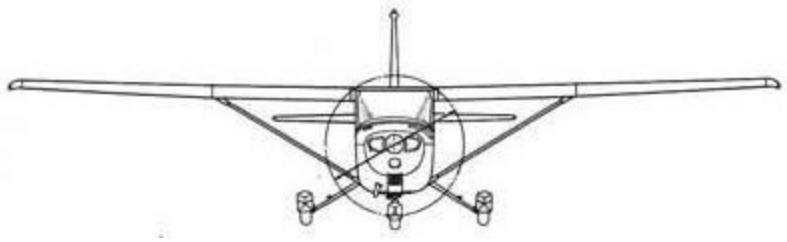
C-172S NAV III Skyhawk

INSTRUMENT COURSE



University *of* Dubuque

Table of Contents

BASIC ATTITUDE INSTRUMENT FLIGHT

Attitude flying is the basis of the entire instrument course. Likewise, it can be linked to the private and commercial course. It is imperative that the students are proficient at attitude instrument flight before other tasks are introduced. If a student has difficulty with a more advanced maneuver, it can possibly be linked to insufficient BAI (basic attitude instrument flight) skills.

Area of Operation IV of the Instrument Practical Test Standards require the evaluation of basic instrument flight maneuvers under both full-panel and reference to backup primary flight instruments/electronic flight instrument displays. These maneuvers are described in detail in FAA-H-8083-15, Instrument Flying Handbook. The examiner will determine that the applicant demonstrates competency in either the *Primary and Supporting* or the *Control and Performance Concept* method of instrument flying. Both attitude instrument flying methods are described in FAA-H-8083-15 and either is recommended by the FAA because it requires specific knowledge and interpretation of each individual instrument during training

Instructors will teach both the *Primary and Supporting* and the *Control and Performance Concept* during the student's course of training. It will be up to the student to decide which method they prefer to use for the practical test.

CONTROL/PERFORMANCE RULES-OF-THUMB

Pitch:

1 degree of pitch change equals a change in vertical speed of approximately 2 times the indicated airspeed. This relationship holds true in any airplane as long as the speed is held constant and is accurate to about 10%.

- 100 KIAS: 1 degree change in pitch = 200 FPM change in vertical speed
- 250 KIAS: 1 degree change in pitch = 500 FPM change in vertical speed

Bank:

For a standard rate turn: (KIAS divided by 10) plus 5 = required bank angle. This will work for any airplane up to approximately 30 degrees of bank (250 KIAS).

- 100 KIAS: (100 / 10) + 5 = 15 degrees angle of bank
- 150 KIAS: (150 / 10) + 5 = 20 degrees angle of bank

Power:

100 RPM change equals 5 knots of airspeed change with constant altitude. This relationship gives approximate power change requirements. It is fairly accurate and a good place to start.

MENTAL SHORTCUTS

The following mental shortcuts are to make flying more accurate and easier. Most of them are based on the rule of 60. The rule of 60 is a trigonometric relationship using circles and multiples of 60 to solve problems. For example, if you are 60 miles from a VOR then each degree is equal to one mile displacement.

Rule 1: Distance require to descend at a 3 degree angle

Distance in nautical miles is equal to the height in thousands of feet divided by 1000 and multiplied by 3.

- D = H * 3
- For a 3000 feet altitude change: Distance = (3000 / 1000) * 3 Distance = 9 nm
- For a 6000 feet altitude change: Distance = (6000 / 1000) * 3 Distance = 18 nm

Rule 2: Rate of Descent required for a 3 degree angle

The rate of descent required is approximately groundspeed times 10 then dived by 2. Another way to think of it would be groundspeed plus an extra 0 then divided by 2.

- R = (GS * 10) / 2

- 100 knot GS: (100 * 10) / 2 = 500 FPM or 100 + 0 = 1000 1000 / 2 = 500 FPM
- 200 knot GS: (200 * 10) / 2 =1000 FPM or 200 + 0 = 2000 2000 / 2 = 1000 FPM

AIR TRAFFIC CONTROL CLEARANCES AND PROCEDURES

Area of Operation III in the Instrument Practical Test Standards examines air traffic control clearances and procedures; compliance with departure, en route, and arrival procedures and clearances; and holding procedures. Students must demonstrate IFR communication proficiency on the practical test; therefore, instructors shall make every effort to simulate the ATC environment whenever practical. Students will gain experience with ATC during the cross country phase of stage two.

Instructors will give students simulated ATC instructions whenever possible when flying under visual flight rules and in all training devices. Students are expected to respond and/or inquire appropriately just as they would have had the instruction come from an air traffic controller.

For maneuvers training and practicing, the instructor will advise the student when leaving and returning to the simulated ATC environment by stating:

- "Leaving the ATC environment"
- "Entering the ATC environment"

While conducting simulated instrument flight, the instructor will inform the student when to discontinue simulated instrument flight. If, upon reaching the decision altitude or missed approach point, the instructor has not indicated that the student has reached "visual" conditions, the appropriate missed approach procedure shall be executed. The instructor will enunciate the entrance to visual conditions in one of several ways:

- "Take over visually"
- "Foggles/hood off"
- "Look up, do you see anything?"
- Any other predetermined phraseology between the instructor and student

COLLISION AVOIDANCE

The instructor/safety pilot will assume the responsibility to "see and avoid" other traffic whenever the student is using a view-limiting device during the flight. Prior to beginning a turn, the student will challenge the instructor/safety pilot "clear left/right?" and the instructor/safety pilot will visually verify that the direction of turn is clear of conflicting traffic and respond "clear left/right" (see callout section).

When conducting instrument approaches at Dubuque over an initial approach fix or anything other than a vector-to-final approach, the outbound portion shall be flown no less than 500 feet above the highest inbound

approach altitude for that runway. Instructors should be mindful of the other approaches to that runway and assign the outbound altitude accordingly. Descent to the published altitude on the appropriate approach chart may begin during the procedure turn inbound or when the instructor has ensured there is no traffic conflict.

If the weather will allow for approaches in visual conditions, but not allow for the 500 feet additive, every effort should be made to conduct approaches that will not create a traffic conflict. If it is necessary to travel outbound along an approach course at any altitude lower than the highest inbound plus 500 feet, instructors must ensure there is no other conflicting traffic to that approach/runway. This should be done via ATC and well communicated intentions with other traffic on the UD company frequency.

5T'S CHECK

The "5 T's" mental checklist will be conducted at each fix on any given procedure and verbalized whenever possible. These fixes include (but are not limited to): IAF, IF, PT, FAF, intercepting a DME arc, arrival at the lead radial on a DME arc, entering a holding pattern, and each leg in the holding pattern as applicable.

1. **Turn:** the student turns the airplane to the new desired heading
2. **Time:** the student will start a stopwatch or the aircraft timer as appropriate
3. **Twist:** the student will twist the appropriate CDI needle to the desired course, or ensure the GPS autotuned the appropriate course
4. **Throttle:** the student will adjust the throttle for the appropriate setting for speed and phase of flight
5. **Talk:** the student will report to ATC (or the instructor as appropriate)

APPROACH SETUP AND BRIEFING

An approach briefing must be accomplished for every instrument approach flown. A full approach briefing should be completed during periods of low workload such as cruise, or prior to descent. After obtaining the local airport weather via ATIS, ASOS, AWOS, or FSS, the student shall select the appropriate approach procedure.

Once the approach has been determined, the student will "set up and review" the procedure. This involves loading the procedure into the FMS, tuning the appropriate navigation radios, setting appropriate ATC frequencies, and setting any desired references such as the MDA/DA.

After the instrument approach procedure has been set up, the student will brief the approach. The approach briefing shall contain as a minimum:

- Name of the approach
- Chart valid date
- Final approach frequency
- Final approach course
- CDI needle (green, GPS, etc)
- FD mode (NAV or APR)
- Final approach fix
- Altitude crossing the FAF
- Required visibility
- Minimum Descent Altitude or Decision Altitude
- Missed Approach Point
- Missed Approach Procedure

Prior to reaching the FAF on any approach, an abbreviated briefing will be conducted. The abbreviated briefing includes:

- Minimum Descent Altitude or Decision Altitude
- Missed Approach Point
- Missed Approach Procedure (first leg)

SIMULATED IFR EMERGENCIES

Area of Operation VII of the Instrument Practical Test Standards addresses emergency operations, specifically loss of communications and loss of primary flight instruments (for the practical test conducted in a single-engine airplane). Although the loss of communication task is typically considered a knowledge area and covered during the oral portion of the practical test, students should to be exposed to real-world practice of the loss communications procedures outlined in 14 CFR 91.185. Instructors are expected to simulate lost communication scenarios in real-time with students whenever feasible both in the aircraft and the flight training devices.

The FAA has stressed that it is imperative for instrument pilots to acquire and maintain adequate instrument skills and they be capable of performing instrument flight with the use of the backup systems installed in the aircraft. The Instrument Rating Practical Test Standards place emphasis on and require the demonstration of a

non-precision instrument approach without the use of the primary flight instruments or electronic flight instrument display. A non-precision approach without the use of the primary flight instruments/electronic flight instrument display is considered one of the most demanding situations that could be encountered. Instructors shall teach all approaches—precision and non-precision—with and without the primary flight instruments. Instructors are responsible to ensure that the student is familiar with and proficient in all possible partial panel scenarios. These include, but are not limited to failures of the AHRS, ADC, PFD, and MFD.

INSTRUMENT CALLOUTS

CONDITION	CALLOUT
Prior to beginning any turn	**CLEAR LEFT/RIGHT** (Pilot flying states & Instructor/safety pilot verifies and repeats)
When the FMS, all flight instruments, and radios are set for the approach (Procedure activated, radios identified & CDI set)	**FLIGHT INSTRUMENTS VERIFIED**
Movement of the CDI	**LOCALIZER / COURSE ALIVE**
Movement of the Glide Slope / Path	**GLIDE SLOPE / PATH ALIVE**
CDI centered	**LOCALIZER / COURSE CAPTURED**
Glide Slope / Path centered	**GLIDE SLOPE / PATH CAPTURED**
2 NM from FAF on a GPS approach	**APPROACH MODE ACTIVE**
At the FAF	**(FAF NAME) ALTITUDE CHECKS** ("GOLDN altitude checks")
CDI 1 dot deflection	**LOCALIZER / COURSE, CORRECTING**
Glide Slope / Path 1 dot deflection	**GLIDE SLOPE / PATH, CORRECTING**
Airspeed 10 kts from target	**AIRSPEED, CORRECTING**
At 100 feet above MDA / DA	**APPROACHING MINIMUMS**
At MDA / DA	**MDA / MINIMUMS, CONTINUING / MINIMUMS GO-AROUND**
At Missed Approach Point	**MISSED APPROACH POINT, GO-AROUND**
Approach lights insight (non-precision approach)	**APPROACH LIGHTS IN SIGHT, LEAVING MDA**
When visual reference is established	**RUNWAY IN SIGHT, LANDING**

Notes:

The callouts listed above are unique to operating in the instrument environment and are in addition to the normal callouts for all operations.

INSTRUMENT CHECK

References:

Instrument Flying Handbook, Instrument PTS, Skyhawk Information Manual

Description:

The pilot performs a check of the flight and navigation instruments prior to beginning an IFR flight.

Objective:

To ensure the aircraft is in a condition to be used for safe and legal instrument flight.

Procedure:

Before Engine Start:

1 > Check the maintenance status sheet to determine the appropriate IFR inspections have been completed

2 > Check the VOR log to determine if the VOR check has been performed within the preceding 30 days

After Engine Start:

1 > Verify the navigational database is current on the MFD

2 > Set altimeters (primary and standby) to the local barometric setting and verify the primary displays no red X's and they both indicate within 75 of known field elevation

3 > Verify the VSI reads "0" or note the discrepancy

4 > Verify HSI heading display matches (or nearly so) the magnetic compass

5 > Program the FMS appropriately (as desired)

6 > Perform VOR check if required and log appropriately on the aircraft VOR log

7 > Tune and identify the appropriate navigation radios

8 > Select the appropriate CDI display on the HSI

9 > Tune the communication radios to the appropriate frequencies and transponder to the appropriate code

While Taxiing:

1 > Verify that the magnetic compass is full of fluid and turns freely during taxi turns

2 > Check that the airspeed tape displays no red X's and reads "0"

3 > Check that the standby airspeed indicator reads "0"

4 > Check that the primary attitude indicator displays no red X's, is stable, and pitch and bank match outside visual references

5 > Check that the standby attitude indicator displays no flags, is stable, and pitch and bank match primary attitude and outside visual references

6 > Check that the heading indicator displays no red X's, readings decrease in left turns, and increase in right turns

7 > Check that the rate-of-turn indicator shows a trend on the heading indicator in the same direction as the aircraft is turning

8 > Check that the inclinometer moves in the opposite direction of the aircraft's turn

FLIGHT DIRECTOR TAKEOFF

References:

Instrument Flying Handbook, Instrument PTS, Skyhawk Information Manual

Description:

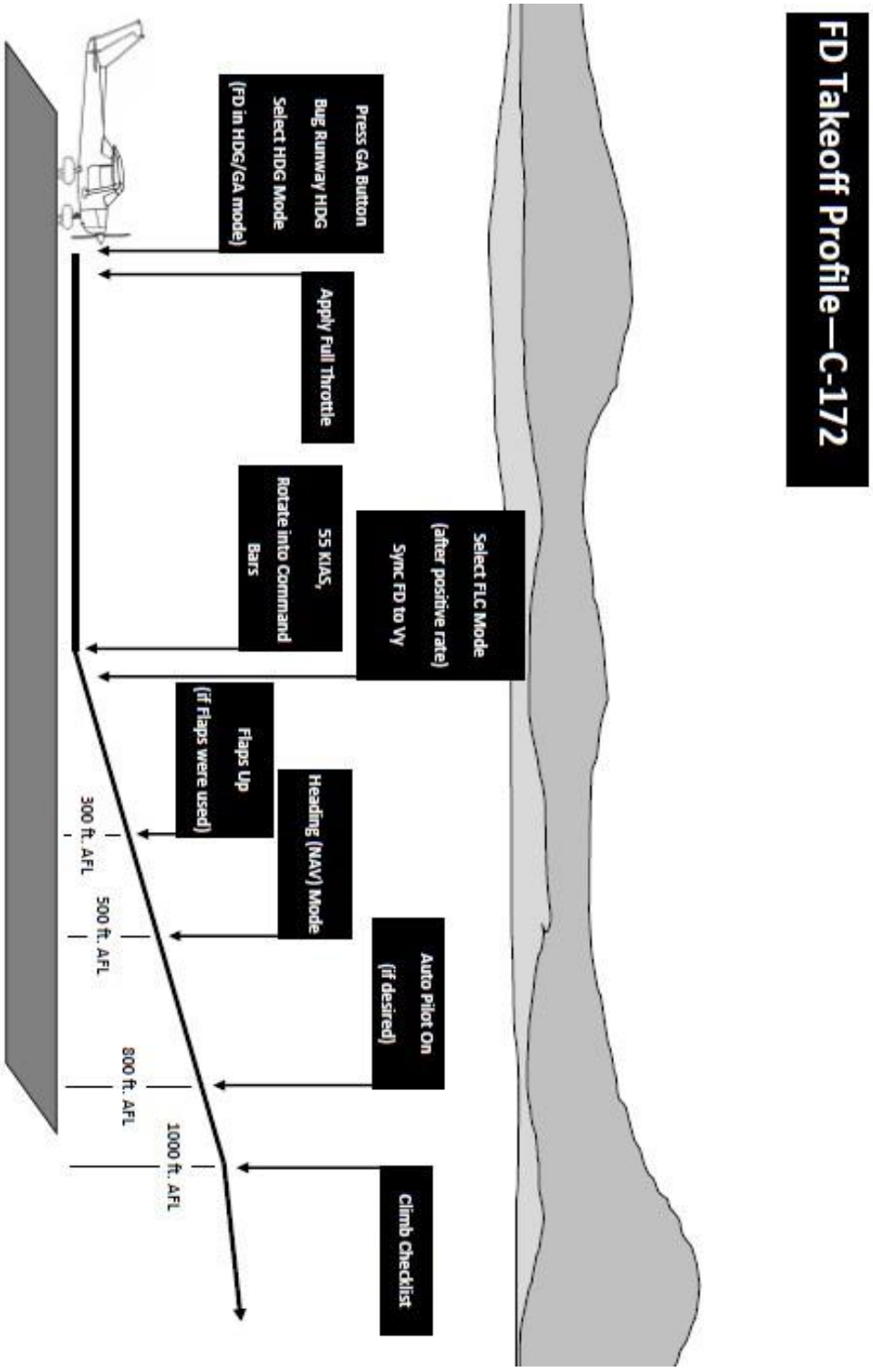
The aircraft begins the takeoff roll with the FD active and programmed for departure

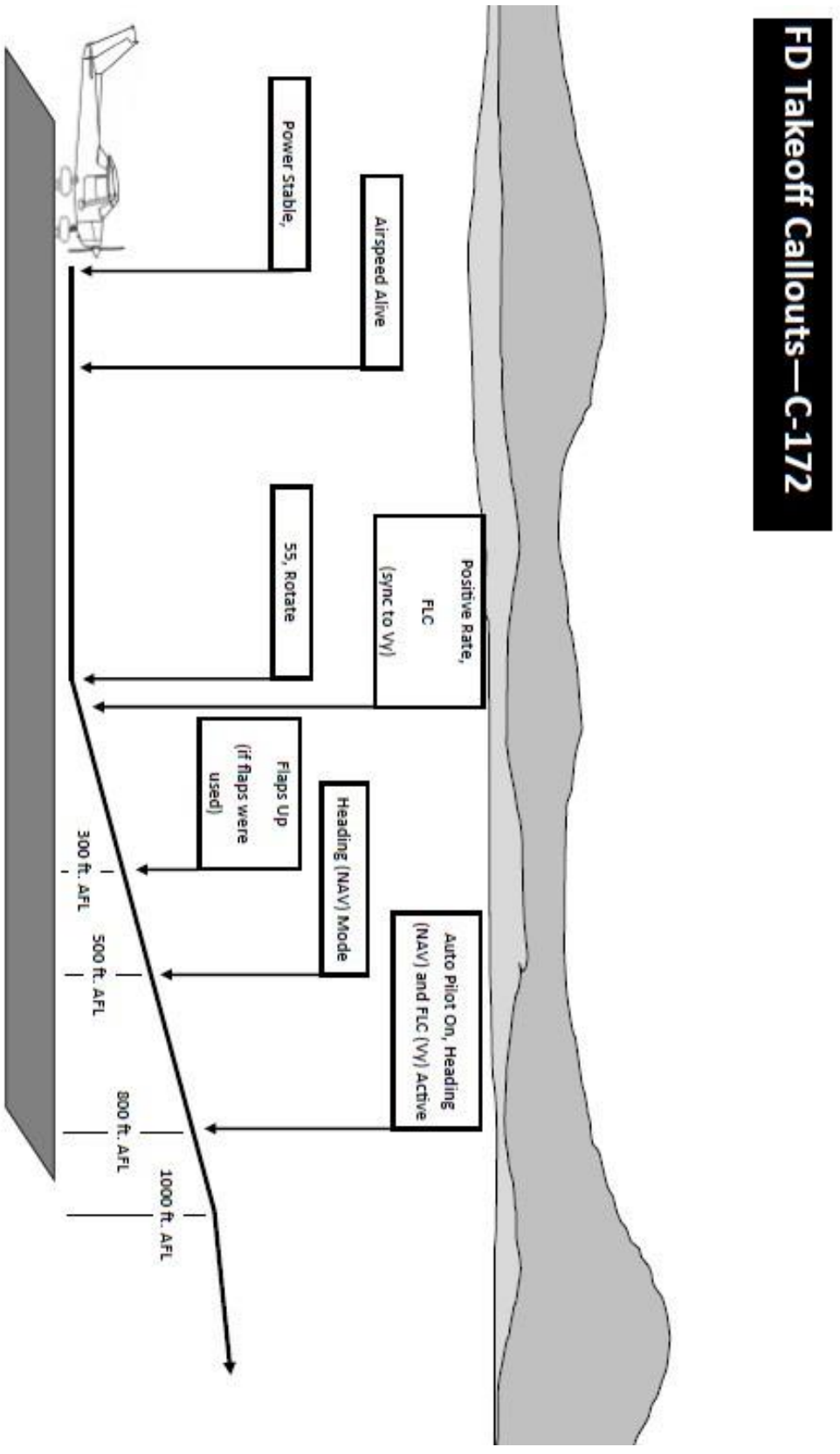
Objective:

To develop the pilot's ability to use the FD as a resource during the initial after takeoff climb and enroute phases of flight

Procedure:

1 > Press the GA button to display the FD command bars in the GA/GA mode
2 > Set the heading bug to the runway heading found on the airport diagram
3 > Select heading mode to display the FD in HDG/GA mode
4 > Line up on the centerline of the runway
5 > Apply full throttle
6 > Apply appropriate control inputs to correct for crosswind and torque reaction
7 > At 55 KIAS, smoothly rotate the aircraft into the command bars
8 > After a positive rate of climb is established, select FLC mode
9 > Pitch for Vy and sync the FD using the CWS/sync switch
10 > Above 300 AGL, retract flaps (if the optional 10 degrees flaps were used)
11 > Above 500 AGL, select HDG or NAV as appropriate
12 > Above 800 AGL, engage the autopilot if desired
13 > Above 1000 AGL, complete the climb checklist


FD Takeoff Profile—C-172
Press GA Button
Bug Runway HDG
Select HDG Mode
(FD in HDG/GA mode)
Apply Full Throttle
55 KIAS,
Rotate into Command Bars
Select FLC Mode
(after positive rate)
Sync FD to Vy
Flaps Up
(if Flaps were used)
Heading (NAV) Mode
Auto Pilot On
(if desired)
Climb Checklist
300 ft. AFL
500 ft. AFL
800 ft. AFL
1000 ft. AFL


FD Takeoff Callouts—C-172
Power Stable,
Airspeed Alive
55, Rotate
Positive Rate,
FLC
(sync to Vy)
Flaps Up
(if flaps were
used)
Heading (NAV) Mode
Auto Pilot On, Heading
(NAV) and FLC (Vy) Active
300 ft. AFL
500 ft. AFL
800 ft. AFL
1000 ft. AFL

BAI MANEUVERS - STRAIGHT AND LEVEL

References:

Instrument Flying Handbook, Instrument PTS, Skyhawk Information Manual

Description:

The airplane is flown at a specified heading, altitude and airspeed

Objective:

To develop the pilot's ability to control the airplane in straight and level flight solely by reference to instruments

Procedure:

1 > Set the pitch attitude to a level flight attitude

2 > After reaching cruise speed, set the power to a cruise setting

3 > Trim the airplane as necessary

4 > Maintain pitch control by referencing both primary and supporting pitch instruments and making control inputs appropriately

5 > Maintain roll control by referencing both primary and supporting bank instruments and making control inputs appropriately

6 > Maintain airspeed by referencing both primary and supporting airspeed instruments and making control inputs appropriately

7 > Make sure to regularly include the engine instruments in your scan

BAI MANEUVERS - CHANGE OF AIRSPEED

References:

Instrument Flying Handbook, Instrument PTS, Skyhawk Information Manual

Description:

The airspeed of the airplane is changed while maintaining level altitude in straight or turning flight

Objective:

To develop the pilot's ability to control the airplane in straight and level flight and in turning flight solely by reference to instruments while increasing or decreasing airspeed

Procedure:

INCREASE AIRSPEED:

1 > Increase the power setting by approximately 100 RPM per 5 knots of desired airspeed increase

2 > Reduce back pressure or increase forward pressure to lower the aircraft pitch attitude to maintain level altitude

3 > Increase the angle of bank as necessary to maintain a standard rate turn (if in turning flight)

4 > Trim as necessary as the desired airspeed is reached

5 > Adjust the power setting if necessary

DECREASE AIRSPEED:

1 > Decrease the power setting by approximately 100 RPM per 5 knots of desired airspeed decrease

2 > Increase back pressure to increase the aircraft pitch attitude to maintain level altitude

3 > Decrease the angle of bank as necessary to maintain a standard rate turn (if in turning flight)

4 > Trim as necessary as the desired airspeed is reached

5 > Adjust the power setting if necessary

BAI MANEUVERS - CONSTANT AIRSPEED CLIMBS

References:

Instrument Flying Handbook, Instrument PTS, Skyhawk Information Manual

Description:

The airspeed of the airplane is maintained while climbing at full power solely by reference to instruments

Objective:

To develop the pilot's ability to control the airplane in a climb and maintain the airspeed solely by reference to instruments

Procedure:

1 > Establish the pitch attitude for the desired airspeed using the attitude indicator

2 > After reaching desired speed, smoothly apply full power

3 > Adjust the pitch attitude as necessary to maintain the desired airspeed

4 > Trim as necessary as the desired airspeed is reached

5 > Level off from the climb by applying forward control pressure to lower the pitch attitude when the aircraft is 10% of its vertical speed away from the desired altitude (500 FPM = 50 ft, 1000 FPM = 100 ft)

6 > Allow the aircraft to accelerate as the pitch attitude is lowered at the desired altitude

7 > Upon reaching cruise airspeed set cruise power, reference straight and level flight

BAI MANEUVERS - CONSTANT AIRSPEED DESCENTS

References:

Instrument Flying Handbook, Instrument PTS, Skyhawk Information Manual

Description:

The airspeed of the airplane is maintained while descending solely by reference to instruments

Objective:

To develop the pilot's ability to control the airplane in a descent and maintain the airspeed solely by reference to instruments

Procedure:

1 > Adjust power for the desired airspeed, reference change of airspeed

2 > Establish the pitch attitude for the desired airspeed using the attitude indicator

3 > Adjust the pitch attitude as necessary to maintain the desired airspeed

4 > Trim as necessary as the desired airspeed is reached

5 > Level off from the descent by applying aft control pressure to increase the pitch attitude when the aircraft is 10% of its vertical speed away from the desired altitude (500 FPM = 50 ft, 1000 FPM = 100 ft)

6 > Apply cruise power while leveling at the desired altitude

7 > Upon reaching cruise airspeed, reference straight and level flight

BAI MANEUVERS - CONSTANT RATE CLIMBS

References:

Instrument Flying Handbook, Instrument PTS, Skyhawk Information Manual

Description:

The rate of climb is maintained while climbing at full power solely by reference to instruments

Objective:

To develop the pilot's ability to control the airplane in a climb and maintain the vertical speed solely by reference to instruments

Procedure:

1 > Set full power

2 > Establish the pitch attitude for the desired rate of climb using the attitude indicator

3 > Adjust the pitch attitude as necessary to maintain the desired rate of climb

4 > Trim as necessary as the desired rate of climb is reached

5 > Level off from the climb by applying forward control pressure to lower the pitch attitude when the aircraft is 10% of its vertical speed away from the desired altitude (500 FPM = 50 ft, 1000 FPM = 100 ft)

6 > Allow the aircraft to accelerate as the pitch attitude is lowered at the desired altitude

7 > Upon reaching cruise airspeed set cruise power, reference straight and level flight

Notes:

1 degree of pitch change equals a change in vertical speed of approximately 2 times the indicated airspeed. (refer to Control/Performance Rules of Thumb—Pitch)

BAI MANEUVERS - CONSTANT RATE DESCENTS

References:

Instrument Flying Handbook, Instrument PTS, Skyhawk Information Manual

Description:

The rate of descent is maintained while descending solely by reference to instruments

Objective:

To develop the pilot's ability to control the airplane in a descent and maintain the vertical speed solely by reference to instruments

Procedure:

1 > Establish the pitch attitude for the desired rate of descent using the attitude indicator

2 > Adjust power as necessary for the desired airspeed, reference change of speed

3 > Adjust the pitch attitude as necessary to maintain the desired rate of descent

4 > Trim as necessary as the desired rate of descent is reached

5 > Level off from the climb by applying aft control pressure to increase the pitch attitude when the aircraft is 10% of its vertical speed away from the desired altitude (500 FPM = 50 ft, 1000 FPM = 100 ft)

6 > Apply cruise power while leveling at the desired altitude

7 > Upon reaching cruise airspeed, reference straight and level flight

Notes:

1 degree of pitch change equals a change in vertical speed of approximately 2 times the indicated airspeed. (refer to Control/Performance Rules of Thumb—Pitch)

BAI MANEUVERS - TIMED TURNS TO A COMPASS HEADING

References:

Instrument Flying Handbook, Instrument PTS, Skyhawk Information Manual

Description:

The airplane is banked into a standard rate turn and time is noted in order to determine when the plane will reach a pre-determined heading

Objective:

To develop the pilot's ability to perform timed compass turns accurately

Procedure:

1 > Calculate the number of degrees the aircraft has to be turned to reach the requested/assigned heading
2 > Divide that number by 3 to get the time (in seconds) it will take to make the turn
3 > Establish a standard rate turn by appropriately banking the aircraft
4 > Begin timing once the standard rate is established
5 > Maintain standard rate throughout the turn
6 > Roll out of the bank as the required time is reached

Notes:

For a standard rate turn: (KIAS divided by 10) plus 5 = required bank angle (refer to Control/Performance Rules of Thumb—Bank)

BAI MANEUVERS - COMPASS TURNS

Description:

The magnetic compass is used as the sole heading reference while performing turns

Objective:

To develop the pilot's ability to perform compass turns accurately, adjusting for compass errors

Procedure:

1 > The instructor simulates an AHRS or HSI/Heading failure

2 > Compute the amount of error due to magnetic dip for each particular turn

3 > Undershoot the heading by the computed error when turning to a northerly heading

4 > Overshoot the heading by the computed error when turning to a southerly heading

Notes:

U ndershoot
N orth
O vershoot
S outh

Rule of thumb: overshoot or undershoot by 15 degrees plus half the latitude of the aircraft's position. The Dubuque airport is located at 42 degrees north latitude. The overshoot or undershoot amount should be equal to 15 + (42 / 2) = 36 degrees

RECOVERY FROM UNUSUAL FLIGHT ATTITUDES

References:

Instrument Flying Handbook, Instrument PTS, Skyhawk Information Manual

Description:

The airplane is placed in an unusual attitude by the instructor/examiner and is then brought back to straight and level flight by the pilot

Objective:

To develop the pilot's ability to recognize and recover from extreme nose high/low attitudes without overstressing or stalling the aircraft and return to level cruise flight

Procedure:

1 > The pilot passes the controls to the instructor/examiner using the positive exchange of flight controls procedure, then closes his/her eyes

2 > The instructor/examiner performs a series of maneuvers with the intent of disorienting the pilot

3 > When the controls are returned to the pilot using the positive exchange of flight controls procedure, the pilot has two options:

Airspeed is increasing:

4 > Smoothly close the throttle as appropriate for the airspeed

5 > Level the wings with coordinated use of the rudder and ailerons

6 > Establish a level pitch attitude by smoothly applying back pressure to the control wheel

7 > Once the aircraft has been returned to straight and level flight, apply cruise power and resume cruise, reference straight and level

Airspeed is decreasing:

4 > Smoothly apply full power

5 > Establish a level pitch attitude by smoothly applying forward pressure to the control wheel

6 > Level the wings with coordinated use of the rudder and ailerons

7 > Once the aircraft has been returned to straight and level flight, reduce power to cruise and resume cruise, reference straight and level

Notes:

The correct sequence MUST be followed for the recovery depending on the pitch attitude in which the recovery was started

INTERCEPTING AND TRACKING VOR RADIALS

References:

Instrument Flying Handbook, Instrument PTS, Skyhawk Information Manual

Description:

Procedure for intercepting a specified VOR radial and maintaining a precise track along the selected/assigned VOR radial

Objective:

To develop the pilot's ability to identify a VOR station, intercept a VOR radial, and track to or from the VOR on the selected/assigned VOR radial

Procedure:

Intercepting a VOR Radial/Course:

1 > Tune and identify the VOR station
2 > Turn to a heading that parallels the assigned course
3 > Center the CDI to determine the aircraft's position
4 > Determine the difference between your current position and the assigned radial/course
5 > Calculate the intercept angle by doubling the difference found in step 4
(the angle should not be less than 20 degrees or more than 90 degrees)
6 > Reset the OBS to the assigned radial/course (to or from as appropriate)
7 > Note the CDI deviation
8 > If the CDI deflection is to the left, subtract the intercept angle from the assigned radial/course
9 > If the CDI deflection is to the right, add the intercept angle to the assigned radial/course
10 > Turn to the determined intercept heading
11 > Reduce the intercept angle as the CDI moves toward the center in order to reach the desired course upon intercepting the radial/course

Tracking a VOR Radial/Course:

1 > Tune and identify the VOR station
2 > Intercept the assigned radial/course via ATC assigned heading (or the procedure above)
3 > Apply wind drift correction to keep the CDI centered

INTERCEPTING AND TRACKING GPS COURSES

References:

Instrument Flying Handbook, Instrument PTS, Skyhawk Information Manual

Description:

Procedure for intercepting a specified GPS course and maintaining a precise track along the selected/assigned GPS course

Objective:

To develop the pilot's ability to identify a GPS waypoint, intercept a GPS course, and track along the GPS course

Procedure:

Direct-To:

1 > Set the CDI to GPS

2 > Select the assigned/appropriate waypoint

3 > Select the "direct-to" function and execute it

4 > Set the OBS to the displayed GPS course

5 > Turn to parallel the course and apply wind drift correction to maintain the course

Intercepting a GPS Course/Leg:

1 > Activate the assigned/appropriate leg in the flight plan

2 > Determine an intercept angle

3 > If the CDI deflection is to the left, subtract the intercept angle from the GPS course

4 > If the CDI deflection is to the right, add the intercept angle to the GPS course

5 > Turn to the determined intercept heading

6 > Reduce the intercept angle as the CDI moves toward the center in order to reach the desired course upon intercepting the course

Tracking a GPS Course:

1 > Determine and activate the assigned/appropriate course/leg (see the procedures above)

2 > Set the CDI to GPS

3 > Set the OBS to the displayed GPS course

4 > Apply wind drift correction to maintain the course

INTERCEPTING AND TRACKING DME ARCS

References:

Instrument Flying Handbook, Instrument PTS, Skyhawk Information Manual

Description:

The aircraft is maneuvered along a circular course at a set distance from a VOR facility until interception of an approach course

Objective:

To develop the pilot's ability to properly intercept and track DME arcs

Procedure:

1 > Tune and identify the navigational aid used as the primary reference for the arc
2 > Tune and identify the DME station
3 > Intercept and track the assigned course to the arc (see intercepting and tracking VOR radials/courses)
4 > Determine initial heading for the direction of the arc
5 > Turn 90 degrees from the radial the aircraft is on as the arc is intercepted
6 > Lead the arc by 1% of the ground speed (100 kts = 1 NM)

Using RMI / Bearing Pointer: (Preferred method when properly equipped)

7 > Keep the bearing pointer at approximately the 90/270 degree relative bearing for right/left turns Respectively

Using the OBS:

8> When the CDI displaces half scale, turn the aircraft 10 degrees in the direction of the arc and twist the CDI
10 degrees in the direction of the arc
(Repeat until the angle of lead (AOL) is reached to leave the arc)
9> Adjust heading to correct for wind drift
10> If arc is not maintained, correct as follows:
- For every 0.1 NM inside the arc, correct 5 degrees outside the arc
- For every 0.1 NM outside the arc, correct 10 degrees inside the arc

11> At the AOL, intercept and track the assigned/appropriate radial/course from the arc

Notes:

To determine the angle of lead (AOL) for a standard rate turn to intercept:

- AOL = (GS ÷ 3) ÷ DME arc
- *GS = 100 kts* (100 ÷ 3) ÷ 10 = AOL
- *DME arc = 10 nm* 33 ÷ 10 = 3.3 or 3 degrees

For half standard rate, double the above calculation

HOLDING PROCEDURES

References:

Instrument Flying Handbook, Instrument PTS, Skyhawk Information Manual

Description:

The aircraft is maneuvered to reach a specific instrument fix and then enters the desired holding pattern until further clearance is received

Objective:

To develop the pilot's ability to enter and become established in published and non-published holding patterns

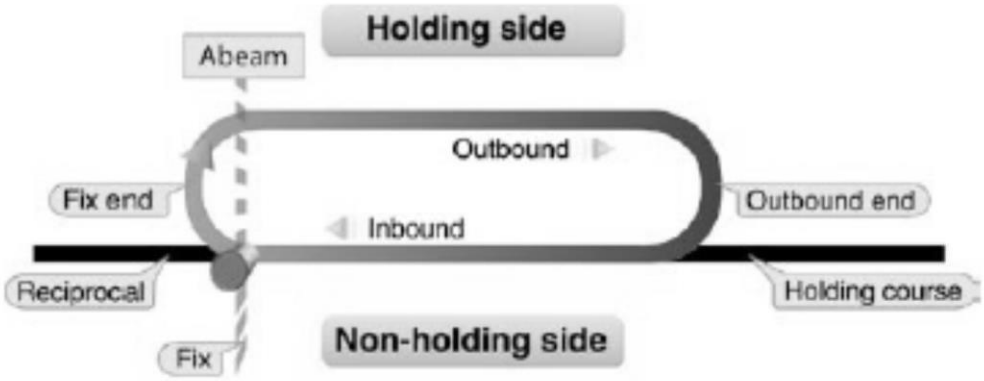
Procedure:

1 > After receiving and copying the holding clearance, determine the type of entry and the entry heading by drawing the hold
2 > Tune and identify the navigational aid(s) used to define the holding fix
3 > Slow to holding airspeed (90 KIAS) within 3 minutes of the holding fix
4 > Upon reaching the holding fix, turn to the selected entry heading, report the time, altitude, and fix to ATC
5 > As the fix is reached after the entry (or the first time on a direct entry), begin the outbound turn at a standard rate
6 > Start the outbound time (if appropriate) when abeam the holding fix or after level off on the outbound heading (if unable to determine "abeam")
7 > After 1 minute, turn inbound at a standard rate
8 > Adjust the rate of turn to intercept the inbound course
9 > Begin the inbound time when leveled off from the inbound turn
10 > Note the elapsed time when you reach the fix and begin the outbound turn
11 > Adjust the outbound time to make the next inbound leg 1 minute
12 > Use 3 times the inbound wind correction on the outbound leg
13 > Repeat steps 5 through 12 (omit timing if not a timed hold)
14 > Exit the hold when cleared to do so or at the EFC time

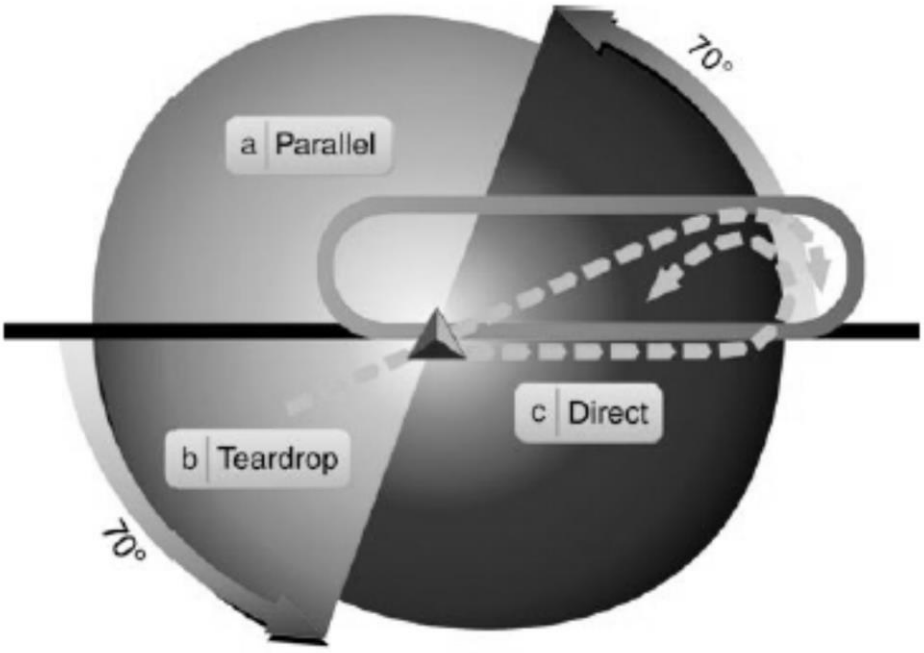
Notes:

Holding diagrams and entry procedure on the following page

HOLDING PATTERN DIAGRAM



Standard pattern: Right turns (illustrated)
Non-standard pattern: Left turns



NON-PRECISION APPROACH

References:

Instrument Flying Handbook, Instrument PTS, Skyhawk Information Manual

Description:

The aircraft is maneuvered to the final approach fix where a descent begins to the MDA. Types of non-precision approaches include: VOR, Localizer, Localizer Back Course, GPS, LDA, and SDF

Objective:

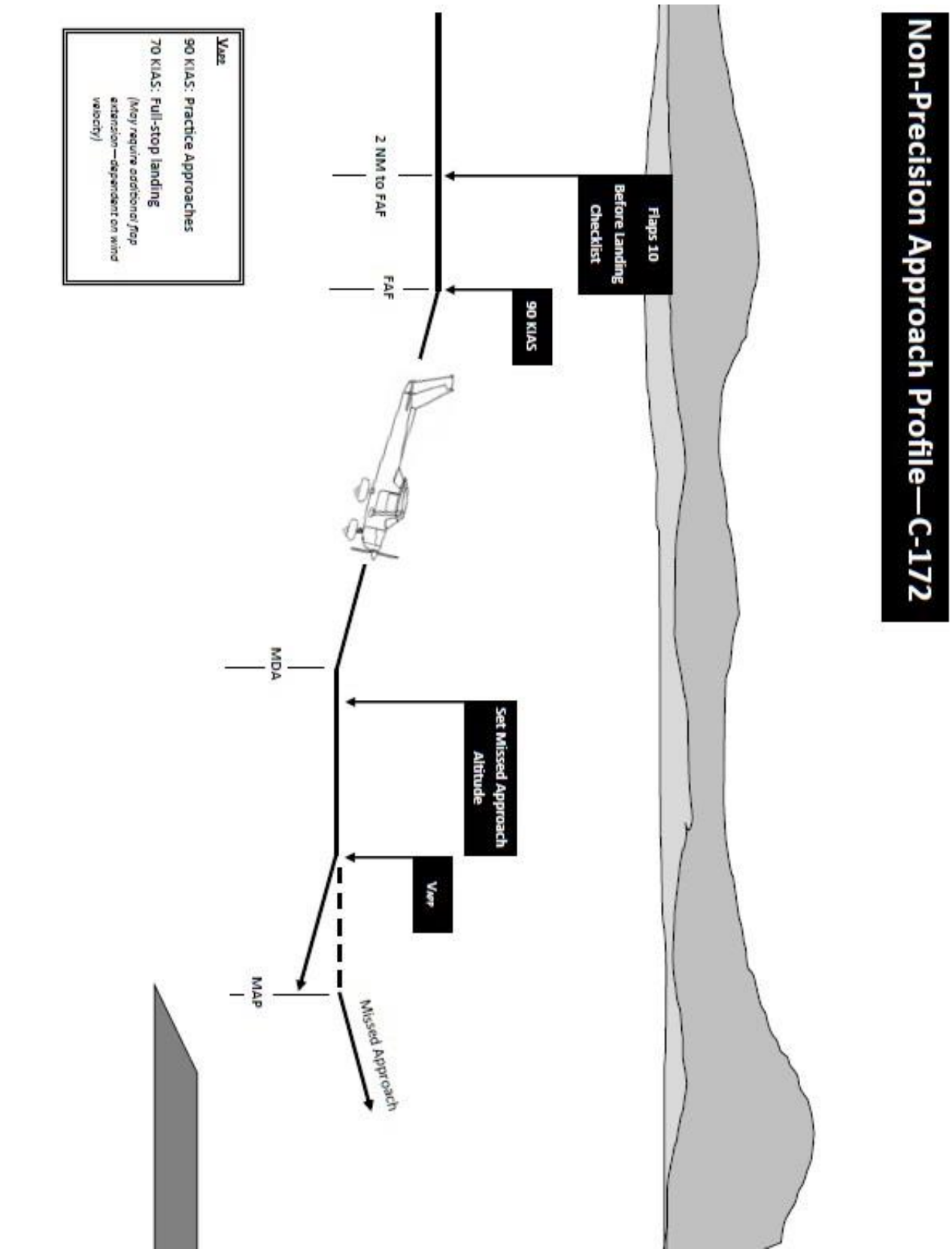
To develop the pilot's ability to safely execute non-precision approaches

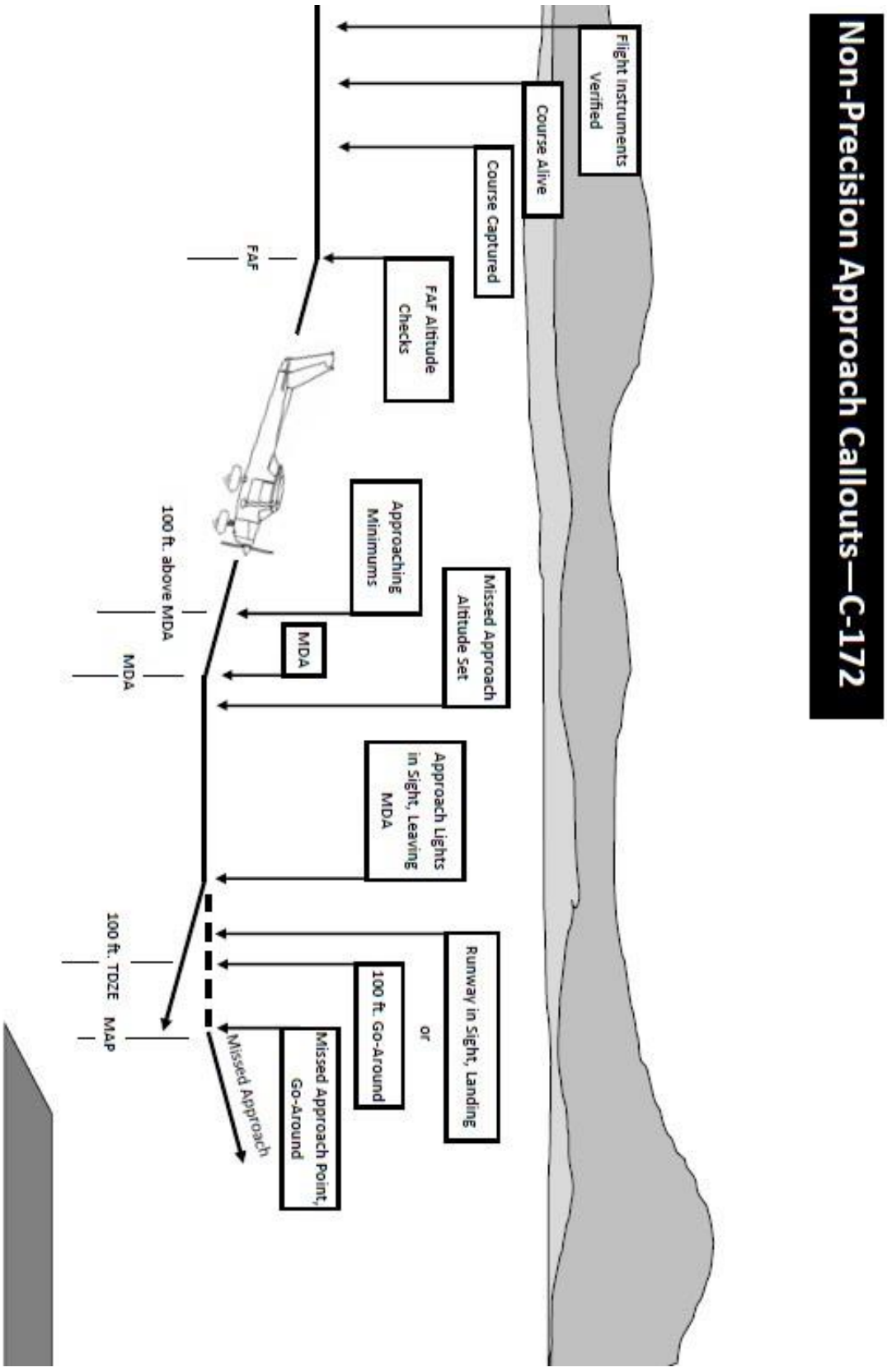
Procedure:

1 > As soon as practical, obtain the ATIS or local weather
2 > Once the appropriate approach has been determined, the pilot will setup, review, and brief the procedure
3 > When established inbound, reset the OBS to the inbound course
4 > Configure with 10 degrees flaps and complete the Before Landing Checklist by 2 NM prior to the FAF
5 > Slow to approach speed (90 KIAS) by the FAF
6 > At the FAF, begin time (if required to identify the MAP)
7 > After crossing the FAF, begin descent (700 FPM) to reach the MDA prior to the MAP
8 > Maintain at or above all step-down fixes and the MDA until the MAP
9 > After capturing the MDA, set the altitude preselect to the MAP altitude
10 > When the runway environment is insight—and a normal descent to landing can be made—slow to final approach speed (70 KIAS) and resume a descent for the landing runway
11 > Execute a missed approach procedure whenever below the MDA and the runway environment is not in sight, a normal approach to landing cannot be made, or at the MAP

Notes:

This procedure may be modified to comply with ATC requests within the aircraft and pilot's capabilities


Non-Precision Approach Profile—C-172
Flaps 10
Before Landing Checklist
2 NM to FAF
FAF
90 KIAS
MDA
Set Missed Approach Altitude
VMP
MAP
Missed Approach
Vapp
90 KIAS: Practice Approaches
70 KIAS: Full-stop landing
(May require additional flap extension—dependent on wind velocity)


Non-Precision Approach Callouts—C-172
Flight Instruments Verified
Course Alive
Course Captured
FAF
FAF Altitude Checks
Approaching Minimums
100 ft. above MDA
MDA
MDA
Missed Approach Altitude Set
Approach Lights in Sight, Leaving MDA
Runway in Sight, Landing
or
100 ft. Go-Around
Missed Approach Point, Go-Around
100 ft. TDZE
MAP
Missed Approach

PRECISION APPROACH

References:

Instrument Flying Handbook, Instrument PTS, Skyhawk Information Manual

Description:

The aircraft is maneuvered to intercept the Glide Slope/Path of an ILS/LPV approach, and then descend to the DA using the Glide Slope/Path and localizer/course

Objective:

To develop the pilot's ability to safely execute ILS and LPV approaches

Procedure:

1 > As soon as practical, obtain the ATIS or local weather

2 > Once the appropriate approach has been determined, the pilot will setup, review, and brief the procedure

3 > When established inbound, reset the OBS to the inbound course

4 > Accomplish the before landing checklist

5 > Configure with 10 degrees flaps when one dot below the Glide Slope / Path

6 > At Glide Slope / Path intercept, begin descent while tracking the GS/GP to the decision altitude

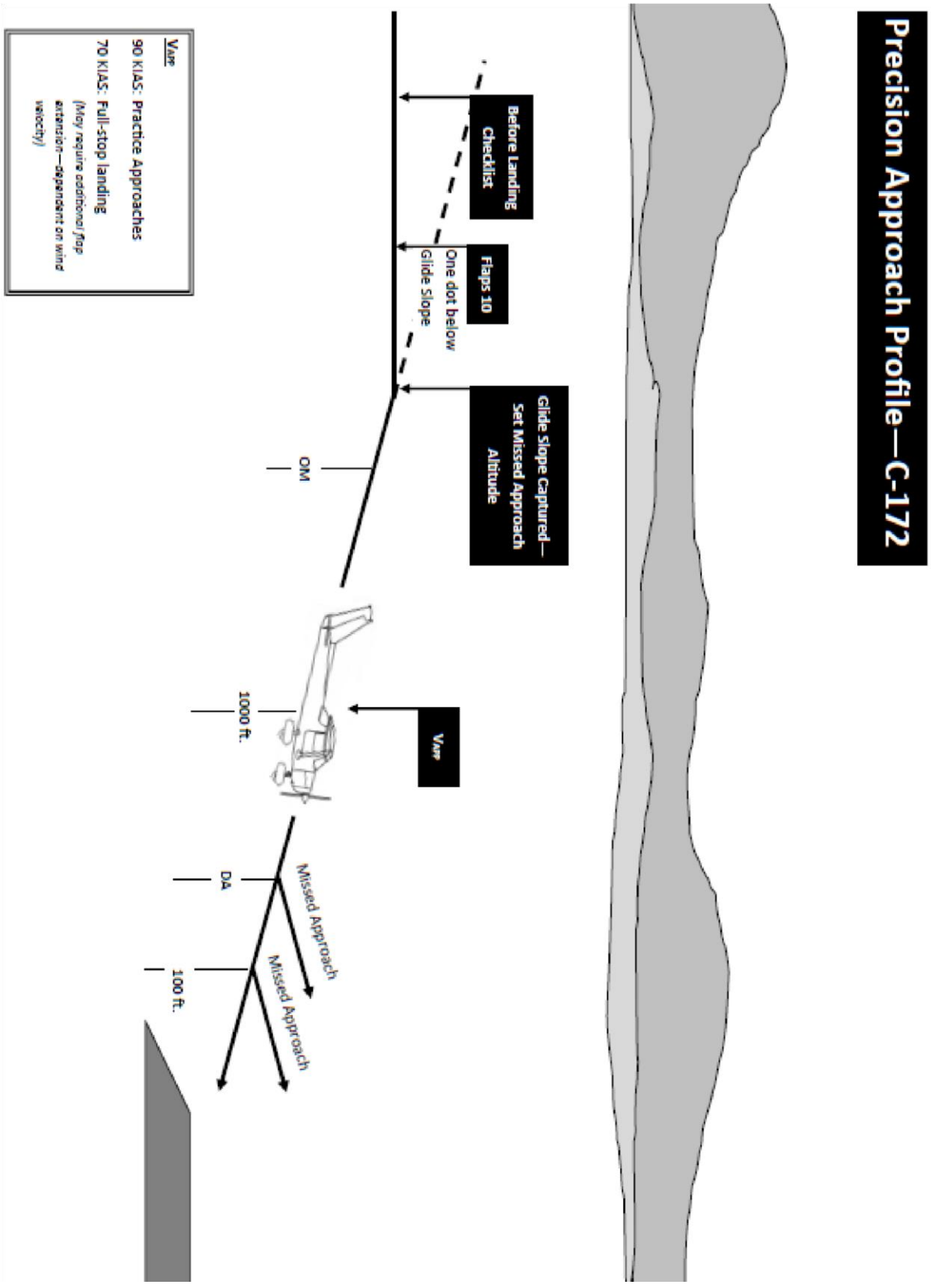
7 > Set the altitude preselect to the MAP altitude

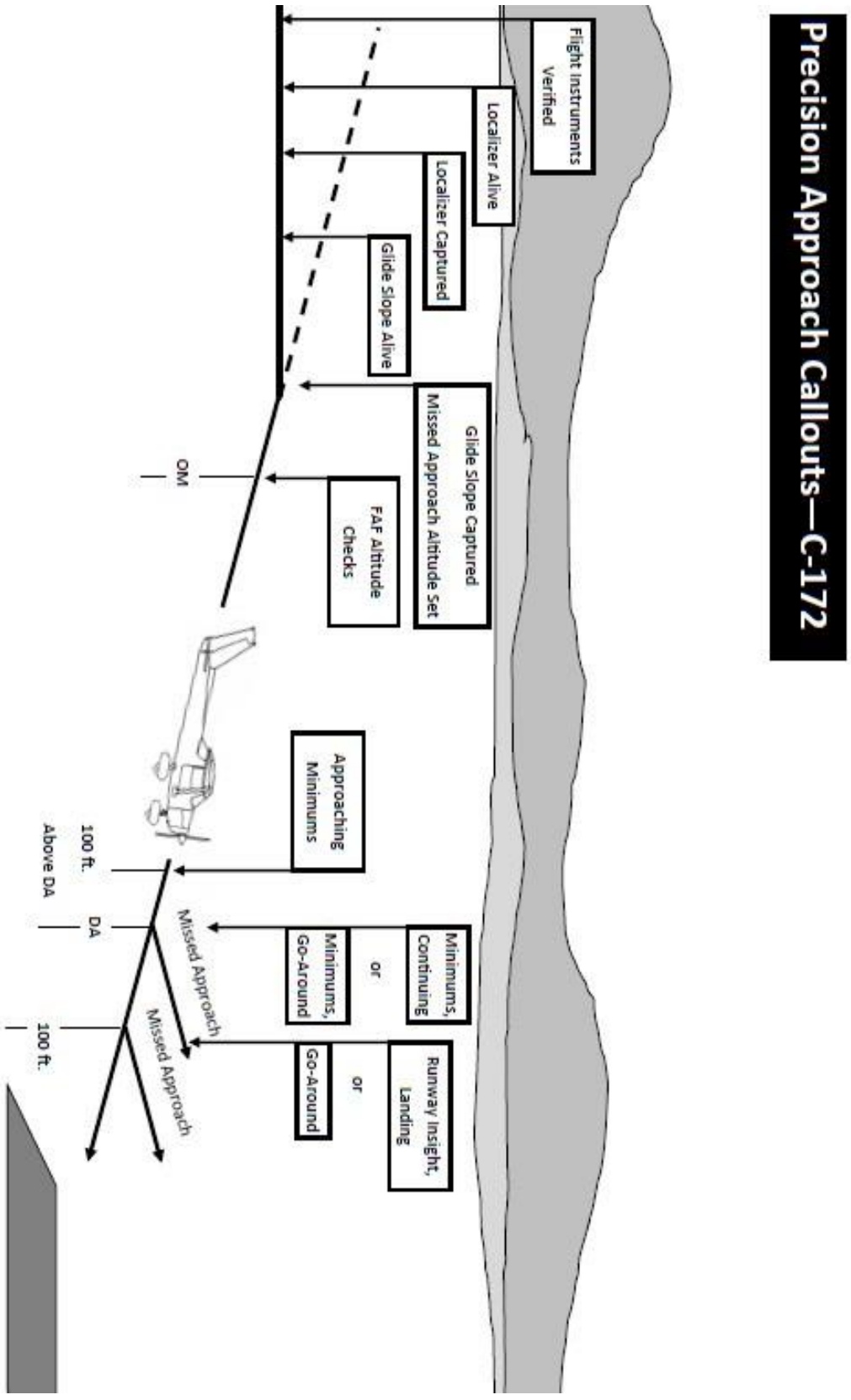
8 > Slow to approach speed (90 KIAS for practice / 70 KIAS for full stop) by 1000 above TDZE

9 > Execute a missed approach procedure whenever the runway environment is not in sight or a normal approach to landing cannot be made at the DA

Notes:

This procedure may be modified to comply with ATC requests within the aircraft and pilot's capabilities


Precision Approach Profile—C-172
Before Landing Checklist
Flaps 10
One dot below Glide Slope
Glide Slope Captured—Set Missed Approach Altitude
OM
1000 ft.
VAPP
DA
100 ft.
Missed Approach
Missed Approach
VAPP
90 KIAS: Practice Approaches
70 KIAS: Full-stop landing
(May require additional flap extension—dependent on wind velocity)


Precision Approach Callouts—C-172
Flight Instruments Verified
Localizer Alive
Localizer Captured
Glide Slope Alive
Glide Slope Captured
Missed Approach Altitude Set
FAF Altitude Checks
OM
Approaching Minimums
100 ft. Above DA
DA
Minimums, Continuing
or
Minimums, Go-Around
Missed Approach
Runway Insight, Landing
or
Go-Around
Missed Approach
100 ft.

MISSED APPROACH PROCEDURE

References:

Instrument Flying Handbook, Instrument PTS, Skyhawk Information Manual

Description:

Upon reaching the missed approach point without the runway environment in sight, the pilot transitions from an approach configuration to a go-around configuration while executing the missed approach procedure

Objective:

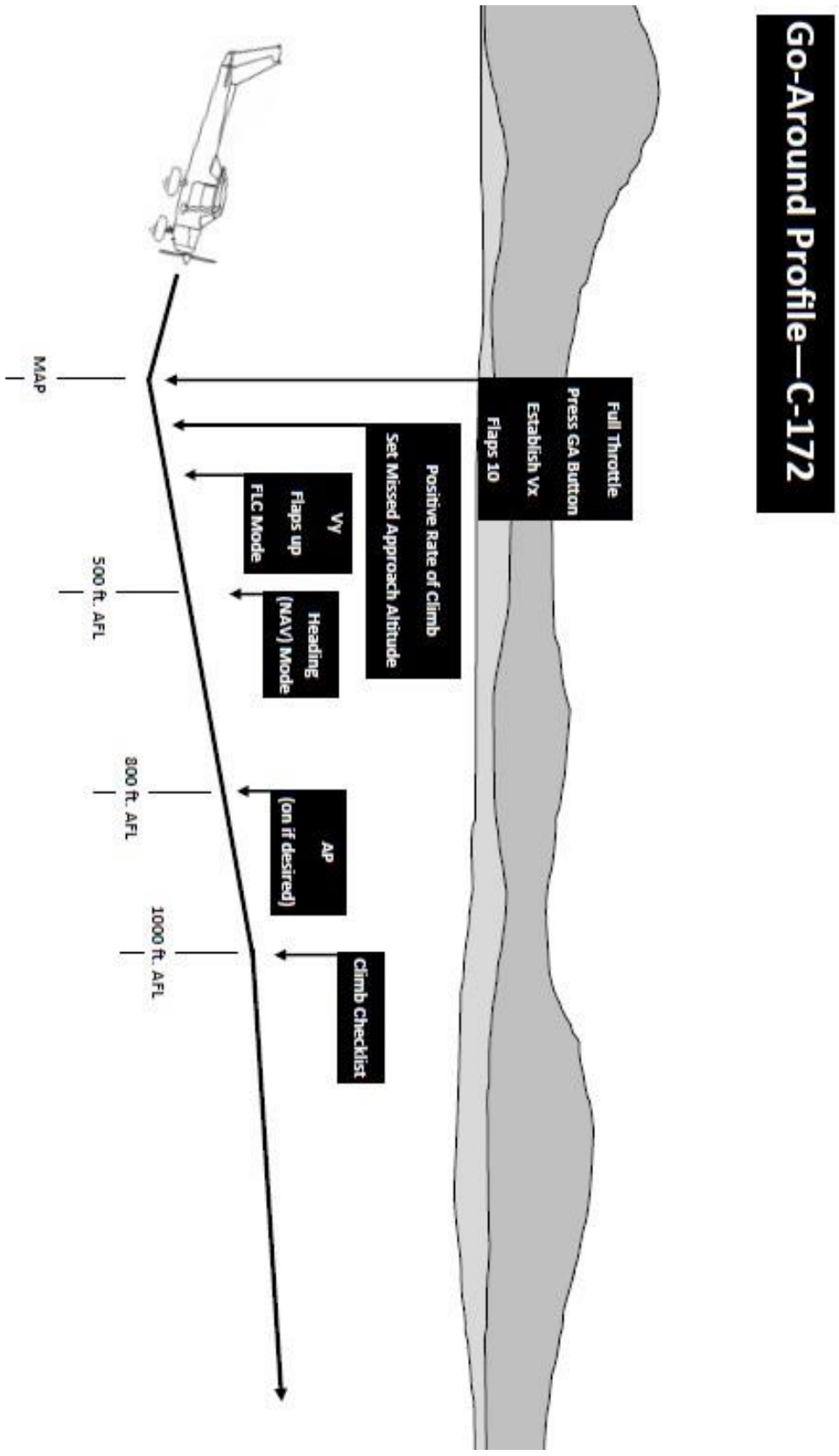
To develop the pilot's ability to safely execute missed approach procedures

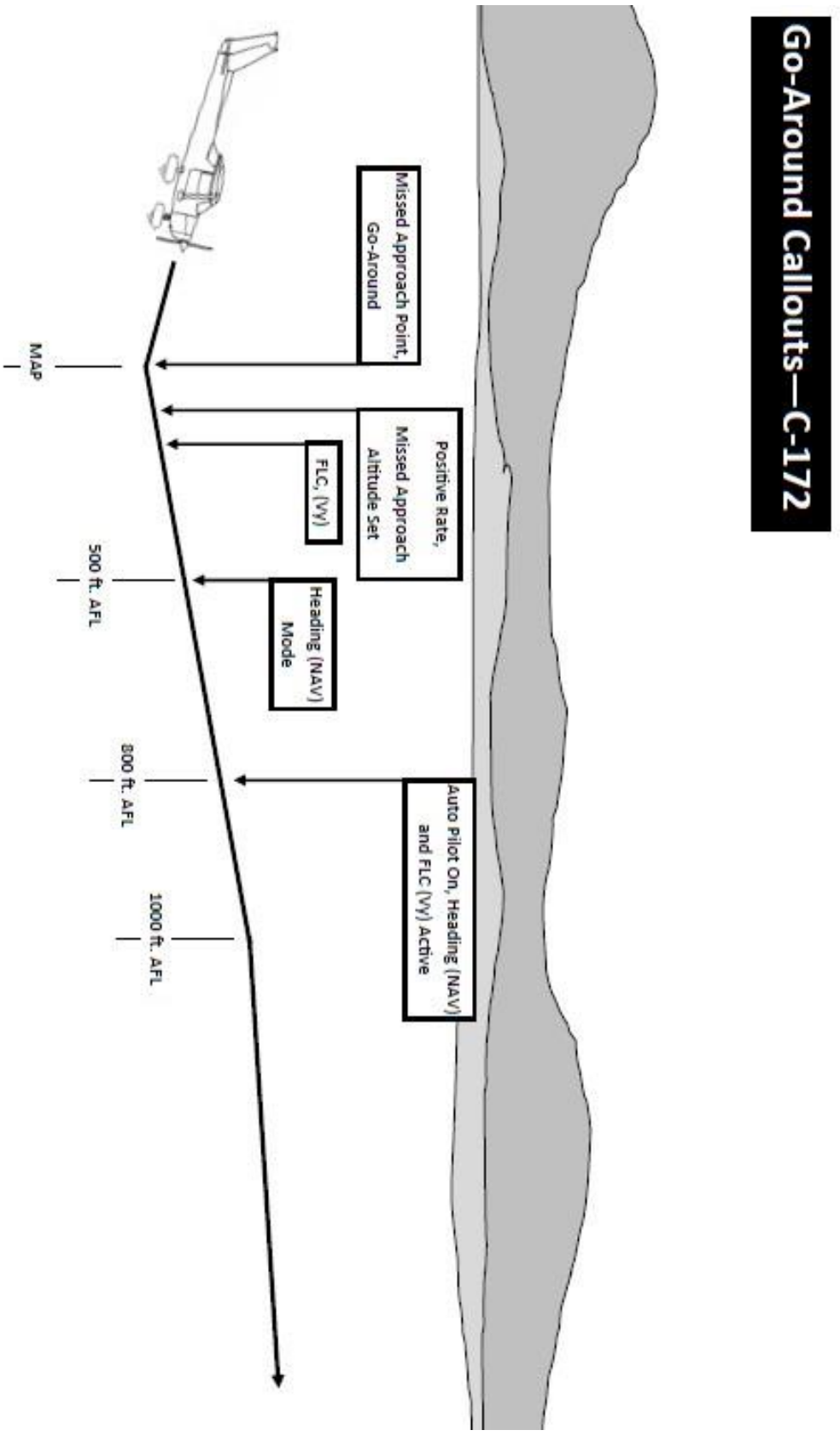
Procedure:

1 > Apply full throttle
2 > Select the GA button (if operable / installed)
3 > Pitch for and establish a climb at VX
4 > Retract the flaps to 10 degrees (if more than 10 were used)
5 > Set the MAP altitude or verify that the MAP altitude has been previously set
6 > Establish a climb at Vy and then retract the flaps
7 > Execute the published or assigned missed approach procedure
8 > When able, report going around to ATC
9 > After reaching a safe altitude, complete the climb checklist

Notes:

If course guidance is lost prior to reaching the MAP, remain at or above the MDA or DA, or climb until reaching the MAP before any turns are made


Go-Around Profile—C-172
Full Throttle
Press GA Button
Establish Vx
Flaps 10
Positive Rate of climb
Set Missed Approach Altitude
Vy
Flaps up
FLC Mode
Heading
(NAV) Mode
AP
(on if desired)
Climb checklist
MAP
500 ft. AFL
800 ft. AFL
1000 ft. AFL


Go-Around Callouts—C-172
Missed Approach Point, Go-Around
Positive Rate, Missed Approach Altitude Set
FLC, (Vy)
Heading (NAV) Mode
Auto Pilot On, Heading (NAV) and FLC (Vy) Active
MAP
500 ft. AFL
800 ft. AFL
1000 ft. AFL

LANDING FROM A STRAIGHT-IN OR CIRCLING APPROACH

References:

Instrument Flying Handbook, Instrument PTS, Skyhawk Information Manual

Description:

After establishing visual reference with the runway environment, the aircraft is maneuvered below the MDA or DA to a landing to the approach runway or another runway at the airport

Objective:

To develop the pilot's ability to safely execute a landing at the completion of an instrument approach

Procedure:

Straight-In:

1 > Maintain level flight at the MDA until reaching the VDP

2 > When the runway environment is insight—and a normal descent to landing can be made—slow to final approach speed (70 KIAS) and resume a descent for the landing runway

3 > Adjust power and speed to ensure a touchdown in the touch down zone (first 3000 or 1/3 whichever is less)

Circling:

1 > Maintain level flight at the circling MDA until the aircraft is in a position to continue a normal descent to landing from that altitude in a traffic pattern

2 > Begin the circling maneuver within the lateral limits of the operating category (A-1.3 NM, B-1.5 NM)

3 > When the runway environment is insight—and a normal descent to landing can be made—slow to final approach speed (70 KIAS)

4 > Adjust power and speed to ensure a touchdown in the touch down zone (first 3000 or 1/3 whichever is less)