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REJECTED TAKEOFF

- The goal of this briefing is to improve the pilots decision making and procedural accomplishment in case of failures during takeoff.
- Statistically the majority of all RTO overrun accidents occurred when the RTO was initiated at speeds above 120 kt. More than half of these accidents occurred because the RTO was initiated above V1. One-third occurred on wet or contaminated runways. Only about 1/4 of the RTO's were initiated because of engine failures.
- Analysis of statistical data reve aled that 80% of the RTO accidents were avoidable. Of these 80% more then half could have been avoided by continuing the takeoff and one - seventh by correct stop techniques.
- Generally we should be go-minded.

DECISION TO REJECT A TAKEOFF

- The total energy dissipated during an RTO is proportional to the square of the airplane velocity. At low speeds (up to approximately 80 knots), the energy level is low. Hence the airplane should be stopped if an event occurs that would be considered undesirable for continued takeoff roll or flight. Examples include Master Caution, unusual vibrations or tire failure. The rejection of a takeoff should be normally restricted to:
  1) Aural alerts
  2) Engine failure
  3) Control problems affecting safe aircraft handling
- As the airspeed approaches V1 during a balanced field length takeoff, the effort required to stop can approach the airplane maximum stopping capability.
  After 80 knots and before V1, the takeoff should be rejected only for :
  1) Engine fire/failure
  2) Unsafe configuration or
  3) Other conditions severely affecting the safety of flight.
- V1 is the maximum speed for initiating an RTO. Therefore, the decision to stop must be made prior to V1.
- Historically, rejecting a takeoff near V1 has too often resulted in the airplane stoppin g beyond the end of the runway. Common causes include initiating the RTO after V1 and failure to use maximum stopping capability (improper procedures). The maximum braking effort associated with an RTO is a more severe level of braking than most pilots experience in normal service.
- Rejecting the takeoff after V1 is not recommended, unless the Captain judges the airplane incapable of flight. Even if excess runway remains after V1, there is no assurance that the brakes will have the capacity to stop the air plane prior to the end of the runway.
- Either pilot may call *"STOP"*. In all other cases the decision to reject is restricted to the captain.
- In all cases the captain remains responsible to the best of his ability.
- If the call *"EIGHTY"* is missed, by the PNF , do <u>not</u> make another call (e.g. *"ONE HUNDRED"*). Another call is considered not to have any practical value.
- During the reject no information about the reason for the reject should be given in order not to distract the attention of the cockpit crew.

EFFECTS OF GO/STOP DECISIONS NEAR V1

- V1 is often considered as the decision speed. This is incorrect because V1 is the speed at which the stopping actions must have been initiated.
- The decision to continue or reject a takeoff must have been made just prio r to V1. Therefore it is of importance that the V1 call is completed at the moment actual speed is at the V1 mark.

RTO PROCEDURE

- The rejection of a takeoff is initiated by the call: "STOP". Once the rejection is initiated, it must be completed.
- PF duties :
  1) Rapidly & simultaneously retard the thrust levers to idle (disconnect autothrottle)
  2) Apply maximum braking
  3) Immediately extend the speedbrakes & initiate maximum reverse thrust consistent with the conditions
  4) Maintain maximum braking & reverse thrust as required, transitioning to the normal landing roll procedure after determining that stopping on the remaining runway is assured.

- PNF must :
  1) Monitor the stopping procedure (calls : *"Autobrakes disarm"* when this condition occurs)
  2) Check Speedbrakes extension as they have a large effect on stopping distance.
  3) Check Green REV indications
  4) Calls *"60 knots"* during deceleration when passing that speed.

- After the parking brake is set and the nature of the failure is clear, the procedure becomes function related.

REMARKS

- When ATC is informed, in principle always request Fire Fighting Equipment.
- Active information management is required to determine the status of the aircraft.
- Making a damage assessment on engines, wings, wheels etc. In this respect ATC, Fi re Brigade, Cabin Crew and your own observations (by opening the cockpit side -windows) can rapidly increase awareness of the situation.
- After performing the memory -items the F/O performs the applicable Non Normal procedure to check if all memory items have been performed properly and if there are not any relevant items left. (no need to wait for a call from the Captain to start reading the Non Normal C/L).
- If rejecting due to fire, in windy conditions, consider positioning the aircraft so the fire is on the downwind side.
- Note that Fire Fighting Service can maneuver easier around the airplane when it is still on the runway, instead of on a small taxiway.
- Besides this, it will permit to stay more favorable into the wind which might prevent fumes/smoke from the (probably red -hot) brakes from entering the cabin via the air conditioning system.

- Reading of the normal checklist should only be done only when time permits, or when the airplane is towed in. The RTO procedure can be divided into 3 phases :

  Phase 1……..……..Stopping the aircraft.
  Phase 2……. Containment of the failure (freezing the problem).
  Phase 3…….. Follow up.

PHASE 1

- Starts with the command *"STOP"* and concerns the actual stopping of the aircraft. Crew duties are performed as PF and PNF.
- During this phase both pilots must pay full attention to the stopping of the aircraft, and bringing it to a complete standstill.
- Phase 1 ends after the aircraft is at a full stop or when the parkin g brake is set by the Captain.

PHASE 2

- Starts after the parking brake is set, and ends after the containment of the failure.
- After the failure has been identified, crew duties become seat related, i.e. as CAPT and F/O.
- Captains function is mainly the over all management of the situation, decision to evacuate, informing the PAX and ATC, decide on the further course of action etc.
- F/O function is to perform the memory items and / or Non -Normal procedures and finally read Non-Normal C/L .

PHASE 3

- Starts after the containment of the failure.
- To stay on the runway initially has the advantage that the movement area around the aircraft is bigger.
- Before taxiing off the runway, consider to have the airplane, engines, wheels and brakes checked by authorized personnel.

STOPPING FORCES

- During a RTO the aircraft is stopped by :
  1. Aerodynamic drag (speedbrakes)
  2. Reverse thrust (not taken into account for performance calculations).
  3. Runway tire friction (autobrakes or maximal manual braking).
- SPEEDBRAKES are manually deployed by the Captain as soon as the thrust levers are on idle position.
- AUTOBRAKES are only available above 85 kt.
- AUTOTHROTTLE : until 80 kt IAS the autothrottle remains in the N1 mode of operation. If the take-off is rejected before 80 kt and the A/T is not disengaged the thrust levers will move forward when reaching for the reverse thrust levers thereby unabeling the reverse thrust levers to be lifted.

HOT BRAKES AND TIRES

- Check brake temp if the aircraft is equipped.
- The TYRES take even longer to reach a critical temperature :
  DO NOT APPROACH THE GEAR FOR ONE HOUR, because when the brake temperature is already dropping the tires are still heating up with the risk of a Fuse Plug melting or a Tire burst.