

AVOIDANCE OF TAIL-STRIKE DURING LANDING

LANDING A JETLINER:

The quality of a landing made by an airline pilot today is a matter of growing concern as most of the passengers have been in well acquaintance by experience to identify between a good & an undesirable one. They judge a pilot by on-time performance, in-flight announcements and mainly the landing / touchdown.

A well disciplined stabilized approach by itself establishes the fact that the operating pilot has proper control over the coordination between his '**Mind & Actions**' i.e better control over the aircraft, at that particular time. Such desirable stabilized approaches would normally result in a proper landing.

CHARACTERISTIC OF A SWEEP-BACK WING JETLINER AIRCRAFT :

By virtue of a Sweepback wing there are several advantages but one disadvantage is that it subjects a large increase in Drag at ' High Angles of Attack' which becomes even more significant at about the stalling angle.

During Flare, with full flaps, if the nose is lifted the Lift increases but the coefficient of Drag increases rapidly resulting the SINK-RATE to almost double. At Vls (lower speeds) the Drag rise is so large that the L/D ratio falls off very quickly to the extent that EVEN THE APPLICATION OF FULL ENGINE POWER MAY NOT PREVENT the a/c sinking rapidly (mushing down), this is known as a 'Super- stalled condition'.

I. NORMAL LANDING :

A normal landing /touchdown is when an a/c approaches over the correct flare point with a pitch attitude of about 3° (A320), the pilot performs a gentle flare to reduce the descent rate (i.e. initiates a round-off) & reduces engine power to idle simultaneously. The a/c touches down at the correct place, with the correct speed and Rate of Descent (ROD).

A smoother touchdown is achieved by allowing the a/c to fly almost parallel to the ground i.e. the ROD at about the touch down is very low. This does consume more of a/c travel over the runway surface consuming more distance as pilots are well aware of, but the ignorant passengers like this better.

The normal pitch attitude at touchdown, after flare is about 6°.

II. ABNORMAL LANDING :

There are two aspects in regard to an improper landing that could lead to tail-strike :

1. HIGH FLARE
2. EXCESSIVE FLOATION

HIGH FLARE

Due to any reason such as an undisciplined approach, lack in judgment, dual input, a gust of wind, a matter of chance, etc etc it so happens that the a/c could get subjected to a high flare / early flare. The a/c would now have a tendency to float longer at a higher distance above ground before the wheel touches the runway surface :

- (i) Now, at this higher flare point as speed drops, the a/c sinks with thrust at idle, the pilot subsequently has to increase the control / side stick input backward to reduce the sink-rate. As explained earlier, due to the characteristic of a Sweptback-wing, the drag increases rapidly and the airfoil does not deliver that requisite amount of Lift which results in the sink rate to further increase. i.e the a/c then tends to move towards a condition for a touchdown at a higher ROD, which the rapidly sinking pilot experiences.
- (ii) To avoid this unusual sinking experience, the pilot's instinctive reaction is to apply more backward input to the controls and the angle of attack is further increased. This aggravates the situation as the a/c was already at a higher angle of attack and by now the speed has also further decayed. Due to this low speed & higher pitch attitude when more pitch-up input is made to the elevators, it is the nose that is going up higher but the expected lift is not being generated by the wing i.e. the flaps acts like a wall as the wing's higher angle of attack has resulted it to arrive at a super- stalled condition. The net result is that the a/c sinks rapidly and lands at a high pitch-up attitude leading to a tail-strike.

CORRECTIVE ACTION :

1. The pilot by virtue of experience must be able to recognize a higher flare condition / situation and must correct without any delay by easing the nose down slightly, but immediately, so as to avoid speed decay. This correction would thereby allow the a/c to

continue fly downward along a correct trajectory and then pilot should soon perform another flare input at the correct height above ground. If the speed is allowed to reduce, the consequence would get aggravated gradually i.e. directly proportional to the amount of delay on part of the pilot to correct the situation.

2. If there is delay in the corrective action, the pilot would have to use engine power to control the situation as it is only forward thrust that can arrest the sink rate to some extent at higher angle of attack and NOT elevator input.
3. Whilst struggling to somehow land in such abnormal situations a glance at the PFD / pitch attitude or a PNF callout could reveal the forthcoming problem. If pitch attitude is about 9° degrees (i.e. almost close to the long horizontal bar for the 10° pitch indication for an A320) be wise to GO-AR. Maintain attitude and allow engine power to come in.
4. If the r/w length is limiting, it would be best to GO-around at an earlier stage itself instead of trying to salvage a safe landing out of such situations.

EXCESSIVE FLOATATION

If the a/c is close enough to the ground and a flare is initiated at about the correct flare point but, if due to higher speed or /& a slightly excessive elevator input was made by the pilot, the resultant trajectory made-good would be flying the a/c almost parallel to the runway surface at an acceptable distance above runway surface. The a/c would continue flying parallel to the surface till speed decay takes place and the a/c starts to sink & touchdown. Here the chances of a tail strike at the point of attempting to land the a/c from this situation is almost negligible as the a/c's wheel is already close enough to the ground **but** the a/c would consume more landing distance (ALD).

PROPER LANDING TECHNIQUE FOR JET AIRLINE AIRCRAFT :

- (i) For a large transport jet aircraft it is very important for a pilot to make a stabilized approach, arrive at the right distance above ground, i.e. at the correct flare point, perform a flare to reduce the sink-rate and simultaneously get engine power to idle. Maybe another gentle input would be required to cushion the landing. If a long runway is available, the cushioning could be further refined to have smoother touchdown.

- (ii) The other method for landing an a/c adopted by some is where the engine power is first brought to idle and the a/c is held off the ground, as in the good old days. The pitch attitude at touchdown is relatively higher. This not suitable for large Jet transport a/c as it consumes a lot of distance (ALD). Here the a/c is actually stalled onto the ground whereas in the above / other case (i), the a/c is eased on to the ground at the proper place with proper speed & pitch attitude

Ultimately it amounts to the fact that one has to have more control over one's mind, intellect & body faculty available with the individual. As one transcends to higher planes of human consciousness, one is always able to perform better & better, as another normally invisible **HELP** also sets in to help, guide & protect those who are Pure.

To learn and gain more about the art of understanding this invisible help within one's Human System and its associated applications, visit the Human Science file in the www.divinekripa.in

The earlier you strive to grasp this valuable wisdom the better, because natural evolutionary progress would also make you feel the absolute necessity to learn the hidden secrets within each of us; in order to gain better access over control of the mind and enjoy a state of perennial joy in this world of ignorance.

There is a much much greater joy awaiting for all of us. It is absolutely futile to try & seek happiness through lust, name, fame, wealth, immoral activities, cheating and adopting other foul means to derive happiness in materialistic/egoistic achievements which would ultimately only bring about pain & misery.