FLYING THE JET CITY AIRCRAFT DC-9 SERIES 30

The DC-9 Series 30 is a fairly forgiving airplane provided you understand some basic fundamentals about it. The purpose of this brief guide is to walk you through a flight in the DC-9, pointing out some key features and characteristics of the airplane that will help you to pilot it successfully.

This document is not intended for real world flight and is by no means a complete "how to fly" document, as many specific aspects of flying involve specific settings in the cockpit that we won't cover here. Because users of this airplane could be using a variety of cockpit environments, we will do our best to keep descriptions as generic as possible and will omit panel-specific procedures where we can. Please note that the speeds and figures listed below are only for general reference only; your airplane may need slight adjustments to account for aircraft weight, engine thrust, and weather conditions, but overall the figures below will work in most situations.

Are you ready? Let's get started!

PREPARATION

One of the most important parts of a successful flight is being prepared. Plan your flight, know your routing, and plan your fuel load accordingly.

COMPUTING MINIMUM DISPATCH FUEL

The following flight plan factors must be considered to determine the dispatch minimum fuel requirements:

- Flight plan fuel as calculated
- Alternate fuel as calculated
- Taxi fuel: 400 lbs for each stop
- Reserve: 3500 lbs
- Holding Fuel: 4400 lbs
- Instrument Approach: 500 lbs for each approach

The sum of all factors will provide the minimum fuel requirements for the flight and should not be less than 5,000 lbs.

We have provided a fuel and flight planning quick reference chart at the end of this document to assist you with your fuel planning.

Once in the cockpit, prepare the airplane for the flight as per cockpit procedure. At this time, load up the fuel you'll need for your flight. When you're ready to go, turn on the rotating beacons and switch to external view to do a quick visual check of the airplane to make sure your doors are all closed and ground service equipment is out of the way. Since you are outside the airplane, now is a good time to check the movement of your flight controls – rudder, elevators, stabilizer trim, ailerons, and spoilers should all move freely. Switch back to cockpit view and let's get going.

PUSHBACK, STARTUP, and TAXI

Push back from the gate and go ahead and start your left (No. 1), or port engine. When it's stable, you can start the right (No. 2), or starboard engine. In the DC-9, you can start engines at the gate and powerback (at certain airports), start them during the pushback process, or push back, set the parking brake, and start them at that point. Whichever way, once your engines are running and you are cleared to taxi, the fun begins.

Turn on your taxi lights, release the parking brake, and advance the throttles to approximately 45% N1. The airplane will slowly move forward. You may need slightly more or less N1 depending on winds and aircraft weight.

Keep the nose wheel centered until the aircraft starts rolling then apply pressure to the nose wheel steering to make the desired turn. Differential power or wheel braking may be used for sharp turns but do not lock the pivot wheels as this causes premature tire wear.

Keep engine RPM below 45% N1 when departing the gate where possible. Once clear of the gate area, you can increase thrust to achieve a taxi speed of between 10 and 20 knots. Taxiing at around 40-45% N1 should allow you to maintain a fairly consistent taxi speed (this is a higher N1 setting than in the real plane, but the simulator doesn't model ground handling well). After leaving the ramp, verify that your stabilizer trim and flaps are at the proper takeoff settings, and spoilers are retracted.

TAKEOFF AND CLIMBOUT

When clearance is received for takeoff, scan the annunciator panel and taxi onto the runway. Set the heading bug on the runway heading as an aid in maintaining directional control in the event an engine fails after V1.

Turn on your landing lights, and press SHIFT-W to extend them into position out of the wingtips. Turn on your strobes at this time as well.

When beginning your takeoff roll, smoothly advance throttles to around 50% N1 and allow your engines to spool up a bit. Scan your engine instruments for abnormal indications. If all is OK, continue advancing the throttles until reaching takeoff EPR (See Chart). Have your takeoff power set by 60 knots.

At VR, initiate a smooth pull back on the yoke to create a five to six second interval to rotate to approximately 15° pitch attitude.

Minimum altitude for engaging the autopilot is 600 feet AGL.

With a positive rate of climb indicated on the altimeter, retract the landing gear. Continue the climb to 1,000 feet AGL at minimum V2+10 airspeed. No turns are to be made below 300ft AGL.

At 1,000 feet AGL, lower the nose to approximately 10° and set climb thrust. During adverse conditions, the power may be left at takeoff setting, but not to exceed the 5 minute limitation. Continue climbing to 3,000 feet at a minimum of V2 + 10. Start retracting your flaps and slats as per the charts below.

Passing 3,000 feet, set climb thrust (approx 1.7 EPR) and accelerate to 250 knots at a 500 to 1,000 ft/min climb rate. Once at 250 knots, increase your climb rate to maintain 250 knots to 10,000 feet. Your climb rate should be between 1,500 and 3,500 ft/min depending on the aircraft weight, engine performance, and weather.

At 10,000 feet, turn off your landing lights and retract them by pressing SHIFT-W. Lower the climb rate to approximately 1,000 ft/min and let the airplane accelerate to a climb speed of 290 knots. At 290 knots, raise the nose again and maintain a 290 knot climbout to FL 280. You may need to increase EPR to maintain speed, but not more than an EPR of 2.23. Above 280, maintain a mach speed of .72 - .74 up cruise altitude.

If you are using the autopilot to maintain your climb rate, about 1,000 feet before capturing your cruise altitude, lower the vertical speed setting in the autopilot to 500-700 ft/min. This will enable a nice, smooth altitude capture (as the ability of the simulator to capture an altitude is less than optimal in most aircraft).

<u>NOTE:</u> Because of the design limitations of the autopilot in the simulator, many self-taught virtual pilots think that climbing up to cruise altitude is as simple as setting the autothrottle, altitude, and vertical speed, then kicking back and enjoying the ride. This is NOT a realistic way to climb in an airliner! Operating a large jet requires constant monitoring of EPR or N1 fan speed, air speed, and climb rate; it's not a "Set it and forget it" type of deal. As you are learning, it's almost easier to control the airplane's climb manually than with the autopilot vertical speed settings. What you want

to do is set your climb EPR and then adjust your rate of climb higher or lower in order to maintain a certain air speed. Remember that as you get higher, it takes more power to climb and maintain that airspeed... The reaction is to give it more throttle, but you need to do avoid touching the throttles and instead reduce your rate of climb, which will in turn allow you to maintain your airspeed. You may be able to climb at 3,000 ft/min at FL100 and by the time you are at FL280, your climb rate may be as little as 500 ft/min in order to maintain 290 knots and your climb EPR setting. This is perfectly normal when flying airliners. And of course, the settings you use today may not be the same as what you need tomorrow, as aircraft weight and weather impact performance greatly. That's part of the fun of flying… it's always different!

CRUISE

Do not normally exceed .76 mach during cruise. Max cruise speed is .78 mach, normal cruise speed is .76 mach, and econo cruise is .74 mach.

DESCENT

From cruise altitude, rotate the vertical speed wheel on the AP to between –500 and –1,000 ft/min. Maintain Mach cruise speed until FL280. At FL280, set IAS to 280 knots and set the sink rate to -1,000 ft/min. Do not exceed 1000 ft/min above FL250, as the DC-9 requires this due to cabin pressure issues. As you pass FL250, adjust the descent rate to descend at idle thrust and 280 knots. Reduce your descent rate to about 1000 ft/min at 12,000 feet to start bleeding off speed as you need to be at or below 250 knots at 10,000 feet. At 10,000 feet, turn on your landing lights, and press SHIFT-W to extend them. Set your IAS for 250 knots. Maintain 250 knots for the remainder of your descent until advised by ATC to reduce speed.

APPROACH AND LANDING

Determine aircraft landing weight from the fuel totalizer gauge. If the totalizer is inoperative, subtract the fuel consumed by both engines from the ramp gross weight.

By the time you turn onto final approach, you should be at approximately 210 knots at flaps 5. As you capture the localizer, set flaps 10 and let speed bleed to maintain 190-200 knots.

Just before glidepath capture, set flaps 15 and then flaps 25 and slowly bleed off speed to maintain 160 knots to the outer marker. Lower the landing gear. Once the gear is down and locked, arm the ground spoilers. Set flaps 30. As you approach the outer marker, set flaps 40.

Passing the outer marker, set landing flaps and establish your final approach speed as listed in the speed booklet. You should be in full landing configuration at this point.

You should not have to touch the throttles much during the final approach phase of flight, as the added drag from the gear and flaps will slow the aircraft down gradually.

Minimum altitude for disengaging autopilot is approximately 60 feet AGL.

Plan to pass over the runway numbers at 50 feet AGL. At approximately 20 feet AGL, slowly reduce throttles to idle and initiate the flare.

When the main gear touches down, the spoilers will extend, but they may not immediately extend if the runway is wet or slippery because of lack of wheel spin up. Spoilers must then be extended manually.

Pull the throttle levers immediately to the idle position while gently lowering the nose to the runway. Once the nose wheel is on the ground, reverse thrust power may be used up to 80% N1.

Upon reaching 70 knots, gradually reduce reverse thrust so as to reach reverse idle detent position by 60 knots and then use manual braking to reduce to taxi speed. Leave throttles in reverse idle

detent until forward thrust is needed, however, they must be stowed before turning off the runway. Delay application of the wheel brakes until below 80 knots if possible.

Vacate the runway at the first available turnoff. When clear of the active runway, turn off your landing lights and press SHIFT-W to retract them, and turn off your strobes. Turn on your taxi lights, retract your spoilers and raise flaps to 0.

Upon reaching the parking area, set the parking brake, shut down both engines, and turn off your rotating beacons.

That's the general procedure for flying the DC-9 Series 30.

Most of the settings listed in this document were taken directly from official flight/aircraft documents, and only modified where necessary to compensate for shortcomings in the simulator.

DC-9 SERIES 30 LIMITATIONS

WEIGHT LIMITATIONS:

	SERIES 31	SERIES 32	SERIES 33	SERIES 34	C-9
Max Ramp Weight (lbs)	109,000	111,000	115,000	122,000	109,000
Max Takeoff Weight (lbs)	108,000	110,000	114,000	121,000	108,000
Max Landing Weight (lbs)	99,000	102,000	102,000	110,000	99,000
Zero Fuel Weight (lbs)	87,000	92,000	96,000	98,500	90,000

These weights have been standardized for each aircraft type. The DC-9 Series 30s can be equipped with several different auxiliary fuel tank configurations, which would get very complicated to explain within the confines of this document. For simulator use, the above figures will be quite adequate. Takeoff and landing weights may be further restricted by runway lengths and performance requirements.

FUEL CAPACITIES:

	SERIES 31	SERIES 32	SERIES 33	SERIES 34	C-9
Main Wing Tanks (Qty: 2)	1394 gallons each	1394 gallons each	1394 gallons each	1394 gallons each	1394 gallons each
Center Wing Tank	918 gallons	918 gallons	918 gallons	918 gallons	918 gallons
Auxiliary Tank	N/A	780 gallons	580 gallons	780 gallons	1000 gallons
Auxiliary Tank	N/A	N/A	780 gallons	1000 gallons	1250 gallons

These capacities have been standardized for each aircraft type. The DC-9 Series 30s can be equipped with several different auxiliary fuel tank configurations, which would get very complicated to explain within the confines of this document. For simulator use, the above figures will be quite adequate, and these are the figures that our flight models are based on.

AIRSPEED LIMITATIONS:

Vmo: 350 KIAS
Mmo: 0.84 Mach

MANEUVERING SPEED

Do not operate aileron controls to full throw above speeds listed:
Sea Level: 235 KIAS
30,000 Ft: 270 KIAS
35,000 Ft: 255 KIAS

FLAPS EXTEND SPEEDS

Flaps 0 / Slats EXT: 280 KIAS / 0.57 Mach
Flaps 5 / Slats EXT: 280 KIAS / 0.57 Mach
Flaps 15 / Slats EXT: 240 KIAS / 0.57 Mach
Flaps 25 / Slats EXT: 210 KIAS / 0.57 Mach
Flaps 40 or 50 / Slats EXT: 180 KIAS / 0.57 Mach

LANDING GEAR OPERATING SPEEDS

Extension: 300 KIAS
Retraction: 250 KIAS

TURBULENCE PENETRATION SPEED

285 KIAS / 0.76 Mach, whichever is lower

TIRE LIMITS

Do not exceed 195 knots ground speed

MAXIMUM OPERATIONAL ALTITUDE

35,000 feet

ENGINE REVERSERS

Reverse taxiing is prohibited
In-flight reversing is prohibited

WIND COMPONENTS

Maximum tailwind for takeoff and landing: 10 knots
Maximum crosswind for takeoff and landing: 38 knots

SPOILERS

The speed brakes must only be used in the 0° flaps configuration, with or without slats extended.
Do not extend the gear with the speed brakes deployed
Do not arm the ground spoilers prior to gear extension

AUTOPILOT LIMITATIONS

Do not use the autopilot ILS mode with an engine inoperative
Minimum altitude for engaging the autopilot is 600 feet AGL
Minimum altitude for disengaging the autopilot is 60 feet AGL

DC-9 SERIES 30 REFERENCE CHARTS

FUEL AND FLIGHT PLANNING REFERENCE

(Includes 400lbs taxi fuel and figures are based on an 88,000 lb cruise weight. Be sure to add in reserve, alternate, and holding fuel to the totals below when fuel planning.)

TRIP LENGTH (nm)	FUEL REQUIRED (lbs)	TRIP TIME	OPTIMAL ALTITUDE
100	3000	0:27	FL 190
150	3800	0:34	FL 250
200	4500	0:40	FL 290
250	5000	0:48	FL 300
300	5600	0:55	FL 320
350	6200	1:01	FL 350
400	6800	1:08	FL 350
500	7900	1:22	FL 350
600	9100	1:35	FL 350
700	10200	1:50	FL 350
800	11400	2:03	FL 350
900	12500	2:16	FL 350
1000	13600	2:30	FL 350
1100	14800	2:44	FL 350
1200	15900	2:57	FL 350
1300	17100	3:11	FL 350
1400	18200	3:24	FL 350
1500	19300	3:38	FL 350
1600	20500	3:51	FL 350

TAKEOFF EPR / N1 RPM (JT8D-9 LISTED, OTHERS SIMILAR)

RAT °C	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10	15	20	25	30	35	40
Sea Level	2.01	2.01	2.01	2.01	2.01	2.01	2.01	2.01	2.01	2.01	2.01	2.01	2.01	2.01	1.99	1.95	1.90
	84.3	85.2	86.0	86.8	87.7	88.5	89.4	90.2	91.1	92.0	92.8	93.6	94.4	95.3	95.8	94.8	94.0
1000 feet	2.05	2.05	2.05	2.05	2.05	2.05	2.05	2.05	2.05	2.05	2.04						
	86.0	86.9	87.8	88.6	89.5	90.4	91.2	92.1	93.0	93.9	93.8						
2000 feet	2.11	2.11	2.11	2.11	2.11	2.11	2.11	2.11	2.10	2.07							
	87.6	88.5	89.4	90.2	91.1	92.0	92.8	93.7	94.4	94.1							
Above 5000 feet	2.28	2.28	2.27	2.24	2.22	2.19	2.16	2.13									
	94.0	95.0	95.4	95.2	95.0	95.0	94.6	94.5									

DC-9-30 FLAP SETTINGS

0
SLATS
5
10
15
25
30
40
50

TAKEOFF SPEEDS – FLAPS 0

WEIGHT (lbs)	V1	VR	V2	FL RET	SL RET	CLEAN	SEC
114,000	159	161	166	-	191	215	214
110,000	156	159	164	-	189	212	210
105,000	152	155	160	-	185	207	205
100,000	148	151	157	-	182	202	200
95,000	143	147	153	-	179	197	195
90,000	139	143	149	-	174	191	190
85,000	134	138	145	-	170	185	185
80,000	129	134	141	-	166	180	179
75,000	124	129	137	-	162	175	174
70,000	120	126	135	-	160	169	168

If over 100 degrees F or over 4,000 feet altitude, add +2 to V1 / VR

V1 = Take-off decision speed. Before V1, the pilot can abort take-off. After V1, the pilot MUST take off
VR = Take-off rotation speed at which the pilot pulls the flight controls to raise the nose and take off
V2 = Take-off safety speed to be reached before passing 35 ft above runway altitude
FL RET = Speed to begin flap retraction
SL RET = Speed that slats should be retracted
CLEAN = Minimum maneuvering speed, clean config, flaps and slats retracted
SEC = Best Engine-Out Climb. Safety speed to maintain should an engine fail.

TAKEOFF SPEEDS – FLAPS 5

WEIGHT (lbs)	V1	VR	V2	FL RET	SL RET	CLEAN	SEC
121,000	158	160	164	164	197	222	221
120,000	157	159	163	163	196	221	220
115,000	153	155	160	160	192	216	215
110,000	149	151	157	157	189	212	210
105,000	145	148	154	154	185	207	205
100,000	141	144	150	150	182	202	200
95,000	137	140	147	147	178	197	195
90,000	132	136	143	143	174	191	190
85,000	128	132	140	140	170	186	185
80,000	123	127	136	136	166	180	179
75,000	118	123	132	132	162	175	174
70,000	114	120	130	130	160	169	168

If over 100 degrees F or over 4,000 feet altitude, add +2 to V1 / VR

V1 = Take-off decision speed. Before V1, the pilot can abort take-off. After V1, the pilot MUST take off
VR = Take-off rotation speed at which the pilot pulls the flight controls to raise the nose and take off
V2 = Take-off safety speed to be reached before passing 35 ft above runway altitude
FL RET = Speed to begin flap retraction
SL RET = Speed that slats should be retracted
CLEAN = Minimum maneuvering speed, clean config, flaps and slats retracted
SEC = Best Engine-Out Climb. Safety speed to maintain should an engine fail.

TAKEOFF SPEEDS – FLAPS 15

WEIGHT (lbs)	V1	VR	V2	FL RET	SL RET	CLEAN	SEC
114,000	-	-	-	-	-	-	-
110,000	-	-	-	-	-	-	-
105,000	132	134	139	149	185	207	205
100,000	128	130	136	145	182	202	200
95,000	124	127	133	143	178	197	195
90,000	120	123	130	140	174	191	190
85,000	116	119	127	137	170	186	185
80,000	111	115	123	133	166	180	179
75,000	107	111	120	130	162	175	174
70,000	103	108	118	128	160	169	168

If over 100 degrees F or over 4,000 feet altitude, add +2 to V1 / VR

V1 = Take-off decision speed. Before V1, the pilot can abort take-off. After V1, the pilot MUST take off
VR = Take-off rotation speed at which the pilot pulls the flight controls to raise the nose and take off
V2 = Take-off safety speed to be reached before passing 35 ft above runway altitude
FL RET = Speed to begin flap retraction
SL RET = Speed that slats should be retracted
CLEAN = Minimum maneuvering speed, clean config, flaps and slats retracted
SEC = Best Engine-Out Climb. Safety speed to maintain should an engine fail.

LANDING SPEEDS – FLAPS 40

WEIGHT (lbs)	CLEAN	SLATS	FLAPS 5/15	FLAPS 25	LANDING FLAP 40	MIN G/A
105,000	207	171	165	151	136	139
100,000	202	167	161	149	132	136
95,000	197	163	157	145	129	133
90,000	191	159	153	141	125	130
85,000	186	154	149	137	122	127
80,000	180	150	144	133	118	123
75,000	175	145	140	129	115	120
70,000	169	140	135	124	111	118

CLEAN = Minimum maneuvering speed, clean config, flaps and slats retracted
SLATS = Minimum maneuvering speed, slats only extended
FLAPS 5/15 = Minimum maneuvering speed, slats and flaps 5/15 extended
FLAPS 25 = Minimum maneuvering speed, slats and flaps 25 extended
LANDING FLAP = Speed at which the aircraft should touch down at that flap setting
MIN G/A = Speed to maintain over the runway should a go-around be required

LANDING SPEEDS – FLAPS 50

WEIGHT (lbs)	CLEAN	SLATS	FLAPS 5/15	FLAPS 25	LANDING FLAP 50	MIN G/A
114,000	216	178	172	157	136	144
110,000	212	175	170	154	134	142
100,000	202	167	161	149	128	136
95,000	197	163	157	145	124	133
90,000	191	159	153	141	121	130
85,000	186	154	149	137	118	127
80,000	180	150	144	133	114	123
75,000	175	145	140	129	111	120
70,000	169	140	135	124	107	118

CLEAN = Minimum maneuvering speed, clean config, flaps and slats retracted
SLATS = Minimum maneuvering speed, slats only extended
FLAPS 5/15 = Minimum maneuvering speed, slats and flaps 5/15 extended
FLAPS 25 = Minimum maneuvering speed, slats and flaps 25 extended
LANDING FLAP = Speed at which the aircraft should touch down at that flap setting
MIN G/A = Speed to maintain over the runway should a go-around be required

DC-9 SERIES 30 CHECKLISTS

PRESTART

Master Battery Switch	On
Electrical	On
Anti-Collision Lights	On
Recognition Lights	On
Air Conditioning System	On
Radios	On

ENGINE START

Parking Brakes	Check
Fuel Quantity	Check
Beacons	On
Doors	Check
Air Conditioning Supply	Check
Fuel Boost Pumps	Check On
Ignition	Both
Pneumatic Pressure	Check
Fuel Heat	Set
Port Engine	Start
Starboard Engine	Start

AFTER START/BEFORE TAXI

Electrical Power	Check
Electrical Bus	Check
Ignition Switch	Off
Yaw Damper	On
Air Conditioning Temperature Switches	Check
Emergency Lights / Cabin Signs	Check
Hydraulic Pressure Indicators	Check

TAXI

Flight Instruments	Check
Taxi Lights	On
Fuel Heat	As Required
Flaps	Set Takeoff
Takeoff EPR	Set
Stabilizer Trim	Check
Flight Controls	Check
Brake Temperature	Check

TAKEOFF

Landing Lights	On
Strobes	On
Ignition	Both
Ice Protection	Check
Hydraulic Booster Pumps	On
Transponder	On
Radio Altimeter	Set

CLIMB AND CRUISE

Flaps	Full Up
Taxi Lights	Off
Landing Gear	Up
Ignition	Off
Boost Pumps	As Required
Air Conditioning Shutoff	Override
Hydraulic Boost Pumps	Off
Radio Altimeter	Check
Cabin Pressurization	Set
Passing 10,000ft - Landing Lights	Off

DESCENT

Cabin Pressure	Set
EPR Bug	Set
Hydraulic Boost Pumps	On
Passing 10,000ft - Landing Lights	On

APPROACH

Hydraulic Boost Pumps	Check On
Cabin Signs	On
Altimeters	Set
Navaids	Check
Flight Instruments	Check

LANDING

Landing Gear	Down / 3 Green
Ignition	Both
Spoilers	Auto
Annunciator Panel	Check
Landing Weight and Data	Check
Hydraulic Indicators	Check
Flaps	Set
Landing Lights	On

AFTER LANDING

Hydraulic Boost Pumps	Off
Flaps	Full Up
Spoilers	Retract
Landing Lights	Off
Strobes	Off
Ignition	Off
Anti-Ice Switches	Off
Taxi Lights	On

PARKING

Brakes	Release
Emergency Lights / Cabin Signs	Off
Air Conditioning Supply	As Needed
Taxi Lights	Off
Beacons	Off
Parking Brake	Set
Engines	Off
Flight Recorders	Off

SECURE

External Lighting	Off
Air Conditioning System	Off
Radios	Off
Electrical	Off
Master Battery Switch	Off