“Roger”** Descent to 100’ above TDZE

ITEM	SINGLE PILOT RESPONSE	PM RESPONSE	PF RESPONSE
No visual reference	**“Missed Approach”**	**“Missed Approach”**	**“Missed Approach”** Initiate missed approach procedure.

Circle-To-Land Approach

GENERAL

Circling may require maneuvers at low altitude, at low airspeed, and in marginal weather conditions. Pilots must use sound judgement, have an in-depth knowledge of their capabilities, and fully understand the aircraft performance. Factors such as weather, unique airport design, and the aircraft position, altitude, and airspeed must all be considered for a successful circling approach.

Use the charted minima, but never less than 1,000 ft ceiling and 3 SM visibility.

A circling-to-land approach consists of an instrument approach followed by a visual circling maneuver.

Published circling minimum provide obstacle clearance (300 ft) when pilots remain within the appropriate protection area. During the circle-to-land maneuver, the aircraft must remain clear of clouds. Remain at an altitude not less than the charted circle-to-land MDA or 1,000 ft above the airport (HAA), whichever is higher, until the aircraft is in position for a normal descent to the landing runway.

WARNING: COMPLY WITH ALL CIRCLING RESTRICTIONS ON THE APPROACH CHART AND THE AIRPORT INFORMATION PAGE (10-7). THE PILOT FLYING MUST BRIEF TERRAIN AND OBSTACLES IN THE VICINITY OF THE AIRPORT IN THE ARRIVAL BRIEFING.

INSTRUMENT APPROACH

Use any approved instrument approach.

Approach Setup

1. Set up the intended approach.
2. Set the derived circling minimums with the BARO Minimums Selector. The derived circle-to-land MDA is either 1,000 ft HAA or the Category A circle-to-land minima, whichever is higher.
3. Approach speed is 75 KIAS

Before Circling

1. Fully configured.
2. Stabilized approach criteria must be met with the exception of:
   A. On lateral and vertical profile by 500 ft.
3. Cleared for the Approach

When cleared for the approach:

1. Arm NAV. Do not arm APP.
2. Verify LNAV is active.

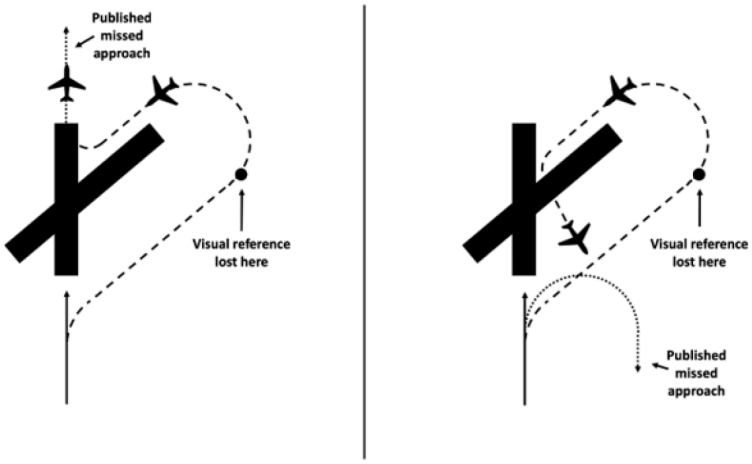
3. Verify VNAV is active.
4. Set the derived minimum in the altitude selector. (Not less than the charted MDA or 1,000 ft above the airport (HAA), whichever is higher, rounded up to the next 100 ft increment.)
5. At minimums, set the missed approach altitude and begin the visual circling maneuver.

Before beginning the circling maneuver, the aircraft must be fully configured for landing.

No Runway in Sight

At minimums, if the runway is not in sight. Set the missed approach altitude and execute the Missed Approach Procedure.

MISSED APPROACH
If a missed approach is required while circling, make a climbing turn in the shortest direction toward the landing runway. Continue the turn until established on an intercept heading to the missed approach course corresponding to the instrument approach procedure just flown. This may result in a turn greater than 180° to intercept the missed approach course. Maintain the missed approach flap setting until close-in maneuvering is completed. Different patterns may be required to become established on the prescribed missed approach course. This depends on aircraft position at the time the missed approached is started. The following figures illustrate the maneuvering that may be required. This ensures the aircraft remains within the circling and missed approach obstruction clearance areas.



Missed Approach

No approach is initiated, unless the prevailing conditions are understood, briefed, and a landing is anticipated without undue risk. Philosophically, all approaches are treated as approaches followed by a missed approach. A landing is treated as an alternate procedure. This mindset depends on a good approach briefing, on the knowledge of the missed approach procedure, and on proper programming of the FMS.

Sufficient visual cues must exist to continue the approach below DA (DH) or MDA. When visual cues are lost, initiate a go-around immediately and fly the published missed approach procedure.

91.175 Requires the flight visibility is not less than the visibility prescribed in the standard instrument approach being used; and

(i) The approach light system, except that the pilot may not descend below 100 feet above the touchdown zone elevation using the approach lights as a reference unless the red terminating bars or the red side row bars are also distinctly visible and identifiable.
(ii) The threshold.
(iii) The threshold markings.
(iv) The threshold lights.
(v) The runway end identifier lights.
(vi) The visual glideslope indicator.
(vii) The touchdown zone or touchdown zone markings.
(viii) The touchdown zone lights.
(ix) The runway or runway markings.
(x) The runway lights.

Although the PF is initially responsible for the go-around callout, the PM may also make this callout when it is not made in a timely manner. The PF's immediate response to this callout by the PM is the execution of a go-around/missed approach.

Conduct a missed approach as follows:

1. When a go-around is required at any time while maneuvering in the traffic pattern and visual conditions cannot be maintained, perform a climbing turn toward the runway of intended landing
2. When over the airport and climbing, turn (in the shortest direction) to the missed approach fix and proceed with the published procedure
3. To initiate the go-around, apply go-around power.
4. Sequence the missed approach procedure. If you are past the Missed Approach Point, press the activate missed approach when prompted by the FMS. Prior to the Missed Approach Point, the pilot must go to the flight plan page, select the missed approach and activate the leg.
5. Retract flaps to 20° and rotate to an initial pitch of 5-7° nose up.
6. With a positive rate of climb, retract the flaps to 10°
7. At 1,000 ft AGL or obstacle clearance altitude, whichever is higher, accelerate to V_y and retract the flaps to 0°.
8. When missed approach is activated, the missed approach procedure from the database is inserted into the FMS flight plan

9. When the missed approach is selected, the APR annunciator is cleared and the FMS transitions from the approach mode to the terminal mode.

Missed Approach Fuel

The estimated missed approach fuel is 3 gallons and 20 minutes.

LANDINGS

LANDINGS

Land and Hold-Short Operations [LAHSO]

Student Pilots are prohibited from performing Land and Hold-Short Operations.

OVERVIEW

For operational necessity ATC may request you to land and hold-short of a requested runway, taxi way or landmark intersection.

Normal and Crosswind Landing

Short Field Landing

Soft Field Landing

Power-Off 180 Landing

Instrument Landing

Missed Approach

Go-Around

Initiating a Go-Around

A Go-Around should be initiated any time at the discretion of the pilot flying (PF). Conditions that should automatically initiate a go-around include:

1. Unstable approach
2. Low-level Wind Shear (LLWS)
3. Traffic on the runway within 3,000 feet of the aircraft
4. ATC request
5. Collision hazard with aircraft, terrain, obstacles, wires, vehicles, vessels, persons, or wildlife

OVERVIEW
The landing approach is abandoned and the airplane is transitioned to a climb.

OBJECTIVE
To develop the student's ability to correctly perform the go-around/rejected landing procedure.

PROCEDURE

The pilot flying initiates the go-around by making the standard call out, adding full power and being the flap retraction sequence.

1. PF **"Go-around, flaps 20"**
2. Add full power
3. Retract flaps to the 20° position
4. Pitch for the horizon to level off and begin accelerating
5. Once there is a trend reversal on the VSI, retract flaps to 10° position
6. Radio intentions to ATC
7. Accelerating through V_y, retract flaps to 0° / UP position
8. Above 1,000' AGL complete the *climb checklist*

COMMON ERRORS
Delayed recognition of the need for a go-around/rejected landing. Delayed performance of a go-around at low altitude.
Improper application of power.
Improper airplane configuration.
Collision hazards, to include aircraft, terrain, obstacles, wires, vehicles, vessels, persons, and wildlife.
Low altitude maneuvering including stall, spin, or CFIT.
Distractions, loss of situational awareness, or improper task management.

COMPLETION STANDARDS

PA.IV.N.S4 Apply takeoff power immediately and transition to climb pitch attitude for V_X or V_Y as appropriate +10/-5 knots.
PA.IV.N.S7 Maintain V_Y +10/-5 knots to a safe maneuvering altitude.
CA.IV.N.S4 Apply takeoff power immediately and transition to climb pitch attitude for V_X or V_Y as appropriate ±5 knots.
CA.IV.N.S7 Maintain V_Y ±5 knots to a safe maneuvering altitude.

Aborted / Bounced Landing

OVERVIEW

An aborted or bounced landing can occur for a variety of reasons:
1. Wind shear
2. Low-level turbulence
3. Excessive rate of descent
4. Excessive airspeed
5. Power not at idle during touchdown
6. Incorrect flare technique

OBJECTIVE

To develop the student's ability to correctly recover from an aborted or bounced landing.

PROCEDURE

Light Bounce Recovery Procedures

1. Maintain or reestablish landing attitude
2. Use power as required to soften the subsequent touchdown
3. Beware of increased landing distance

Increasing pitch attitude can lead to a tail strike

Severe Bounce Recovery Procedures

1. Do not attempt to land
2. Advance throttle to max power
3. Maintain pitch attitude until you begin to accelerate in airspeed and have a positive VSI trend
4. Trim
5. Follow normal go-around procedures

COMMON ERRORS

Tail strike from increasing pitch after a bounced landing
Delayed recognition of the need for a go-around/aborted landing.
Improper application of power.
Improper airplane configuration.
Collision hazards, to include aircraft, terrain, obstacles, wires, vehicles, vessels, persons, and wildlife.
Low altitude maneuvering including stall, spin, or CFIT.
Distractions, loss of situational awareness, or improper task management.

COMPLETION STANDARDS

PA.IV.N.S4 Apply takeoff power immediately and transition to climb pitch attitude for V_X or V_Y as appropriate +10/-5 knots.

PA.IV.N.S7 Maintain V_Y +10/-5 knots to a safe maneuvering altitude.

CA.IV.N.S4 Apply takeoff power immediately and transition to climb pitch attitude for V_X or V_Y as appropriate ±5 knots.

CA.IV.N.S7 Maintain V_Y ±5 knots to a safe maneuvering altitude.

AFTER LANDING

AFTER LANDING

TASKS

In an effort to not block runway exits, first get a taxi clearance from ground control. When there is a moment of reduced work load or the aircraft is stopped complete the tasks, flows and checklist.

In CRM situations the PF should continue taxing while the PM completes the after landing items.

Flaps

During normal operations, when returning to parking set the flaps to 0. If there is a plan to taxi back to the runway for traffic patter work and the planned departure requires flaps 10, set the flaps accordingly.

The flaps may already be up after completing a short field landing.

FLOWS

Single pilot or PM performs the after landing flow.

1. Trim - Set to Takeoff
2. Mixture - Leaned one inch for ground operations.
3. Carburetor Heat - Off
4. Lights - Landing and strobe off. Taxi, Nav, and rotating beacon remain on.

CHECKLISTS

ITEM	SINGLE PILOT RESPONSE	PM RESPONSE	PF RESPONSE
	The After Landing Checklist is verified silently.		
	“After landing checklist complete”	“After landing checklist complete”	

SHUTDOWN / SECURE

SHUTDOWN / SECURE

TASKS

Securing the Aircraft

Tie or chain the aircraft and chock at least one wheel.

Post Flight

The post flight inspection should be completed in a similar fashion to the preflight inspection. The primary focus is to detect any damage that happened during the flight, for example looking for indications of a bird strike.

In the event of another crew taking over the the aircraft, the next crew's pre flight can substitute for the post flight on the incoming crew.

Any discrepancies should be written up and reported to maintenance.

Record the hobbs and tach in the flight log.

FLOWS

1. Avionics Switch - Off
2. Magneto Grounding - Check by turning the ignition switch to the **OFF** position momentarily and then back to **BOTH**. If the engine dies, do not attempt to restart.
3. Throttle - Advance to 1200 RPM and immediately move the mixture to idle cut off.
4. Electrical Switches - All light and pitot heat off. The NAV light may be required for repositioning an aircraft at night.
5. Master Switch - Off
6. Ignition Switch - Off
7. Fuel Selector - LEFT or RIGHT

CHECKLISTS

ITEM	SINGLE PILOT RESPONSE	PM RESPONSE	PF RESPONSE
	The Shutdown / Secure Checklist is verified silently.		

APPENDIX I - MANEUVERS INDEX