INSTRUMENT SUPPLEMENTAL

VT-6

18 April 2023

1. Introduction

The goal of this supplemental is to amplify/clarify certain topics found in existing publications (NATOPS, NATOPS Instrument Flight Manual, CNAF 3710.7, INAV FTI, TW-5 FWOP, FAR/AIM, Advisory Circulars, etc.). **This document is NOT intended to be the sole reference for instrument events**. This has been created to aid your preparation for the instrument stage and help set expectations.

2. Expectations

Pre-Flight Brief

SNAs shall tailor the NATOPS brief to instrument flight specifics and be thoroughly familiar with the JPPT Syllabus Notes and Special Syllabus Requirements for the current block.

*****BE PREPARED TO DISCUSS, IN-DEPTH, HOW YOU COMPUTED YOUR JOKER/BINGO/DIVERT FUEL NUMBERS*****

The STAN office cannot emphasize enough that students SHALL maintain a high level of knowledge when it comes to Emergency Procedures and Limits. SNAs should fully expect, at a minimum, to discuss the handling of different emergencies in the IFR environment both in IMC and non-IMC situations.

SNAs should call or text the IP the night before the event(s) for a preferred route of flight. If unable to reach the IP, SNAs should have a primary and secondary plan for what they need for training, proficiency and weather mitigation. Have a primary and a secondary plan due to the difficulty of getting GCAs, try to get these accomplished as early in the block as possible. The following list of local airfields are suggestions:

- Crestview (CEW) and Monroeville (MVC) – All variety of approaches, especially good for early I4100. Very close, and event can get 3-4 approaches and holding complete.
- Cairns AAF (OZR) – GCAs. Busy from 1000 and 1400 and COMMS can be difficult.
- Tyndall AFB (PAM)– GCAs. Call first and be flexible if they turn you away.
- NAS Pensacola (NPA) – GCAs, LOC/ILSs, GPS.
- Mobile (MOB) and (BFM) – All variety of approaches.
- Tallahassee (TLH) – Good variety of approaches but may only allow one approach to a full stop, so be flexible. You can hit CEW and MAI prior to TLH.
- Montgomery (MGM) and Gulfport (GPT) – Numerous approaches and several opportunities for PTPs.
- Navy New Orleans (NBG) – Great place to get GCAs accomplished if scheduled for an out-in. Their radar control room is just inside the front door of Base Ops, and if you ask, they may give you a tour and demonstrate how they give a PAR/ASR.

JPPT Note:

Minimum of 2 events SHALL be flown from the front cockpit PER BLOCK.

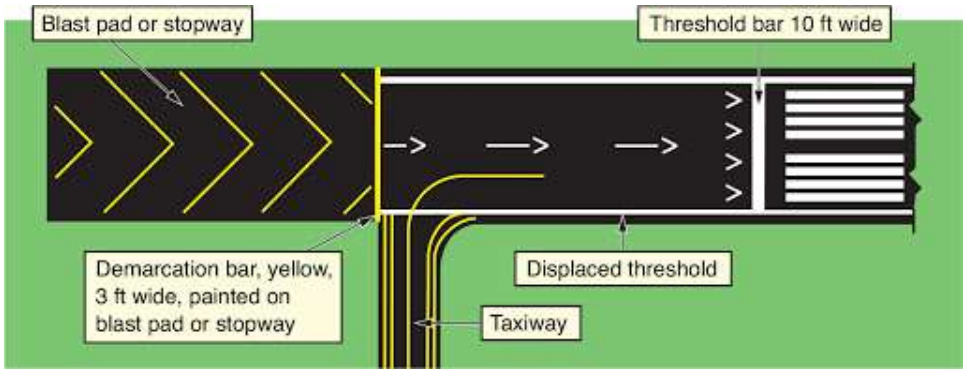
3. Airspace

Types of Airspace

- Reference VNAV FTI, Chapter 3 for airspace types and requirements.
- RVSM (Reduced Vertical Separation Minimums) airspace (FL 290-FL410).
    - 1,000 feet separation if RVSM compliant
    - Exists for the purpose of squeezing more traffic into a smaller amount of airspace thanks to improvements in GPS, baro-altimeters, and auto-pilot systems.
    - The T-6B is **NOT** RVSM certified.
    - We are able to fly between FL290 and FL310, but only if ATC approves our request, and they are able to maintain our separation at 2,000 feet with current traffic load.

4. Airfield Diagrams

- Runway length and width (always double check that it meets our minimums of 4000 x 75).
- Displaced Thresholds.
    - If there is one, be sure to check the IFR Supplement for the exact length in order to subtract this amount from the total runway length. This will be your Landing Distance Available (LDA). Airnav.com also has these numbers readily available, however, there is no guarantee that they are not out of date.
    - Remember, the distance labeled next to the runway on your approach plate is the TOTAL paved surface, not necessarily what you are allowed to use for landing (Landing Distance Available - LDA)
    - You CANNOT land on a displaced threshold; however, you CAN use it for landing rollout at the opposite end.
    - You CAN use a displaced threshold to begin your takeoff roll, as well as use the displaced threshold at the opposite end of the RWY (if there is one) to stop in the event of an aborted takeoff.



Blast Pad / Stopway - Not intended for normal use for takeoff/landing/taxi due to reduced weight bearing capacity. Can only be used in the event of an aborted takeoff.

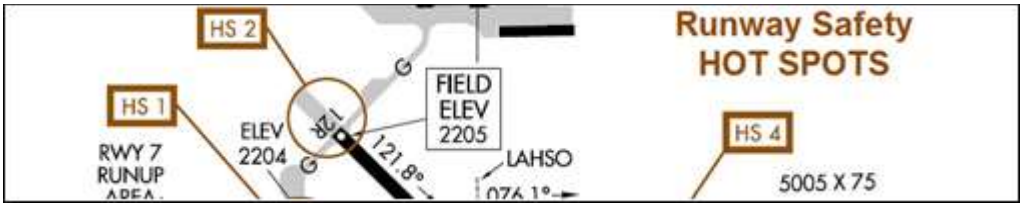
JOHN F KENNEDY INTL, NY KJFK P N40°38.40' W73°46.72' 13 UTC-5(-4DT)
H-10I-12J, L-33B-34H

(B) **RWY-04L** L4,5,9,50	(12079x200 CON PCN 90 R/B/W/T)	L4,5,50 **RWY-22R**
460→		←3425
RWY-04R L2,3,4,5,10,50	(8400x200 ASP PCN 90 F/B/W/T)	L2,3,4,5,10,50 **RWY-22L**
RWY-13L L2,3,4,5,10,43,50	(10000x150 ASP PCN 90 F/B/W/T)	L2,3,4,5,8,15,50 **RWY-31R**
907→		←1027
RWY-13R L4,5,50	(14511x200 CON PCN 98 R/B/W/T)	L4,5,50 **RWY-31L**
2043→		←3263

RWY-13R (14,511 feet long) has a DT that is 2,043 feet long. RWY 31L has a DT that is 3,263 feet long, from the opposite direction. The LDA for RWY-13R is 12,468 feet, and 11,248 feet for RWY-31L. The takeoff distance available is the maximum pavement length of 14,511 feet.

- Arresting Gear:
    - Knowing the location of arresting gear is critical as we are only permitted to taxi over rigged gear as slow as possible, otherwise we risk severe damage to the aircraft.
    - Arresting gear is normally found at military airfields with tailhook equipped aircraft, however, joint fields such as Eglin and Montgomery may have arresting gear rigged.
    - Location from the approach and departure ends can be found in the IFR supplement as noted in the example below.
    - For example, if the "short field gear is rigged" (approach end), the distance from the runway threshold to the arresting gear must be subtracted from the calculated Landing Distance Available, due to the fact we must land beyond the arresting wire. If both runway ends are rigged, we must subtract the distances from each approach end in order to calculate Landing Distance Available (i.e. we must land between the arresting wires).
    - Locally, KNPA (Sherman) and KNBG (Navy New Orleans) WILL usually have arresting gear "rigged and in battery" at the approach end, departure end, or both ends of a specified runway. Therefore, if you plan to execute touch and goes or full stop landings call ahead to Base Ops to confirm the status. Typically, practice approaches will be conducted to runway 7L/25R at KNPA and the arresting gear will be rigged on runway 7R/25L. Real-time status can be confirmed in the ATIS remarks. If there's any question as to the status, ask the tower before touching down.
    - ATIS remarks can include:
        - "...Runway seven-right, short (long) field gear rigged..."
            - Approach (departure) end arresting wire laying across the runway and could be laying flat or raised in battery.
        - "...Rigged and in battery..." or "...Rigged and up..." or "...Rigged with boots..." or "...Rigged with donuts..."

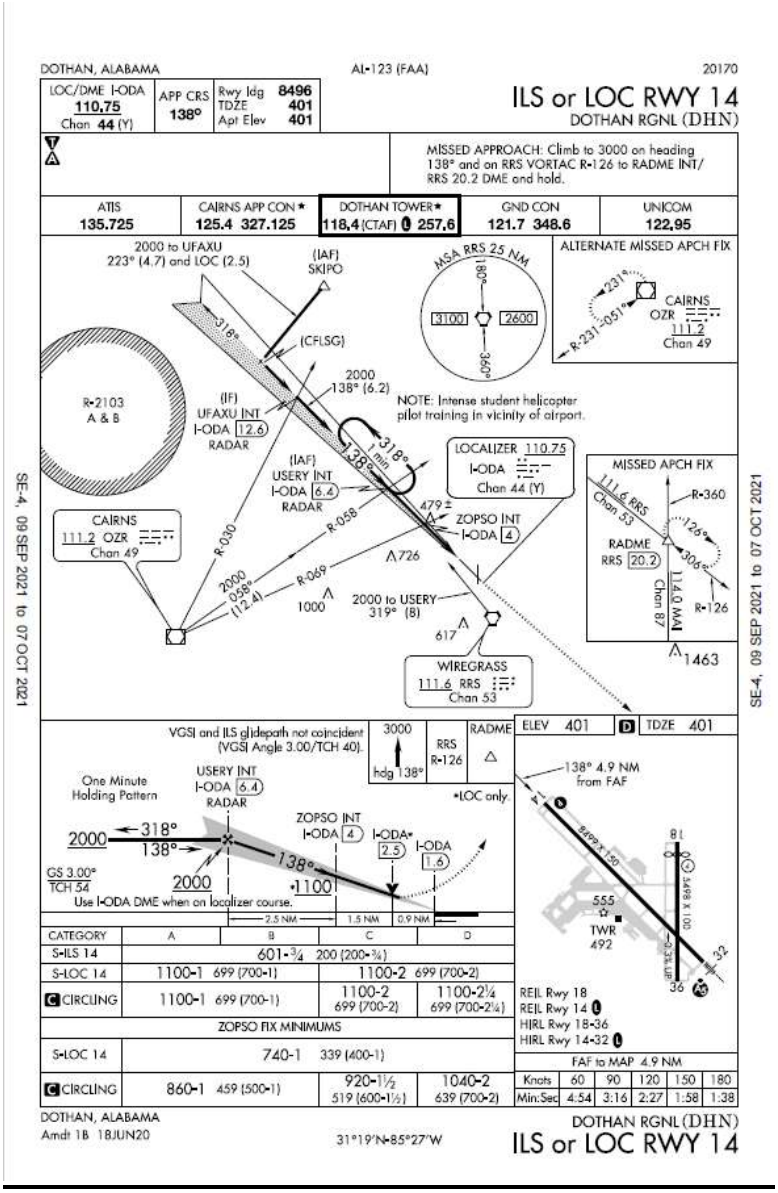
        - Further describes the respective arresting wire is raised off the runway surface with rubber boots/donuts.
    - "...Rigged flat..." or "...Rigged and down..."
    - Respective arresting wire is laying across the runway not raised
- Pavement Classification Number (PCN): This number indicates the strength of the runway and how much weight it can handle. Not a factor for us in the T-6B due to our light weight. As you move onto heavier aircraft such as the P-8A, E-6B or C-130J, it will definitely become something you will routinely check. If your NATOPS calculated Aircraft Classification Number (ACN) exceeds the runway or taxiway PCN, you cannot land or move on that surface without authorization from the airfield manager.
- Hot Spots, labeled with a circle and an "HS" with a number next to it. A hot spot is defined as a location on an airport movement area with a history of potential risk of collision or runway incursion, and where heightened attention by pilots and drivers is necessary. Reference the front section of your FLIP for specific details about the Hot Spots for an airfield.



5. Approach Plates

- The best way to learn how to read an approach plate is simply to look at a few different plates and try to identify every item you see, no matter how small. Anything you can't identify, should be cross-checked with the Chart Supplement (to include approach lighting, angle into the runway, other airports in the vicinity, etc)
- Tips for briefing any approach (technique only): HAVE A STANDARD FLOW. The instrument FTI (8-4) outlines required briefing items for the approach, but see the below example TECHNIQUE:
    - Approach Name and Page Number
    - NAVAID(s) to be tuned
    - Inbound Course(s)
    - Weather Minimums
    - Speeds, Stepdowns/Altitudes/VDPs/DMEs
    - Timing
    - MDA/DH/MSA/"Remain Within" Distances
    - Missed Approach Instructions (may need to be updated if given different climbout from ATC)
    - Unusual items (trouble Ts, NOTAMS, Obstacles, etc)

- The following page depicts an ILS, and a SAMPLE brief for your understanding. By no means is this all-inclusive, however it will highlight the necessary information to safely conduct the approach using the above flow as a GUIDELINE. Each approach will require its own briefing requirements in certain places. Again, the key is to develop a standard flow to highlight all the necessities in a timely manner, while understanding that not every approach is the same, though the necessary briefing information will be fairly similar across the board as it pertains to safely flying the approach/missed approach. Note that if the below approach was a localizer, we would need to include the stepdown fix, MDA, and VDP. If no VDP is published, calculate your own using the Instrument FTI 9-3.



"Sir/Ma'am, briefing the ILS 14 at Dothan, page xx, you up? ILS 14 DHN, we will be using the localizer 110.75, DME is collocated so no need to hold DME, inbound course will be 138, weather required to shoot the approach is 200-3/4, we have the weather per ATIS. Altitudes will be 2000' minimum once established (within 5 radials), and we can expect to intercept glideslope at the FAF of USURY at 6.4 DME. Decision height will be 601 MSL, 200 AGL, RADALT set to 200. 6Ts at the final approach fix and we will hack the clock. We'll go missed at 2 minutes and 27 seconds if no field in sight/not in a safe position to land (if flying the localizer; for the ILS, you'll execute missed approach procedures at your DH/DA). Missed approach instructions will be to climb to 3000 on a 138 heading to intercept the Wiregrass 126 radial out to 20.2 DME and hold. Trouble T's/NOTAMS reviewed. MSA is 3100 feet. Any Questions?"

- You may set up your instrumentation as you brief the approach, but always use DLIDS or LDDHA to make sure you covered everything/as a sanity check. Or do DLIDS/LDDHA first and then brief to ensure you covered everything. Dealer's choice.

6. Communications

Tips for Staying Ahead of the Aircraft:

- Anticipate and be ready for ATC's next call. Know what's coming next, but understand ATC might throw you a nonstandard call. DO NOT JUST READ BACK GARBAGE TO THEM.
- Knowing how to respond when ATC says literally *anything* that is even the *slightest* bit 'non-standard' from the FTI can be trained to. Several resources are available to you.
- TOOLS/TECHNIQUE ONLY:
    - Go online to Flight Aware or ADSB Tracker, find a T-6 operating around Mobile, Dothan, Meridian, Montgomery, Etc, and then get on LiveATC.net, and find the T-6 callsign you wanted to track. You're now essentially riding along in that cockpit. It does WONDERS for instrument students.
    - The SNFO Voice Communications FTI (P-806), which can be downloaded from the CNATRA PAT Pubs page. Lots of great information with plenty of examples.
        - https://www.cnatra.navy.mil/local/docs/pat-pubs/P-806.pdf

Anytime you are being radar vectored for an approach you will typically be given your approach clearance from your base leg or dogleg to final. "Shooter 123, turn right **110**, maintain **1,700** until established, **cleared** for the ILS runway 14". The bolded words are what you should be specifically listening for. The call will almost always be a dogleg **heading**, an **altitude** to maintain (usually they already have you at that altitude) until you are established on lateral guidance for the approach, and finally a **clearance** to commence the approach OR possibly an instruction to track the localizer, intercept the localizer, or join the localizer. All three of those are the same thing, but every approach controller is a bit different. Words have meaning, so it is absolutely critical that you pay attention to what is being said to you. In the case of being told to "track, intercept or join" the localizer, you are NOT cleared for the approach. What that means is you are to continue inbound using localizer guidance, but you are NOT allowed to descend on the glideslope until cleared for the approach. ATC may do this if there is a potential traffic conflict they need to resolve first before clearing you and having you switch to tower. If you are ever uncertain about your clearance, simply ask ATC for clarification. Better to double-check than to do something you aren't cleared to do.

Inevitably, you may find yourself getting behind the aircraft while being vectored onto an approach. When this happens, recognize it early and think about where you are (downwind, base, dogleg, etc.). Do your ABCs every time. Atis, Brief, Cockpit Setup. If you think you have some downtime, you're probably not doing enough to be one step ahead.

7. Aviation Weather

Table 3-13. Station Plot Weather Categories

Category*	Color	Ceiling		Visibility
LIFR (Low IFR)	Magenta	Below 500 feet AGL	and/or	Less than 1 mile
IFR	Red	500 to below 1,000 feet AGL	and/or	1 mile to less than 3 miles
MVFR (Marginal VFR)	Blue	1,000 to 3,000 feet AGL	and/or	3 to 5 miles
VFR	Green	Greater than 3,000 feet AGL	and	Greater than 5 miles

**These categories are not flight rules and should not be confused with the flight rules provided in Part 91, including those for Basic VFR Weather Minimums. Rather, these categories were created for weather charts as a means to visually enhance the products.*

ICING

Icing can occur at any time of year. Understanding how to interpret various weather products is critical to accurately determining the presence, or potential, for icing conditions.

In order for structural icing to occur, an aircraft surface must be at or below freezing and visible moisture must be present (clouds, fog, rain, etc.). Because an aircraft's wing (and some parts of the fuselage, stabilizers, and air intake) accelerate airflow, a local reduction of pressure and temperature occur. This creates the possibility of ice buildup while operating in ambient temperatures above 0°C. **The T-6B is considered in icing conditions when visible moisture is present and OAT (not IOAT) is 5°C or less.**

Since we do not have an OAT gauge in the cockpit, the only way for us to find the OAT in-flight is to utilize the IOAT conversion chart on our quad fold. Based on our IAS and altitude, we can subtract the charted number to get the OAT. Remember, IOAT is the OAT coming in through the engine air inlet, which is then heat soaked by the engine. IOAT it will always be warmer than the air outside the aircraft.

If the number we calculate is 5°C or less, we need to definitely steer clear of clouds. Even though the aircraft is rated for up to 5,000' of light rime ice, **you should NEVER plan to fly into icing conditions if you can avoid it!**

AIRMET Zulu is an advisory for widespread moderate structural icing. So, it would seem plausible that an AIRMET for moderate icing would be a forecast for known icing conditions. However, AIRMETs are what forecasters at the Aviation Weather Center (AWC) refer to as time-smeared forecasts. That is, they are forecasts valid over a six (6) hour period. In fact, the AWC provides a good explanation on their website. They say:

"These AIRMET items are considered to be widespread because they must be affecting or be forecast to affect an area of at least 3,000 square miles at any one time. However, if the total area to be affected during the forecast period is very large, **it could be that only a small portion of this total area would be affected at any one time**."

Icing conditions that are expected to develop, move, or dissipate within the six-hour forecast period must be included within the bounds of the AIRMET. Consequently, AIRMETs can cover large regions of airspace because of their time-smeared nature.

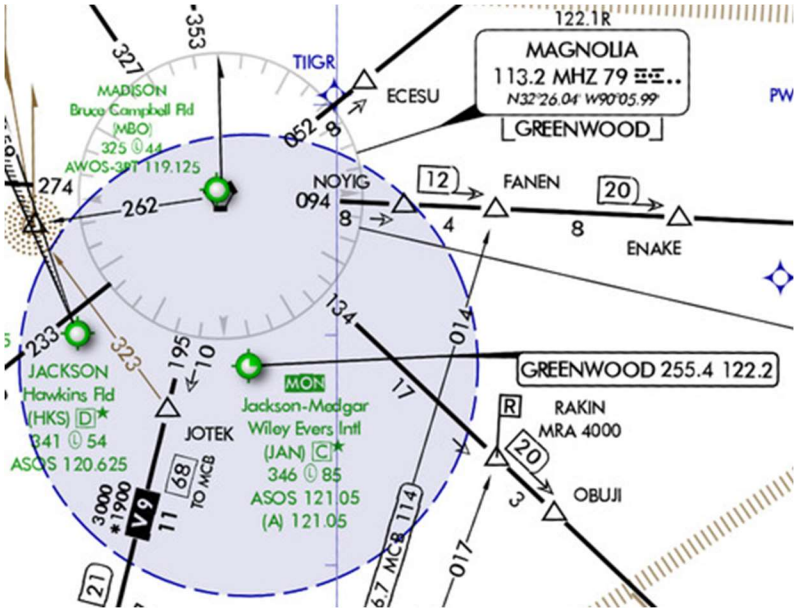
FLIGHT SERVICE STATION (FSS)

FSS is a very useful tool in-flight when you need to update your flight plan or get an unofficial weather update.

On your chart, look around for a boxed or bracketed (under a VOR) facility name with associated frequencies. In the case below, Greenwood Radio could be contacted with two-way communication on either 255.4 (UHF) or 122.2 (VHF).

Alternatively, you could also contact Greenwood on 122.1, as listed above the VOR facility name (Magnolia). The "R" indicates that this frequency is 'receive only'. This means that you can only transmit to Greenwood FSS using your VHF radio on 122.1, but they do not have the ability to talk back to you on that same frequency. In this situation, you would need to utilize the voice capability of the VOR (Magnolia) to listen to Greenwood's response. This can be done by tuning up 113.2 in your NAV radio and pushing out your NAV button on your comm panel. On the three-way switch on the right-side of your comm panel, select "V" for voice only. When you contact FSS, your call will sound like: "Greenwood Radio, Shooter 123, transmitting on 122.1, receiving on the Magnolia VOR, 113.2". You will talk to FSS with the VHF radio and listen to them with the NAV radio.

Remember, a frequency without an associated "R" means that it has two-way communication ability. A VOR/ILS/LOC frequency that is underlined means that the facility does not have voice capability.



NOTE: In the event of a lost-COMMS situation in the IFR environment, ATC may attempt to establish one-way communication with you by transmitting over the nearest VOR/ILS/LOC with voice capability. After you've positioned the aircraft somewhere safe (AVEFAME), your next thought after squawking 7600 should be to tune up the closest voice-capable facility in your NAV radio in case ATC tries to contact you. Granted, you won't be able to respond verbally if both your VHF and UHF radios are dead, but you may be able to receive instructions from ATC. "Shooter 123, Pensacola Approach, if you can hear this transmission squawk IDENT". Once the controller sees your ident, he now knows that you can hear him and can provide you with instructions to follow.

8. Fuel Planning

Technique for coming up with an appropriate bingo/divert begins at the *end* of your flight. That is, begin with landing at your weather divert field and work backwards from there. Remember, CNATRA requires that student flight events always have an alternate should the weather degrade in-flight.

1) To begin, we need to land with a **minimum of 200 lbs**, per SOP.

2) We don't want to plan to land RIGHT AT 200 lbs, so let's **add 50 lbs [250# total]** for slop. If you end up getting longer vectors, a strong headwind, weather you need to get vectored around, then you're going to appreciate the extra gas. Remember, if we land at 199 lbs, we'll have to explain to Skipper why we pushed our fuel planning to the absolute minimum. That's not a conversation anyone wants to have…

3) Now let's **add 75 lbs [325# total]** for the instrument approach into our alternate. Only add 50 lbs if you are utilizing the Alternate/Divert table in your IFG (more explanation on that later). In all likely-hood, if the weather was so bad at your destination that you couldn't break-out, your alternate may not be significantly better. Best case, you picked a

great alternate with CAVU weather, and that extra 50/75 lbs is now unnecessary. Worst case, you need it and already have it factored-in.

4) Now we have to figure out how much fuel it's going to take to get to our alternate. If the airfield is listed in the back of your IFG, then you're allowed to utilize those numbers, but keep in mind how you will need to fly your divert profile in order for those numbers to work.

   WARNING: The divert fuel numbers listed in your IFG assume that you are climbing to the altitude listed at 140 KIAS from the MAP, direct route at max range speed, and a penetration descent at 250 KIAS (speed brake extended). *Note: refer to the LRC tables in your PCL; there is no max range quick-reference table in the NATOPS/PCL*. The IFG divert table also requires an addition of 25 lbs to the listed required fuel for the overhead break. If planning an instrument approach, you must add 50 lbs to the listed value. Example (NSE to PNS): charted value is 260. VMC is 260 +25= 285 lbs. IMC is 260 + 50= 310 lbs. Be aware that if you do not plan to fly your divert profile that aggressively, then **THESE FUEL NUMBERS WILL NOT BE SUFFICIENT!** These numbers will also only get you to your alternate at 200 lbs, and does NOT include ANY slop for unforeseeable situations (strong head winds, long vectors, etc.).

5) You will still need to understand how to calculate transit fuel for when you have an alternate that is not listed, which is very likely on out-and-ins, and of course, on cross-country. For our example, let's say we are travelling ~60 NM @ 6k' to our alternate of KMOB.

   a. First, we need to find the IAS/TAS we will use to fly to our alternate. Utilize the Long-Range Cruise table in the PCL to find these speeds. The IAS is the speed you will fly, the corresponding TAS is what we will use to calculate our fuel required. The chart is broken into altitudes at 5,000 feet increments. To stay conservative, we'll round down to the next lowest altitude. In the case of our example, we'll use 5k'. Refer to your DD-175-1 to get the temperature deviation. For temperature deviation, round up to stay conservative. For our example, we'll assume STD (15°C at the surface). This gives us an IAS of 223 and a **TAS of 243.**

   NOTE: By only using TAS, we are discounting winds and adding in a bit of error. So long as the winds aren't excessive, the error should be mostly negligible. If you're feeling really motivated though, by all means check the winds aloft on your DD-175-1 and come up with a rough groundspeed prior to step C. In any case, always at least check the winds aloft to ensure you won't be fighting a strong headwind to your alternate.

   b. Next, we need to reference the fuel flow for the speed we just found. In our example, we get **534 PPH**.

LONG RANGE CRUISE

DRAG INDEX = 0

GEAR AND FLAPS RETRACTED

ZERO WIND
AVERAGE WEIGHT - 6500 LB

Altitude FEET	OAT °C	IAS KNOTS	TAS KNOTS	FUEL FLOW PPH
SL	35 (STD+20)	239	251	644
	25 (STD+10)	245	252	652
	15 (STD)	246	250	650
	5 (STD-10)	249	248	643
	-5 (STD-20)	246	241	621
5000	25	228	257	571
	15	231	256	572
	5	223	243	534
	-5	227	243	535
	-15	231	242	532
10000	15	204	249	471
	5	202	242	458
	-5	208	244	462
	-15	208	239	448
	-25	206	233	435

ZERO WIND
AVERAGE WEIGHT - 6500 LB

Altitude FEET	OAT °C	IAS KNOTS	TAS KNOTS	FUEL FLOW PPH
15000	5	191	252	414
	-5	188	244	398
	-15	189	240	388
	-25	191	238	384
	-35	189	231	371
20000	-5	187	267	391
	-15	188	263	382
	-25	188	258	374
	-35	187	252	363
	-45	190	250	362
25000	-15	170	264	340
	-25	178	272	351
	-35	179	267	345
	-45	176	257	332
	-55	175	251	323
29000	-22	152	251	302
	-32	170	274	327
	-42	171	270	324
	-52	173	266	319
	-62	172	259	311
31000	-26	140	240	281
	-36	160	267	306
	-46	171	279	322
	-56	165	263	302
	-66	170	265	306

WEIGHT EFFECTS:
1. DATA ARE GIVEN FOR 6500 LBS. TO REPRESENT AN AVERAGE CRUISE WEIGHT.
2. MAINTAIN THE IAS FOR ANY OPERATING WEIGHT UNLESS LIMITED BY MAXIMUM CRUISE POWER.
3. VARIATION IN FUEL FLOW DUE TO WEIGHT WILL BE WITHIN ± 5 LB/HR.

4. THE SPECIFIC RANGE WILL DECREASE UP TO 1.5% ABOVE 6500 LBS.; AND INCREASE UP TO 1.5% BELOW 6500 LBS.

DEFOG ON EFFECTS:
FOR OPERATIONS WITH DEFOG ON, SPECIFIC RANGE WILL DECREASE BY 2% AND FUEL FLOW WILL INCREASE UP TO 20 LB/HR.

PN01D
121255AA.AI_cl

c. Now we need to take our fuel flow of 534 PPH and divide it by the quotient of our cruise speed of 243 KTAS divided by the distance in NM that we will need to travel (60 nm). We will then round our answer up to the next 10 lbs.

$$\frac{\textbf{Fuel Flow}}{\textbf{([TAS or GS] / Distance)}}$$

$$\frac{\textbf{534} \text{ PPH}}{(\textbf{243} \text{ TAS} / \textbf{60} \text{ NM})} \rightarrow \textbf{132 lbs} \rightarrow \boxed{\textbf{140 lbs}}$$

d. **Adding the 140 lbs** to get to KMOB, we currently have a **total of 465 lbs.**

6) Now we need to account for the approach into our destination. **Add 75 lbs [540# total]** for the approach. Remember, you only add 50 lbs if you are using the Alternate/Divert table in your IFG, and that only applies to your alternate. We now have our **divert fuel of 540 lbs**. Therefore, when we show up at the **IAF at our destination**, if we are **below 540 lbs**, we have to make the decision on whether or not it is prudent to: (A) Commit ourselves to an approach at our destination, and thus potentially remove the ability to make it to our alternate above 200 lbs in the event we don't break out. (B) Decide that the weather is too dicey and the risk of not breaking out too high, so we choose to go straight

to our alternate PRIOR to commencing the approach, even though we legally could attempt it.

Keep in mind, the ATIS that is calling weather above minimums for the approach we want to fly may be 20, 30, or even 40 minutes old. If the ceilings and/or visibility have been steadily coming down throughout that time, you may legally be allowed to commence the approach thinking the weather is better than it really is. Hopefully, in that situation Tower has received a PIREP recently from another aircraft.

7) Finally, for your Bingo, simply calculate using the above techniques, the amount of fuel it will take to get you to the IAF at your destination from the location where you are doing your training. This will be the fuel state at which training is over and you will need to begin the recovery phase back to your destination. If, however, the weather at your destination poses little to no risk of diverting (for weather), you have the option to drop your Bingo down to allow for more time for training (or more time on-station in the fleet).

   In this situation, we have decided that the weather is a non-threat, and thus we remove the possibility of an IFR divert. However, we must still always have a back-up plan should we not be able to land at our destination (i.e. an aircraft FODs out the intersection of both runways at KNSE). In this case, our divert fuel is now a VFR divert to either KNDZ or KPNS utilizing the Alternate/Divert table in your IFG and adding **at least 50 lbs** for slop (**310# bare minimum** for KPNS IMC divert).

   For all of your flights in the INAV stage, you will be expected to come up with appropriate Bingo/Divert numbers for your profile.

9. Cruise Performance

Rule of thumb: TAS increases at roughly 2% of your IAS with every 1,000' of altitude. Further discussion at the end of this section. When referencing the Divert Summary tables in the NATOPS/IFG, it is very easy to see that for most situations, higher altitudes will yield the most range.

Max Range Cruise (MRC): the speed at which the aircraft can travel the maximum distance on a given amount of fuel. This speed can be found in the Specific Range charts in the NATOPS. Max Range Cruise is always slower than Long-Range Cruise. Max Range AOA (4.4), below 20,000' MSL, will generally direct you to fly an airspeed that is potentially far slower than what the Specific Range charts will indicate for a max-range cruise speed. Max Range Cruise AOA (4.4) can therefore be considered generally unreliable below approximately 20,000', as the charts are the accurate source for Max Range Cruise speeds.

Long Range Cruise (LRC): the speed which yields 99% of the range of MRC, but with a 3-5% higher airspeed. This speed will always be faster than Max Range Cruise. This can also be found in the Specific Range charts in the NATOPS, as well as in the Long-Range Cruise tables in the

NATOPS and PCL. This speed sacrifices a small amount of range in exchange for a higher airspeed; an acceptable tradeoff.

Max Endurance Cruise (MEC): The speed at which the aircraft can stay aloft for the longest amount of time for a given amount of fuel. This speed in the T-6B is always 125 KIAS for all configurations and altitudes.

THE 2% RULE: Calculate TAS for any IAS/Altitude

Your TAS will vary depending on the IAS and your altitude. In order to calculate your TAS, you have three options available:

1) Use a CR flight computer "whiz wheel" (nobody's first choice).
2) Google: "TAS Calculator". Plenty of free calculators online.
3) Use the 2% Rule.

The 2% Rule is easy to use and fairly quick to calculate. Begin by taking the IAS that you plan to fly (in our case we'll use the FTI cruise speed of 200 KIAS). Take 2% of that number (4 KIAS) and multiply it by the number of thousands of feet that you plan to cruise at (in this example we'll use 6,000'). That gives us 4 x 6 = 24. Now take that number and add it back to your IAS, 200 + 24 KIAS → 224 TAS @ 6,000'. What this means is that we get a 2% bump in our TAS for every thousand feet that we climb. The TAS you calculate will usually be within 1-2 KTAS of what you'll actually see in the plane, if it's not right on the money. The only variance is due to OAT, which is generally minimal.

11. Instrument Maneuver Techniques

NOTE: For the scope of this syllabus on all approaches, you are not considered "established" on the approach until you are within ONE DOT on your CDI deflection scale, which is typically 5 radials.

Point-to-Point

In order to properly do a PTP, perform the following steps, which enhance the instructions given in the FTI.

1) Technique Only: Know where your aircraft is at all times. Plot yourself on your chart/approach plate. You're always on the tail of the green needle, with a station tuned in and a heading index, so at any time you should be able to determine your relative location to a NAVAID and the direction you're headed in. This will GREATLY enhance your SA long before you are told to proceed direct to a radial/DME, and it should help get you in the right direction before you even split the heads.
2) When you first begin, get the radial/DME for the point you want to go to. This will either be given to you by your IP, or you will have to look at your chart if it is an actual waypoint. Tune up your CDI to the desired radial. In this example, we will proceed to the CEW-340-R/20-DME, starting from the CEW-240-R/10-DME. **Set your CRS to 340.**
3) Next, **turn** to place your Ground-Track Pointer (the orange diamond), not your heading, **in-between the HEADS of your CDI and the bearing pointer**.

If you are going to a larger DME (i.e. starting at 10-DME and going to 20-DME) then put your orange diamond (ground track indicator), not your heading, closer to the CDI head (since that's the pointer associated with the larger DME. Remember, we are on the green pointer, the CDI is the destination). Technically, so long as you put your course somewhere between the two heads, you'll at least be in the ballpark. Ultimately, that's why we're doing this step in the first place. We're getting the aircraft going in the general direction of the point before we start to make finer corrections (the pencil method).

4) Continue to update your pencil method heading early and often throughout the transit to the desired point. Don't forget to take the winds into account; use the ground track diamond.

To recap:

1) Plot yourself on the chart/approach plate
2) Turn to place your aircraft's **track** somewhere **in-between the two heads**, although ideally slightly closer to the head with the higher DME.
3) Use your **pencil-method** correction to figure out where to place your **HDG** bug.
4) Move your **Ground-Track Pointer directly under the heading bug** and occasionally re-check for error as you get closer to the point.

Holding

There are a couple of important points you will need to keep in mind when holding in order to stay consistent with your timing and corrections.

1) Begin timing when **abeam**, which does not mean when the station is 90° off from your heading. In a no-wind situation, the station will be abeam AND 90° off your heading. However, anytime you are applying a triple-the-drift correction for wind, these two will not be collocated.

   According to the FTI, you can either wait until the TO flag changes to a FROM flag, or you can begin your timing once the needle passes through the perpendicular position of the CDI (lined up with the dots). Technically, both should happen simultaneously, but the TO/FROM switch is the preferred method.

   If you were instead fighting a crosswind from the opposite direction and had a TTD correction to the right, the opposite issue would occur. If you began your timing when the VOR needle was at the 90° benchmark, you would end up beginning your timing later than you should.

To fly a consistent holding pattern, you will have to precisely maintain your airspeed, heading, and turn rate. Especially after you have added your triple-the-drift correction to account for the winds. It will be absolutely crucial that you maintain your heading (to the degree!) to not inadvertently induce error into your correction. Inducing error into your corrections will make subsequent corrections very difficult. You will not be able to determine if the extra correction is due to not using enough the first lap around, or simply from poor air work. Strive to maintain

150 KIAS and exact headings (keep your ball trimmed to prevent the nose from drifting). Arguably the most important parameter that you will need to maintain accurately is the turn-indicator. **Maintain a full SRT throughout the entire turn!** Too often students let out angle-of-bank without realizing it, which will greatly affect your turn radius and thusly the outcome of your triple-the-drift correction.

Recommended Power Setting on Final for Non-Precision Approaches

The INAV FTI (9-1) states: Upon reaching Final Approach Fix, "set approximately 15% torque, trim for 120 KIAS descent to next segment altitude or MDA, as required. **NOTE:** Adjust pitch to maintain airspeed; use power to maintain a stabilized rate of descent *not to exceed 1000 fpm*."

- Many IPs have found setting 15% torque at the FAF results in rates of descent in excess of 1000 fpm and also results in unnecessary and annoying warning calls from ATC, such as "SH-XXX, CHECK ALTITUDE IMMEDIATELY"
- Many IPs have found setting 20% torque at the FAF on non- precision approaches results in a satisfactory rate of descent that does not exceed 1000 fpm and avoids unwanted ATC altitude warnings.
- BLUFF: **Using 20% torque as a starting point at the FAF on non-precision approaches is recommended.** Certain wind conditions may necessitate adjustments to this prescribed power setting to maintain the desired rate of descent.

ILS

1) Tips for a better ILS: Pitch for airspeed, Power for rate of descent/glideslope
2) Calculate a target rate of descent to use your VSI. The VSI is a rate instrument and tells the future. If on glideslope and on target VSI, you will travel perfectly down the glide slope. If high on glide slope, use more than the target. If low on glide slope, use less than the target. Calculating the target rate of descent for a 3 degree glide slope (ILS/PAR) is as easy as taking the GS, divide the first number by 2 and add two zeros.
    - No wind example: GS is 120 kts. 12/2=6 Target VSI is 600 fpm.
    - 20 kts headwind example: GS is 100 kts. 10/2=5 Target VSI is 500 fpm.
    - 20 kts tailwind eample: GS is 140 kts. 14/2=7 Target VSI is 700 fpm.
3) Once established on course, SMALL deviations in airspeed are acceptable in order to maintain glideslope. Don't go chasing needles. Small and patient corrections will do wonders.

HEADING CONTROL: In order to receive accurate course guidance on both approaches, it is imperative you fly EXACTLY the assigned heading(s). The controller does not have your heading information and therefore assumes you are flying the assigned heading. Being 1-2° off heading from the start will result in increasingly ineffective vectors.

It is unnecessary to use an AOB greater than desired heading change. The rudder may be used GENTLY for 1-2° heading changes.

Again, fly the exact headings the GCA controllers give in order to assist them with giving you proper course guidance. DO NOT USE THE WIND DIAMOND

RNAV

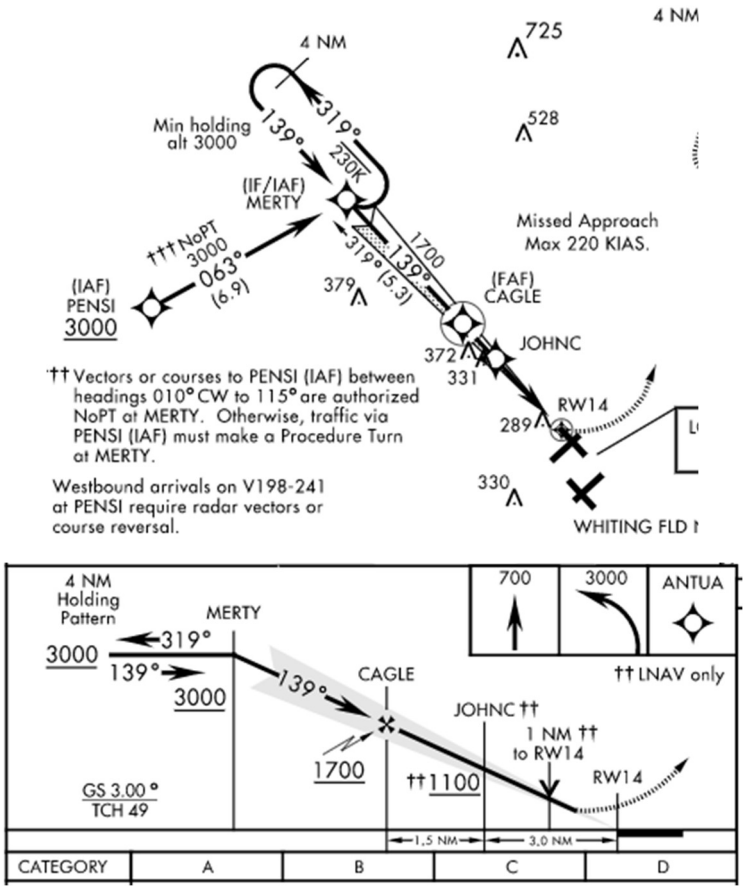
While being radar vectored to final for an RNAV approach, you may hear some IPs tell you to extend the Final Approach Course (FAC) line from the Final Approach Fix (FAF) (a.k.a. "line to infinity") in the FMS to give you course guidance regardless of where ATC vectors you onto final. In and of itself, this is not bad advice, although it does come with a word of caution.

Take the RNAV (GPS) RWY 14 @ KNSE for example. Let's assume we were being vectored for this approach at 3,000 feet MSL. Usually we can expect ATC to put us on a FAC intercept somewhere in between the FAF (CAGLE) and the IAF (MERTY). Now let's assume we were given extended vectors downwind, and thus vectored onto a dogleg outside of the IAF (MERTY) while still at 3,000 feet MSL.

If we had extended the FAF (CAGLE) out in the FMS, which would have deleted the IAF (MERTY), we would now have the FAF (CAGLE) as the next WPT in our LEGS Page. Without MERTY listed as the next WPT, since it is still in front of us, you could mistakenly think that there is nothing in-between you and the FAF. If cleared for the approach, you could mistakenly begin a descent down to 1,700' without actually having crossed MERTY yet.

A simple way to prevent this is to extend out the IAF each time you are on vectors. If you get vectored inside the IAF (as we usually do), then the next WPT will cycle past it automatically. If your IP is dead-set on extending the FAF out, keep track of where you are and ensure that you aren't coming down early once established on final. As you can see from the profile view below, there is no distance listed between MERTY and CAGLE. On the Plan View, however, the distance is labeled.

Be especially vigilant during RVFAC when an RNAV procedure has a "dog leg" segment (e.g. NSE RNAV RWY23). The controller is vectoring you to the leg prior to the FAF. When setting up the FMS for the approach, be ABSOLUTELY SURE to have the right course in the legs page. Typically, the FMS suggested course will always be correct. In our example of the NSE RNAV RWY23, the pilot should set the 199 degree segment (FMS suggested 202 degrees [due to magnetic variation]) vice the listed 229 degree final approach course! If you set the wrong course in the legs page, you'll never intercept the portion of the approach the controller is vectoring you to.



12. Final Thoughts

CLEARANCE FOR AN APPROACH

Pay special attention when flying an approach to ensure that when you are given your clearance for the approach on your dogleg turn to final, that you actually hear the words “cleared for the XXX runway XX approach”. Sometimes, you may be given the instruction to “track the localizer/FAC inbound”, and not actually be cleared for the approach. This is usually because there is traffic ahead of you that ATC is not yet 100% sure won’t be a factor for you, so they intentionally keep you from descending. Remember, the only way you are allowed to descend on an approach, short of ATC specifically giving you a lower altitude, is for you to be cleared for the approach. Anything short of that, and you are not allowed to descend via the approach plate. In this situation, typically the approach clearance will be given to you shortly after once the traffic conflict no longer exists.

SCRUTINIZE ALTERNATES

When it comes to choosing an appropriate alternate, especially if it’s an airfield that you are not used to visiting, ensure that you are checking all of the approaches available at that location to confirm what your planned weather minimums will be. An example of this is Crestview (KCEW), which has an ILS, two RNAVs, and a VOR-A. Normally, an airfield with an ILS would be an ideal pick for a weather divert. At Crestview, however, the IFR Alternate

Minimums on the approach plate states very clearly that the procedure cannot be utilized for the purpose of an alternate. This is very likely due to the fact that the field is non-towered and the integrity of the ILS is not monitored remotely by ATC. Therefore, if you diverted for weather to Crestview and were expecting to fly the ILS, you could potentially arrive there only to find that the ILS is down, and ATC would have no way of knowing ahead of time. Not a great situation.

Remember, anything relating to ceiling and/or visibility minimums in the IFR Alternate Minimums section of your approach plate do not apply to USA, USN, and USAF. Everything else listed does.