

Horizontal Speed Control

General

Speed control is one of the most desirable ways to achieve or maintain a desired separation between aircraft. In general, it results in the smallest increase in controller workload and is particularly useful when sequencing aircraft (such as towards a TMA entry point).

The primary variable affecting the future position, and consequently, separation between aircraft is ground speed. However, it is generally impractical to instruct aircraft to maintain a certain ground speed. Therefore, speed assignments are made with reference to indicated airspeed (IAS) or Mach number.

Use of horizontal speed control

Speeds may be used to:

- Adjust separation (different speeds applied between aircraft)
- Maintain separation (the same speed applied between aircraft)
- Absorb delay by reducing speed enroute (as an alternative to holding)
- Avoid or reduce vectoring:
 - As an alternative to vectoring
 - In combination with vectoring to reduce the number and magnitude of heading changes required

Considerations

Applying speed control

Most jet turbine aircraft will be unable to quickly increase or decrease speed, especially at higher altitude, so due consideration must be given to the time taken for an aircraft to reach a desired speed. In certain cases, the speed control may need to be applied, one or two miles prior to when the desired spacing is achieved.

Due consideration must also be given to prevailing winds aloft, as a headwind will decrease an aircraft's ground speed and a tailwind will increase an aircraft's ground speed. This may affect the magnitude of the speed instruction that is given to an aircraft.

Aircraft performance characteristics

Speeds in excess of the maximum or minimum speeds shall not be assigned to aircraft. Due consideration must be given to the performance characteristics of different aircraft. This ensures that aircraft do not operate too close to high speed/low-speed buffet regions of the flight envelope, especially for aircraft at higher levels (FL350 and above). (See Table 7-1)

Aircraft category	Safe operating Mach	Maximum IAS (below FL250)
<i>SUPER (A380)</i>	<i>0.82 - 0.87</i>	<i>330</i>
<i>HEAVY (B747, B787, A350)</i>	<i>0.82 - 0.87</i>	<i>330</i>
<i>HEAVY (B777, B767, A330, MD11)</i>	<i>0.81 - 0.85</i>	<i>320</i>
<i>MEDIUM (A320, B737)</i>	<i>0.75 - 0.79</i>	<i>300</i>

Table 2-1: Safe operating speed and Mach number ranges

Speed control during climb or descent

Instructions for aircraft to maintain a high rate of descent and a low speed, or a high rate of climb and high speed, are generally incompatible.

When aircraft are instructed to increase speed during a climb or decrease speed during a descent, they can be expected to maintain a short period of level or near-level flight in order to comply with the speed instruction. Conversely, when aircraft are instructed to reduce speed during a climb or increase speed during a descent, they can be expected to increase their rate of climb or descent, respectively.

Effectiveness

Speed control generally takes more time to achieve the desired separation as compared to other techniques such as vectoring, so due consideration must also be given to the volume of airspace available to achieve the desired separation.

The longer the controller waits before applying speed control, the more drastic the speed change needs to be in order to achieve the desired separation at the handover point. Should this be the case, the controller should revert to vectoring to achieve separation.

Relationship between Mach number and true airspeed

When aircraft are flown with reference to Mach number, the true airspeed of an aircraft will decrease with increasing altitude. This must be considered when applying Mach number control between aircraft at different flight levels, as aircraft at higher levels will be flying slower than those at lower levels despite reporting the same Mach number.

Relationship between indicated airspeed and true airspeed

When aircraft are being flown with reference to indicated airspeed, their true airspeed will increase with increasing altitude. Therefore, aircraft at higher altitude will be flying faster than those at lower altitude, despite reporting the same indicated airspeed.

Mach/airspeed crossover

Aircraft climbing under speed control should be given a Mach number to maintain during the crossover point between indicated airspeed and Mach number to ensure that they maintain a safe operating margin and do not unexpectedly increase speed during the climb.

Conversely, descending aircraft should be given an indicated airspeed to maintain during the crossover, so their speed does not continue to increase as the aircraft descends.

Rules of thumb

- 0.01 Mach = 6 knots
- Speed difference of 6 knots gives 1 NM of separation change every 10 minutes
- Speed difference of 30 knots gives 1 NM of separation change every 2 minutes
- Speed difference of 60 knots gives 1 NM of separation change every minute
- True airspeed (TAS) = Indicated airspeed (IAS) + 6 knots per 1000 ft above MSL

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