

Canadian Virtual Airlines

Aircraft Operating Instructions

Boeing 737 series

Preface

This document has been prepared to help CVA members with basic procedures to successfully operate the B737 series aircraft in FS2002 and 2004. There are 2 types of flight simulator pilots: those that like to jump in, engines running, file GPS direct and go, and those that prefer to start cold-and-dark cockpit, research their flight planned route, plan a realistic fuel load and conduct a more realistic experience. This training document has various benefits for both types of flightsim pilots.

I am not a 737 pilot, nor a licensed pilot. I am an aviation enthusiast and confirmed flightsim addict since the early days of Microsoft Flight Simulator 5 and 086 processors. I am employed as a Naval Officer, having served in HMC Ships and Submarines after beginning my military career in the Army.

Tom McCall, CVA39

Check Pilot

This document is general in scope, based on reference material available for the B737 through Microsoft Flight Simulator and PMDG. The specifications used are drawn from the PMDG 737 Series and Boeing B737 Corporate documentation, but should apply with the default B737-400 and the "737Experience B737-700" as well.

The payware model is the PMDG B737-600/700, is available at <http://www.precisionmanuals.com>. The 737-400 is included with MSFS, and the freeware "737Experience B737-700" can be found at: <http://www.avsim.com>. All three are excellent models and have advantages/disadvantages. They are similar in performance and capabilities and should perform well for you. There are a plethora of B737 aircraft available in payware and freeware models, so these procedures should work well with all of them. The 737's simplicity and ease of handling are two of the trademarks which have made it the most successful commercial aircraft in it's class.

This AOI has been created as a CVA company procedures and tutorial document. **This is not a definitive flying document for the B737.** If you require more information with procedures contained in this document feel free to contact either the author of this document or another senior member of the CVA staff for clarification. The CVA forums are also an excellent source of information on aircraft operations and other flight simulation related topics.

This manual is divided into the following sections

1. Aircraft
2. Pre-Flight
3. Start and Taxi
4. Take Off and Climb
5. Enroute
6. Descent
7. Approach
8. Appendix

1. Aircraft (B737-700 Series)

The Boeing 737-series of aircraft has gained pre-eminence as the world's most popular and reliable commercial jet transport. The 737 family has won orders for more than 5,200 airplanes, which is more airplanes than The Boeing Company's biggest competitor has won for its entire product line since it began business.

The 737 - a short-to-medium-range airplane - is based on a key Boeing philosophy of delivering added value to airlines with reliability, simplicity and reduced operating and maintenance costs. The Next-Generation 737 models build on the strengths that made the 737 the world's most successful commercial airliner, while incorporating improvements and value-added technology designed for the 21st century.

A quick search of airliners.net revealed the following Canadian operators of the B737: WestJet, Canadian North, Kelowna Flightcraft, Zoom (winter lease), CanJet, Air North, Astoria, and First Air. Almost every major US carrier operates 737 flights into Canadian airspace. The versatility of the B737 is further demonstrated by its selection by the US Navy as the replacement for the venerable P-3 Orion Maritime Patrol Aircraft.

Powerplants	CFMI CFM56-7B 24,200lb (108kN)
Performance	Max cruising speed 0.785 Mach 530 mph.
Service ceiling	37,000 feet ASL.
Range	with full passenger load and reserves: 6,038km (3,752nm)
Weights	Operating empty 11,657kg (25,700lb)
Standard Max takeoff	70,143kg (154,500lb).
Dimensions	Wing span 34.3m (112ft 7in) Length 33.6m (110ft 4in) Tail height 12.5 (41ft 2in).
Capacity	Flightcrew of two. Single class seating for 149 passengers at six abreast or 126 passengers in a two class configuration

2. Pre-Flight

Prior to commencing any flight every aviator will have determined a departure point, a planned route and a destination (along with an alternate, should bad weather arise). Flight sim enthusiasts vary in their immersion into the hobby, from flying exact real world flightplans coinciding with actual departure times, passenger loads, fuel and weather, to those that jump in and “let ‘er go”. This manual will provide you with a “middle ground” that should offer a reasonable balance between entertainment and challenge. We will assume that you are flying a standard CVA company route, commencing with a “cold and dark” flightdeck and will be flying online with squawkbox and the VATSIM network.

Your pre-flight paperwork should include:

- ◆ the departure **airport diagram**
- ◆ the SID (**standard instrument departure**) (if applicable) filed or likely to be assigned
- ◆ your flightplanned route
- ◆ the STAR (**standard terminal arrival**) filed or likely to be assigned
- ◆ approach plates for the destination airport
- ◆ the destination **airport diagram**
- ◆ Have a pencil/pen and paper to write ATC clearances/ instructions as issued

Setting up your Flight Simulator:

- ◆ start your flight program, select the 737 model, set the date/time, departure airport and choose medium gate position, not an active runway.
- ◆ start weather generation software (if req'd)
- ◆ conduct a fuel/weight and balance check
- ◆ start the squawkbox software (tutorials on installing and running SB are available at the CVA academy site). **DO NOT CONNECT TO THE NETWORK.**
- ◆ open the flight plan window and fill in appropriate fields, see diagram below
- ◆ squawk standby in SB
- ◆ connect to the VATSIM network, and immediately PING server and resend flightplan
- ◆ contact ATC (if available) to request clearance:

“Halifax Clearance Delivery, good morning, CanadianXXX with information HOTEL, request IFR clearance to Boston”

- ◆ It is important to copy the clearance as issued by ATC on your notepad to ensure a correct readback, note any changes in assigned clearance from the flightplan you submitted, query ATC if unsure. Always have a pen or pencil ready.
- ◆ enter SB FMS waypoints for your flightplanned route
- ◆ setup the FMS if flying PMDG 737
- ◆ set transponder to assigned code

- ◆ set your altitude limiter for the SID altitude
- ◆ adjust Nav and SB waypoints for any changes to route or for SID departure

You should be now ready to commence pre-start checks. Captains will normally call for engine start after receiving their clearance from ATC. ATC will usually authorize pushback and start on receipt of a correct flight clearance readback. After a successful start and pushback, you will be required to contact ATC for taxi clearance to the departure runway

3. Start and Taxi

For detailed information on the PMDG 737, refer to the excellent operating guidelines contained in the PMDG documents folder.

- ◆ conduct engine start IAW with appropriate flightsim model direction and pushback from the dock a sufficient distance to permit your aircraft to turn as you begin to move toward the assigned taxiway.
- ◆ you should have both your aircraft position light and red rotating beacon on when starting/idling
- ◆ ensure you have a clear warning panel before proceeding with your flight. The only warning light that should be illuminated post start is the parking brake indication.
- ◆ set your Nav and Comm radio frequencies as required for departure
- ◆ ensure your altimeter is set to station pressure
- ◆ contact online ATC (if available) and request taxi clearance:

“Halifax Tower, good morning, CanadianXXX ready for taxi to runway 06 for departure”

- ◆ readback the taxi clearance
- ◆ review assigned taxi clearance on airport diagram
- ◆ if other aircraft are present and online ATC is not available make a general broadcast on UNICOM freq 122.800 stating your intentions:

“Halifax traffic, CanadianXXX taxiing rwy06”

- ◆ turn on taxi light
- ◆ release brakes (make note of time for PIREP)
- ◆ advance throttles and start a slow forward roll
- ◆ test braking to ensure systems are operating normally
- ◆ taxi to the active runway, do not exceed 25 knots speed while taxiing

4. Take off and Climb

Upon reaching the hold short line or once you are in position for the departure runway as directed by ATC:

- ◆ turn off taxi lights, turn on flare/approach lights
- ◆ select strobes ON
- ◆ select wing insp lights ON
- ◆ turn on weather radar (if fitted)
- ◆ select mode C on Squawkbox and aircraft transponder
- ◆ set flaps to takeoff (iaw weight tables in ops manual)
- ◆ get takeoff clearance from ATC, and readback before advancing throttles:

“CanadianXXX, Halifax Tower, winds 070 at 13, Halifax altimeter 29.68, climb and maintain 5000’ runway heading, contact Halifax Departure through 1000’, cleared to takeoff Rwy 06”

- ◆ readback the ATC instruction.
- ◆ advance the throttles smoothly for takeoff until reaching approximately 60% N1
- ◆ when engines have stabilized and before aircraft has reached 80 kts, advance throttles to takeoff power
- ◆ monitor engine gauges closely during takeoff roll
- ◆ rotate smoothly at predetermined Vr speed from weight/balance calculations

TOW 1000kg	V1	VR	V2
70	158	162	168
65	152	154	162
60	144	147	155
55	137	139	149
50	129	131	143
45	121	123	136
40	112	115	130

◆ rotation for the 737 is 2.5° to 3° per second until a target takeoff pitch attitude of approximately 8° nose up is attained. Maintain an initial attitude of + 8-10 degrees.

- ◆ once you have verified a positive rate of climb select gear up
- ◆ flaps should be retracted according the flap retraction schedule. During flap retraction, do not select the next flap setting until the aircraft has accelerated beyond the stated airspeed for the next flap setting
- ◆ if a turn is required during the climbout, do not begin banking until the aircraft has climbed at least 200 feet AGL. Between 200 AGL and 400 AGL do not exceed bank angles of 15°.
- ◆ through 1000 AGL contact ATC as directed:

“Halifax Departure, CanadianXXX with you through 1000’ for 5000’, runway heading”

- ◆ select wing insp lights OFF
- ◆ establish 180 kias climb profile
- ◆ engage autopilot no earlier than 1000 AGL
- ◆ set ALT SEL mode (reset altitude when cleared by ATC)
 - ◆ establish 300 kias climb profile (250 kias below 10000’ AGL in USA) between 2000-2600 fpm, unless otherwise directed by ATC
 - ◆ set HDG or NAV mode as required to follow flightplanned route
 - ◆ fly assigned SID profile
 - ◆ through 10,000 ASL select flare/approach lights OFF
 - ◆ through 10,000 ASL select passenger lights OFF
 - ◆ through 10,000 ASL set IAS (290) as required for climb
 - ◆ through FL180 set altimeter to standard pressure 29.92 inches
 - ◆ reaching flightplanned altitude smoothly level off and set appropriate cruise speed (M0.70)

5. Enroute

- ◆ monitor aircraft systems to ensure ops normal
- ◆ monitor fuel consumption
- ◆ monitor weather at destination and alternate aerodromes
- ◆ plan approach procedure based on prevailing winds at the destination, standard procedures for destination airport and/or consultation with ATC
- ◆ program any variations deviations in STAR arrival into SB and/or aircraft FMS
- ◆ provide enroute ICING/TURBULENCE PIREPS to ATC as required
- ◆ monitor TCAS closely, esp in uncontrolled airspace
- ◆ monitor SB online ATC and verify whether you enter controlled airspace while enroute
- ◆ contact ATC 10-20 miles before entering the airspace
- ◆ private msg (.msg CVA822) your friends and other CVA pilots to say hello. If no ATC online and you are voice capable, maintain a listening watch on rw.avsims.net/cva for other company traffic

6. Descent

- ◆ determine top-of-descent (TOD) point

The basic calculation for rate of descent is 3 times your altitude +10 ie: at FL200 (20 X 3 = 60) +10 = 70 start a 1500fpm descent at 70 miles from destination

- ◆ prior to TOD point request descent from ATC (if available)
- ◆ if no online ATC, and Servinfo/SB TCAS indicate traffic in the area, make a general broadcast on UNICOM 122.800

“Boston traffic, CanadianXXX currently 95 miles northeast, leaving FL280 on the SCUPP2 arrival, planning ILS Rwy 27”

- ◆ monitor descent rate to level at your initial approach fix (IAF) altitude approximately 20 miles from destination
- ◆ monitor speeds/angle of attack during descent
- ◆ where speed brakes are used to control speed, they should be closed before thrust is added
- ◆ comply with ATC/STAR routing restrictions as appropriate
- ◆ below FL180 altimeter set to local station pressure
- ◆ on reaching 10,000 ASL, ensure speed is 250kts IAS or less, set flaps as called for in descent schedule
- ◆ below 10,000 ASL select passenger switches ON
- ◆ below 10,000 ASL select flare/approach lights ON
- ◆ nav radios set for approach
- ◆ study approach chart and review missed approach procedures

7. Approach

Proper planning and preparation is the key to a successful (and uneventful) approach. Aircrew workload increases with proximity to the runway. Approach and landing information should be checked and validated prior to 10,000 ASL.

- ◆ plan to be level at the initial approach fix (IAF) altitude and established clean 200kias (gear/flaps up) approximately 10 miles from the IAF
- ◆ in areas of moderate or above turbulence/chop reduce to a max of 180kias
- ◆ ATC may request you fly at a higher speed due traffic
- ◆ 1000 AGL on an instrument approach, set landing configuration (gear down and flaps iaw schedule), set autobrake and spoilers
- ◆ final check that you are on descent profile (ILS Localizer and glide slope Speed within 5 knots of target REF speed)
- ◆ throttles set to maintain speed and rate of descent
- ◆ if short field landing set maximum flaps
- ◆ upon passing final approach fix (FAF) reduce to appropriate final approach speed
- ◆ if flying a LOC - LOC(BC), ILS if either localizer or glideslope needle reaches full deflection in either direction immediately carry out a missed approach
- ◆ avoid any “drastic” manoeuvres while in this full “dirty” configuration If using the autopilot to track the approach, disconnect autopilot when:
 - airport environment in sight
 - 500.AGL
 - MAP (missed approach) procedure

Landing Weight 1000kgs	Landing V Refs		
	40	30	15
70	155	159	177
65	149	154	171
60	143	147	164
55	137	141	156
50	130	134	149
45	124	127	141
40	116	119	132
35	109	111	123

“Boston Tower, CanadianXXX, clear to the left rwy 27...”

“CanadianXXX, Boston Tower, welcome to Logan, contact Ground...”

Change frequency, contact ground (if available):

“Ground, CanadianXXX with you, clear Rwy 27, taxi to the gate”

“CanadianXXX, Ground, squawk standby, taxi to gate of your choice via...”

- ◆ readback instructions
- ◆ Complete **After Landing** Check
- ◆ Taxi to the CVA assigned parking area (if available)

At the gate, inform ATC you are shutting down:

“Ground, CanadianXXX is at the gate, shutting down, thank you and good day”

“CanadianXXX, Boston Ground, flightplan closed 2132Z, thanks for flying Boston ARTCC, good day”

Engage parking brake (record flighttime for PIREP).

- ◆ Complete the **Shutdown** Check
- ◆ Remove cap from pop/beer/vodka bottle and enjoy the beverage.
- ◆ go to CVA website, file your PIREP.

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737 Series Checklist

The following comprises an In-Flight Checklist that should be printed and kept handy in the cockpit for use during flight. This Checklist is designed to assist the virtual pilot in checking their work and validating that proper procedures have been accomplished prior to any critical phase of flight.

BEFORE START

FLIGHT DECK PREPARATION COMPLETED
 YAW DAMPER ON
 FUEL ____LBS/KGS PLANNED, ____ BOARDED
 PUMPS ON
 CAB/UTIL & IFE PASS SEAT POWER ON
 EMERGENCY EXIT LIGHTS ARMED
 CABIN SIGNS ON
 WINDOW HEAT ON
 HYDRAULICS NORMAL
 AIR CON & PRESS __ PACKS, BLEEDS ON, SET
 AUTOPILOT DISENGAGED
 INSTRUMENTS X CHECKED
 AUTOBRAKE RTO
 SPEED BRAKE DOWN
 PARKING BRAKE SET
 STABILIZER TRIM ____ SET
 FMC, RADIOS, TRANSPONDER SET
 TRIM SET
 FMC/CDU SET
 N1 & IAS BUGS SET

TOW 1000kg	V1	VR	V2
70	158	162	168
65	152	154	162
60	144	147	155
55	137	139	149
50	129	131	143
45	121	123	136
40	112	115	130

BEFORE TAKEOFF

DOORS/WINDOWS CLOSED
 RECALL CHECKED/CLEARED
 FLIGHT CONTROLS FREE
 FLAPS ____ SET
 TRIM ____ SET
 TAKEOFF BRIEFING REVIEWED
 ENGINE START ON SWITCHES

AFTER TAKEOFF

AIR CONDITIONING & PRESSURIZATION SET
 ENGINE START SWITCHES OFF
 LANDING GEAR UP and OFF
 FLAPS UP

The basic calculation for rate of descent is 3 times your altitude +10 ie: at FL200 (20 X 3 = 60) +10 = 70 start a 1500fpm descent at 70 miles from destination

DESCENT APPROACH

ANTI-ICE AS REQUIRED
 AIR COND & PRESS SET
 ALTIMETER & INSTRUMENTS SET / XCHECKED
 N1 & IAS BUGS CHECKED/SET

Landing Weight 1000kgs	Landing V Refs Flaps		
	40	30	15
70	155	159	177
65	149	154	171
60	143	147	164
55	137	141	156
50	130	134	149
45	124	127	141
40	116	119	132
35	109	111	123

LANDING

ENGINE START SWITCHES ON
 RECALL CHECKED / CLEARED
 SPEED BRAKE ARMED, GREEN LIGHT
 LANDING GEAR DOWN 3 GREEN
 FLAPS ____ SET

SHUTDOWN

FUEL PUMPS OFF
 CAB/UTIL & IFE/PASS SEAT POWER SWITCHES
 AS REQUIRED
 ELECTRICAL SOURCE ____
 FASTEN SEATBELTS SIGN OFF
 WINDOW HEAT OFF
 PROBE HEAT OFF
 ANTI-ICE OFF
 ELECTRIC HYDRAULIC PUMPS OFF
 AIR CONDITIONING AS REQUIRED
 ENGINE START SWITCHES OFF
 AUTOBRAKE SWITCH OFF
 SPEED BRAKE DOWN
 FLAPS UP
 PARKING BRAKE AS REQUIRED
 FUEL SHUTOFF LEVERS CUTOFF
 TRANSPONDER OFF

SECURE CHECK

EMERGENCY EXIT LIGHTS OFF
 AIR CONDITIONING PACKS OFF
 APU / GROUND POWER OFF
 BATTERY OFF