

# Instrument Approach Procedures – Part 1

Boston Virtual ARTCC Ground School

March 11, 2019



## **SIMULATION USE ONLY**

These materials are provided for discussion and use in online flight simulation on VATSIM. They are not suitable for real-world flight.

## Objectives

The “Instrument Approach Procedures” Ground School is designed to help pilots understand the components of an Instrument Approach Procedure, as well as the proper way to fly an IAP. This is a simplified session, with the focus on how to fly instrument approach procedures in flight simulator.

This topic is split over two sessions. Today’s session focuses on an introduction to the Instrument Approach Procedure.

On Monday, March 18, we’ll get into the flying of various procedures based on different air traffic control clearances.



## Purpose of an Instrument Approach

- Designed to take aircraft from the terminal environment to the airport
- Can begin from a STAR, an enroute fix, or (most commonly) start with vectors to final from air traffic control
- Instrument approaches include ground-based aids (e.g., VOR, NDB, ILS) as well as GPS-based approaches (e.g., RNAV)
- Instrument approaches can be:
  - For the airport in general (circling to a specific runway) – “VOR-A”
  - For a runway (circling to other runways may be authorized) – “NDB RWY 24”



## Flying Approaches (In General)

In general, flying instrument approaches consists of the following set of activities:

- Prepare the airplane and brief (review) the approach, including the relevant minimums and the missed approach procedure
- Proceed to the final segment:
  - Full approach from IAF or IF
  - Vectors to final
- Descend to the MDA or DA
- Land or circle if visual references are in sight, or conduct a missed approach



# Types of Approaches

There are two types of instrument approach available, depending on the type of navigation provided on the approach. Sometimes there are multiple types of approach combined on the same plate.

## Precision Approach

- Provides vertical guidance
- Lowest altitude is a “DA” (Decision Altitude) or “DH” (Decision Height)
  - A DA is the MSL altitude at which you must decide whether or not to land
  - A DH is operationally the same as a DA, but it is an AGL altitude for use by aircraft equipped with RADAR altimeters
- Aircraft descend to the DA/DH, then must initiate a missed approach unless runway environment is in sight

## Non-Precision Approach

- No instrument vertical guidance provided
- Lowest altitude is “MDA” (Minimum Descent Altitude)
- Aircraft descend to MDA and remain there until reaching missed approach point
  - If runway environment is in sight, landing can be completed
  - If not, a missed approach is initiated



## Types of Approaches

<b>ATC-Based</b>	<b>Type</b>	<b>Navaid</b>
ASR	Non-Precision (MDA)	ATC Radar
PAR	Precision (DA)	ATC Radar
<b>Pilot-Based</b>	<b>Type</b>	<b>Navaid</b>
ILS	Precision (DA)	Localizer + Glideslope
LDA	Either, most commonly Non-Precision (MDA)	Localizer, sometimes Glideslope
VOR	Non-Precision (MDA)	VOR
NDB	Non-Precision (MDA)	NDB
GLS	Precision (DA)	GPS
RNAV	Precision, APV, or Non-Precision	GPS



# Naming Instrument Approaches

- Approach to a runway:
  - LOC RWY 21
- Approach to an airport (not specific to a runway):
  - VOR-A
- Approach requiring multiple nav aids:
  - VOR/DME-A
  - VOR/DME RWY 25
- Multiple approaches with the same guidance (“Z” indicates lower minimum):
  - RNAV (RNP) Z RWY 21L
  - RNAV (GPS) Y RWY 21L
  - ILS Z RWY 28
- Multiple approaches with different guidance on the same procedure:
  - VOR/DME or GPS RWY 31
  - ILS or LOC RWY 4R



# Landing Variations

## Straight In

- A direct instrument approach requires no procedure turn or any other course reversal procedures for alignment (e.g., “ILS RWY 24”)

## Circle-to-land maneuver – alternative to straight-in landing

- Can be on a lettered approach (e.g., “NDB-B”) or a circle-to-land from another instrument procedure (e.g., “ILS RWY 24” approach but landing Runway 6)
  - Used when runway is not aligned within 30 degrees of the final approach course (15 degrees for RNAV approaches) of the instrument approach procedure or the final approach requires 400 feet (or more) of descent per nautical mile
  - Requires some visual maneuvering of the aircraft in the vicinity of the airport after the instrument portion of the approach is completed



# Minimums

- The minimums determine “how low you can go”
- The minimum to choose is dependent on:
  - Type of approach (navaid type and availability of vertical guidance)
  - Aircraft ‘category’, which is based on the aircraft’s final approach speed as shown in the table
  - Landing option (Straight-in, side step, circle)
- If the airport’s reported weather is below the minimum, can you still attempt the approach?
  - Answer: Yes – you simply need to have the runway in sight within the prescribed minima on the procedure

Category	V <sub>REF</sub>
A	91 knots or less
B	91-120
C	121-140
D	141-165
E	166 or more

CATEGORY	A	B	C	D
S-ILS 6		239/40	200 (200- $\frac{3}{4}$ )	
S-LOC 6		380/40	341 (400- $\frac{3}{4}$ )	380/50 341 (400-1)
CIRCLING	480-1 432 (500-1)	500-1 452 (500-1)	500-1 $\frac{1}{2}$ 452 (500-1 $\frac{1}{2}$ )	600-2 552 (600-2)

DA and RVR

MDA and RVR

MDA and Visibility



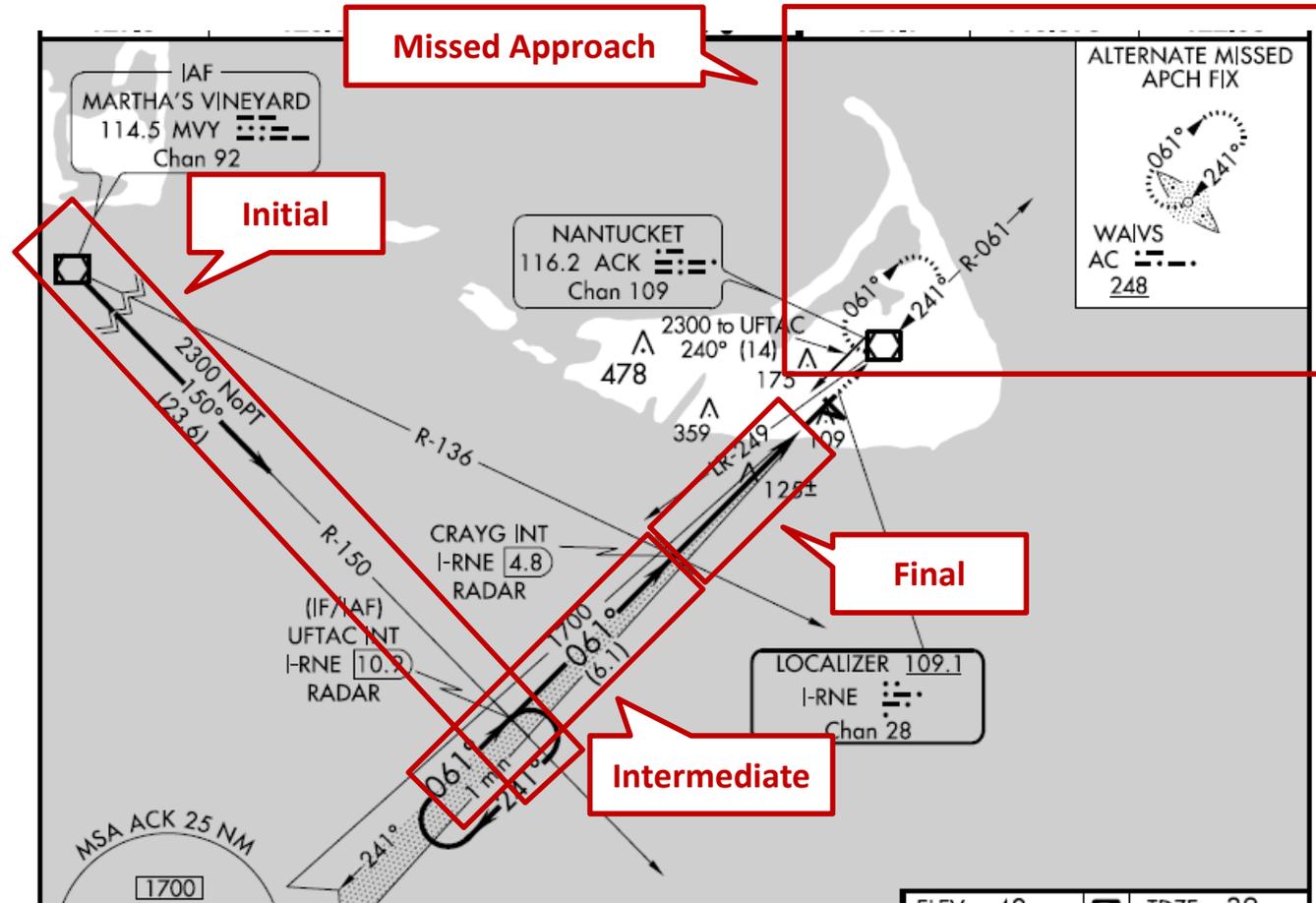
# What's the Minimum?

	← 1 NM →	← 3.4 NM →		
CATEGORY	A	B	C	D
S-ILS 24	248/18 200 (200-½)			
S-LOC 24	420/24 372 (400-½)			420/40 372 (400-¾)
CIRCLING	480-1 432 (500-1)	500-1 452 (500-1)	500-1½ 452 (500-1½)	600-2 552 (600-2)

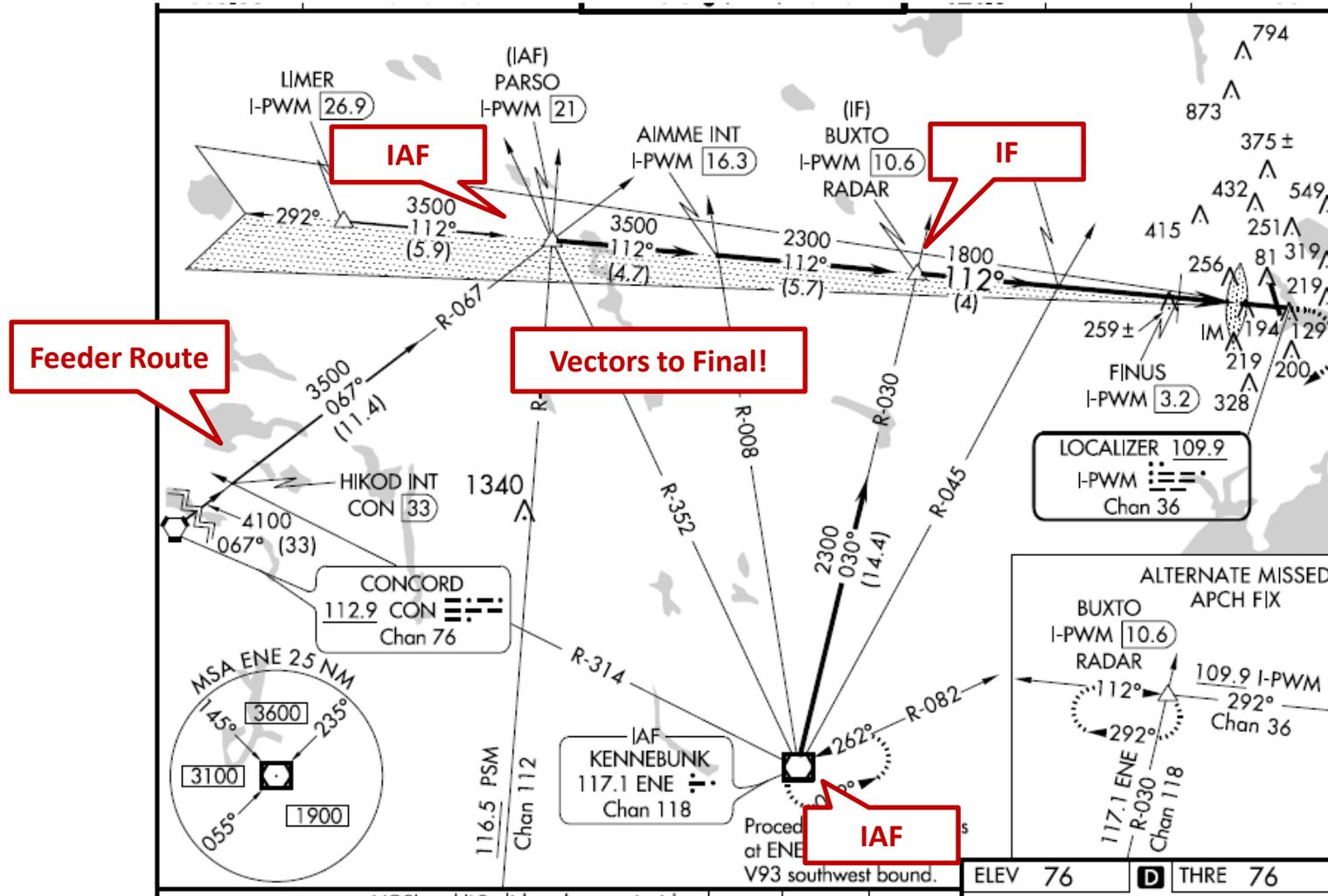
- Straight-in ILS RWY 24 approach for a Category “C” aircraft?
  - 248’ DA, 200’ DH, and 1,800’ RVR
- Straight-in LOC RWY 24 approach for a Category “B” aircraft?
  - 420’ MSL, 372’ AGL, and 2,400’ RVR
- ILS RWY 24 approach, circling to Runway 33, for an aircraft with a VREF of 70 knots?
  - 480’ MSL, 432’ AGL, and 1nm flight visibility
- What do the numbers in parentheses beside the minimums represent?
  - Minimums used by non-civil (military) aircraft



# Approach Segments



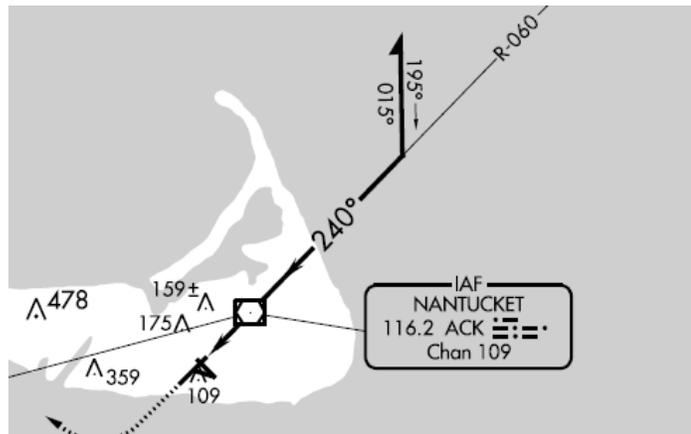
# Navigating to Final: Many Possibilities!



# Procedure Turn and Hold-in-Lieu

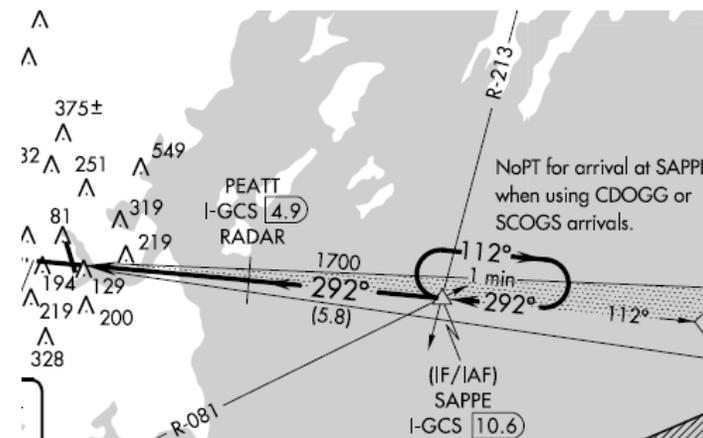
- Required when depicted unless vectored to final, “NoPT”, or cleared for “straight in” approach
- Not authorized unless required

**Procedure Turn**



- Flown as desired, normally as depicted
- Remain on protected side
- Normally, must remain within 10nm of FAF

**Hold-in-Lieu of Procedure Turn**



- Flown as a hold entry
- Use recommended hold entry based on direction approaching the fix
- Only the entry is required; additional turns in holding require specific authorization





## Missed Approaches

- A missed approach should be initiated whenever the runway environment (or an identifiable part of the airport during a circling maneuver) is not visible and:
  - The aircraft is below the MDA
  - The aircraft is at the missed approach point (including a DA)
  - Visual reference with the airport is lost during a circling maneuver
- Missed approaches should also be initiated if instrument approach guidance is lost or if full-scale deflection is reached on the instrument
- Initiate the missed approach at a point as close as possible to the missed approach point for maximum terrain/obstacle clearance



## Missed Approaches

- If a missed approach is initiated during a circling maneuver:
  - Initiate a climb
  - Navigate as closely as possible to the center of the airport
  - Fly the published missed approach procedure for the cleared instrument approach
- Is a missed approach the same thing as a “go around”?
- Should a missed approach be declared on a clear day during the recovery from an unstable landing attempt?



## Contact & Visual Approaches

- Contact Approach

- Requested by a pilot on an IFR flight plan
- Available when:
  - Traffic permits (ATC still provides traffic separation)
  - Reported ground visibility at the airport is at least 1sm
- Pilot must remain clear of clouds and have at least 1nm flight visibility, using a standard or special instrument approach procedure as reference

- Visual Approach

- Initiated by pilot or ATC
- Authorized once the pilot reports the airport or preceding traffic in sight
- Reported weather at the airport must have a ceiling at or above 1,000 feet and visibility 3 miles or greater



## Further Reading

- FAA Instrument Flying Handbook
  - [https://www.faa.gov/regulations\\_policies/handbooks\\_manuals/aviation/media/FAA-H-8083-15B.pdf](https://www.faa.gov/regulations_policies/handbooks_manuals/aviation/media/FAA-H-8083-15B.pdf)
- FAA Instrument Procedures Handbook
  - [http://www.faa.gov/regulations\\_policies/handbooks\\_manuals/aviation/instrument\\_procedures\\_handbook/](http://www.faa.gov/regulations_policies/handbooks_manuals/aviation/instrument_procedures_handbook/)



# Thank You!

Boston Virtual ARTCC Ground School takes place every in our Member TeamSpeak.  
The program is designed to help pilots of all skill levels share their knowledge and experience with members.

## Ground School Curriculum

Radio Communications ✓

Weather ✓

VFR Departure and Arrival Procedures ✓

IFR Clearances ✓

Oceanic Procedures ✓

Emergency Procedures ✓

Approach Plates – Part 1 ✓

Approach Plates – Part 2 (March 18, 2019)

RNAV (Area Navigation): Departures, Arrivals, and Approaches

