Tentative Agenda

	9:00-10:30 (90mins)	10:45-12:00 (90mins)	Lunch	13:20-14:50 (90mins)	15:00-16:30 (90mins)
Day1 Monday	Registration & Introduction	Review of Pre-course Assignment		General Overview -Aircraft Classification -MOC	Speed Conversion* & Turn Calculation*
Day2 Tuesday	Wind Effect & Turn Parameters	Wind Effect* & Turn Parameters*		Fix Tolerance	Fix Tolerance
Day3 Wednesday	NPA -General Criteria Initial Segment	NPA Initial Segment*		NPA Intermediate Segment	NPA Intermediate Segment*
Day4 Thursday	NPA Final Segment	NPA Final Segment* OCA/H*		NPA Final Segment* OCA/H* NPA VSS	NPA Final Segment* OCA/H* NPA VSS
Day5 Friday	Missed Approach -Initial Phase	Missed Approach -Intermediate Phase -Turning MAP		Missed Approach -Intermediate Phase -Turning MAP	Missed Approach -Intermediate Phase* -Turning MAP

Notes:

1. All scheduling is in Beijing time(UTC+8).
2. Topics with * will be followed by a short practical exercise.
3. Each presentation is followed by a 10-minute Q&A session.

Pans-Ops
Procedure Design Initial Course

ICAO APAC FPP Office – Beijing, China

(15 June ~ 10 July 2026)

SPEED CONVERSION & TURN Calculation

OBJECTIVES

- **At the end of the lecture, student is expected to know:**
  - Effect of atmosphere condition on True Air Speed (TAS)
  - Conversion of IAS to TAS
  - Radius of Turn (R)
  - Rate of Turn (r)

SPEED CONVERSION

- Indicated Air Speed (IAS) is the speed indicated by the instruments in the cockpit
- True Air Speed (TAS) is the actual speed of an aircraft relative to the outside environment
- Factors having an influence on the value of TAS in aircraft:
  - Altitude
  - Reference Temperature
- TAS is always used in procedure design process

SPEED CONVERSION

- In order to convert IAS into TAS, a conversion table is used. This table can be found in Doc 8168 Volume II Part-1 Section-2 Chapter-1

- TAS = IAS * k

- k depends on Altitude and Temperature. Value of K is given in the conversion table, for a range of altitudes and temperatures. It can also be calculated using a complex formula.

SPEED CONVERSION

International Standard Atmosphere

Reference: Table I-2-1-App-2

Altitude (feet)	ISA-30	ISA-20	ISA-10	ISA	ISA+10	ISA+15
0	0.9465	0.9647	0.9825	1.000	1.0172	1.0257
1000	0.9601	0.9787	0.9969	1.0148	1.0324	1.0411
2000	0.9740	0.9930	1.0116	1.0299	1.0479	1.0567
3000	0.9882	1.0076	1.0266	1.0453	1.0637	**1.0728**
4000	1.0027	1.0225	1.0420	1.0611	1.0799	1.0892

The following formula is used for values not listed in the table:

$TAS = IAS \times 171233\,[(288 \pm VAR) - 0.00198H]0.5 \div (288 - 0.00198H)2.628$

where: VAR = Temperature variation about ISA in °C, H = Altitude in feet.

SPEED CONVERSION - EXERCISE

- IAS = 185kts, Alt = 6000’, then TAS = ?
  - TAS =
- IAS = 185kts, Alt = 12000’, then TAS = ?
  - TAS =
- IAS = 185kts, Alt = 9100’, then TAS = ?
  - Use Alt at
  - TAS =

SPEED CONVERSION

- Instrument Approach Procedure is a process, using navigation, through which an aircraft transits from the en-route phrase of flight to a position, and in a state, from which a normal landing can be initiated
- A procedure may consist of 5 segments:
  - Arrival Segment
  - Initial Segment
  - Intermediate Segment
  - Final Segment
  - Missed Approach Segment
- For the speed in each segment, refer Table I-4-1-2

SPEED CONVERSION - EXERCISE

- CAT D, Initial Segment, Alt = 10000’msl, then TAS = ?
  - TAS =

- CAT C, Initial Segment, Alt = 8000’msl, then TAS = ?
  - TAS =

TURN

- Turn Calculations
  - Rate of Turn (R) in deg/sec
  - Radius of Turn (r) in NM or km
- Parameters
  - TAS (not IAS)
  - Bank Angle
- 3 Bank Angles used in Pans-Ops:
  - 25° - Terminal e.g. Initial
  - 20° - Visual Manoeuvring (Circling)
  - 15° - Final, MAP & Departure

TURN

- Maximum value of bank angle : 25°
- Maximum rate of turn (R) : 3 °/s

- *Assuming the value of the IAS, the radius of turn used for the design of the trajectory must always have the maximum value calculated either with the maximum value of bank angle or with maximum value of the rate of turn*

TURN - EXERCISE

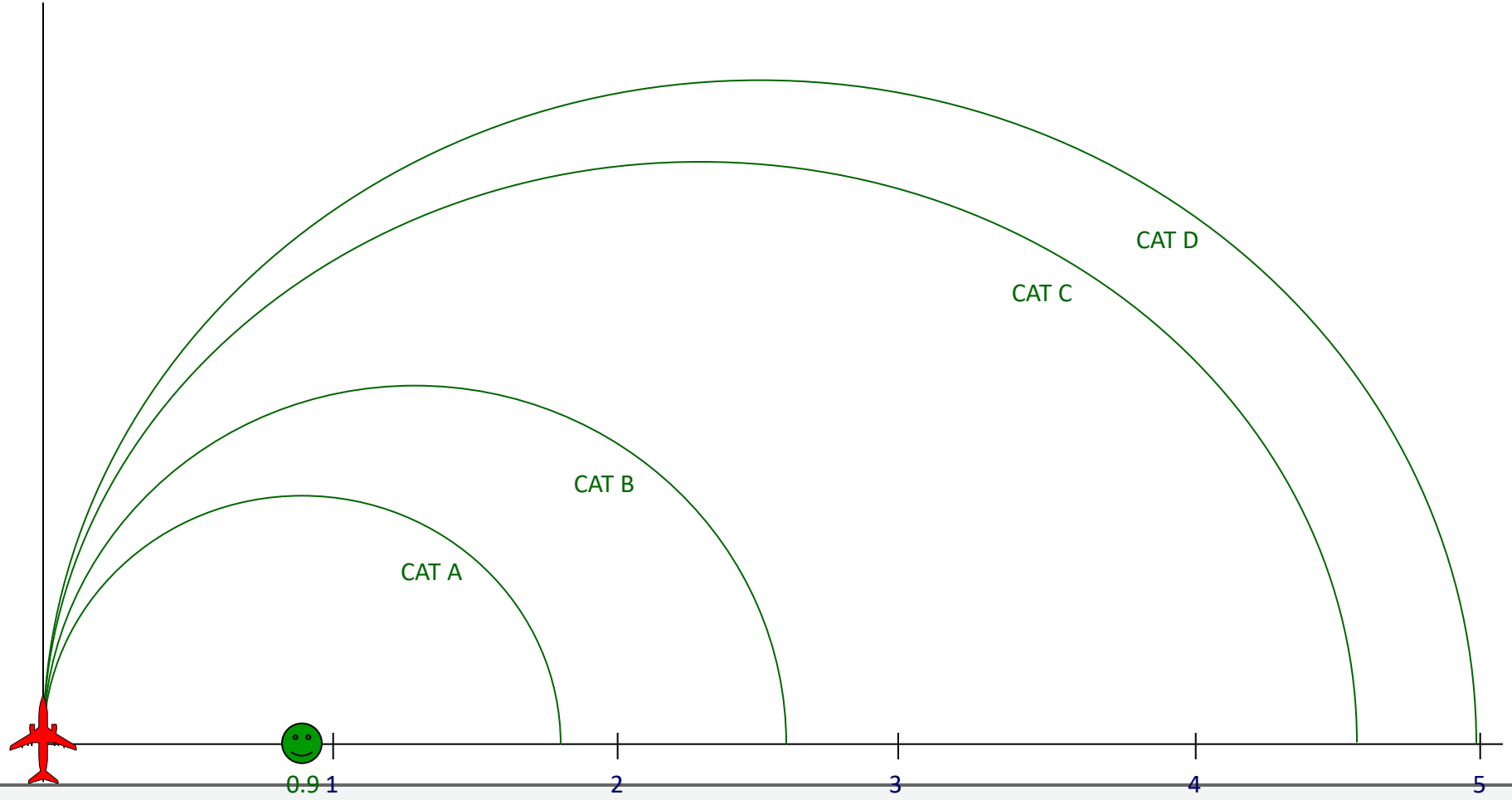
- Formulas (Reference: page I-2-3-2)
  - Rate of Turn: $R = (3431 \tan\alpha)/\pi V$
  - Radius of Turn: $r = V/(20\pi R)$

- Find R & r for CAT A-D at 6000'msl in Initial Segment, ISA+15:

CAT	IAS	Factor	TAS(V) (whole figure)	R (2 decimals)	r (2 decimals)
A					
B					
C					
D					

TURN - EXERCISE

- Plotting the tracks: CAT A-D at 6000'msl,



R & r for CAT D at different altitude during Departure (IAS+15)

Altitude	IAS (kts)	Factor	TAS(V)	R (2 decimals) Degree/sec	r (2 decimals) (Nm)
1000					
3000					
6000					
10000					


Question again?

Let's Focus/Propose/Plan Together