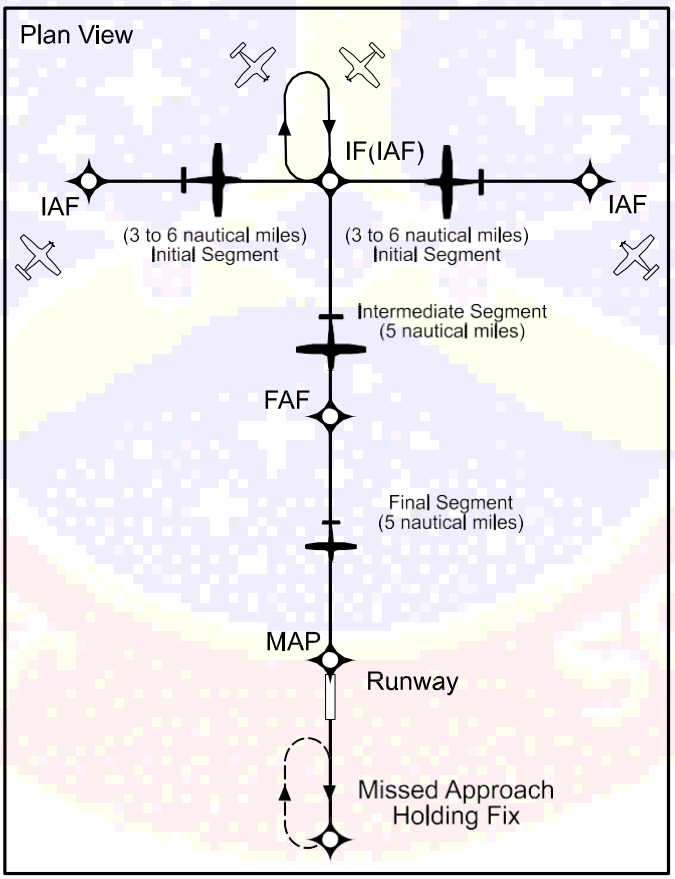
study@avelflightschool.com
www.avelflightschool.com/india/

GPS APPROACHES

A. **Task Objectives: GPS (RNAV)**

1. **Exhibits adequate knowledge of the elements related to a GPS instrument approach procedure.**
   a. GPS standard instrument approach procedure design concepts
      1) Knowledge of how GPS IAPs are designed will provide you with the knowledge of what to expect during a GPS approach.
      2) The objective of the Terminal Arrival Area (TAA) procedure design is to provide a new transition method for an arriving aircraft equipped with a flight management system (FMS) and/or GPS navigational equipment.
         a) The TAA contains within it a "T" structure that normally provides an approach without a procedure turn (NoPT).
         b) The TAA provides you and ATC with a very efficient method for routing traffic from en route to terminal structure.
      3) The basic "T" that is contained in the TAA normally aligns the IAP on the runway centerline. Each of the waypoints has a five-character pronounceable name. The basic "T" design is shown below.



a) The missed approach point (MAP) will be located at the runway threshold, the final approach fix (FAF) 5 NM from the MAP, and the intermediate fix (IF) 5 NM from the FAF.
b) Two initial approach fixes (IAF) are located 3 to 6 NM from the center IF (IAF).
   i) The length of the initial segment (from the IAF to the IF) varies with the category of aircraft using the procedure or descent gradient requirements.
   ii) These initial segments are constructed perpendicular (90°) to the intermediate segment.
      • The intermediate segment is from the IF to the FAF.
c) A holding pattern will be located at the IF (IAF) for course reversal requirements.
   i) Some pilots may desire to execute a procedure turn holding pattern to meet a descent gradient requirement.
d) The missed approach segment is ideally aligned with the final approach course and terminates in a direct entry into a holding pattern.
   i) Conditions may require a different routing.

4) The standard TAA may be modified because of operational requirements.
   a) The left and/or right IAFs may be modified (other than at a 90° angle to the IF) or eliminated.
   b) By looking at the IAP chart, you will easily see how the procedure is designed.

b. A waypoint is a geographical position (fix) used for route/instrument approach definition that is defined by latitude/longitude coordinates. GPS approaches make use of both flyover and flyby waypoints.
   1) **Flyby waypoints** are used when an airplane should begin a turn to the next course prior to reaching the waypoint separating the two route segments.
      a) This is known as **turn anticipation** and is compensated for in the airspace and terrain clearances.
      b) Aflybywaypointisdepictedbythesymbol⊟.
      c) Approach waypoints, except for the missed approach waypoint (MAWP) and the missed approach holding waypoint (MAHWP), are normally flyby waypoints.
   2) **Flyover waypoints** are used when the airplane must fly over the point prior to starting a turn.
      a) Newapproachchartsdepictflyoverwaypointsbythesymbol⊞.
         i) Overlay approach charts (titled “or GPS”) and some early stand- alone approach charts may not use this symbol.

c. An overlay approach is a GPS approach that is based on an existing nonprecision approach (except LOC, LDA, or SDF approaches), i.e., VOR.
   1) When the FAA began authorizing GPS approaches, they used existing VOR approaches as a basis for the GPS approach.
   2) Now the FAA designs stand-alone GPS approaches; i.e., they are not based on an existing approach.

d. On overlay approaches, if no pronounceable five-character name is published for an approach waypoint or fix, it was given a database identifier consisting of letters and numbers.
   1) These waypoints will appear in the list of waypoints in the IAP database but may not appear on the IAP chart.
   2) Procedures without a FAF (approaches with the VOR located on the airport) will have a sensor **final approach waypoint (FAWP)** added to the database at least 4 NM prior to the MAWP to allow the receiver to transition to the approach mode.
      a) Some approaches also contain an additional waypoint in the holding pattern when the MAWP and MAHWP are collocated.

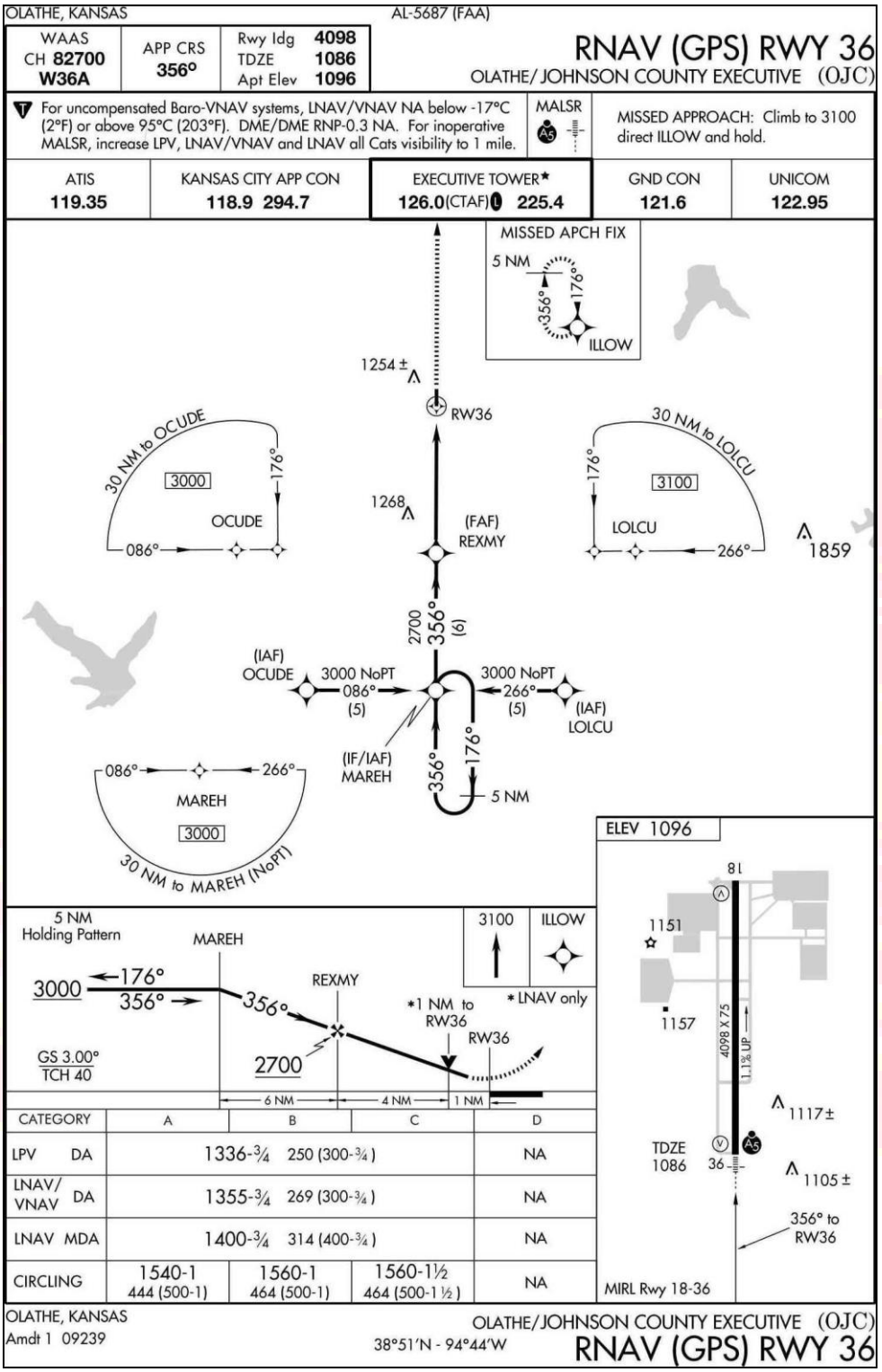
3) Arc and radial approaches have an additional waypoint that is used for turn anticipation computation where the arc joins the final approach course.
   a) These coded names will not be used by ATC.

e. The **runway threshold waypoint**, which is normally the MAWP, may have a five-letter identifier (e.g., SNEEZ) or be coded by the runway identifier (e.g., RW36).
   1) Those thresholds coded as five-letter identifiers are being changed to the runway designation.
      a) The IAP chart and the database may differ until all changes are complete.
   2) MAWPs not located at the runway threshold will have a five-letter identifier.

f. You should pay particular attention to the exact operation of your GPS for performing holding patterns and, in the case of overlay approaches, operations such as procedure turns.
   1) These procedures may require manual intervention by the pilot to stop the sequencing of waypoints by the receiver and to resume automatic GPS navigation sequencing once the maneuver is complete.

g. A fix on an overlay approach identified by a DME fix will not be in the waypoint sequence on the GPS receiver unless a published name is assigned to it.
   1) When a name is assigned, the along-track distance (ATD) to the waypoint may be zero rather than the DME stated on the approach chart.
   2) You should be alert to this discrepancy on any overlay procedure when the original approach used DME.

2. **Selects and complies with the appropriate GPS instrument approach procedure to be performed.**
   a. Once you know what IAP you will be conducting, you should select the appropriate IAP chart and study it to determine that you can comply with the procedure.
      1) The RNAV approach will be designated to a specific runway (e.g., RNAV RWY 9).
      2) In the case that a straight-in approach is not possible due to terrain or other factors, a letter will be appended to the IAP name, such as “RNAV-A” or “GPS-A.”
   b. We will use the RNAV RWY 36 IAP to Olathe/Johnson County Executive Airport (KOJC) on page 5 as an example throughout our discussion.
   c. At the top of the chart, the three rows of information is the **pilot briefing**.
      1) This area contains information on the final approach course, runway/airport data, missed approach text, and various frequencies.
   d. Below the pilot briefing, the **plan view** shows a bird’s-eye view of the approach.
   e. In the plan view for the RNAV RWY 36 IAP, you will see the three Terminal Arrival Area (TAA) icons with the appropriate waypoint IAF (OCUDE, MAREH, or LOLCU) for the approach area.
      1) When crossing the 30-NM boundary of each of these areas or when released by ATC within the area, you are expected to proceed to the appropriate IAF.
         a) EXAMPLE:If your course to MAREH is from 086° clockwise to 176°, you should expect OCUDE as your IAF.
         b) Reference the TAA sector icons on the IAP. There will be one for each TAA listed on the chart.
            i) Minimum safe altitudes for each sector can be found in a box within the TAA icons.



NOT FOR NAVIGATION

2) Once the approach procedure and TAA transition have been selected, you should load the approach into the GPS.
   a) You should only activate the approach if you have been cleared direct to your IAF because the GPS will begin navigating to the IAF when the

approach is activated.

3) Once you arrive at the appropriate IAF, the GPS will sequence to the next appropriate waypoint.

a) If you used OCUDE of LOLCU, the next waypoint will be MAREH followed by a turn toward REXMY.

b) If the IAF is MAREH, then REXMY would be the next waypoint.

c) The minimum altitude to MAREH is 3,000 ft. MSL.

d) Note that each of the IAFs are fly-by waypoints. Some GPS units will provide guidance on how and when to lead the turn. If this guidance is not provided, you will need to plan ahead and lead the turns manually so as not to overfly the inbound course.

f. After passing MAREH, you will be tracking a course of 356° to REXMY, which is the FAF.

1) You are now on the intermediate approach segment.

2) You can now descend to 2,700 ft. MSL.

3) If your GPS is WAAS-capable, you should intercept the vertical glideslope at REXMY.

a) Depending on the approach annunciator (LPV or L/VNAV), you should follow the glideslope to the appropriate minimums found in the minimums table at the bottom of the IAP.

b) Without WAAS assistance, you will fly to the LNAV minimums.

c) If you are circling to land on Runway 18, you should descend to the circling minimums.

g. Once you cross REXMY en route to the RW36 waypoint, you are on the final approach segment.

1) RW36 is the MAP, and it is also a fly-over waypoint. This means you will have tocrossthewaypointbeforetheGPSwillbereadytomoveontothe missed approach procedure.

2) If conducting an LNAV-only approach, notice there is a visual descent point (VDP) 1 NM from the RW36 waypoint.

a) If you have the the approach threshold of the runway, the approach lights, or other markings identifiable with the approach end of the runway clearly in sight, you may descend below the MDA to commence your landing.

h. Upon arrival at the MAP (RW36 waypoint), you must immediately execute the published or ATC-amended missed approach procedure if the required visual references are not seen and identified.

1) The missed approach procedure is printed in the briefing strip, partially indicated by dashed lines in the plan and profile views, and summarized graphically in the profile view inset.

2) In the example, the missed approach procedure is to proceed straight out to 3,100 ft., direct to the the ILLOW waypoint and hold.

3. **Establishes two-way communication with ATC as appropriate to the phase of flight or approach segment, and uses proper communication phraseology and technique.**

a. During the en route part of your flight, you normally maintain two-way communication with an air route traffic control center or approach control (e.g., Kansas City Approach).

b. During the transition from en route to approach segment before the IAF, you will normally be instructed to contact approach control.

1) Where radar is approved for approach control service, it may be used to provide

radar vectors in conjunction with the published GPS approach.

c. Normally, prior to arriving at the FAF inbound, you will be instructed to contact the tower or FSS.
   1) If the airport is not served by a tower or FSS, you will be instructed to change to the advisory frequency (CTAF), and you should broadcast your intentions, including
      a) The approach you are executing (e.g., RNAV RWY 36)
      b) Your position (every mile for the last 5 miles of approach)
      c) When reached, your arrival over the FAF inbound

d. If you execute a missed approach, you must first fly your airplane, and once you are in complete control, you should inform the tower, FSS, or CTAF of your missed approach.
   1) Then you will be instructed to contact approach control by the tower or FSS.
   2) At an airport with no tower or FSS, first announce your missed approach on CTAF; then switch back to the approach control frequency and inform ATC of your missed approach.

4. **Selects, tunes, identifies, confirms, and monitors the operational status of navigation equipment to be used for the approach procedure.**

a. After you have selected the correct IAP chart and studied it, you need to select the approach in your GPS.
   1) Some GPS units require that you have an active flight plan in order to select an approach. Other GPS units require you only to select the airport and then specify the approach.

b. Next, you will need to select which IAF you will use.
   1) This information may be given to you by ATC as what to expect, or you can determine which IAF you will use based on your position in the TAA.
   2) While not a common procedure, you may also be told to expect radar vectors to intercept the final approach course.
      a) Vectoring to final is not common, since the TAAs were established to expedite the flow of traffic.
      b) Some GPS units will have “Vectors to Final” as an option.
      c) For other GPS units, you will not select an IAF, but you may have to follow some other procedures so the GPS sequences the approach waypoints properly.

c. Following are some items to consider when receiving vectors to final on a GPS IAP:
   1) This procedure provides an extended final approach course in cases in which you are vectored onto the final approach course outside of any existing segment aligned with the runway.
   2) Assigned altitudes must be maintained until you are established on a published segment of the approach.
   3) Required altitudes at waypoints outside the FAF or stepdown fixes must be considered.
   4) Calculating the distance to the FAF may be required in order to descend at the proper location.

d. Some GPS units will require you to set the current altimeter setting in the GPS.
   1) This is done to improve the receiver autonomous integrity monitoring (RAIM) capability.
   2) Some GPS units have a default altimeter setting of 29.92 that does not need to be changed for the approach. However, you may change the altimeter setting if

you wish, and the change will improve the RAIM.

e. When an approach has been loaded into the GPS receiver, an “arm” or “apch” annunciation will be activated at a straight-line distance of 30 NM from the airport reference point.

1) You should arm the approach mode at this time if it has not already been armed. Some GPS receivers arm automatically.

a) Without arming, the GPS receiver will not change from en route CDI and RAIMsensitivityof±5NMoneithersideofthecenterlineto±1NM terminal sensitivity.

i) The CDI will smoothly and gradually make this change in sensitivity. In some units, the change may take up to 5 min.

f. Do not attempt to fly an approach unless the procedure is contained in the current GPS database.

1) Flying point to point on the approach does not ensure compliance with the published IAP.

2) The proper RAIM sensitivity will not be available, and the CDI sensitivity will not automaticallychangeto±0.3NM.

a) Manually setting CDI sensitivity does not automatically change the RAIM sensitivity on some receivers.

3) Some existing nonprecision approach procedures cannot be coded for use with GPS and will not be available as overlays.

5. **Complies with all clearances issued by ATC or the examiner.**

a. When ATC (or your examiner) issues a clearance or an instruction, you are expected to execute its provisions upon receipt.

1) You must not deviate from the provisions of any clearance or instruction unless an amended clearance is obtained or an emergency arises.

b. At times, ATC may not specify a particular approach procedure in the approach clearance but will state “cleared for approach.”Such a clearance indicates that you may execute any one of the authorized IAPs for that airport.

1) This clearance does not constitute approval for you to execute a contact approach or a visual approach.

c. When cleared for a specifically prescribed IAP (i.e., “cleared RNAV RWY 36 approach”) or when “cleared for approach,” you are required to execute the entire approach as described on the IAP chart unless an appropriate new or revised ATC clearance is received or you cancel your IFR flight plan.

6. **Recognizes if any flight instrumentation is inaccurate or inoperative and take appropriate action.**

a. For information on recognizing whether any flight instrumentation is inaccurate or inoperative, see Task VII.D., Approach With Loss of Primary Flight Instrument Indicators in the Gleim*Instrument Pilot Flight Maneuvers and Practical Test Prep* book.

b. You should report the malfunction of any flight instrumentation to ATC and advise the action that you will take.

1) You may have several options, including continuing the approach with the remaining instruments, requesting an approach for which you have the full complement of required instruments (e.g., if a navigation instrument has failed), or requesting radar vectors to VFR conditions.

2) On your practical test, you can expect that your examiner will require you to perform the approach with inoperative instrumentation.

7. **Advises ATC or the examiner anytime that the aircraft is unable to comply with a clearance.**
   a. You must inform ATC (or your examiner) anytime your airplane's operating limitations forbid compliance with the clearance issued.
   b. Before you accept a clearance, you must determine whether you can comply with it. If not, inform ATC of the reason you cannot accept the clearance and request an amended clearance.

8. **Establishes the appropriate aircraft configuration and airspeed considering turbulence and wind shear, and completes the aircraft checklist items appropriate to the phase of the flight.**
   a. During the initial segment of the IAP, you should slow your airplane to your desired approach speed. This is normally an airspeed within or just above flap operating range from which your airplane can readily transition to a landing configuration.
      1) In your airplane, approach speed is_____.
      2) Based on known weather conditions, you may want to increase your approach airspeed due to turbulence, gusty winds, and possible wind shear.
      3) If appropriate for your airplane, you should lower flaps to the approach setting.
   b. During the initial approach segment, you should also complete your before-landing checklist as described in your POH/AFM.
      1) All fuel-related items, such as fuel selectors, fuel pumps, and mixture, should be set for landing.
      2) Most pilots will lower the landing gear (if applicable) at the beginning of the final approach segment (i.e., over the FAF).
      3) At the FAF, you should have completed your before-landing checklist.
   c. You should commit to memory certain important items prior to reaching the FAF:
      1) MDA/DA (or step-down minimums)
      2) MAP
      3) Visibility minimums
      4) Missed approach procedure (at least initial part, e.g., "Climb to 3,100 ft. . . .")

9. **Maintains, prior tobeginning thefinal approach segment,altitude within±100 ft. and heading within ±10°,allows less thana 3/4-scaledeflection of theCDI, andmaintains airspeedwithin±10kt.**
   a. In the "T" design of a GPS approach, you must make a 90° turn at the IF.
      1) The IF is a flyby waypoint, and your GPS unit will provide you with guidance on when to make the turn to establish yourself on the intermediate segment of the approach.
      2) You must know what bank angle/turn rate the GPS receiver uses to compute turn anticipation and whether wind and airspeed are included in the receiver's calculations. This information should be in the GPS operating manual.
         a) Over- or underbanking the turn onto the final approach course may significantly delay getting on course and may result in high descent rates to achieve the next segment altitude.
   b. When you are within 2 NM of the FAF with the approach mode armed, the approach mode will switch to active, resulting in a RAIM change to approach sensitivity and a change in CDI sensitivity.
      1) Beginning 2 NM prior to the FAF, the full-scale CDI sensitivity will change from ±1NMto±0.3NMattheFAF.

2) As sensitivitychangesfrom±1NMto±0.3NMapproaching theFAFwiththe CDI not centered, the corresponding increase in CDI displacement may give the impression that the airplane is moving farther away from the intended course even though it is on an acceptable intercept heading.

a) Referencing the digital track displacement (or cross track error) if it is available in the approach mode may help you to remain position-oriented in this situation.

3) Being established on the final approach course prior to the beginning of the sensitivity change at 2 NM will help prevent problems in interpreting the CDI.

a) Thus, requesting or accepting vectors that will cause you to intercept the final approach course within 2 NM is not recommended.

c. If a RAIM failure/status annunciation occurs prior to the FAF, the approach should not be completed since the GPS may no longer provide the required accuracy.

1) The GPS receiver performs a RAIM prediction by 2 NM from the FAF to ensure RAIM is available at the FAF as a condition for entering the approach mode.

2) You should ensure that the GPS receiver has sequenced from “armed” to “approach” prior to the FAF (normally 2 NM prior to the FAF).

a) Failure to sequence may indicate the detection of a satellite anomaly, a failure to arm the receiver (if required), or other problems that will prevent completing the approach.

d. If the GPS receiver does not sequence into the approach mode or a RAIM failure/ status annunciation occurs prior to the FAF, you should not descend to the MDA but should proceed to the FAF, execute the missed approach, proceed to the MAP, and contact ATC.

1) Refer to your GPS operating manual for specific indications and instructions associated with the loss of RAIM prior to the FAF.

e. The RNAV RWY 36 example on page 5 indicates that you will maintain 3,000 ft. MSL to MAREH.

1) Once established on the final approach course of 356° to REXMY (FAF), you can descend to 2,700 ft. MSL.

f. The final approach segment begins at the FAF.

1) You should have your airplane stabilized (speed, tracking, etc.) prior to the FAF.

10. **Applies the necessary adjustments to the published MDA and visibility criteria for the aircraft approach category when required, such as–**

a. **NOTAMs**

1) Flight Data Center (FDC) NOTAMs are regulatory in nature and inform you of amendments to IAPs or aeronautical charts prior to their normal publication.

a) FDC NOTAMs are available from FSS and are published in the *Notices to Airmen Publication (NTAP)*.

2) The *NTAP* contains all FDC NOTAMs that are current at the time of publication and those NOTAM (D)s that are expected to remain in effect for 7 days after the issuance of the publication. The *NTAP* is issued every 28 days.

a) During your preflight briefing, you must ask your FSS specialist for any published NOTAMs that are pertinent to your flight.

b) Alternatively, you may view the NTAP web version at:

www.faa.gov/NTAP/

b. **Inoperative airplane and ground navigation equipment**

1) You cannot perform an RNAV (GPS) IAP unless the GPS equipment in your airplane is working properly.

a) In certain instances, you may be able to conduct an approach but to higher minimums.

2) If RAIM is not available, you cannot conduct the RNAV (GPS) approach.

a) Monitor your GPS units for RAIM messages.

3) The GPS database (updated every 28 days) must be current.

c. **Inoperative visual aids associated with the landing environment**

1) Higher minimums are required with inoperative visual aids.

a) FAA charts will have this information listed in the Inoperative Components Table located on the inside front cover.

b) JEPP charts will have this information listed within the minimums section of the IAP chart.

2) For RNAV (GPS) IAPs, an inoperative visual aid will increase the visibility requirement but not the MDA/DA.

d. **National Weather Service (NWS) reporting factors and criteria**

1) On FAA IAP charts, this information is included in the briefing strip.

a) Some IAP charts will instruct you to use an alternate altimeter setting when the local altimeter setting is not available and to increase all MDAs by a certain amount.

11. **Establishes a stabilized approach profile with a rate of descent and track that will ensure arrival at the MDA prior to reaching the MAP.**

a. At the FAF, you can start your descent to the MDA while tracking the desired course to the MAP.

1) In the profile view, the vertical descent angle (VDA) or glideslope (65) and the threshold crossing height (TCH) will be provided.

a) In the RNAV RWY 36 IAP, the VDA is depicted as 3.00° and the TCH is 40 ft. AGL.

2) This information is provided so you can determine a rate of descent in order to establish a stabilized approach descent from the FAF (or stepdown fix) to the TCH.

a) FAA has a rate of descent table on the inside back cover of the IAP chart book.

b) JEPP has a rate of descent table on the IAP chart itself.

3) EXAMPLE:For an approach speed of 90 kt. and a VDA of 3.00°, a target rate of descent of approximately 478 fpm should be established for a stabilized approach.

b. You will want to maintain a constant airspeed whether in level flight, descending to the MDA, or leveling off at the MDA.

1) To accomplish this, all you will need to do initially is to have the power and trim set for your desired approach airspeed, e.g., 90 kt.

2) To descend, reduce power to a predetermined setting to establish the rate of descent desired.

a) As the power is reduced, the nose of the airplane will lower. All you may need to do is ensure that the nose does not pitch down too much.

b) Since the airplane is trimmed for your approach speed, no change of the trim or elevator control is required.

c) You will be able to adjust the rate of descent with minor power adjustments.

c. See Task Objective, Constant Airspeed Climbs and Descents, in the Gleim*Instrument Flight Maneuvers* book.

12. **Allows, while on the final approach segment, no more than a 3/4-scale deflection of the CDI,andmaintains airspeedwithin±10kt. ofthatdesired.**

a. The final approach segment is from the FAF to the MAP.

b. Maintain the final approach course (i.e., 356° in our example) so that the CDI needle is centered.

1) Use all available information from the GPS (i.e., track, track angle error, etc.) to maintain the course.

2) You should have no problem keeping the CDI within a 3/4-scale deflection.

a) If you do have problems, the error is in your basic instrument flying skills, and your instructor will help you correct the problem.

c. Throughout the final approach segment, you must maintain your approach airspeed at alltimes,±10kt.

d. If a RAIM failure occurs after the FAF, the GPS receiver is allowed to continue operating without displaying an annunciation for up to 5 min. to allow completion of the approach (refer to your GPS operating manual).

1) If the RAIM flag/status annunciation DOES appear after the FAF, you must execute the missed approach immediately unless you have the required runway environment in sight to continue for a landing.

13. **Maintains the MDA, when reached, within +100 ft., –0 ft. to the MAP.**

a. Since you must not descend below the MDA, your authors suggest flying at approximately 50 ft. above the MDA to allow for turbulence (e.g., for an MDA of 1,400 ft. MSL, use 1,450 ft. MSL).

1) On a calm day, you should have no problem holding the MDA.

b. Using predetermined pitch and power settings, lead your level-off by approximately 100 ft. to allow you to maintain a constant airspeed and smooth control of your airplane.

c. In the example RNAV RWY 36 IAP on page 5, the straight-in LNAV MDA for all approach categories is 1,400 ft. MSL, and the MDA for a circling approach is 1,540 ft. MSL (Cat. A), 1,560 ft. MSL (Cat. B and C), and not applicable (N/A) for Cat. D.

d. If a visual descent point (VDP) is published, it will not be included in the sequence of waypoints.

1) You are expected to use normal piloting techniques for beginning the visual descent.

2) Additionally, any unnamed step-down fixes in the final approach segment will not be coded in the waypoint sequence.

a) You must calculate the ATD (along-track distance) to identify these fixes.

3) In the example RNAV RWY 36 IAP on page 5, the VDP is 1 NM to RW36 (MAP).

e. In the case of a WAAS approach, where a pseudo-glideslope is used to descend to a DA, you may only use the WAAS minimums that correspond with the mode annunciation on your GPS unit.

1) If your GPS unit indicates LPV mode, you may descend to those minimums. The same is true for LNAV/VNAV.

14. **Executes the missed approach procedure when the required visual references for the intended runway are not distinctly visible and identifiable at the MAP.**

a. The MAP is identified by MAP waypoint.
   1) When the distance to the MAP is 0.0 NM, you are at the MAP.
   2) In the example RNAV RWY 36 IAP on page 5, the MAP is RW36.

b. To descend below the MDA (FAR 91.175), you are required to
   1) Have the runway environment in sight
   2) Have visibility at or above the minimums for your approach category
   3) Be in a position to make a normal descent to the intended runway

c. Runway environment is defined as any one of the following visual references required for descent below the MDA:

   1) Approach light system
      a) However, you are not allowed to descend below 100 ft. above the touchdown zone elevation (TDZE) using the approach lights as a reference unless the red terminating bars or the red side row bars are also distinctly visible and identifiable.
   2) The threshold
   3) The threshold markings
   4) The threshold lights
   5) The runway end identifier lights
   6) The visual approach slope indicator
   7) The touchdown zone or touchdown zone markings
   8) The touchdown zone lights
   9) The runway or runway markings
   10) The runway lights

d. You are required to execute the missed approach procedure when either of the following happens:
   1) You cannot identify one of the required visual references at either of the following times:
      a) Upon arrival at the MAP
      b) At any time that you are below the MDA until touchdown
   2) An identifiable part of the airport is not distinctly visible to you during a circling maneuver at or above MDA, unless this is caused only from a bank of your airplane during the circling approach.

e. The missed approach procedure is written in the pilot briefing of FAA charts. Additionally, the procedure is also depicted by icons in the profile view.
   1) In the example RNAV RWY 36 IAP on page 5, the missed approach procedure is a climb to 3,100 ft. direct to ILLOW and hold.

f. Protected obstacle clearance areas for missed approach procedures are predicated on the assumption that the missed approach procedure is initiated at the MAP not lower than the MDA. Reasonable buffers are provided for normal maneuvers.
   1) When an early missed approach is executed (i.e., before the MAP), you should, unless otherwise cleared by ATC, fly the IAP as specified on the chart to the MAP at or above the MDA before executing a turning maneuver.
   2) If you lose visual reference while circling to land, you must follow the prescribed missed approach procedure.
      a) To become established on the missed approach course, you should make an initial climbing turn toward the landing runway and continue the turn until you are established on the missed approach course.

g. A GPS missed approach requires you to sequence the GPS past the MAP to the missed approach portion of the procedure.
   1) You must be thoroughly familiar with the activation procedure.
   2) Activating the missed approach prior to the MAP will cause CDI sensitivity to change immediatelyto terminal(±1 NM)sensitivity,and theGPS willcontinue to navigate to the MAP.
      a) The GPS will not sequence past the MAP.
   3) Turns should not begin prior to the MAP.
   4) If the missed approach is not activated, the GPS will display an extension of the inbound final approach course, and the along-track distance (ATD) will increase from the MAP until it is manually sequenced after crossing the MAP.

h. Missed approach routings in which the first track is via a course rather than direct to the next waypoint may require you to set the course.
   1) Being familiar with all of the inputs required is especially critical during this phase of flight.

15. **Executes a normal landing from a straight-in or circling approach when instructed by the examiner.**
   a. See Task VI.E., Landing from a Straight-in or Circling Approach, beginning in the Gleim*Instrument Flight Maneuvers* book.

16. **Uses MFD and other graphical navigation displays, if installed, to monitor position, track wind drift and other parameters to maintain desired flightpath.**
   a. An MFD or GPS moving map can substantially aid your situational awareness when conducting instrument approach procedures.
      1) Procedure guidance is drawn on the display and (in some installations) turn and step-down annunciations are provided, effectively turning such equipment into a co-pilot.
      2) In addition to guidance to the MAP, these displays can also greatly aid your missed approach procedure adherence by graphically drawing the procedure and suggesting an appropriate hold entry procedure.
   b. Even if you are flying a non-GPS approach, your authors recommend that you load the procedure in your GPS (if equipped) to provide an important resource in maintaining and enhancing your situational awareness.

17. **Demonstrates an appropriate level of single-pilot resource management skills.**
   a. Unlike instrument training where workload levels remain high from beginning to end, the typical instrument flight involves a high workload period during departure, followed by a relative calm while en route to your destination, followed by another high workload period when you begin your approach.
      1) Because the en route period can lead to complacency, be sure to demonstrate to your examiner that you are thinking ahead of the airplane.
      2) Complete all appropriate checklists based on the phase of flight you are in.
      3) Brief the approach procedure, set all required frequencies, and load the approach into the GPS (if equipped) while en route to the the IAF. The earlier the better.
   b. The examiner will be evaluating how well you maintain your situational awareness throughout this task.
      1) Specifically, (s)he will evaluate your CFIT awareness as you descend on the approach and conduct missed approach procedures.
      2) Your task and automation management skills will be evaluated throughout as you prioritize and schedule activities and program information in your cockpit equipment.
      3) Your decision-making and risk management skills will be evaluated in how you react to unexpected routing changes and possible/real failures.

c. Make use of all available cockpit resources unless specifically restricted by the examiner.
   1) If the examiner has not specified the autopilot is inoperative during an approach procedure, you should make use of it if doing so will not cause you to become distracted.
   2) Only use a resource you fully understand and have time to use effectively.
      a) Do not try to impress the examiner with your automation knowledge, as this is unnecessary and will likely result in distraction from other important responsibilities.

B. **Common Errors during a GPS Instrument Approach**

1. **Failure to have essential knowledge of the information on the GPS instrument approach procedure chart.**
   a. Know your IAF and the way to arrive at the final approach course.
   b. Know how to identify the FAF.
   c. Know your minimum altitudes during each segment of the approach, including the MDA.
   d. Be able to identify the MAP, and know the missed approach procedure.
   e. Ensure that the sequence of waypoints in the GPS matches the IAP chart.
2. **Incorrect communication procedures or noncompliance with ATC clearances.**
   a. Always follow correct communication procedures.
   b. You are required to follow all ATC clearances. If you cannot comply with a clearance, you must request an amended clearance from ATC.
3. **Failure to accomplish checklist items.**
   a. You must complete the before-landing checklist for your airplane. This is normally begun during the initial segment and completed by the start of the final approach segment.
   b. An approach is a busy time in the cockpit. Attempt to complete your checklist as much as possible before the FAF.
   c. Set and check your HI. Failure to accomplish this could result in tracking errors on a GPS approach.
4. **Faulty basic instrument flying technique.**
   a. It is a busy time, but you must continue your cross-check and instrument interpretation throughout the approach.
   b. Remember to fly your airplane first, then track your course, and then talk.
5. **Inappropriate descent below the MDA.**
   a. You can descend below the MDA only when you have the required visual references and the visibility is equal to or better than that published on the IAP chart.
   b. Give yourself a cushion (e.g., add 50 ft.) above the MDA to allow for altitude variations.
6. **Failure to operate your GPS unit properly.**
   a. Since there is no established standard on information presentation and operation of GPS receivers (such as with a VOR), you must become knowledgeable about the make and model of GPS in your airplane.
   b. Differences exist between manufacturers and even within various models of a manufacturer.
   c. Practice all the operations using the demo mode of the GPS and under VFR while in the airplane before flying into IMC.
   d. Incorrect inputs into the GPS receiver are especially critical during approaches. In some instances, an incorrect entry can cause the receiver to exit the approach mode.