
Subject: Pitch Awareness Report, Takeoff and Landing Pitch Limits, and HUD Symbology

Background

This bulletin provides crew guidance regarding the Pitch Awareness Report, takeoff and landing pitch limits, and HUD guidance to enhance tail strike awareness and avoidance. The information contained in this report can be helpful in reducing the likelihood of tail strikes.

Pitch Awareness Reports are automatically generated and printed after the airplane passes through 18,000 feet during climb, and at the end of the flight when the aircraft slows to less than 20 knots. Items of particular interest in the reports are max pitch at takeoff, max pitch rate at takeoff, pitch at landing, and speed at landing.

Procedures

While there are no crew procedures associated with these reports, taking advantage of the instant feedback by comparing the actual flight performance to normal parameters could reduce the likelihood of tail strikes.

Sample Pitch Awareness Report - Takeoff Pitch Data

PITCH AWARENESS REPORT			
FLIGHT NO. 1234		DATE: 010713	
8.12	DEG	:	MAX PITCH ON TAKEOFF
3.06	DEG/SEC	:	MAX PITCH RATE AT TAKE-OFF
165.1	KNOTS	:	CAS AT ROTATION
149	DEG (T)	:	WIND DIRECTION
2	KNOTS	:	WIND SPEED
272	DEG	:	MAG HEADING
-5.4	C	:	SAT
163400	LBS	:	GROSS WEIGHT
2.1	FT	:	RADIO ALTITUDE

Sample Pitch Awareness Report - Landing Pitch Data

PITCH AWARENESS REPORT			
FLIGHT NO. 1234		DATE: 010713	
2.26	DEG	:	PITCH AT LANDING
131.3	KTS	:	CAS AT LANDING
103	DEG (T)	:	WIND DIRECTION
4	KNOTS	:	WIND SPEED
273	DEG	:	MAG HEADING
138520	LBS	:	GROSS WEIGHT

Review of Normal Parameters

Note: The values in the tables below have been rounded for simplification. The most precise data can be found in the FCTM, chapters 3 and 6.

Normal (Flaps 1) Takeoff

Flap settings greater than Flaps 1 result in lower pitch attitudes and more tail clearance.

Model	Pitch Attitude	Tail Strike	Pitch Rate
737-700	9°	15°	3 deg/sec
737-800	8°	11°	2-3 deg/sec
737-900 ER	8°	10°	2 deg/sec

Normal (Flaps 30) Landing

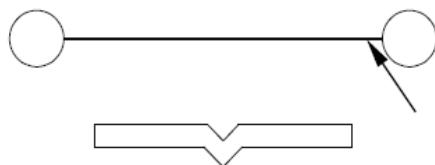
Touchdown at Vref and main struts compressed.

Model	Pitch Attitude	Tail Strike
737-700	6°	12°
737-800	5°	9°
737-900 ER	6°	8°

HUD Symbology Review

Tail Strike Pitch Limit Symbol

The tail strike pitch limit symbol is displayed relative to the aircraft reference symbol and indicates that the aircraft is at or approaching the tail strike pitch limit. Tail strike will occur if the tail strike symbol meets the aircraft reference symbol. The tail strike pitch limit symbol shows the pitch angle margin to tail strike during takeoff (including during a touch & go). The tail strike pitch limit symbol is displayed if the aircraft pitch angle approaches the tail strike angle or the pitch rate is excessive during takeoff rotation (below 10 feet AGL).



Tail Strike Warning Message

The “TAILSTRIKE” warning message provides an indication that a tail strike is likely during landing. During approach, tail strike monitoring is active below 100 feet wheel height until aircraft touchdown.



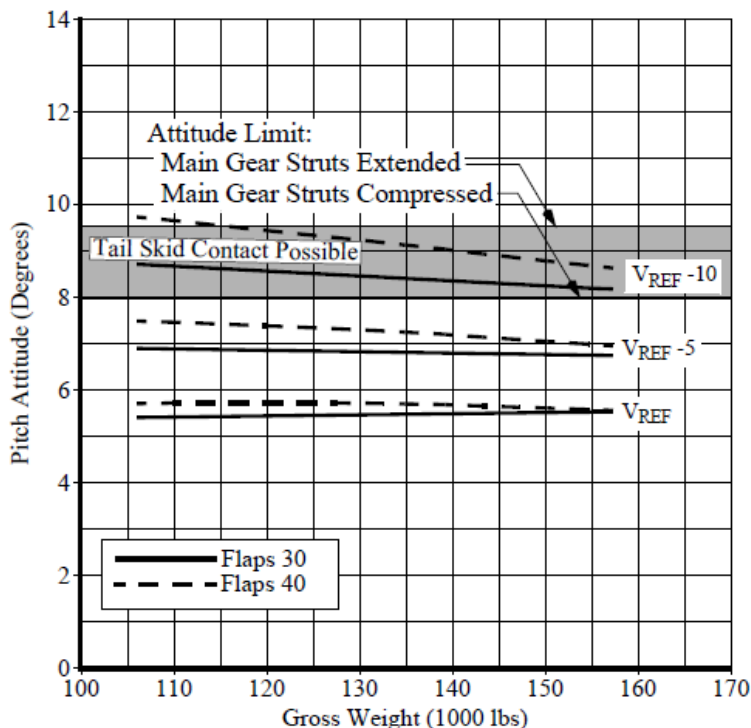
-900ER Considerations

The 737-900ER presents an increased threat of tail strikes. During takeoff, the margin between typical liftoff and potential tail strike is 2° for the -900s. Avoid fast rotations.

During landings, energy management is key. The target touchdown speed must be V_{ref} . Touchdown at $V_{ref} - 5$ reduces the tail strike margin on a firm landing to just 1°. As shown in the following figure, at $V_{ref} - 10$, a tail strike is nearly guaranteed.

Use of the HUD and avoiding the temptation to “hold it off” will further increase the clearance margin.

737-900ER



Conclusion

The Pitch Awareness Reports require no action from crews other than a simple comparison. After takeoff, compare actual pitch rate and pitch attitude to the normal values. After landing, compare the actual pitch attitude to the normal value, and speed with V_{REF} .

Now, in advance of the -900ER deliveries, is the time to increase awareness of the upcoming threat and to familiarize yourself with the Pitch Awareness Report, takeoff and landing pitch limits, and HUD symbology.

Approved by:

Steve Wilson

Bill Jansson

Michael Mannino

737 Fleet Captain 737 Chief Line Check Pilot 737 Technical Manager