# Module 1 – Airspeed Indicator

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| **AVAILABLE INPUTS** | **DESCRIPTION** | **TYPICAL RANGE** |
| pitot | ADC output from pitot tube pressure sensor, PSI | 0 to 25 |
| stat | ADC output from static port pressure sensor, PSI | 0 to 20 |
| rho | Air density, kg m-3 | 0 to 2 |
| flap | Flap position, degrees | 0 to 30 |

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| **REQUIRED OUTPUTS** | **DESCRIPTION** |
| kias | Indicated Airspeed, knots |
| vmoWarn | Airspeed warning, boolean, true when indicated airspeed exceeds VMO |

Module 1 receives data from the pitot-static pressure sensors to calculate airspeed, and produces a warning signal when airspeed exceeds the maximum operating velocity of the aircraft.

The formula for calculating the velocity of a fluid using a pitot-static sensor is:

where

= Velocity of fluid (m s-1)  
 = Static Pressure, measured by static port (kg m-1 s-2)  
 = Total Pressure, measured by Pitot tube (kg m-1 s-2)  
 = Density of fluid (kg m-3)

The following unit conversions may be required for this module:

1 m s-1 = 1.94384 knots

1 PSI = 6894.76 kg m-1 s-2

Maximum Operating Velocity, VMO, varies based on the flap position as follows\*:

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| **Flap Position** | **VMO (knots)** |
| 0 | 350 |
| 1 | 240 |
| 5 | 220 |
| 15 | 210 |
| 20 and above | Varies linearly from 195 knots at flap detent 20 to 162 knots at flap detent 30 |

\*Loosely based on B757 Flight Manual, L.7. Actual VMO is determined by various factors not included in this simulation.

# Module 2 – Excessive Manoeuvre Warning

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| **AVAILABLE INPUTS** | **DESCRIPTION** | **TYPICAL RANGE** |
| weight | Gross weight of aircraft, kg | 50,000 to 120,000 |
| vac | Vertical acceleration of aircraft, G (9.81 m s-2) | -2 to 2 |
| flap | Flap position, degrees | 0 to 30 |
| vmoWarn | Airspeed warning, boolean, generated in module1 | Boolean: 0 or 1 |

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| **REQUIRED OUTPUTS** | **DESCRIPTION** |
| vacWarn | Vertical Acceleration warning, boolean, true when vertical acceleration load limits are exceeded |
| manWarn | Manoeuvre Warning, boolean, true when both vertical acceleration and airspeed limits are exceeded |

Module 2 receives various data sources from the DFDAU to determine current aircraft condition, and produces warning signals when excessive manoeuvres occur.

The vertical acceleration load limits are determined by flap position and aircraft gross weight, as follows\*:

a) Flaps up . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 2.5g to -1.0g

b) Flaps down

< 1 > Flap detents 1, 5, 15, and 20 . . . . . . . . . 2.0g to 0.0g

< 2 > Flap detents 25 and 30, positive limits vary linearly from +2.0g at maximum landing  
 weight to +1.5g at maximum take off weight.  
  
\*Boeing 757 Aircraft Maintenance Manual, para 05-51-04-210-002.

Additional Information\*:

**Maximum Takeoff Weight**115,892 Kilograms

**Note:** The maximum structural weight is 115,892 Kilograms at elevations below 1,500 feet and varies linearly from 115,892 Kilograms at 1,500 feet to 115,666 Kilograms at 5,000 feet

**Maximum Landing Weight**95,254 Kilograms  
\*Boeing 757 Flight Manual, L.10.3