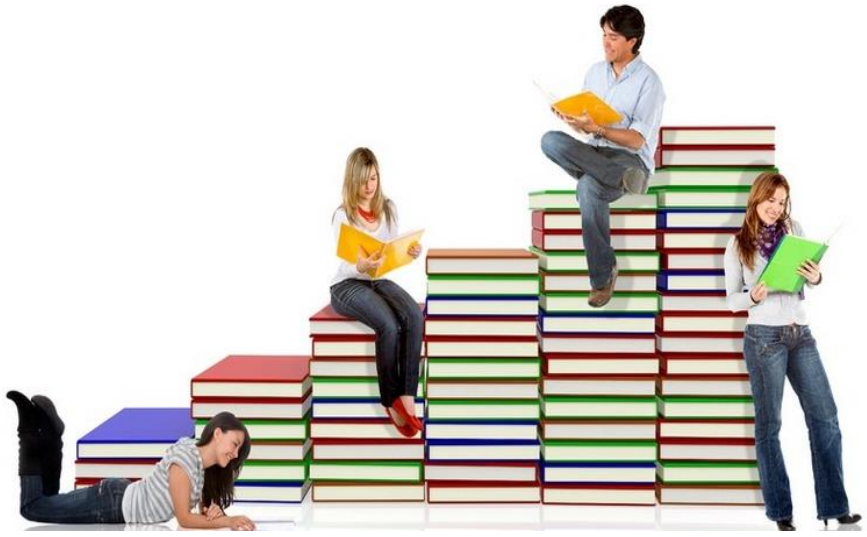
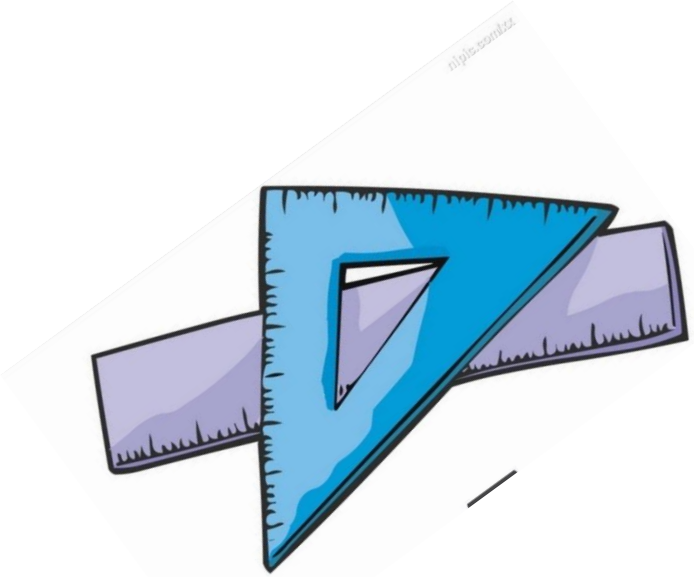
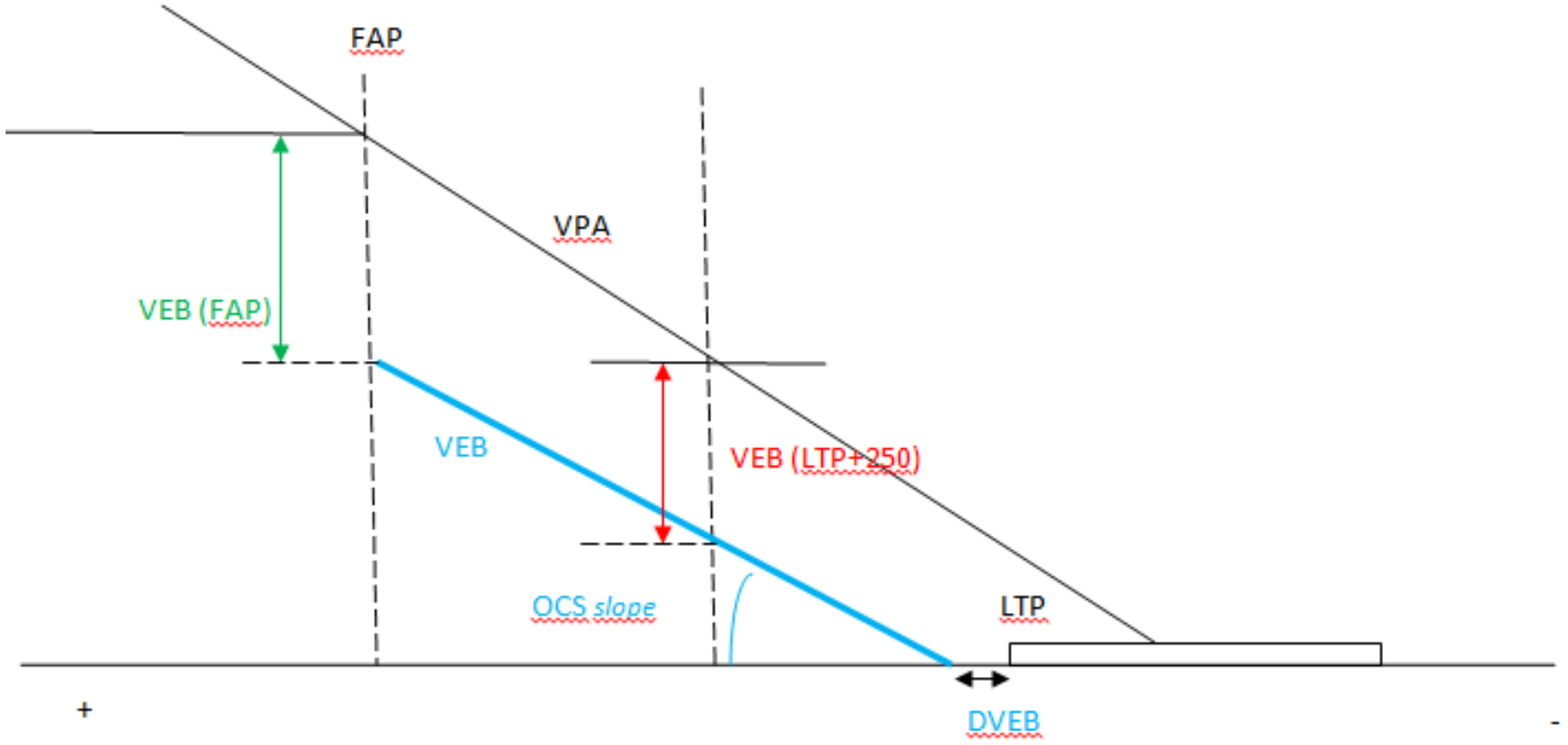
VEB MOC





- **VEB(Vertical Error Budget) MOC**
  - **The MOC for the VEB is derived by combining three known standard deviation variations by the root sum square method (RSS) and multiplying by four-thirds to determine a combined four-standard deviation(4σ) value.**
  - **VEB = vertical TSE compute:**
    - at 250ft (75m) above LTP (note:250ft = OCHmin)
    - At FAP altitude
    - Using these 2 value we can define Origin (OAS Origin) and slope (OAS Gradient)

$$MOC = bg - isad + \frac{4}{3}\sqrt{anpe^2 + wpr^2 + fte^2 + ase^2 + vae^2 + atis^2}$$



- **VEB MOC(unit: m)**

$$MOC = bg - isad + \frac{4}{3}\sqrt{anpe^2 + wpr^2 + fte^2 + ase^2 + vae^2 + atis^2}$$

  - **1) Actual navigation performance error(anpe)= 1.225×RNP_{FAS}×1852×tan（VPA）**
  - **2) Waypoint precision error (wpr)=18×tan（VPA）**
  - **3) Flight technical error (fte) fixed =23m**
  - **4) Altimetry system error (ase)**

$$ASE(m) = (-2.887 \times 10^{-7} \times H^2) + (6{,}5 \times 10^{-3} \times H) + 15$$

  - **5) Vertical angle error (vae)** $\frac{Alt - Alt_{LTP}}{\tan(VPA)} \times [\tan(VPA) - \tan(VPA - 0.01°)]$
  - **6) Automatic terminal information system (atis) fixed = 6 m**

VEB MOC

$$MOC = bg - isad + \frac{4}{3}\sqrt{anpe^2 + wpr^2 + fte^2 + ase^2 + vae^2 + atis^2}$$

- **Actual navigation performance error(anpe)=**

  $1.225 \times RNP_{FAS} \times 1852 \times \tan$（VPA）

  - Horizontal Error effect on the longitudinal part
  - Link to RNP_{FAS} value => 1.225 x RNP_{FAS} (in Nm)
  - To determine vertical error the longitudinal error is projected on vertical

VEB MOC

$$MOC = bg - isad + \frac{4}{3}\sqrt{anpe^2 + wpr^2 + fte^2 + ase^2 + vae^2 + atis^2}$$

- **Waypoint precision error (wpr)=18×tan（VPA）**
  - Waypoint horizontal error (18,3m = 60ft)
  - translated into vertical direction

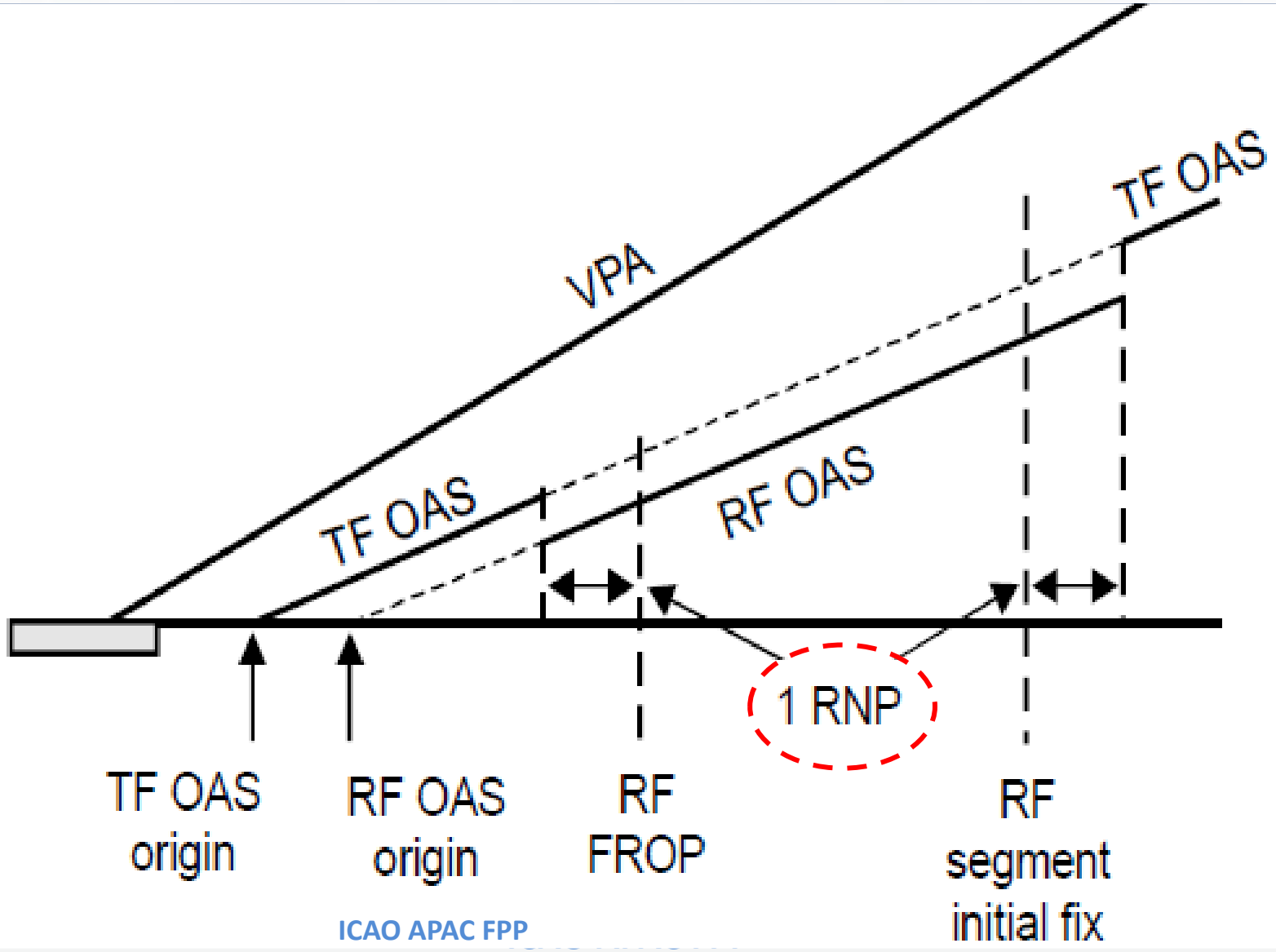
VEB MOC

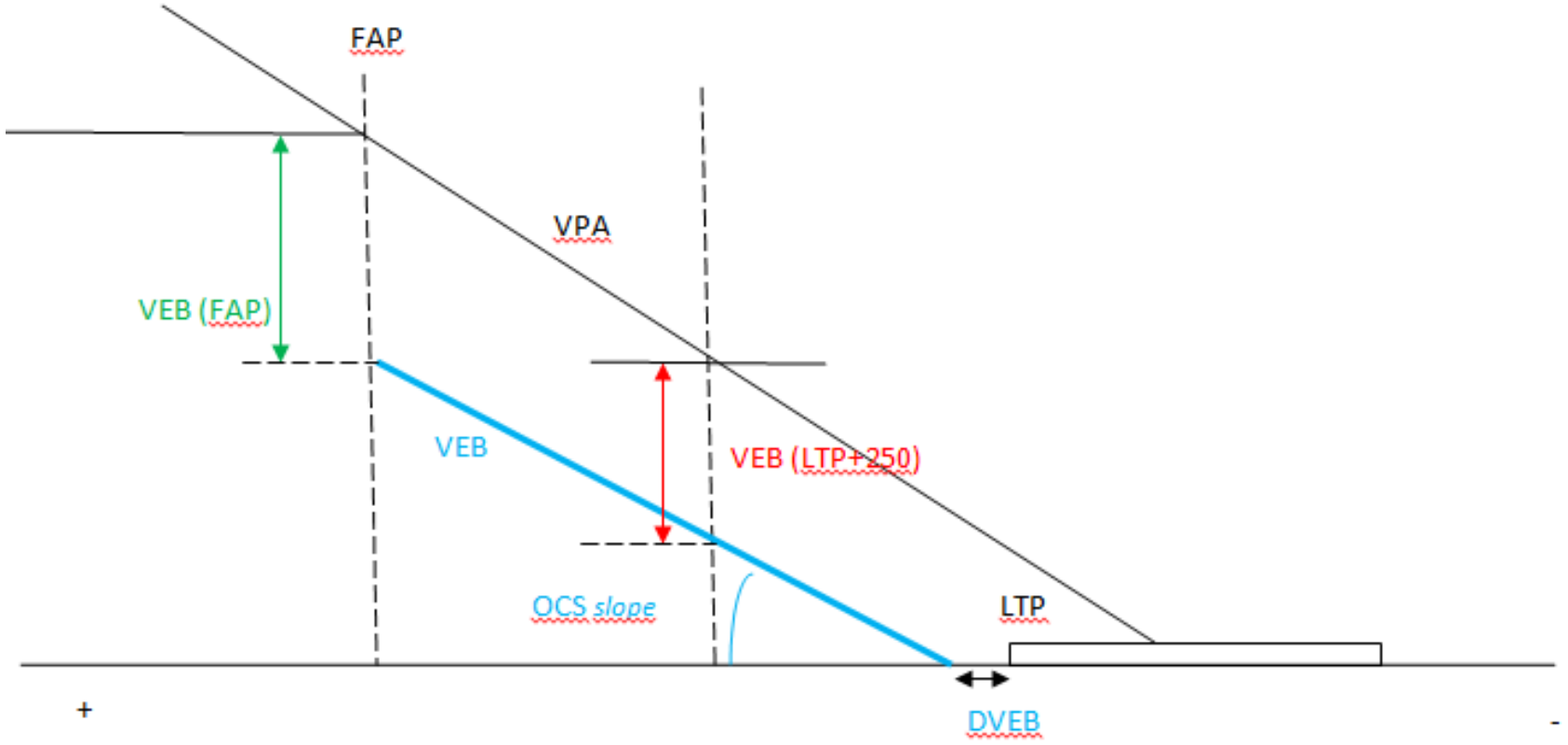
$$MOC = bg - isad + \frac{4}{3}\sqrt{anpe^2 + wpr^2 + fte^2 + ase^2 + vae^2 + atis^2}$$

- **Flight technical error (fte) fixed =23m**
  - PBN Manual : § 6.3.4.2.9 Pilots must execute a missed approach if the lateral deviation exceeds 1 × RNP or the vertical deviation exceeds –22 m (–75 ft), unless the pilot has in sight the visual references required to continue the approach.

- **VEB MOC**
  - **MOC Bias error computations:**
- **International standard atmosphere temperature deviation**
  - isad(m)=（alt-LTPelev）×△ISA/(288+△ISA-0.5×0.0065×alt)
  - isad(ft)=（alt-LTPelev）×△ISA/(288+△ISA-0.5×0.00198×alt)
  - ALT FAP or ALT LTP+75m/250ft
  - △ISA＜0，isad＜0
- **Body geometry (bg) error：**
  - Straight segment bg=7.6m(appendix 1) or 8m/25ft(chapter 4)
  - RF segment bg=Semi-span×sinφ=40×sinφ

FAS


VPA
TF OAS
TF OAS
RF OAS
1 RNP
TF OAS origin
RF OAS origin
RF FROP
RF segment initial fix


FAP
VPA
VEB (FAP)
VEB
VEB (LTP+250)
OCS slope
LTP
+
DVEB
-

- Compute MOC at 75m height : MOC_{75}
- Compute MOC at FAP Altitude MOC_{FAP}
- The OAS gradient is calculated by taking the difference in heights of the OAS surface at MOC_{FAP} and MOC_{75}

$$OAS_{gradient} = \frac{(Alt_{FAP} - Alt_{LTP} - MOC_{FAP}) - (75 - MOC_{75})}{(Alt_{FAP} - Alt_{LTP} - 75)} \times \tan(VPA)$$

- The OAS origin is calculated by taking the distance from LTP of the 75-m point of the VPA and subtracting the distance from the MOC_{75} point.

$$OAS_{origin} = \left(\frac{75 - RDH}{\tan(VPA)}\right) - \left(\frac{75 - MOC_{75}}{OAS_{gradient}}\right) = D_{VEB}$$

Let's Focus/Propose/Plan Together