



## **SUBJECT : THRUST ACCELERATION IN A/THR MODES**

These are specific thrust acceleration logics when A/THR is engaged in thrust or speed mode. The crew should be aware of each.

The purpose of the logic is to obtain adapted thrust variation to the whole flight envelope, depending on the current mode engaged, "G" load limitation, and vertical modes switching if any.

This is based on different logics which can be summarized as following :

### **1. LOGIC IN THRUST MODE "CLB" (ASSOCIATED WITH OP CLB/EXP CLB/CLB) :**

#### **1.1 WHEN AP IS ENGAGED**

During thrust increased, the maximum acceleration rate is 20 %/sec until the N1 reaches N1 target minus 5 %. At that point, the acceleration logic is speed mode. This acceleration limit is defined to achieve a smooth and rapid transition without noticeable speed excursion. However normal acceleration rate is between 1.5 %/sec and 20%/sec.

When target N1 minus 5 % is reached, N1 rate becomes 1.5 %/sec until target N1 (Max CLB Thrust) is obtained.

*Note : When decelerating (more than 10 knots between current speed and speed target), the N1 rate is maintained at 1.5 %/sec.*

#### **1.2 WHEN AP IS OFF**

It has been revealed, that during manual flying with AP off, the rate limit up to 20 %/sec was not as optimum as with AP engaged. The reason for this is that during transition the system was using A/THR speed mode logic to obtain N1 rate limit of 20 %/sec MAX ; if the pilot did not fly the FD bars, established CLB thrust was not always obtained.

Consequently, the current system maintains the fixed value of 1.5 %/sec which represents the best value when following the FD bars.

Flight tests proved this logic (it means to provide maximum rate of 20 %/sec only if autopilot is engaged) to be the optimum compromise through the flight envelope.

**WARNING :** If FD bar commands are not smoothly followed or not followed at all, a speed excursion may occur, due to the fact that the change of attitude is not adapted to the thrust acceleration rate.

If required, additional manual thrust may be briefly added by the pilot during the transition.

## **2. LOGIC IN THRUST MODE "IDLE" (ASSOCIATED WITH OP DES/EXP DES/DES) :**

The N1 rate limit is 2 %/sec (IS8) and 1 %/sec (full standard). Both rates were selected to preclude speed excursion and improve passenger comfort (smooth attitude variation during transition).

## **3. LOGIC IN SPEED MODE :**

The N1 rate limit is 20 %/sec MAX, however it can be lower depending upon the difference between the current speed and the target speed.

There is no difference in A/THR speed mode linked to AP ON or OFF. The speed hold is the same with AP ON or OFF.

When pilot is flying manually, a temporary speed loss can occur if an increased load factor is required. This authority is not possible with AP due to system.