

## Podcast 19 – Memory Items part 2

Hello everyone and welcome to another episode of the 737 Talk where Ian and I will be delving into the manoeuvres section of the QRH to pull out for you those situations where we need to react to an event without the use of a checklist. First things first though, we need to announce the winner of the B737Training.org free subscription, a big thank you to all who entered. Drum roll please...

Congratulations to Mark Handford, a very worthy winner and all the extra training this guy can get the better. Ok, so Mark decided to give up his win for one of our listener's so well done to James Fletcher. We'll be in touch shortly with details of how to log in to the site. For the rest of you remember that for the next 3 weeks only we're running a year at 25% off.

Anyway, after all that excitement we'll get on with today's subject. The manoeuvres section is separated into two areas. Flight patterns show procedures for some all engine and engine inoperative situations. They do not include all procedural items but show required/recommended config changes, thrust changes, MCP changes, pitch and roll mode changes and checklist calls.

The area we're focussing on today though is the non-normal manoeuvres where we are expected to do certain actions by memory. We'll keep to the order of the QRH and again I will be Captain and PF with Ian First Officer and PM.

The first manoeuvre is the approach to stall or stall recovery. We need to do all recoveries from an approach to the stall as if a stall has occurred and recover on first indication of stall while ignoring any FD commands. As a quick recap the indications of approach to the stall are the aircraft warning systems, be that the AIRSPEED LOW call or the stick shaker or initial buffet. The signs of the stall itself are buffeting, lack of pitch authority, lack of roll control or the inability to arrest the decent rate.

As PF my initial actions are to initiate the recovery. This involves:

- Holding the control column firmly
- Disengage the autopilot and autothrottle if engaged
- Smoothly apply nose down elevator to reduce the angle of attack until buffet or stick shaker stops. Nose down stabiliser trim may be needed with the caveat that excessive use of pitch trim can aggravate the condition, or result in loss of control or high structural loads

As PM at this time, I would be:

- Monitoring altitude and airspeed whilst verifying all needed actions are done, calling out any omissions
- I would also call any trend toward terrain contact

Having initiated the recovery, I would then continue to recover by

- Rolling in the shortest direction to wings level if needed. There is a warning in the QRH here that excessive use of rudder can aggravate the condition or can result in loss of control or in high structural loads and the FCTM does state rudder is normally not needed. There is a good section in the FCTM chapter 7 that's well worth a read.
- Next advance thrust levers as needed then retract speedbrakes
- Do not change gear or flap configuration except during lift off if flaps are up, call for flaps 1

As the recovery continues, I would continue to monitor airspeed and altitude making sure that this next stage of actions were all complete. Any trends towards terrain would be called and if directed and correct I would move the Flap lever to 1.

Next is the completion of the recovery. Here I would:

- Check airspeed and adjust thrust as needed, establish pitch attitude and return to the desired flight path.
- Once happy I could reengage the autopilot and autothrottle if desired

PMs actions remain to monitor that altitude and airspeed, verify actions and call omissions and call any trend toward terrain contact.

Next is the rejected takeoff. We're not going in to the reasons for reject as each company has slight variants to this so we'll leave you to check your company procedures but the actions taken are universal so here we go.

The crewmember who first notices the abnormal situation will call it and if the Captain subsequently decides to stop they will initiate this with their company SOP call and then:

- Simultaneously close the thrust levers, disengage the autothrottle and apply maximum manual wheel brakes OR verify operation of the RTO autobrake
- If RTO autobrake is selected, monitor system performance and apply manual wheel brakes if the AUTO BRAKE DISARM light illuminates or deceleration is not adequate.
- Raise SPEED BRAKE lever.
- Apply reverse thrust up to the maximum amount consistent with conditions.
- Continue maximum braking until certain the airplane will stop on the runway.

During these initial actions I would be verifying the actions as follows:

- Thrust levers closed. Autothrottles disengaged. Maximum brakes applied.
- Verify SPEED BRAKE lever UP and call "SPEEDBRAKES UP." If SPEED BRAKE lever is not UP, call "SPEEDBRAKES NOT UP."
- Reverse thrust applied. When both REV indications are green, call "REVERSERS NORMAL."
- If there is no REV indication(s) or the indication(s) stays amber, call "NUMBER 1 REVERSER ONLY", or "NUMBER 2 REVERSER ONLY", or "NO REVERSERS".
- Call out omitted action items.

Field length permitting I would next initiate movement of the reverse thrust levers to reach the reverse idle detent by taxi speed.

Here I would Call out 60 knots, then communicate the reject decision to the control tower and cabin as soon as practical.

Next you are into procedures once stopped which again may have subtle differences from company to company, so we'll let you look into that one too.

On through the section we go, and we next come to GPWS. Before we move on to the warning just a note on the actions required in the event of a caution. Here we would be expected to correct the flight path, configuration, or airspeed depending on what the appropriate action would be in accordance with the caution.

On Activation of the "PULL UP" or "OBSTACLE OBSTACLE PULL UP" warning or other situations resulting in unacceptable flight toward terrain my initial actions would be:

- Disconnect autopilot.
- Disconnect autothrottle.
- Aggressively apply maximum thrust.
- Simultaneously roll wings level and rotate to an initial pitch attitude of 20°.
- Retract speedbrakes.
- If terrain remains a threat, continue rotation up to the pitch limit indicator (if available) or stick shaker or initial buffet.

During those initial actions as PM I would assure maximum thrust was set and then verify all those actions have been completed calling any omissions.

My other memory items are:

- Do not change gear or flap configuration until terrain separation is assured.
- Monitor radio altimeter for sustained or increasing terrain separation.
- When clear of terrain, slowly decrease pitch attitude and accelerate.

Throughout the manoeuvre I am required to monitor speed and altitude, radio for terrain clearance and Baro for MSA, and call out any trend toward terrain contact.

A few notes exist on this procedure. Firstly, aft control column force increases as the airspeed decreases. In all cases, the pitch attitude that results in intermittent stick shaker or initial buffet is the upper pitch attitude limit. Flight at intermittent stick shaker may be required to obtain a positive terrain separation. Smooth, steady control will avoid a pitch attitude overshoot and stall.

Secondly, do not use FD commands. Thirdly, Maximum thrust can be obtained by advancing the thrust levers full forward if the EECs are in the normal mode. If terrain contact is imminent, advance thrust levers full forward.

As we're getting a Pull up warning here, I can't see how the statement "If terrain contact is imminent" is applied. Any thoughts on that let us know!

Finally, if positive visual verification is made that no obstacle or terrain hazard exists when flying under daylight VMC conditions prior to a terrain or obstacle warning, the alert may be regarded as cautionary, and the approach may be continued. Just a note of caution here from us on this QRH note, a high level of shared crew SA would need to be communicated clearly and are we 100% confident of terrain we can't see directly below us isn't a factor. Just food for thought.

A couple more page turns, and we get to Traffic avoidance and TCAS alerts. We again have memory items for the caution here too. In this case that's a TA and we are to look for traffic using traffic display as a guide and call out any conflicting traffic. As PF the instruction is then if traffic is sighted, manoeuvre if needed. Again, a note is added that needs careful consideration in accordance with that last item and that is; manoeuvres based solely on a TA may result in reduced separation and are not recommended. Perhaps a slight whiff on contradiction there.

Anyway, on to an RA, there are two situations here, inflight or inflight for a climb in landing config. Also, a warning not to follow a descend RA that's issued below 1,000AGL. When the inflight RA is received:

If manoeuvring is required, disengage the autopilot and autothrottle. Smoothly adjust pitch and thrust to satisfy the RA command. Follow the planned lateral flight path unless visual contact with the conflicting traffic requires other action.

As a crew we are also to attempt to establish visual contact and call out any conflicting traffic.

For a climb RA in the landing configuration:

Disengage the autopilot and autothrottle. Advance thrust levers forward to ensure maximum thrust is attained and call for FLAPS 15. Smoothly adjust pitch to satisfy the RA command. Follow the planned lateral flight path unless visual contact with the conflicting traffic requires other action.

As PM I would verify maximum thrust set and position flap lever to 15 detent. I would then verify a positive rate of climb on the altimeter and call "POSITIVE RATE."

On hearing that call I would verify a positive rate of climb on the altimeter and call, "GEAR UP."

I would then set the landing gear lever to up. During the manoeuvre as a crew, we would both again attempt to establish visual contact and call out any conflicting traffic.

We're getting toward the home straight now we promise. A couple of big ones to go in Upset recovery and windshear escapes and we'll give the old brains a well-deserved rest. The text around these manoeuvres and the relevant FCTM sections are well worth a read in

conjunction with this for the big picture as remember we're solely giving you those memory items here.

Our upset recoveries are split into two categories, Nose High Recovery and Nose low recovery but we need to remember that if in either case if the aircraft is stalled, we need to recover from that first. The important first line to both recoveries is to Recognize and confirm the situation so bare that in mind and we'll start with the next part to each. First to Nose high.

- Disconnect autopilot and autothrottle
- Apply nose-down elevator, as much as needed to obtain a nose down pitch rate
- Apply appropriate nose down stabilizer trim
- Reduce thrust
- \* Roll (adjust bank angle) to obtain a nose down pitch rate
- Complete the recovery:

-When approaching the horizon, roll to wings level

- Check airspeed and adjust thrust

- Establish pitch attitude.

A QRH warning associated with this is the familiar; Excessive use of pitch trim or rudder may aggravate an upset situation or may result in loss of control and/or high structural loads. The QRH text also says; careful use of rudder to aid roll control should be considered only if roll control is ineffective and the airplane is not stalled.

During those actions I would call out attitude, airspeed and altitude throughout as well as verifying all actions are complete and calling out any continued deviation.

On to nose low. After recognition and confirmation, we have:

- Disconnect autopilot and autothrottle
- Recover from stall, if required
- \*Roll in shortest direction to wings level (unload and roll if bank angle is more than 90 degrees)
- Recover to level flight:
  - Apply nose up elevator
  - Apply nose up trim, if required
  - Adjust thrust and drag as required.

The same QRH warning applies and the same PM items too in that I would call out attitude, airspeed and altitude throughout as well as verifying all actions are complete and calling out any continued deviation.

On to the final manoeuvre of the section and that's windshear. We again have something to think about should we get a caution which is to; Manoeuvre as needed to avoid the windshear. Some important notes in the QRH follow with guidance on the takeoff roll but we'll stick to the escape manoeuvre here.

We will cover one thing extra here though and that's indications. We know the system will shout at us when it's detected windshear, but as the system uses weather radar and droplet detection, we need to be aware that it will not necessarily pick up on all shears. We therefore need to be aware of the other indications and these are defined as Unacceptable flight path deviations recognized as uncontrolled changes from normal steady state flight conditions below 1000 feet AGL, in excess of any of the following:

- 15 knots indicated airspeed
- 500 fpm vertical speed
- 5° pitch attitude
- 1 dot displacement from the glideslope
- unusual thrust lever position for a significant period of time.

Should we encounter these or our aural warnings the PF would initiate the procedure using the company SOP call and then.

#### In MANUAL FLIGHT

- Disconnect autopilot.
- Press either TO/GA switch.
- Aggressively apply maximum thrust.
- Disconnect autothrottle.
- Simultaneously roll wings level and rotate toward an initial pitch attitude of 15 °.
- Retract speedbrakes.
- Follow flight director TO/GA guidance (if available).

As PM verify maximum thrust and that all actions have been completed calling out any omissions.

#### In AUTOMATIC FLIGHT

- Press either TO/GA switch.
- Verify TO/GA mode annunciation.
- Verify thrust advances to GA power.
- Retract speedbrakes.
- Monitor system performance

As PM I would verify GA thrust and that all actions have been completed calling out any omissions.

#### For Manual or Automatic flight

- Do not change flap or gear configuration until windshear is no longer a factor.
- Monitor vertical speed and altitude.
- Do not attempt to regain lost airspeed until windshear is no longer a factor.

As PM I monitor vertical speed and altitude and call out any trend toward terrain contact, descending flight path, or significant airspeed changes.

There are several QRH notes to this manoeuvre which are:

Aft control column force increases as the airspeed decreases. In all cases, the pitch attitude that results in intermittent stick shaker or initial buffet is the upper pitch attitude limit. Flight at intermittent stick shaker may be required to obtain a positive terrain separation. Smooth, steady control will avoid a pitch attitude overshoot and stall.

Secondly, Maximum thrust can be obtained by advancing the thrust levers full forward if the EECs are in the normal mode. If terrain contact is imminent, advance thrust levers full forward.

And finally, if TO/GA is not available, disconnect autopilot and autothrottle and fly manually.

We also have the associated warning that:

Severe windshear may exceed the performance of the AFDS. The pilot flying must be prepared to disconnect the autopilot and autothrottle and fly manually.

Well, that wraps up that! Thanks again to Darren for suggesting what we hope will be a useful set of podcasts and we will try to keep this one updated should any of the guidance change. Congratulations again to our competition winner who will be lucky enough to see detailed briefs and simulator videos covering a number of these manoeuvres over on [b737training.org](http://b737training.org).

Thanks again for listening and to continue the talk please head over to our social media pages [@b737talk](https://twitter.com/b737talk) as well as the website [b737talk.com](http://b737talk.com) where you can sign up to the newsletter or even get in touch with us directly as well as if you're so inclined book in to see us in the simulators for a revalidation, renewal or interview prep. From Mark and I though, until next time fly well and be safe.