EASA Safety Information Bulletin

SIB No.: **2015-07**
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Subject: **Prevention of Hazardous Low Speed at High Altitude Cruise**

Ref. Publication: None

Applicability: All aeroplane type designs with a maximum altitude above flight level (FL) 300.

Description: Recent civil aviation accidents have resulted from a loss of control where the aeroplane was initially cruising at high altitude (above FL 300).

Upset recovery training programs developed by the Aviation Industry resulting from EASA recommendations provide pilot training, which puts emphasis on stall recovery.

However, these training programs may be usefully complemented by information helping crews to prevent the development of hazardous low speed situation at high altitude.

At this time, the safety concern described in this SIB is not considered to be an unsafe condition that would warrant Airworthiness Directive (AD) action under EU 748/2012, Part 21.A.3B.

Recommendation(s): Flight crews should be reminded of some basic flight physics principles to better manage the aeroplane speed (Mach number) when flying at high altitudes to prevent entry into upset situations such as stall.

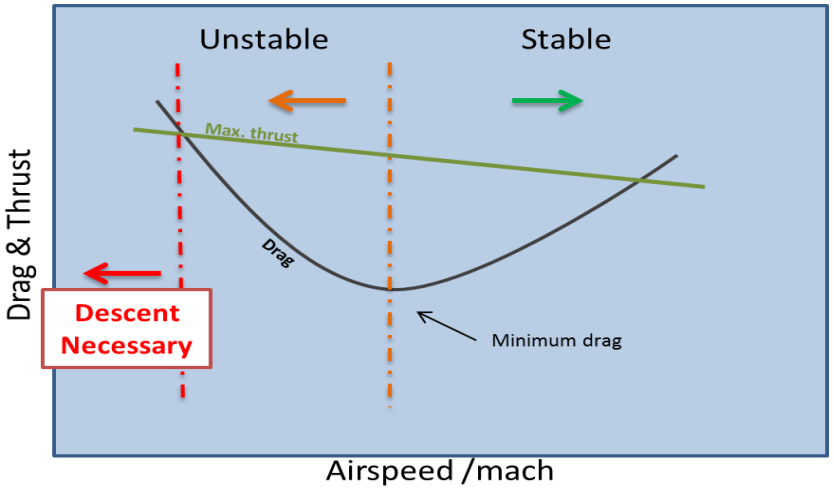
The following principles are reminded:

1. At high altitude, the maximum available thrust is considerably lower than at lower altitude.
2. Effects of speed reduction from the trimmed flight condition at cruise Mach:
   - When Mach decreases from the cruise Mach (as e.g. based on external disturbance like turbulence or gusts), the aeroplane drag initially decreases, consistently with Mach reduction. With constant thrust setting (and assuming level flight) the aircraft has a natural tendency

to recover initial Mach i.e. aeroplane has speed stability. In this range and as Mach decreases (as e.g. based on intentional speed change command from the flight crew), less thrust is required to maintain level flight with a decreasing Mach.

- However, if Mach continues to decrease, the aeroplane will reach the point of minimum drag where, due to the aerodynamic characteristics of the wing profile, drag will start to increase with Mach decreasing (inversion point), see Figure 1 below.
- At airspeeds/Mach below the inversion point, a further reduction of the aeroplane speed will lead to increased drag and will require a thrust increase to maintain level flight. This flying zone is called the zone of reversed command or 'back side of the drag curve'; Mach is unstable.
- If the deceleration (Mach decrease) is not stopped, the aeroplane drag will increase rapidly and significantly up to a point where the maximum available thrust (which is limited due to the high altitude) cannot compensate for the increased drag.
- Beyond this point and if priority is given to keep level flight, Mach will continue to decrease no matter what power is set and the situation will inevitably end in a stall.

Figure 1



Conclusion:

When in cruise,

- if continuous Mach decrease cannot be stopped after the maximum available thrust has been applied, and
- if the Mach/airspeed indication can be considered reliable,

flight crews should establish the aeroplane in a reasonable descent to recover the initial targeted Mach.

Then after a descent has been initiated, appropriate actions to mitigate the risk of air-to-air collision should be taken (ATC advised, TCAS monitoring etc.). Return to the previous cruise altitude should be initiated only after reaching the optimum Mach for climb and only then in co-ordination with ATC.

Failure of the flight crew to take the decision to descend in due time will result in a stall with significant altitude loss and a potential loss of control of the aeroplane. The initiation of a controlled descent manoeuvre is the correct action to be taken by the flight crew.

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