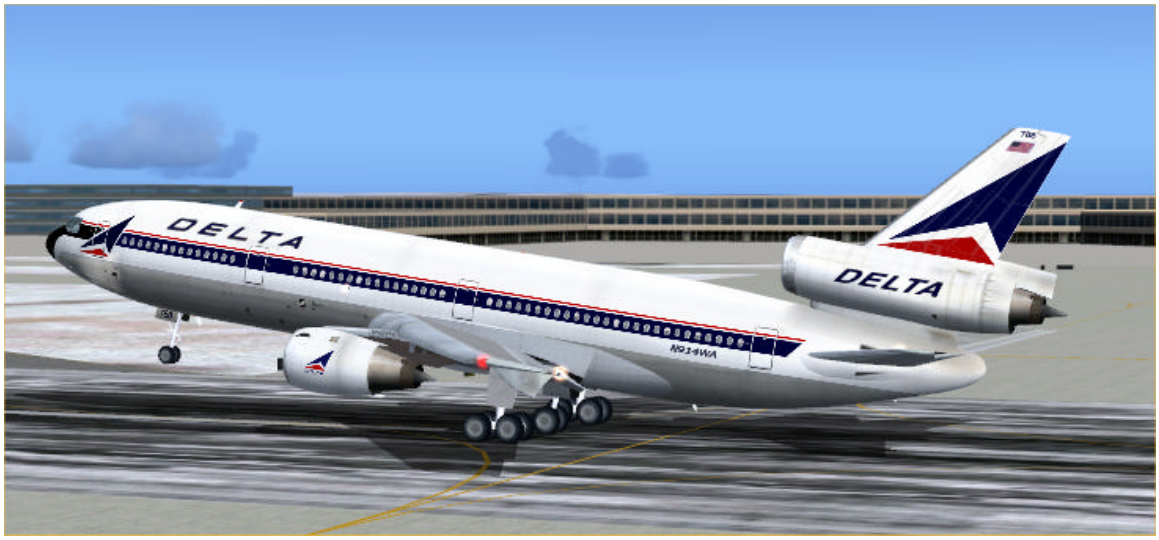
Welcome to the DC10. I'm your instructor and I will give you an overview of the DC10. We will also discuss some flying techniques to help you fly your 10 in a realistic manner.

Before we get started lets do a walk around. At first sight you may feel dwarfed by its size. She is a relatively large aircraft. Certain variants go as high as 590,000 pounds for takeoff. Now lets look at the engines. The engines on this model are the general electrics CF-6-50 high bypass turbofans. The 3 twin spooled variable stator vane engines, efficiently churn out around 52,000 pounds of thrust up to 30c degrees. Let it be known that the aircraft was first designed with only 2 engines. Next we look at the wing design. The wings were designed with high speed in mind. The key to flying the DC10 is understanding the wing. First there is a 7.5 aspect ratio. Long and thin wings produce less induced drag by weakening the wing tip vortex. Also the airfoil and wing sweep allows for higher speeds, but at a cost. The ideal high-speed wing would be a flat plate since airflow doesn't accelerate across a flat airfoil. This would push the critical Mach number up to mach 1.0. Critical mach is the speed at which the airflow over the wing starts to travel at sonic speed. If the airflow goes supersonic, it causes a shock wave that separates the airflow from the wing. This creates drag, loss of lift, and affects the pitching moments. Critical mach is a limiting speed. The dc10s critical mach number is .88. This was achieved by an airfoil compromise. Though a flat wing is ideal, it would be structurally weak, and takeoff and landing speeds would be abnormally high because of its poor lift. The DC10 airfoil is a peaky design. This means that the concentration of lift is created at the leading edge, but the airflow velocity is made to fall very rapidly in order to delay the onset of supersonic flow to a higher mach number (mach .88). Next you notice the wing sweep. Wing sweep increases the critical Mach number. The wing will behave as though it is flying slower than it actually is. The wing is swept 35 degrees. There are some disadvantages due to the sweep. 1st the low speed maximum coefficient of lift is reduced about 19%. This wing requires a higher angle of attack to produce the same lift as a straight wing.



2nd The wing tips tend to stall before the rest of the wing. 3rd Wing sweep reduces the effectiveness of the trailing edge control devices and lift devices. The lift effectiveness of a single slotted flap in a 35-degree swept wing is reduced by more than 50%.

The wing also has a 0 degree incidence. As a result of the wing design the aircraft requires a higher pitch than most to produce lift. You will also notice that the aircraft has a body clearance of 7 to 11 feet. This also gives a lot of clearance due to the high pitch angles at rotate and touch down. As you look at the #2 engine 2 things should come to mind. 1st The engine cannot gravity feed fuel in a loss of all electrical power situation. 2nd With the long intake crosswinds can cause some problems. Notice the center gear as we move around the left side. The center gear allows the aircraft to increase to higher gross weights by increasing the aircrafts footprint. As we approach the nose gear take note. The max steering angle is 68 degrees. At full tiller only 1 tire remains in contact with the ground. The surface area is that of a loaf of bread. Keep this in mind while making turns on wet or slippery surfaces. Ok enough of show and tell lets lite some fires and turn some tires.

OPS

For this flight reduce your weight to 400,000 pounds. We will plan on a cg 0f 24% 15c temp at sea level. Takeoff data= N1=110.9% V1=122 VR=140 V2=157 VFR=172 VSR=210 MIN. MAN=240 FLAPS 15. Go ahead and set your bugs and let's get ready to start. Now the normal start sequence is 3-1-2. #2 is usually started during taxi. There are 2 reasons for this. 1st The number 2 engine can cause serious damage to 2 story buildings and equipment. 2nd This will save gas. The #2 should have at least 3 minutes of idle operation before takeoff. If your gross weight exceeds 500,000 pounds then consider starting #2, but leave it idle during ground operations. Since we are at 400k lets just start 3 and 1. Once 3 and 1 are at idle, we are ready to

go. As we taxi out ill run you through some ground ops info. Now for break away thrust use about 10% of your gross weight on the N1s. That would be about 40% for us. Just remember that the nose wheel sits behind us aft of the forward entry doors. It's easy to under-shoot a turn. Keep in mind the surface area of the nose gear tires during turns. Try to make your turns at 6kts ground speed. Normal taxi speed is about 14. Also the wing engines are prone to vortex formations at slow speeds with high power settings. Think of a vortex as a small tornado that extends from the intake lip to the ground. This may cause any debris below the engine to be ingested causing foreign object damage. So try to stay below 40% if possible. Rolling takeoffs will minimize this effect. Studies have shown that 30 kias destroy vortices formed at takeoff thrust. Now when we roll onto the runway ill transfer the jet to you. When you are ready for takeoff push the power up to about 40%. Once engines are stable and scan good set takeoff power. At 80kts ensure power was set or reject the takeoff. Passing V1 you are committed. At Vr smoothly make a 4 sec-rotation to about 17 or 18 degrees to capture V2 + 10. Remember the wing design? We have to force this aircraft into the air. The 4-second rotation usually takes 800 to 1300ft of runway to lift off. As the aircraft climbs away aim for v2 + 10 or v2 engine out. Confirm a positive rate of climb and retract the gear. At 1500ft AGL set climb power and lower your nose to achieve 1000fpm or 500 if very heavy. This will allow the aircraft to accelerate. Retract flaps and slats on schedule. Climb out at MIN. MAN. or 250 which ever greater. At 10000ft lower your nose again to achieve your climb out speed. I've seen climb speeds from 300kts to 330kts company specific. Use pitch or vvi to keep your climb speed with climb power set. Try updating your climb every 5000ft. around 27,000ft continue to climb at .80 or .825. Just remember to watch your power settings. Turbofan engines are powerful at low alts but lose their punch at higher alts with thinner air. Modern turbofans are about 73% fan and 27% core when it comes to thrust. Fan dependant engines tend to lose performance at a higher rate when compared to core dependant engines. Once at alt select your cruise profile. When you get enough of cruise boredom we will start down.

DESCENT THRU LANDING

1ST Lets plan on 380k for landing. Ill let you shoot an ILS to a full stop. Decide which airfield you want in the area and review the approach. Speeds for landing are 0/RET=234 0/EXT=202 22/EXT=166 35/EXT=147. Lets descend at 320kts. Go ahead and let the autopilot handle it if you want. Plan out your descent point to give you enough time to get down. Never rush an approach. Passing 13,000 select about 500 to 1000ft per minute to slow to 0/RET or 250 which ever greater. Use the spoilers or slats if you have too. In the real jet, once at 250 you can get a max of 1500ft per minute with throttles idle and hold 250. When cleared to a lower altitude, select 0/EXT and slow to that speed. Do a quick once over to check your nav radios and make sure you are set up for the approach. Once on a vector for the approach select 22/EXT and slow to speed. Go ahead and arm the ILS or hand fly it. Take note of the pitch required to maintain level. When the glide slope indicator starts to

move put the gear down and select flaps 35 and landing speed. Do a landing check and don't forget to arm the spoilers. If the autopilot is flying keep an eye on it to ensure it's doing what you have selected. You will notice the pitch is about 4 to 5 degrees with 35 flaps on speed. Prepare to hand fly. Remember the maneuvers need to be anticipated. It's a big plane and will take a little to respond. This is important during the flare. If there is a crosswind, use the rudder to stay aligned and ailerons to move left and right. Remember to offset the rolling moment with opposite aileron when the rudder is deflected. Kill any drift or deviations from centerline early. The earlier you fight for centerline the easier your final approach will be. Start your flare between 50 and 40ft. Flare to a pitch 0f 6 to 8 degrees. Be prepared for nose pitch up at touch down. The spoilers cause this as they deploy. Because of this you will have to fly the nose to the runway. At nose contact use full reverse thrust. Passing 80kts ease to reverse idle by 60kts. Full reverse thrust below 60 will eject debris, snow and mist obstructing your view or engine ingestion. If you prang it on good job. If you grease it excellent. If you goof it go around and try try again. For practice try some touch n gos. After your nose touch down just select flaps 22 and set power to100% N1. At approach speed rotate and shoot another.

Happy Landings….

Rick