

## EMERGENCIES



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### 1. RAPID DECOMPRESSION AND EMERGENCY DESCENT

All high altitude Jets and some Turboprop aircrafts are pressurized for cruising altitude. What this means is that air is pumped in (by the engines through "pacs") to the cabin so that the crew and passengers can breath it. The air than goes out of the aircraft through something called "outflow valves" which modulate and regulate the pressure of the cabin. The cabin (pressure vessel) is airtight. Everything works great until a hole appears in the pressure vessel and the pressurized air escapes. This can occur if a window or door "blows out". If this emergency should occur, than we have to descend the aircraft quickly to an altitude where everyone can breath. We are given some help breathing by oxygen masks, which the crew and passengers (hopefully) would put on once we had a rapid decompression.

The second part of this emergency is Emergency Descent. Because we have experienced Rapid Decompression we need to get our aircraft to a safe altitude FAST. A good question is what is a safe altitude? The obvious (but not always correct) answer is 10,000 feet above mean sea level.

This would be correct if this emergency occurred over Boston or New York. However, if you had this emergency over the Rocky Mountain area of the US, than a 10,000-ft MSL level off altitude could be catastrophic. The primary consideration is to know where you are all the time (situation awareness) or use a target altitude of FL 180 (18,000 ft) to begin level out.

In order for you to try this in your aircraft we will start from KSCH at NIGHT and climb to FL 280 (28000 ft). If your aircraft is capable of a higher altitude, than go up to a max altitude of FL 370. We will consider that we have been given (by ATC) a block altitude for training between FL 370 and the ground. OK, we are now ready to begin. Our Memory items will be highlighted in **BOLDFACE RED**.

At the first sign of Rapid Decompression (in the real world, you would be well aware of this happening) **PUT YOUR OXYGEN MASK ON**. Grabbing your baseball cap and placing it quickly on your head can easily simulate this step. Now we must **ESTABLISH CREW COMMUNICATION**. The next step is **CABIN LIGHTS / BELTS / NO SMOKING - ON** (if your panel will allow you to do this). Now we must begin our **EMERGENCY DESCENT**. To do this you must **DISENGAGE THE AUTOPILOT**. Put the **THRUST LEVERS TO IDLE** and **ACTIVATE FLIGHT SPOILERS**. Turn off the airway by executing a bank and **DESCEND AT MMO - VMO** (airspeed indicator on the "barber pole". Keep the bank angle constant as you descend. **DECLARE AN EMERGENCY** and **SQUAWK 7700. BEGIN LEVEL OFF AT FL 180 DESCEND TO 10,000 FEET**.

OK, how did you do? Did you do all of the memory items? Did you exceed VMO - MMO and "overspeed" the aircraft? Did you put the aircraft in "to steep" a bank angle and enter some strange unusual attitude? Did you begin your level out at FL180? Did you remember to put the flight spoilers in (retracted) after you leveled out? In the real world this is a very serious emergency. In my real flying (thirty years worth) I had to do this only once (wide open stuck outflow valve) In that case, I experienced a gradual loss of pressurization that was not as scary as a full-blown Rapid Decompression. Ok that concludes this month's emergency.

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## **2. CATASTROPHIC ENGINE FAILURE BEFORE V1**

In this emergency we will talk about engine failure before V1. We will consider the "one engine-out" takeoff **DECISION**

speed (V1) to be 120 knots. In your aircraft, taxi to the end of the runway of your choice and set takeoff power (set N1s). Release the brakes and begin your takeoff roll. At 119 knots yell out (to yourself) "**ENGINE FIRE ABORT** " Now you have to do the memory items which are to **STOP** (through idle power and positive control) your aircraft in the available runway remaining (use max braking, full reverse or beta range and spoilers) **DECLARE AN EMERGENCY** to the tower, **SHUT DOWN THE REMAINING ENGINES** than "**BLOW**" the fire bottle on the effected engine (if your panel will let you do this) and signal **POSSIBLE EMERGENCY EVACUATION** . All this has to be done quickly and accurately.

OK, how did you do? How much runway did you use? Were you too heavy for conditions and ran off the end of the runway? Did you do all the items? If any parts were forgotten than practice some more. OK, this will conclude this particular emergency.

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### **3. ENGINE SHUTDOWN IN FLIGHT - FUEL DUMP - 'ONE ENGINE OUT' LANDING**

This month's emergency will involve three critical operations. They are all tied together for a successful handling of the emergency followed by a safe landing. Ok, let me explain what we are going to do.

**The Scenario:** We are going to takeoff from either BOS or JFK at night on a runway of your choice. You must have the aircraft "maxed out" (maximum gross weight at takeoff) for passengers and fuel. Follow a SID (SD) of your choice and start a climb to FL 280. Remember to change your altimeter to 29.92 before passing FL 180. When passing through FL 240 we are going to have a catastrophic engine failure. We will have to turn off items of the "blown" engine and dump fuel in order to make a safe landing back at Boston or JFK. Again, we will consider that we have been given, by ATC, a block altitude for training between FL 280 and the ground. Ok, we will take up the emergency passing through FL 240. Memory items will be highlighted in **BOLDFACE RED**.

Passing through FL 240 we must shutdown one of the engines. There are various ways to do this. Some panels will allow a switch or lever to shutdown an engine. One sure way to do this (and allow for some simulated panic) is to go to your "pull down" menu in Flight Sim and select "Aircraft" than select "Aircraft Settings" than "Engines" and using your

mouse turn off an engine. Now, to get the effect, use your mouse and pull back the thrust lever of your **SHUTDOWN** engine. You should now be flying with one engine out.

When the engine "blows up" our first memory item is - **TAKE POSITIVE CONTROL OF THE AIRCRAFT**. You do this by **TURNING OFF THE AUTOPILOT**. The next thing we must do is turn on the **NO SMOKING - FASTEN SEATBELT SIGN** (if your panel will allow you to do this). This is followed by **DECLARING AN EMERGENCY** to ATC and **SQUAWKING 7700**. Please note, that I chose FL 240 for this emergency to occur so that we would not have to "drift down" to a safe "engine out" altitude. Had this emergency occurred at a higher altitude than we would have had to do a "one engine out" drift down.

Ok, we should have the memory items out of the way. Our next concern is to "clean up the aircraft". Various aircrafts would have specific checklist to cover this. If you are using an emergency checklist for your aircraft, than go ahead and use it.

Now that we have the immediate emergency under control, our next concern is to return to JFK or BOS and land safely. However, before we can do this we must consider the "Max Landing Weight" of the aircraft. I am going to allow (for training) that an 80% fuel load will qualify as giving us the weight required for landing. Any more than this amount would mean that we would have to dump fuel to reach this amount. Dumping fuel must be requested to ATC who will give us a specific location for dumping. If you have more than 80% fuel go ahead and engage the autopilot and fly to some location over water and "dump fuel" - "Aircraft" than "Aircraft Settings" than "Fuel". Adjust the total fuel to 80%.

Turn to a coarse direct to BOS or JFK and set up to do an approach of your choice. There are a few things to consider at this point. After doing our Descent and Landing Checklist we will use an approach speed of no less than **140 knots for turboprops** and **150 knots for jets**. Also, we will do our approach with **FLAPS SET FOR TAKEOFF**. Another very important thing to consider (while we still have some time) is to brief our Chief Flight Attendant as to the possibilities of having to do an **EMERGENCY EVACUATION** after landing. Flight Attendants have FAA approved training for situations such as these.

Go ahead and fly the approach. You may use the autopilot or

you may "hand fly" the aircraft - Captain's choice. Remember, some aircrafts are harder to turn in to the good engine side, so give yourself plenty of maneuvering room. Watch your airspeed. When landing is **FULLY ASSURED** go ahead and then apply you're landing flaps. Both JFK and BOS have long runways, so you should be able to "get it on" without a problem. After you land safely and "roll out" on the runway you must **TURN OFF ANY REMAINING ENGINES** and **EVACUATE YOUR PASSENGERS**. Do not try and taxi the aircraft as emergency men and equipment would be standing by at your "rollout stop point" on the runway. After the aircraft is fully "shut down" and all passengers evacuated, a tug would than tow you to the maintenance hanger. Please note the following. Depending on what aircraft you are flying would indicate how the passengers are evacuated. If in a 747-400 you could taxi to the gate on three engines once cleared of the emergency and approved by company and the tower. Also an Emergency Evacuation may not be needed if the situation is under control and you are stopped on the runway. The company would supply a stairway for your passengers to egress from the aircraft. My point in Emergency Evacuation is to be able to **USE IT IF NEEDED**.

Advanced procedures for this scenario. You might want to fly the approach to minimums and then "Go AROUND". Remember to mind your directional control in regard to the "dead engine". This is where the Takeoff Flaps, that we used, and the higher than normal airspeed will come in handy. You might want to try a circling approach. This is where you "shoot" an approach to a runway and then have to circle to another. For training, we will use 1500 feet MSL (mean sea level) as "circling mins".

Ok, how did you do? Some of the common mistakes, in doing this scenario, are pulling back the wrong thrust lever when shutting down the engine, turning off the wrong generator, forgetting to reset the altimeter when passing through FL 180 descending, dumping fuel over populated areas, forgetting to brief your Chief Flight Attendant, landing the aircraft over landing gross weight, failure to mind airspeed and altitude on "missed approaches" and "go around", landing the aircraft on the runway and leaving the cockpit before shutting down the remaining engine (engines) and seeing that your passengers were evacuated safely and the number one problem is **paying to much attention to the emergency and not enough attention to flying the** aircraft. Remember, when you declare an emergency to ATC, you can do just about anything you want to affect a safe outcome. The one thing you cannot do is **CRASH**. As in the real world, there is no

such thing as "Reset Flight". Ok, this concludes this emergency. Have fun with it.

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#### **4) "THE FINAL EXAM" (For now) – ENGINE FAILURE ON TAKEOFF AFTER V1 – HOLDING - FUEL DUMPING – ILS APPROACH WITH A "ZERO FLAP LANDING".**

Here is an overview of the scenario. We are going to takeoff, at Max Gross Takeoff Weight, from JFK's runway 4 Left with the weather down to 300 feet and the visibility at one half a mile. The surface winds will be calm We are going to do the "Kennedy Seven" SID (SD)". Shortly after our takeoff decision Speed (V1) we are going to lose an engine. We will continue the takeoff, follow the SID, and go to an area for dumping fuel. We will than return to JFK and "shoot" an approach with "zero " flaps.. A "tall order" but I am sure you are up to it : <)

Our Flight Plan clearance (as given to us by JFK Clearance Delivery) is: "**WW1838 (or use your own pilot number) cleared to Destination Airport, Kennedy Seven Departure, Flight Plan Route, Departure Control On 135.9, Squawk 2201**"

The Kennedy Seven Departures for 4 Left is as follows.

**"After Takeoff, Turn right to a Heading of 100 degrees, climb to 5000"**

OK, Now let us have a discussion on "**Standard Callouts**" and "**V**" **Speeds** that we will use on this takeoff. Starting with the takeoff roll, the Pilot Flying (PF) and the Pilot Not Flying (PNF) will say the following "Callouts"

**PF – " Max Power"**

**PNF - "Set"**

**PNF – "Airspeed Alive"**

**PNF – "90 Knots"**

**PNF – "V1"**

**PNF – "Rotate"**

**PNF - "Positive Rate"**



## PF – "Gear Up"

### PNF – "V2"

OK, now let's define what these callouts mean.

**"Max Power** = Set the power setting, as derived from the aircraft's "Aircraft Performance Manual,"

for the Field conditions that you have. Some power settings are based

on "N1's", " EGT's" or "EPERS" - Use the takeoff power setting for your **aircraft**.

**"Set"** = The engines are giving their required takeoff thrust.

**"Airspeed Alive"** = The Airspeed Indicators are showing an increase in speed and they are "cross checked" and working correctly.

**"90 knots"** = The speed where the rudder becomes effective for "Directional Control". At this speed you transition from "Noise Wheel steering" to using the rudder for "Directional Control". This speed comes from the "Limitation" Section of the particular **aircraft** you are flying.

**"V1"** = The "One Engine Out "Decision Speed". If you had a problem below this speed you would

top on the runway. **Any problem above this speed, you continue the TAKE- OFF.** The speed, that we will use, for this exercise will be **130 knots for Turboprops and 140 knots for Jets.**

**"Rotate"** = A speed that the **aircraft** will takeoff. This speed is derived from the **aircraft's "Aircraft. Performance Manual".** The speed, that we will use, for this exercise will be **140 Knots for Turboprops and 150 Knots for Jets.**

**"Positive Rate"** = An acknowledgment that the **aircraft** is climbing and an indication to the PF to "Raise The Gear". It is determined by a "positive rate of climb" from the VSI gauge on the **aircraft's** panel.

**"Gear Up"** = Raise the landing gear to the Up position.

**"V2"** = A speed where the **aircraft** will give you "some rate of

climb" with one engine out. It is 1.2 times the stall speed in the Takeoff Configuration. The speed that we will use is **150 Knots for Turboprops and 160 Knots for Jets**

There are two additional speeds we want to talk about and than we will be ready to fly.

**Vfs** = Is a speed where the aircraft will fly with flaps up. This number is found in the Aircraft Performance Manual. For our exercise we will use a speed of V2 plus 20 knots.

Some pilots may question this speed but it is based on "One Engine Out" flight.

**Vref** = Is a speed we use for landing. It is based on 1.3 times the stall speed in the **Landing**

**Configuration**. It is based on weight and flap settings.

Please note that I had to come up with speeds for all Aircrafts (Turboprops and Jets). You might want to "fine tune" them for your particular aircraft. There are other callouts that are done in the real world but these are enough for us to do this exercise. Please review and memorize them.

OK, start up Flight Simulator and get in your aircraft at JFK. Set the weather to the field conditions as stated above and taxi out to Runway 4 Left and "Hold short" of the runway. Before you take the runway ("Position and Hold" or "Line Up and Wait") we want to set up the following:

**Nav One = 110.9 (Runway 4 Left ILS). Set 043 on Nav One CDI**

**Nav Two = 115.9 (JFK VOR Freq.)**

**Heading Bug Indicator on 100 degrees**

**Autopilot Altitude set for 5000 feet Altitude**

**Bug Speed (if your panel will allow) of a V2 speed of 150 knots for Turboprops and 160 for Jets.**

**Bug Speed (again if your panel will allow) of Vfs speed of 170 for Turboprops and 180 for Jets.**

No bug speed markers on your airspeed indicator? Than use you're Mouse Pointer as a bug marker. Place the pointer on



the airspeed you want to "bug" on the Airspeed Indicator.

**"Cessna 1838, Kennedy Tower, Taxi into "Position and Hold"**. Go ahead and line up on Runway 4 Left.

OK, now go over your "Takeoff Checklist".

**"Cessna 1838, Kennedy Tower, "Cleared for Takeoff"**

OK, now begin your takeoff roll.

Use the callouts that we went over above. At 90 knots test the **rudders** do they work? At 140 knots (V1) for Jets (130 knots for turboprops) we are going to **TAKEOFF NO MATTER WHAT HAPPENS**. At 150 knots (for Jets) 140 knots for turboprops we are going to start our **ROTATION**.

**OK, RIGHT AT OUR ROTATION SPEED, WE ARE GOING TO LOSE AN ENGINE.**

**Emergency memory items are in BOLD FACE RED.**

**At the first indication of Engine Failure TAKE POSITIVE CONTROL OF THE AIRCRAFT**

You will need to get a lot of rudder to stay on the runway. Keep the aircraft on the runway and continue the Rotation. **Do Not Over Rotate**. Use 10 degrees "nose up" on your Attitude Direction Indicator. When you see a Positive VSI call for Gear Up. **Accelerate to at least V2**. Fly straight-ahead until you get to 400 feet above the ground. Keep the Flaps down, unless you have Vfs. At 400 feet level off and get **V2 plus 10 knots**. When you have V2 plus 10 knots (or more airspeed) than you can start the turn to 100 degrees (Kennedy Seven SID). Easy on the bank. Make shallow turns. Again, if you have Vfs you can raise your flaps, but if not than keep them as they were. You may engage your autopilot when you have everything under control. Start off with only a 400-foot rate of climb and adjust from there. By now you should have Vfs so "up with the flaps".

When everything is under control **DECLARE AN EMERGENCY, SQUAWK 7700** You would now call for the "After Takeoff" and the "Engine Shutdown in Flight" Checklist. Remember to fly the SID (100 degrees and climb to 5000). One thing we can do for an "Engine Shutdown" checklist is turn off the generator of the failed engine. Go to your "Pull Down Menu" and select "Aircraft" than "Aircraft

Settings" than "Engines". When you get there, turn off the generator of the **FAILED ENGINE**. Get the APU (auxiliary power unit) "up and running" if you have one.

OK, at 5000 feet on a heading of 100 degrees, ATC gives you this clearance:

**Cessna 1838 cleared to CAMRN intersection, climb to 10,000 feet, and hold pilot's discretion at CAMRN, advise if fuel dumping is needed.**

The Lat. & Longs. for CAMRN Intersection are **N40.01.0 and W073.51.7**

CAMRN is made up of the 121-degree Radial of RBV (113.8) and the 198-degree Radial of JFK (115.9)

OK, I want you to fly the aircraft to **CAMRN** Intersection (about 40 miles south of JFK) and start a climb to 10,000 feet. Watch your airspeed on the climb. After you have everything set, now would be a good time to brief the Chief Flight Attendant on the situation (possible Emergency Evacuation). Also you might want to do a "cabin call" and in your **"smooth professional calm voice"**, brief the passengers on the situation. : <)

You can hold at CAMRN intersection anyway you want. We are in an emergency condition so use what you need to get the job done. I want you to try and do "10 mile legs" at CAMRN. When you hit the holding fix TURN RIGHT 180 degrees and reverse your course. Use the DME from JFK or the 4-Left Localiser to judge your turns. In the real world you would do something just like this, as you might need to "Dump Fuel" and it takes time to set things up (traffic flow and ground emergency equipment) for your return "arrival".

OK, if you need to dump fuel than go ahead and do it while you are in the hold. Go to your "pull down menu" and select "Aircraft" than "Aircraft Settings" than "Fuel". Adjust your total fuel load to 80 %. Now go ahead and do your Descent and Landing Checklist (if you have one)

After you have the required landing weight (by dumping fuel), JFK Tower will give you this clearance.

**"Cessna 1838 depart CAMRN on a Heading of 360, descend to 3,000 feet. You are cleared for the Approach, Runway 4 left".**

Now, go ahead and take up the coarse and start you descent to comply with the ATC instructions. You should not have to do any radio tuning as this was done before we departed JFK. When you get close to the Localiser intercept, you may go to extend your flaps. **BUT GUESS WHAT? NO FLAPS THEY DON'T WORK! (DO NOT EXTEND THE FLAPS) : <**

Most modern aircrafts have, at least, three ways to "get the job done" (triple redundancy). However there are a lot of mechanical devices (torsion rods, jackscrews etc.) that can get jammed. Today you are having a particularly "**bad day**" and this is your present situation. You must fly the approach and land with "**ZERO FLAPS**".

We must now come up with a Vref speed that will allow for a "zero flap" landing. I have come up with this speed for you. Use a Vref speed of 180 knots for Jets and 170 knots for Turboprops. I know this is high but I have great confidence that "**YOU CAN DO IT**". The runway length for 4 Left at JFK is 11,351 feet long.

OK, go ahead and fly the approach for 4 Left at JFK. Pay close attention to your airspeed and keep it up (at least Vref or more). When you get ready for your touchdown, the aircraft will try and "float" down the runway with this excess speed. Do not allow this to happen. Also, make sure you get the noise wheel down (forward yoke). Get Reverse or Beta range operating and apply Emergency Braking (if your panel will allow this).

**If you do this successfully, YOU will hear a "THUNDEROUS APPLAUSE" erupt from your passengers when you come to a complete stop. : <**

OK, how did you do? Some of the common problems are failure to set all the radios before takeoff, failure to maintain directional control after engine failure (going off one side of the runway), over rotating and stalling the aircraft, forgetting to do the SID (SD), bring the flaps up before Vfs, turning that aircraft at to great a bank angle, failure to dump fuel to get to landing weight, getting to slow on the approach, not landing at the touchdown markings and running off the end of the runway and finally, just "giving up".

Do not become disheartened if you can't do them the first time. **I guarantee that, through practice, you will master them perfectly.**

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