PMDG 737NGX

Tutorial #2

Written by Ryan Maziarz - PMDG

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INTRODUCTION

Welcome to the second tutorial flight for the **PMDG 737NGX**!

This more advanced tutorial flight picks up where Tutorial #1 left off and continues your **PMDG 737NGX** education. You'll go through the complete *Amplified Normal Procedures* from a "cold and dark" state including the various tests that a real crew performs on the first flight of the day, you'll fly a special noise abatement takeoff and climb procedure and you'll learn about numerous advanced features of the **PMDG 737NGX's** FMC that you may not know about. Finally you'll conduct a very unusual and picturesque visual approach and landing in mountainous terrain.

I want to first extend a very special thank you to Panos Lalas, Vangelis Vaos, Robert S. Randazzo, Giorgio La Pira, Jack Colwill, Johan Ketting and of course PMDG's beta team for their invaluable assistance in the creation and editing of this tutorial. Innsbruck is a difficult airport and the people above demystified it with their considerable experience.

A few prerequisites before we begin:

PREREQUISITES

1. Tutorial #2 builds on concepts introduced in Tutorial #1 and is written with the assumption that you have flown it and fully understand everything contained in it. Screenshots are not shown for every single item this time because it is assumed you know where the basic things in the cockpit are.

   If you have any questions about information or procedures from Tutorial #1, please post the questions in our forum at Avsim.com or submit a support ticket and we'll be happy to answer them.

2. PMDG expended significant resources to obtain the rights to include the actual Boeing flight manuals that pilots use in the real airplane. This tutorial makes extensive use of them. While we have provided screenshots and explanations for many of the steps, we want you to get in the habit of using these manuals as you continue learning the airplane in the future.

3. Tutorial #2 assumes that you have installed the latest service pack for the **PMDG 737NGX**, which is SP1c at the time of this

writing. If you do not have SP1c or later, please download and install it here:

http://www.precisionmanuals.com/pages/downloads/updates.html

4. A note on navdata – the **PMDG 737NGX** includes the August 2011 AIRAC cycle from Navigraph by default. (aka the "1108" cycle) Many simmers update their navdata each month through Navigraph's service. The data does change over time and thus certain aspects of the route in these tutorials can end up changing in newer data. If you're using a later navdata cycle you may see differences – just use your best judgment, things do not often change drastically and most terminal procedures will have a similar name if they've changed, often moving up one number or letter in the sequence. (for example, the BXK2 SID becomes the BXK3, things like that) If you see a NAV DATA OUT OF DATE message on the FMC scratchpad when you load the airplane, the older 1108 navdata cycle included with the product is the reason why.

5. Several utilities popular with simmers are optionally used in this tutorial:

   Active Sky 2012 – this is a full featured weather program that provides you with realistic real world weather in the simulator – AS2012 or a similar program is required to have fully accurate winds aloft and descent forecast predictions for the FMC, which is described in the addendum.

   http://www.hifitechinc.com

   FSBuild 2 – a flight planning and route export tool. In this tutorial it's used only to place the exact route into AS2012 as an exported FSX flightplan file.

   http://www.fsbuild.com

   TOPCAT – a performance calculator that will give you accurate flaps, reduced thrust and assumed temperature settings for the runway you're taking off from, similar to what a dispatcher at an airline uses.

   http://www.topcatsim.com

Aerosoft's Approaching Innsbruck – very nice FSX scenery product for the Innsbruck area.

http://www.aerosoft.com

6. This tutorial assumes the use of the default **PMDG 737NGX** aircraft options configuration – if you have changed them, please reset them to the defaults on the PMDG SETUP/AIRCRAFT page.

OVERVIEW

Our second tutorial flight has us piloting our winglet equipped 737-800 from **EHAM - Amsterdam Schiphol, The Netherlands** to **LOWI – Innsbruck, Austria**, high in the Alps. The route is around an hour and a half in length and like Tutorial #1 is a common inter-European regional flight in the real world, especially during the busy winter ski season.

Innsbruck is world-famous for its unique approaches and today we'll be flying the most famous and challenging one, known as the LOC/DME East with the circle to land procedure and visual approach for Runway 8. The last part of this approach is completely handflown – no autolands here!

A NOTE ON WEATHER AND WINDS

This tutorial will not use weather by default because doing so correctly and realistically requires a weather addon such as Active Sky 2012. If you do have AS2012 or a similar real world weather program that can output readable winds aloft data the addendum at the end of this tutorial explains how to set up AS2012 and the FMC for use with wind predictions.

If you are going to do this just please be aware that the weather situation changes dynamically just as it does in real life. The optional weather related sections are written in a generic form to account for this but it is quite possible that the departure runway at EHAM will not be Runway 24 and the arrival runway in Innsbruck will be Runway 26 instead of Runway 8 based on the actual winds.

If this is the case you have two choices – either follow the tutorial as written and accept that you may be violating real life standard operating procedures for crosswind or tailwind components on landing, or look at the charts for both EHAM and LOWI and slightly modify the tutorial

procedures so that you use the correct runways. At EHAM this will likely just mean selecting a different version of the LUNIX SID that's made for the new runway. At LOWI this could mean doing a straight in approach to Runway 26 instead of the circling procedure to Runway 8.

These are the types of situations real pilots find themselves in every day and adapting to it is something you'll get used to as you use real life weather in the sim.

- If you have a weather program and are going to use it to fly this tutorial start that program now so that it connects to FSX before we launch the flight. Please read the addendum (page 0.00.131) first so you know what to expect during the tutorial.

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A NOTE ON WEIGHTS

This tutorial is written using imperial weight units (pounds) because they're what I'm used to as an American and they're what the PMDG House Livery defaults to. I have however included the metric equivalent kilograms wherever applicable in parentheses after the imperial units if you'd like to fly with them instead. Note that these equivalents are approximate and may be very slightly "wrong" in a perfect technical sense due to rounding and conversion etc. It does not matter for our purposes here – if you're down to 1 or 2 lbs or kg making a difference, you have much bigger problems on your flight!

Both Tutorial #1 and #2 would be flown in real life with metric units – imperial units are mostly limited to North American airlines.

- If you would like to use metric units, the option can be changed in the FMC by pressing MENU, then PMDG SETUP at LSK 4R, then AIRCRAFT at LSK 1L, then DISPLAYS at LSK 2L. Press PREV PAGE once to get onto page 9/9. The option is located at LSK 3L.

FSX SETUP

Tutorial #2 is designed to pick up literally right where Tutorial #1 left off. If you've just flown Tutorial #1 and are ready to move on, there's nothing else you have to do, we'll start right from the same gate we just parked at in Amsterdam without leaving the simulator. This is simulating what's known as a "short turn" in airline lingo. As a pilot you'd likely have deplaned briefly and grabbed a bite to eat and stretched your legs in the terminal before preflighting the next leg of the day's flying.

Normally, most of the aircraft's systems would be left running for a short turn, however for the purpose of learning the procedures we did a full "cold and dark" shutdown of the aircraft at the end of Tutorial #1. We'll be going through the full preflight procedures this time, just as a crew would do on the first flight of the day.

LOADING THE SAVED FLIGHT:

If you are starting from the end of Tutorial #1 with FSX still running, skip this short section on loading the Tutorial #2 saved flight and go straight to ELECTRICAL POWER UP below.

- Start FSX and click "Free Flight."
- Click the "Load" button.
- Select the flight "PMDG 737NGX Tutorial #2 EHAM-LOWI"

The sim will load and put you in the cockpit at the same position we left off from at the end of Tutorial #1.

Note – the loading may take a long time and it may appear to hang after it finishes. If this happens, Alt-Tab to select FSX, then press Alt-Enter and it should bring it back to life.

ELECTRICAL POWER UP

With the cockpit completely dark our first order of business is to get power to the airplane.

- Open the Flight Crew Operating Manual Volume 1 (FCOM Vol. 1) to page NP.21.1 (page 77 of the pdf version).

This is the *Amplified Normal Procedures* section, which explains the steps not related to actual flying technique that the crew should use during the course of a flight from startup to shutdown. (Flying techniques are covered in the Flight Crew Training Manual (FCTM)).

In real life these procedures are broken down into items the captain and first officer accomplish separately, but since the **PMDG 737NGX** is (for now) a single pilot affair, we'll combine both pilots' duties here.

The very first line of the section informs us that the *Electrical Power Up* supplementary procedure needs to be completed first.

- Go to page SP.6.1 (page 209 of the pdf version) of the FCOM Vol. 1 and let's get started.

- On the right-center part of the lower overhead, flip the BATTERY switch guard to the closed position with a click of either mouse button. This turns the switch on as the guard closes.

- Verify that the STANDBY POWER switch just below and to the right of the BATTERY switch has its guard closed, which puts it in the AUTO position.

- Verify that the red ALTERNATE FLAPS switch guard on the upper left of the lower overhead is closed.

- Verify that both the L and R WIPER switches at the bottom-center of the lower overhead are in the PARK position.

- Verify that both ELECTRIC HYDRAULIC PUMP switches in the center of the lower overhead are OFF.

- Verify that the LANDING GEAR lever in the center of the main panel is in the DN position and that the three green lights are illuminated and the three red ones are extinguished.

Schiphol tries to minimize use of the APU on the ground for noise abatement reasons, so we'll connect the Ground Power and the Air Conditioning cart for now. We'll start the APU later in the preflight process.

- Verify both PACKS are OFF on the pneumatic panel, located on the right center side of the lower overhead.

This comes from the *Ground Conditioned Air Use* supplemental procedure located on page SP.2.2 (page 178 in the PDF). The reason for this is that the air from the cart enters the plenum downstream from the pack outlets and if the packs were supplying air too the higher pressure would cause backflow through the hose and into the air conditioning carts. See the description/schematic of the pneumatic system in FCOM Vol. 2 for more information.

- Pan down and lower the captain's yoke by left clicking it so we can see the FMC CDU clearly.

- Pan down to the captain's FMC CDU and press MENU, followed by FS ACTIONS, then GROUND CONNECTIONS.

- Press LSK 2L to connect GROUND POWER and LSK 3L to connect the AIR CONDITIONING UNIT.

The page should now look like this:

- Press MENU, then the FMC prompt at LSK 1L to get back to the IDENT page.

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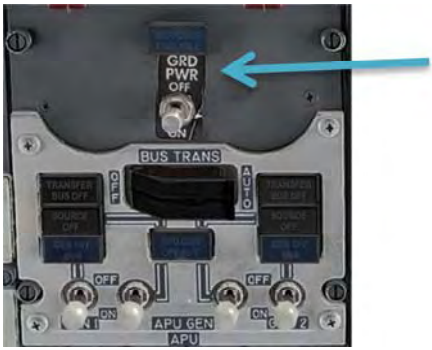
Now move to the electrical sub-panel



- Verify that the blue GRD POWER AVAILABLE light in the center above the GRD POWER switch is illuminated.

- Click the GRD POWER switch to ON.

  You'll see and hear the cockpit come to life now. When on battery only the essential systems are powered to conserve power.

  - Verify that the SOURCE OFF, TRANSFER BUS OFF and STANDBY PWR OFF lights are all extinguished.

- Turn the POSITION lights switch to the STEADY position.

This isn't explicitly stated in the manual's procedures, but these lights must be on any time the aircraft has electrical power applied.

This completes the *Electrical Power Up Supplemental Procedure*. Return now to FCOM Vol. 1 page NP.21.1 (page 77 of the pdf version) and we'll begin the *Amplified Normal Procedures*.

PRELIMINARY PREFLIGHT

Now that we've established electrical power to the aircraft, we can complete the preliminary tasks to ready the cockpit for our flight.

The 737's navigation system relies primarily on two identical Inertial Reference Systems. These use extremely high precision laser gyros located in the avionics bay under the cockpit to sense the aircraft's orientation and motion in 3D space. The FMC uses data from the IRSes to determine the aircraft's position. This position is further supplemented by and checked against data from the airplane's integrated GPS receivers and ground-based VOR radial/DME "raw data" during the course of the flight.

In order for all this magic to take place however, we must align the IRSes. It is extremely important that the aircraft not move in the slightest during the alignment process.

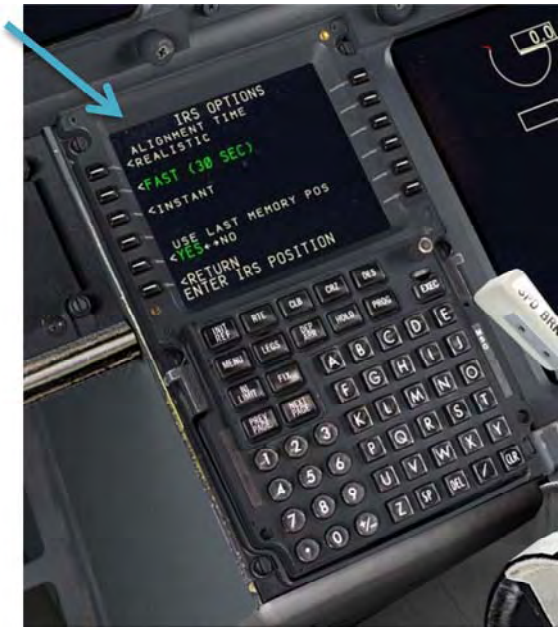
- On the upper overhead panel, rotate both IRS mode selectors to the NAV position.

  - Verify that the ON DC lights illuminate and then extinguish and then verify that the ALIGN lights are illuminated.

    The ALIGN lights will begin flashing after 30 seconds meaning the gyros are aligned but no position has been

entered – we will deal with this in a minute when we enter our current position into the FMC CDU.

Note that by default we've set the IRS alignment time to be much faster than it is in real life. The real process takes around 10 minutes to complete and in the interest of helping out those impatient simmers out there, we defaulted it to 30 seconds. If you'd like the alignment time to be realistic, you can change this in MENU > PMDG SETUP > OPTIONS > SIMULATION > IRS OPTIONS. Chose the first option at LSK 1L, REALISTIC.



Next are a series of miscellaneous checks:

- The VOICE RECORDER isn't something that has a tangible function in Flight Simulator environment so we'll ignore this line.

- Check the round crew oxygen pressure gauge on the upper overhead and ensure that it's within the allowable range for this flight. A table for this exists in a supplementary Boeing manual that is not included with the 737NGX, so you can assume for all intents and purposes that the pressure is sufficient.

- Check the OIL QTY percentage on the lower engine display unit (DU) that is just forward of the thrust levers. Neither engine should read "RF" for refill. It is normal for there to be a difference between the two engines however.

- Press the MFD SYS button above the upper engine DU. Look at the lower engine DU and verify that the hydraulic fluid quantity in both the A and B systems are normal and do not read “RF” for refill.

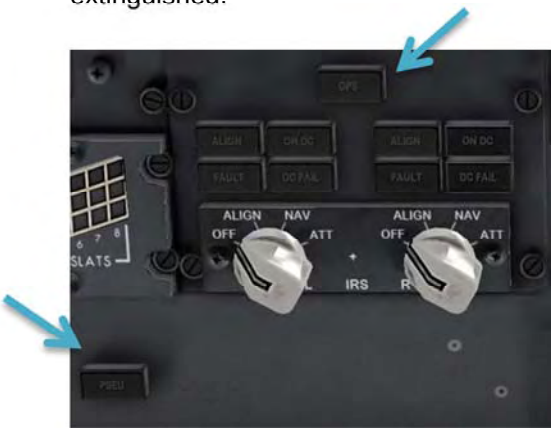
- Press the MFD ENG button to get back to the engine display.

On a real aircraft you would now check the maintenance papers for this particular aircraft like the minimum equipment list (MEL) to see if anything is currently inoperative or “INOP” in industry lingo. This isn’t applicable here, so we’ll skip this step.

- The FLIGHT DECK ACCESS SYSTEM switch referred to on the next line is not modeled in a realistic fashion in the **PMDG 737NGX**. We did this specifically because it’s a critical security system on the real aircraft that no one besides real flight crews need to know how to operate. Ignore this line for now.

- Check for the presence of the crash axe and fire extinguisher, which can be viewed in their normal storage locations in the virtual cockpit. The extinguisher is located behind the FO's seat and the crash axe is located behind the jumpseat near the cockpit door. The escape ropes and other items are stored in the closet near the cockpit door and are not visible.

- Verify that the PSEU and GPS lights on the upper overhead are extinguished.



The Proximity Switch Electronic Unit (PSEU) monitors the position or state of certain components such as the flaps, gear, spoilers, doors and so on and is involved in items such as takeoff configuration warnings and the gear position indicator lights.

- The **PMDG 737NGX** is not equipped with the GNSS Landing System (GLS) option, so skip the next two lines in the manual.

- Verify the SERVICE INTERPHONE switch on the upper overhead is OFF.

- Verify that the REVERSER 1 and 2 lights are extinguished and the two EEC switches under the plastic guards are ON on the upper overhead's engine section.

- Verify that the PASSENGER OXYGEN switch guard is closed and the PASS OXY ON light is extinguished.

  Be very careful here not to open the guard and flip the PASSENGER OXYGEN switch – this will deploy the oxygen masks in the cabin. If you accidentally do that this airplane's not going anywhere today and neither are you!

- Verify that the three backup LANDING GEAR indicator lights on the upper overhead are illuminated green.

- Verify that the FLIGHT RECORDER switch guard is closed, which sets the switch underneath to NORMAL.

- Circuit breakers and the manual gear extension access door are not modeled in the **PMDG 737NGX**, so ignore the next three lines in the manual.

- The ground crew won't be checking the brake wear indicator pins today so there's no need to set the parking brake while we're still chocked at the gate.

ROUTE OVERVIEW

Let's now review the route before we move on to programming the FMC.

Our route is:

LUNI1S.EDUPO.UZ738.MISGO.UZ741.GMH.UL603.TESGA.UZ729.BOMBI.T104.XERUM.UM867.BAVAX.Z106.MANAL.M736.TULSI.TULS3A

This is exactly like the route we used in Tutorial #1 except it has quite a few more airway segments in the enroute portion.

We'll be departing Schiphol's Runway 24 via the LUNIX 1S SID, which ends at a departure "gate" fix called EDUPO that funnels traffic out of the terminal area. From there we follow airway UZ741 to the MISGO

intersection fix, airway UZ741 to the Germinghausen (GMH) VOR, airway UL603 to the TESGA intersection fix, airway UZ729 to the BOMBI intersection fix, airway T104 to the XERUM intersection fix, airway UM867 to the BAVAX intersection fix, airway Z106 to the MANAL intersection fix and finally airway M736 to the TULSI intersection fix, which is also the transition point onto the TULSI 3A STAR into Innsbruck. The TULSI 3A terminates at the Rattenberg NDB (RTT), which is where we'll begin the LOC/DME East approach procedure.

Our flightplath crosses The Netherlands, Germany and then into Austria.

Our alternate on this flight will be EDDM – Munich, Germany about 50 nautical miles to the northeast of Innsbruck.

The charts for the SID, STAR, Approach and the special circle to land procedure are all included at the end of this document.

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FMC PREFLIGHT

Let's continue with the *Amplified Normal Procedures.* Pan down to the captain's FMC CDU, which should be on the IDENT page.

- Verify that the aircraft type, engine thrust rating, and the NAVDATA cycle and active date range are correct.

We're flying a 737-800WL, we have 26K engines, and the 1108 AIRAC and its active date range is correct. (again, remember we're doing this for the purpose of the tutorial, if you see a NAV DATA OUT OF DATE message at any time, just clear it with the CLR key)

- Press LSK 6R to go to the POS INIT page.

  - Verify that the current date and time at LSK 5L are correct. Note that the time is shown in zulu (aka GMT).

- Type EHAM into the scratchpad and line select it into LSK 2L. This gives us the coordinates for the airport's center at LSK 2R.

Notice the ENTER IRS POSITION message in the scratchpad. We now need to give the IRSes our current position to align on. There are several acceptable ways of doing this including using the airport's center coordinates from this page, the airplane's current GPS coordinates and getting the gate's coordinates from the airport's charts and typing them in manually. In this instance we'll use the GPS position as it's more accurate than using the center of the airport.

- Press the NEXT PAGE button to go to the POS REF page.

  - Verify that the GPS L and GPS R positions agree and then press the left side LSK next to either one to copy the coordinates into the scratchpad.

- Press PREV PAGE to go back to the POS INIT page.

- Line select the copied coordinates into LSK 5R.

  You'll now see the PFD and ND change to show the normal aligned symbology.

- Clear the DUAL FMC OP RESTORED message with the CLR key. This message is a result of going from battery power to the full ground power since only one FMC functions while on battery.

We'll now move on to entering and initializing the lateral route.

- Press LSK 6R to go to the RTE page.

- EHAM is automatically in the scratchpad due to entering it on the POS INIT page – line select it into the ORIGIN field at LSK 1L.

- Type LOWI and insert it into the DEST field at LSK 1R.

- Type PMDG738 and insert it into the FLT NO. field at LSK 2R.

  The completed RTE page 1 should look like this:

We'll now enter the runway and SID since we already know what they'll be. The procedure in the manual has the enroute portion entry happen first, which is also perfectly normal. In real life you often don't know exactly which runway and SID you're going to get until you talk to the Clearance/Delivery and Ground controllers, so doing it that way allows you to have most of the route entered and then select the runway and SID when they're actually assigned to you.

- Press the DEP ARR button to go to the DEP/ARR INDEX page, then press LSK 1L for the EHAM DEPARTURES page.

- Press NEXT PAGE then PRESS LSK 3R to select Runway 24.

- Press NEXT PAGE and then LSK 1L to select the LUNI1S SID.

  The page should look like this:

Next we'll enter the enroute portion of the route.

- Press LSK 6R to go to back to the RTE page 1.

- Press NEXT PAGE to get to RTE page 2, where we enter airways.

- Enter the first airway, UZ738 into the VIA column at LSK 2L.

  We're going to use a cool shortcut now to enter the rest of the airways.

When you have a series of connected airways like this, you can actually just enter the airway names alone sequentially into the VIA column. The FMC is smart enough to know what the common waypoint is between each pair and it's automatically entered. This saves a ton of time on routes with a lot of airways like this one.

- Enter UZ741 into the VIA column at LSK 3L below UZ738.

  MISGO automatically appears in the row 2 TO column.

- Enter the rest of the airways in the VIA column

  - UL603
  - UZ729
    (press NEXT PAGE to get to a new route entry page)
  - T104
  - UM867
  - Z106
  - M736

- Complete the final segment by typing TULSI and entering it into the TO column at LSK 4R across from M736.

Now we'll enter the STAR and approach. Again, in real life this would probably be done in the air before descent because you often don't know which STAR, approach, and landing runway ATC will assign you until you talk to the last center controller and the first approach controller later in the flight.

- Press DEP ARR to get to the DEP/ARR INDEX page, then press LSK 2R for the LOWI ARRIVALS page.

- Press NEXT PAGE and then press LSK 1L to select the TULS3A STAR.

- Press LSK 1R to select the LLZ 26 approach, which is the navdata's name for the LOC/DME East procedure.

- Press LSK 3R to select the Rattenberg (RTT) transition for the approach. This links the approach up to the STAR with no route discontinuity.

  The page should look like this when done:

We now need to check the route for accuracy on the LEGS page.

- Press the LEGS button.

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As in Tutorial #1, there's a couple small issues with the coding of the SID procedure in the navdata vs. what the charts indicate. Let's fix that.

- Type 220B/ and enter it at LSK 2R – the EH008 RNAV fix on the chart is actually a MAX 220 knots restriction, not a hard mandatory 220 knots.

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We also want to cross Rattenberg (RTT) at exactly 9500 feet to decelerate, configure our flaps and gear and prepare for the steep descent part of the approach.

- Press NEXT PAGE until you see page 5/9.

- Type 9500 and line select it at LSK 4R across from RTTNB, replacing the “soft” 9500 at or above restriction that’s there.

Note – the navdata often adds “NB” after waypoint names that are NDBs in terminal procedures. The NDB is actually called RTT but the CDU will show it as RTTNB.

Everything else in the route looks good.

- Press LSK 6R to ACTIVATE the route, then press the illuminated EXEC button to execute it.

We now need to initialize the FMC’s performance data.

You may be wondering why we haven't set the aircraft's fuel load yet. The reason is that we're going to use the FMC itself as a fuel planner of sorts to figure out the right amount to load or unload. In real life, airline dispatchers use very sophisticated software that effectively has the aircraft's performance data and path solver integrated into the application. Boeing produces a document called the Flight Planning & Performance Manual that contains tables upon tables that describe this data. This data was used in creating the **PMDG 737NGX**, but we weren't allowed to include the FPPM unfortunately.

For these reasons the most accurate method with an addon like this is to move the fuel planning to later on in the preflight process so that we can use the FMC's own predictions to arrive at a value to use.

It is true that in real life you'd usually get the fuel values on the dispatch papers and the aircraft would be fueled prior to preflight, but this is just the work-around we have to use in the simulation environment to get accurate predictions. We'll get to the fuel planning in a minute.

- Press INIT REF to get to the PERF INIT page.

- Enter the Zero Fuel Weight (ZFW) using the shortcut we learned about in Tutorial #1 – click once on LSK 3L to copy the current value to the scratchpad, then click LSK 3L to enter it. It should be somewhere around 122.6 or 122.7 lbs. (55.6 or 55.7 kgs)

- Since we're flying an airplane with aspirated TAT probes, verify that "TO" for takeoff appears on the upper engine DU.

- For now, enter 5.0 lbs (2.3 kgs) for fuel RESERVES at LSK 4L. (We'll change this in a bit when we figure out the actual fuel load needed.)

- Let's use a slightly higher COST INDEX for this flight than we used in Tutorial #1 – enter 36 at LSK 5L.

- Enter our cruise altitude of FL390 at LSK 1R

  Notice that the TRIP figure on the left half of the LSK 1L cruise altitude field says something between FL395 and FL401 – this is the minimum cost altitude for this route at the weight and CI we've selected. Normally you would want to get as close as you can to this altitude, which is FL390 in this case for our direction of flight. Do note however that sometimes ATC will have a reason for making you file a lower cruise altitude – this can and does happen.

- Enter 360/0 into LSK 2R since we have no wind in the simulator.

  If you are using wind, go to the weather addendum at the end of

this document where this entry is explained in detail.

- Leave the temperature fields at 4R and 5R alone.

  Again if you're using weather, these entries are explained in the addendum.

- Enter 3000 into the TRANS ALT field at LSK 5R, which is EHAM's transition altitude.

- The completed PERF INIT page should look like this:

- Press the illuminated EXEC button to execute the performance data.

  Notice that we now get a USING RSV FUEL message in the scratchpad – this means that we'd be below our current 5000lb (2268kg) reserves limit on arrival to Innsbruck if we took off with our current fuel load. We would be forced to divert or declare an

emergency – not good!

- Clear the USING RSV FUEL message with the CDU's CLR key.

Let's take care of the fuel planning situation now to resolve this.

FUEL PLANNING

First off, if you aren't interested in learning this detailed procedure, a good simple estimate is to take the length of your flight and then add around 2200 lbs (1000 kg) per 100nm. Then add around 5500 lbs (2500 kg) for reserves.

This flight is around 450 nm, so there are effectively 4.5 100nm legs.

- 4.5 x 2200 lbs = 9900 lbs
  (4.5 x 1000 kg = 4500 kg)

- 9900 lbs + 5500 lbs = **15400 lbs**
  (4500 kg + 2500 kg = **7000 kg**)

Remember that this is just an estimate and can be significantly wrong on flights involving a long distance to the alternate.

Let's now continue with the detailed procedure – you may want to pause FSX while we go through these calculations.

We're going to break the fuel calculations up into two basic parts – the main route of the flight from Amsterdam to Innsbruck and then the potential diversion from Innsbruck to our alternate in Munich, Germany.

The formula for the main route is:

Trip fuel + contingency fuel + taxi fuel + extra

The formula for the alternate diversion route is:

Trip fuel + contingency fuel + holding fuel

Add the results of these two parts together, round up to the nearest 500 lbs or kg and we'll have the amount we actually want loaded in the airplane's tanks.

MAIN ROUTE:

TRIP FUEL:

This is how much fuel we actually need in the air from EHAM to LOWI. We'll get this from the FMC PROGRESS page and a bit of basic arithmetic.

- Press the PROG key to bring up the PROGRESS page.

We're concerned with the 4th and 5th rows here. Line 4 is telling us our distance to go (DTG), predicted arrival time and predicted remaining fuel at LOWI. Line 5 shows us our current total fuel on the right side.

Arriving at accurate predictions for these numbers is one of the

most complicated programming tasks we have in creating an addon like the **PMDG 737NGX**. The FMC in effect simulates the whole flight mathematically, taking into account the changes in fuel flow, drag and so on throughout each phase of the route.

Takeoff and climb use more fuel than cruise or descent do – the FMC knows all of this specific to the engine limits for this actual flight. This is why a simple fuel planner that operates on an average fuel flow number won't come up with completely accurate predictions for you.

After my particular run of Tutorial #1's flight, according to the FMC I arrived shut down at the gate in Amsterdam with 9600 lbs (4354 kg) of fuel in the tanks.

Your value may differ slightly, but it doesn't really matter. What matters here is the process we're using, not the exact numbers. You can adapt this process to any flight you do.

Note - the FMC displays fuel quantities in multiples of 1000:

9.6 * 1000 lbs = 9600 lbs
(4.4 * 1000 kg = 4400 kg)

Note 2 – the FMC's total fuel number is often overstated by an average of 200lbs or so versus the true amount displayed on the upper engine DU fuel gauge. This is a realistic quirk of the real airplane that we've modeled in the **PMDG 737NGX**. It is not a concern in these calculations however because all of the FMC fuel numbers are overstated by the same factor – it'll work out the same when we arrive at a total amount to load.

This small variable difference could make the total at LOWI or at EDDM off by one or two hundred pounds with respect to the numbers I'm using here. If this is the case, just adapt the new number into the calculations. The total fuel we load at the end after rounding up should not actually change due to this.

- Take the total fuel at LSK 5R and subtract from it the predicted destination fuel at LSK 4R. For my specific flight these numbers were 9.6 and 3.2 lbs. (4.4 and 1.5 kg)

  9600 lbs - 3200lbs = **6400 lbs base trip fuel**
  (4400 kg – 1500 kg = **2900 kg base trip fuel**)

There are also a couple trip fuel corrective factors that need to be added for this particular flight:

Use of flaps with the gear down adds around 132 lbs (60 kg) per minute more. We'll be in this condition for around 5 minutes earlier than normal as we begin the approach.

- 132 lbs * 5 = **660 lbs flaps and gear down correction**
  (60 kg * 5) = **300 kg flaps and gear down correction**)

We also need to account for the possibility of doing a go-around and missed approach. The standard correction added is **286 lbs (130 kg) to account for a go-around**.

Both of these corrective factors come from the FPPM.

So, our final values for trip fuel are:

- 6400 lbs + 660 lbs + 286 lbs = **7346 lbs trip fuel**
  (2900 kg + 300 kg + 130 kg = **3330 kg trip fuel**

CONTINGENCY FUEL:

This is a legal requirement for airline flights and is defined as 5% of the trip fuel. This accounts for things like ATC vectoring, being assigned non-optimal altitudes and so on.

- Multiply our trip fuel by 0.05

  7346 lbs * 0.05 = **367 lbs contingency fuel**
  (3330 kg * 0.05 = **167 kg contingency fuel**)

TAXI FUEL:

This is an estimate of the fuel that's going to be used by the APU and by the engines while taxiing. The standard figures used on almost every NG flight in real life are 30 minutes APU time and 10 minutes taxi time. The APU burns around 4 lbs (1.8 kg) per minute. Two engine taxi burns around 27 lbs (12.2 kg) per minute)

- 4 lbs * 30 = 120 lbs APU
  (1.8 kg * 30 = 54 kg APU)

  27 lbs * 10 = 270 lbs taxi
  (12 kg * 10 = 122 kg taxi)

  120 lbs + 270 lbs = **390 lbs taxi fuel**
  (54 kg + 122 kg = **176 kg taxi fuel**)

EXTRA FUEL:

This is where your decision making as the captain comes into play. There is no set number for how much extra fuel you need, but for this route there are several obvious practical concerns we need to account for.

- The LOC/DME East approach that's currently loaded into the FMC is set up to land on Runway 26, but we'll be breaking off from it to circle around and land on Runway 8. This uses extra fuel. You always want to plan for the worst case scenario as far as the distance you'll need to go in the terminal area – the winds could change and ATC can always assign you an approach that causes you to have to circle around to the opposite side of the airport that you planned on.

  We'll add 1000lbs (454 kg) extra to account for the circling approach.

- The LOWI approaches are very challenging and there's a very real chance you may have to go-around and execute the missed approach procedure, which involves a high thrust climb

and circling back to try again.

We'll add 573 lbs (260 kg) extra to account for the possibility of extra go-arounds. This number comes from the FPPM.

It's also quite possible that a hold over RTT may be required if there's weather at LOWI. To account for this we'll add 30 minutes of hold fuel.

- Holding uses around 84 lbs (38 kg) per minute. (assumes best hold speed at 1500 feet above ground level)

  84 lbs * 30 = 2520 lbs hold fuel
  (38 kg * 30 = 1140 kg hold fuel)

Our total extra fuel is thus:

- 1000 lbs + 573 lbs + 2520 lbs = **4093 lbs extra**
  (454 kg + 260 kg + 1140 kg = **1854 kg extra**)

Our total main route fuel requirement thus is:

- 7346 lbs + 367 lbs + 390 lbs + 4093 lbs = **12196 lbs main route fuel**
  (3330 kg + 167 kg + 176 kg + 1854 kg = **5527 kg main route fuel**)

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ALTERNATE DIVERSION ROUTE:

TRIP FUEL:

This is how much fuel we actually need in the air to fly the missed approach at LOWI and go directly to EDDM. For this we're going to use a page you may not have seen before – ALTERNATE DESTS. Press INIT REF, then press LSK 6L to get to the INDEX.

- Press LSK 3R to get to the ALTERNATE DESTS page.

The ALTN DEST page allows you to plan diversion routes to a number of airports by inserting their ICAO identifiers. It will tell you how far the alternate is either direct from your current position or via the destination missed approach procedure. In this case we're concerned with what the results are if we have to divert after a go-around and missed approach.

- Type EDDM into the scratchpad and insert it at LSK 1L.

Without any modifications this entry shows that we're going to an alternate (ALTN) of EDDM, via direct (D) from our current position, there's 358nm distance to go (DTG), our estimated time of arrival and the estimated fuel burn to get there.

We don't want to know what it'll take to go direct from our current position though, we want to know what it'll take to go from LOWI to EDDM in the event the weather is bad and we need to go-around and divert.

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- Press LSK 1R to go to page 2.

  (you can also press NEXT PAGE but the right LSKs act as shortcuts if you have more than one alternate entered in)

- Press LSK 5L to switch to calculating the alternate via the MISSED APP.

  Notice now that all the fields change to reflect values that take the whole flight to Innsbruck followed by a missed approach and diversion to Munich into account.

We're going to increase the altitude to FL140 (14000) feet since we can't actually fly at the optimal altitude of 13622 feet. We'd normally want to go to the highest altitude without going over the best cost trip altitude, which for this diversion would be FL120, but in this case we're going to go up to FL140 so that we're absolutely ensured terrain clearance. The highest mountain in the Austrian Alps is about 12500 feet high.

- Enter 14000 into the TRIP ALT field at LSK 1R.

Now we can calculate our alternate trip fuel:

- Subtract the predicted fuel at EDDM - 2200 lbs (998 kg) from the PROG page's predicted fuel at LOWI - 3200 lbs (1451 kg).

  3200lbs - 2200lbs = **1000lbs alternate trip fuel**
  (1451 kg – 998 kg = **453 kg alternate trip fuel**)

CONTINGENCY FUEL:

This is a legal 5% requirement for the alternate as well.

- 1000 lbs * 0.05 = **50 lbs contingency fuel**
  (453 kg * 0.05 = **23 kg contingency fuel**)

HOLD FUEL:

- It's also a legal requirement that we carry fuel to account for 30 minutes in a holding pattern during the diversion to EDDM. Holding uses around 84 lbs (38 kg) an hour. This assumes best hold speed at 1500 feet above ground level.

  30 * 84 lbs = **2520lbs hold fuel**
  (30 * 38 kg = **1140 kg hold fuel**)

Our total alternate diversion route fuel requirement thus is:

- 1000 lbs + 50 lbs + 2520 lbs = **<u>3570 lbs alternate diversion route fuel</u>**
  (453 kg + 23 kg + 1140 kg = **<u>1616 lbs alternate diversion route fuel)</u>**

We can now calculate the total by adding the two parts of the route together:

- 12196 lbs + 3570 lbs = 15766 lbs
  (5527 kg + 1616 kg = 7143 kg)

  Round up to the nearest 100lbs or kg and we have **15800lbs (7200 kg) total to load.**

- On the captain's CDU, press MENU, then FS ACTIONS, then FUEL.

- Enter 15800 (7200 kg) into the TOTAL LBS field at LSK 1L.

- Press INIT REF to return to the PERF INIT page.

  Notice that the TRIP optimal altitude has gone down to FL393 or somewhere close to there now as a result of the additional weight from the fuel.

- Enter our true RESERVES figure into the LSK 4L, which is the total fuel needed for our alternate diversion route. (hold + trip) This is rounded up to the nearest tenth and represents fuel x 1000lbs.

  In my case the number is 3.6 lbs (1.6 kg) but yours may vary depending on what your exact calculation for the alternate diversion is.

  Note – the reserves calculation will be different on ETOPS flights. What is shown here is only valid for normal non-ETOPS flights.

The finished PERF INIT page should now look something like this:

From this point forward, if you get to the point where you see a USING RSV FUEL scratchpad message during the flight, you MUST legally divert to Munich or declare an emergency at Innsbruck. The diversion is obviously preferable in this case - you'll have some explaining to do for the authorities if you declare an emergency!

One final item to talk about relating to fuel planning – the PERF INIT page has a field at LSK 2L called PLAN/FUEL. This effectively allows you to enter in a different amount of fuel you're planning to actually have onboard so that we can get even closer values for our takeoff V speeds. It's normally used (as mentioned in the manual) when refueling hasn't been completed yet to use the correct weight value for the performance calculations, but play around with inserting different fuel numbers here and you can see the effect it has. It changes the gross weight, trip altitude, and so on.

Congratulations, you've just planned and loaded fuel for this flight using similar logic real world dispatchers and pilots would use!

TAKEOFF PERFORMANCE CALCULATION

We'll now continue with the final few FMC preflight steps. Calculating accurate numbers for the takeoff thrust and flap settings involves the use of a tool called TOPCAT, as mentioned earlier. If you don't have the tool you can skip to the end of this section and still get the values to use for this particular flight.

- Start TOPCAT.

We first need to add an aircraft that represents our airplane.

- Press the Add… button on the right side.

- Type N738PM in the registration box.

- Select Boeing 737-800 in the Type dropdown.

- Select PMDG Mixed Class in the Configuration dropdown.

  Note – this profile is actually for our older FS9 version of the 737NG, TOPCAT does not yet have a dedicated profile for the **PMDG 737NGX**. The calculations however are still valid and correct because they come from the same source. You should not use TOPCAT to load any payload or fuel – load it via the FMC. We're just using TOPCAT to get the correct thrust settings.

- Check all three boxes under Thrust Policy. This allows us to use both fixed derates and assumed temperature numbers alone or in combination with each other.

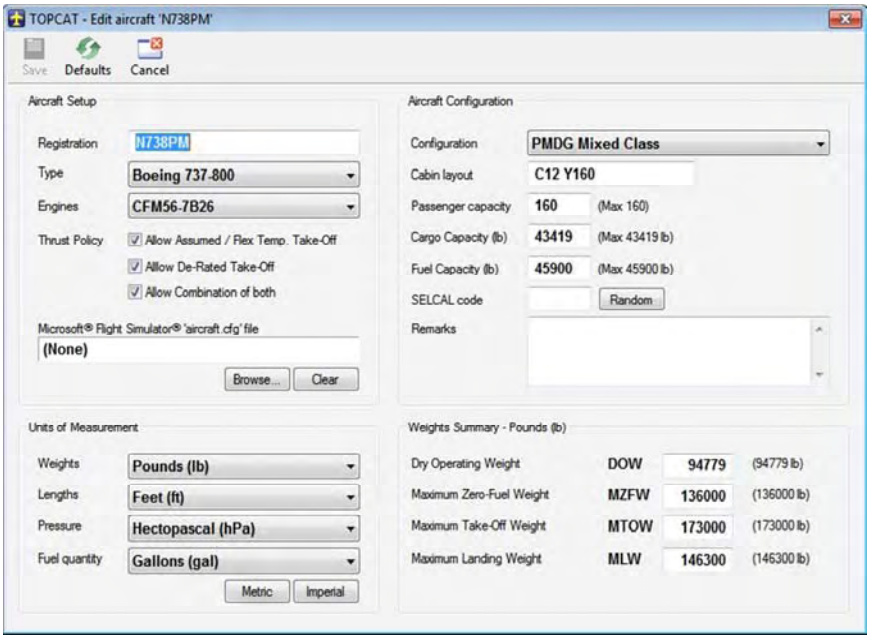
  Our old FS9 version of the 737 didn't have the fixed derate option and that's why they're unchecked by default here when you first select the PMDG Mixed Class profile.

- We do not want to select an aircraft.cfg file because we won't actually be using TOPCAT to load the aircraft.

- If you're using metric weights you can select kilograms in the Weights dropdown.

- Select hectopascal for the pressure unit since we're flying in Europe. You can change this to inHg later if you like for flying in the US.

The window should now look like this:



- Press save and we'll have our aircraft in the window now. Select it by clicking on it.

- Press the Take-Off button with the red icon at the top of the screen.

- Type EHAM into the Airport field and select Runway 24 from the Runway dropdown list.

- Enter 000/00 in the Wind field.

- Enter +16 into the Temperature field

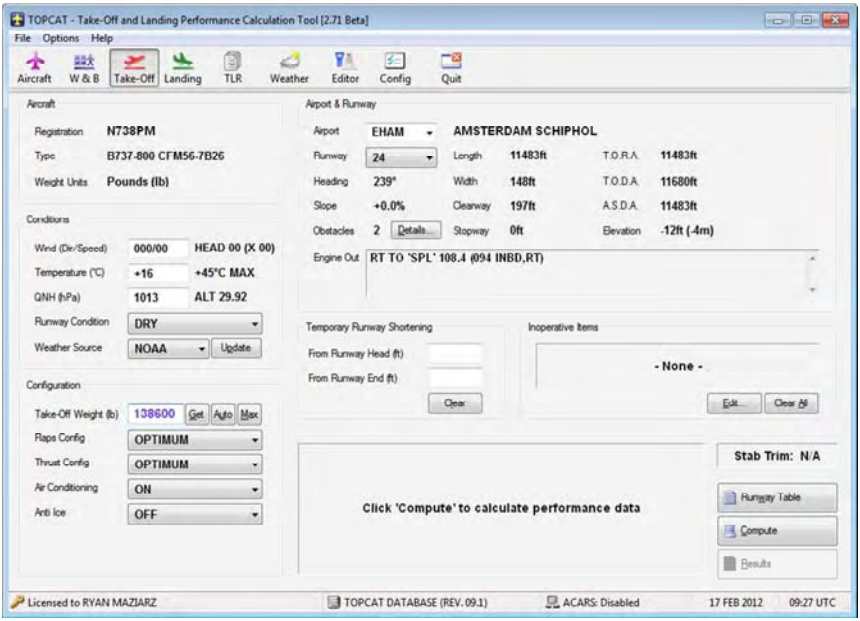
- Enter 1013 into the Pressure field.

  You would enter the actual values for the wind, temperature and pressure if you were using weather.

- Enter your expected takeoff GW from the PERF INIT page into the Take-Off Weight field. This is our predicted takeoff weight after using the PLAN feature in the FMC. For me, this was 138600 lbs (62868 kg).

The other settings can all be left on their defaults.

The page should now look like this:



- Press the Compute button at the lower right side of the window.

The bottom row of the results that appear is the minimum allowed thrust for this takeoff and this is what we'll use.

This should be **Flaps 1, a TO2 fixed derate and a 44C assumed temperature.**

- Back in the cockpit, press LSK 6R to go to the N1 limit page, where we'll begin entering these values in.

- Press LSK 4L to select TO-2.

- Type 45 and enter it into LSK 1L to enter in the 45 degree C assumed temperature.

- CLB-2 will be automatically selected when you do this.

- Press LSK 6R to get to the TAKEOFF REF page.

- Press NEXT PAGE

  Paradoxically, you make entries to TAKEOFF REF page 2 before page 1.

We need to talk a bit about the departure procedure now. Amsterdam Schiphol (along with many other airports around the world) uses a special noise abatement procedure for their departures and climbs.

These are used when there is a populated area that is very close to the airport on the departure path. This procedure requires us to climb at V2+20 knots, reduce thrust to the climb setting at 1500 feet, and then continue at V2+20 until 3000 feet. This allows us to gain altitude quickly per unit of distance over the ground to lessen the noise effect of our engines on the residents below. After 3000 feet we can accelerate normally and retract our flaps.

Setup for this is done on the TAKEOFF REF page 2:

- Type 3000 and line select it into the ACCEL HT field at LSK 4L, replacing the default 1500.

  The plane will now climb to 3000 feet before accelerating normally.

- We don't need to adjust the REDUCTION altitude because it's already set to 1500 feet by default and that's what our procedure needs.

- The EO ACCEL HT (engine out acceleration height) field at LSK 4R needs to be changed to 1000, as is standard at EHAM.

- All runways in FSX are (unfortunately) flat, so enter 0 into LSK 2L for the runway slope.

- Enter 360/0 in the RW WIND field at LSK 1L, because we're not using wind. (If you are using weather, this is explained in the addendum at the end of the document)

The other options on this page can be left at their defaults unless you're flying with weather, in which case you'd input the runway conditions and wind. Yes, this actually does affect the calculations!

The page should now look like this:

- Press PREV PAGE to go back to TAKEOFF REF page 1.

- Enter 1 into the FLAPS field at LSK 1L.

- Click LSK 3L twice to automatically insert the center of gravity (CG) percentage and obtain our takeoff trim setting.

- Click LSKs 1R, 2R, and 3R to transfer the V speeds to the PFD. For me they were 144, 145 and 147.

- Press the DES button, then LSK 6L to go to the DES FORECASTS page.

- Enter FL040 at LSK 1L – this is the EHAM transition level in case of a return to the airport after takeoff.

  If you recall from Tutorial #1, this is usually the airport's transition altitude + 1000 feet. EHAM's is 3000, so add 1000 and we get FL040.

We're now done with the FMC preflight!

- Skip ahead to page NP.21.10. (page 86 in the PDF)

  The pages between the end of the FMC CDU preflight and the start of the first officer preflight contain the procedures used in the physical walkaround inspection of the airplane. This isn't very practical to do in FSX, but if you'd like to try feel free to do so by using the procedures and a tool such as EZdok Camera Addon that lets you walk around in first-person view.

COCKPIT PREFLIGHT FLOWS

We're now going to do the rest of the captain's and first officer's preflight items. These sequences or "flows" as they're called in the industry look very long when written out like this but they can actually be completed very quickly once you have the proper positions for all the items memorized.

We'll do the first officer's flow first – notice when doing this that it follows a loose pattern if you divide the lower overhead up into four vertical strips.

The first few items are on the upper left panel of the lower overhead.

- Verify that the FLT CONTROL A and B have their switch guards closed and thus the switches themselves ON.

- Verify that the SPOILER A and B switches below the FLT CONTROL ones have their switch guards closed as well.

- Turn the YAW DAMPER switch ON and verify the light extinguishes.

  Note – If you're in the normal captain's seat VC view and you can't see the YAW DAMPER switch due the HGS projector housing blocking it, you can left click the projector housing to move it out of the way.

- Verify that the STANDBY HYD LOW QUANTITY and LOW PRESSURE lights are extinguished.

- Verify that the STBY RUD ON light is extinguished.

  This light is only present on an RSEP aircraft, which the **PMDG 737NGX** is. RSEP is the Rudder System Enhancement Program, which was introduced in 2003 as a redesign of the system that actuates the rudder. This was done in response to a history of uncommanded rudder hardover incidents on 737 series aircraft.

- Verify that the red ALTERNATE FLAPS switch guard is closed and that the white position switch to the right of it is OFF.

- Verify that the FEEL DIFF PRESS, SPEED TRIM FAIL, MACH TRIM FAIL and the AUTO SLAT FAIL lights are all extinguished.

Move directly down the left side of the overhead to the NAVIGATION and DISPLAYS panel for the next few items.

- Verify that the VHF NAV, IRS TRANSFER and FMC TRANSFER switches are all in NORMAL.

- Verify that the SOURCE selector is in AUTO and the CONTROL PANEL switch is in NORMAL.

Now move down the left side of the overhead again to the FUEL panel.

- Verify that the ENG VALVE CLOSED and SPAR VALVE CLOSED lights are illuminated.

- Verify that the FILTER BYPASS lights are extinguished.

- Verify that the CROSSFEED selector is closed and the VALVE OPEN light is extinguished.

- Verify that all six FUEL PUMP switches are off and the center tank LOW PRESSURE lights are extinguished and the main tank LOW PRESSURE lights are illuminated.

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Now let's move to the electrical panel immediately to the right of the fuel panel:

- Verify that the BATTERY switch guard is closed.

- Verify that the CAB/UTIL and IFE/PASS SEAT switches to the left of the battery switch are ON.

- Verify that the STANDBY PWR OFF light is extinguished and the STANDBY PWR OFF, BAT DISCHARGE, TR UNIT and ELEC lights are all extinguished.

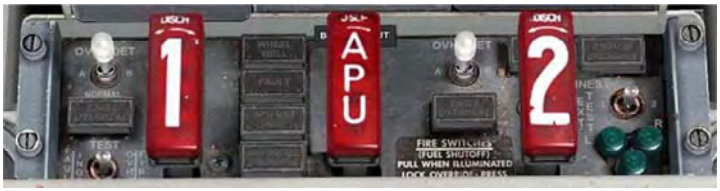
- Verify that the red generator drive DISCONNECT switches are closed and that the DRIVE lights are illuminated

  Note – *never* deliberately turn the drive DISCONNECT switches off unless instructed to by the QRH during a failure situation. Disconnecting the generator drives is an action that can only be repaired by maintenance crews on the ground. It physically disconnects them inside the engine.

Move down to the generator control part of the electrical panel:

- Verify that the BUS TRANS switch has its guard closed, putting it in AUTO, and that the TRANSFER BUS OFF, SOURCE OFF and GEN OFF BUS lights are illuminated.

We'll now test the engine and APU fire detection and warning system in preparation for starting the APU – this is a two part process that is done down on the pedestal just behind the thrust levers.



These tests only need to be run on the first flight of the day.

Note - in real life it is extremely important to notify the ground personnel around the airplane before you run these tests. A loud APU fire alarm rings on the exterior of the aircraft during the test and the ground crew are trained to pull an external fire extinguisher lever located in the main landing gear bay when they hear this alarm unless they've been told in advance that a test is in progress. If this lever is pulled, the APU will be destroyed by the extinguisher process and your time as a pilot at your airline will probably come to an end.

- Verify that both white OVHT DET switches are in the NORMAL position.

- Verify that the 1, APU, and 2 FIRE handles on the pedestal just behind the thrust levers are in their IN (not pulled) position.

- Left click the TEST switch and hold it in the FAULT/INOP position.

  While continuing to hold down the left mouse button, move the mouse off of the switch and then let go of the button. The switch will maintain its held position, allowing you to pan the view and click other switches.

- Verify the following items:

  - The amber MASTER CAUTION lights and OVHT/DET annunciator messages are illuminated on both the captain's and first officer's glareshields.

  - The FAULT and APU DET INOP lights both illuminate to the right of the engine #1 fire handle.

- Left click the TEST switch to spring it back to the center position.

- Now right click the same TEST switch and hold it in the OVHT/FIRE position.

  As before, move the mouse off of the switch while holding it

down and then release it.

- Verify the following items:
    - The aural fire warning bell sounds.
    - The red lights inside the pedestal 1, APU and 2 FIRE handles are illuminated.
    - The WHEEL WELL light is illuminated.
    - The red master FIRE WARN light, amber MASTER CAUTION light the OVHT/DET annunciator message are illuminated on both the captain's and first officer's glareshields.
- Push the red master FIRE WARN light on the captain's glareshield and verify the following:
    - The master FIRE WARN lights on both glareshields extinguish.
    - The aural fire warning bell has stopped.
    - Verify that the 1, APU, 2, ENG 1 OVERHEAT, ENG 2 OVERHEAT and WHEEL WELL lights all stay illuminated.

We'll now test the engine and APU fire extinguisher system.

- Left click the EXTINGUISHER TEST switch to the far right side of the fire handles and hold it in the 1 position. Verify that three green lights illuminate below the switch.
- Right click and repeat the test in position 2.

It's now time to start the APU as we're nearing our pushback time. The APU is a small jet engine that is mounted in the tail cone and it serves

to provide both electrical power and pneumatic bleed air for air conditioning and turning the engine cores during the start process.

- Turn the left FWD fuel pump on while using the APU. This ensures that pressurized fuel is always flowing to the turbine.

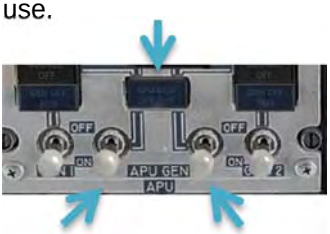
  The FWD pump is chosen because it is easier and less costly to repair than the AFT pump is. The AFT ones are in the wing structure and hard for maintenance to get to.

- Left click twice on the APU switch at the bottom left-center of the lower overhead to begin the start sequence.

  The start sequence takes about 30 seconds to complete. Monitor the APU EGT temperature on the round gauge – it should initially spike up to around 800 degrees and then settle back down to around 400.

  The LOW OIL PRESSURE light will illuminate during the initial EGT rise – this is normal.

  As soon as the blue and white APU GEN OFF BUS light on the lower overhead electrical panel illuminates, the APU is ready for use.



- Left click both APU generator switches.

  This transfers electrical power from ground power to the APU

generators.

- o Verify that the SOURCE OFF and TRANSFER BUS OFF lights are extinguished.

Back to the central lower overhead.

- The PMDG 737NGX doesn't have a lavatory SMOKE light, so ignore this line.

- Verify both EQUIPMENT COOLING switches are in NORM and that the OFF lights are extinguished.

- Close the EMER EXIT LIGHTS switch guard, which places the switch into the ARMED position.

  - o Verify that the NOT ARMED light to the left of the switch extinguishes.

- Click the FASTEN BELTS switch once to put it in AUTO or twice to set it to ON if you want manual control. Whichever one you use is at your discretion.

The PMDG 737NGX doesn't have a NO SMOKING switch but rather a CHIME switch for signaling the cabin crew. Smoking onboard commercial aircraft is generally banned worldwide and many aircraft no longer have the switch.

- Move to the top of the lower overhead and turn on all four WINDOW HEAT switches. Verify that the OVERHEAT lights are extinguished and the ON lights are illuminated.

Note – in areas with high outside temperatures such as Phoenix or Las Vegas in the summer, the Middle East and similar environments you may actually see the OVERHEAT lights on and the ON lights extinguished. In these instances it doesn't indicate a failure and it's actually fine to continue.

As an aside, watch the AC AMPS readout on the electrical system voltage panel to the left of the window heat switches as you move them between on and off. The reading realistically changes depending on how many window heat switches are on. In fact, every electrically powered item on the aircraft affects the numbers on this panel just as it does on the real airplane.

- Verify that the WING ANTI-ICE switch is off and that the L and R VALVE OPEN lights above the switch are extinguished.

- Verify that both ENGINE ANTI-ICE switches are off and that the COWL ANTI-ICE and COWL VALVE OPEN lights above the switches are extinguished.

- Verify that the ENG 1 and ENG 2 hydraulic pump switches are ON and that the ELEC 1 and ELEC 2 hydraulic pump switches are OFF.

Move to the AIR TEMP panel at the upper right of the lower overhead.

- Set the AIR TEMP source selector as needed to see the temperature in the various zones of the aircraft.

- Verify that the TRIM AIR switch is ON.

- Verify that the ZONE TEMP lights are extinguished.

- For our purposes AUTO is fine for the three zone temperature controls – CONT CAB, FWD CAB and AFT CAB.

We now need to disconnect the ground power and air conditioning.

- On the Captain's FMC CDU, press MENU, FS ACTIONS, GROUND CONNECTIONS.

- Press LSK 2L and 4L to remove the GROUND POWER and AIR CONDITIONING UNIT.

Move now to the main pneumatic panel on the left center of the lower overhead panel.

- Verify that both the L and R RECIRC FAN switches are in AUTO.

- Set both the L and R PACK switches to AUTO.

  We can do this now that the ground air is disconnected and there's no danger of backflow anymore. You'll hear the rushing air sound increase slightly.

- Verify that the ISOLATION VALVE is OPEN.

- Verify that the engine 1, APU and engine 2 BLEEDS are all on and that the DUAL BLEED light above the L RECIRC FAN switch is illuminated.

- Verify that the PACK TRIP OFF, WING-BODY OVERHEAT and BLEED TRIP OFF lights are all extinguished.

  Note – similar to the WINDOW HEAT warnings, the WING-BODY overheat light can illuminate without a failure in high temperature area of the world.

Move down to the pressurization panel immediately below the pneumatic panel.

- Verify that the AUTO FAIL and OFF SCHED DESCENT lights are both extinguished.

- Set the FLT ALT to our planned cruise altitude – 39000.

- Set the LAND ALT to the destination elevation rounded up to the nearest 50 feet. Innsbruck Runway 8 is 1906 feet, so we'll set this to 1950.

Move to the strip of exterior lighting and engine start controls along the front edge of the lower overhead.

- Verify that both the RETRACTABLE and FIXED LANDING LIGHTS are OFF. (Use the right click shortcut on the gang-bar)

- Verify that both RUNWAY TURNOFF lights and the TAXI light are OFF.

- Move the ignition switch to the IGN R position.

  The position of this switch is alternated by the crew on each

flight so that the igniters wear evenly.

- The PMDG 737NGX does not have the automatic ignition option, so verify that both engine start switches are in the OFF position.

- Verify that the LOGO light is OFF. (you'd turn this on if it was nighttime)

- Verify the POSITION light is in the STEADY position.

- Verify the red ANTI-COLLISION light is OFF.

- Verify that the WING light and WHEEL WELL light switches are OFF. (again at night you'd want these ON)

We're going to ignore the next few sections in the FCOM Vol. 1 because they're specific to the controls on the first officer's side of the airplane and aren't really applicable to a flight being flown by a single pilot sitting in the captain's seat.

Move to page NP.21.21. (page 97 in the PDF) and pan to the central main instrument panel.

- Move the AUTO BRAKE selector to the RTO (rejected take off) position.

    - Verify that the AUTO BRAKE DISARM light illuminates and then extinguishes.

- Verify that the ANTISKID INOP light is extinguished.

- Verify that the N1 SET and SPD REF knobs to the left of the AUTO BRAKE switch are both in AUTO.

- Move the FUEL FLOW switch to RESET with a right click and then release the mouse button, allowing it to spring back to RATE.

- Scan both engine DUs and make sure the existing conditions are shown accurately and that there are no exceedances.

- As the **PMDG 737NGX** we're flying is equipped with the Fail Operational Autoland option, press the C/R (cancel/recall) MFD button located above the upper engine DU and verify that no autoland status advisory messages are shown on the upper engine DU.

Move to the center of the pedestal directly behind the engine and APU fire handles – we now need to test the cargo fire system.

- Push the TEST switch and verify the following:

  - The aural fire warning bell sounds.

  - The master FIRE WARN lights/switches on the glareshield are illuminated.

- Push the master FIRE WARN light/switch on the captain's glareshield and verify the following.

- The master FIRE WARN lights/switches on the glareshield are extinguished.
- The aural fire warning bell no longer sounds.
- The FWD, AFT, DETECTOR FAULT, EXTINGUISHER, and DISCH lights all stay illuminated.

- Push the TEST switch to exit the test mode.

We'll now set the radios on the pedestal.

- As we will not be using any ATC for this flight, we don't need to worry about setting up the VHF communication radios.

The navigation radios should be set so that we have anything needed for the SID plus ILS frequencies for possible return runways set in the standby fields.

We technically do not need any navaids tuned for this departure because it's an RNAV SID that uses the FMC's own position information as the primary navigation source. It is however always a good idea to have a raw data "sanity check" from the ground based navaids available in a case where the SID overlays a navaid based procedure like this one does.

- Tune the Schiphol VOR (SPL), 108.40 in NAV 1's active field.
- Tune the Pampus VOR (PAM), 117.80 in NAV 2's active field.
- Tune the Schiphol NDB (NV), 332.0 into the ADF's active field.

  We will use these for reference on the ND and RMI (radio magnetic indicator) during the departure.

- Tune NAV 1's standby field to the ILS frequency for EHAM Runway 27, 111.55.
- Tune NAV 2's standby field to the ILS frequency for EHAM Runway 18C, 109.50.

These are the two most likely runways we'd use if we had to return to the airport. Runway 24 is used for takeoffs only and does not have an ILS approach.

- Set the transponder to 2200, just as we did in Tutorial #1.
    - Though it's not part of the *Amplified Normal Procedures*, if you'd like to see the TCAS test, press and hold on the small button on top of the TCAS mode selector and then drag the mouse off of it and release, exactly like what we did in the fire tests. Pan the view to the ND and you'll see the test happen followed by an aural confirmation.

The radios should now look like this:

- Verify that the STABILIZER TRIM override switch at the rear right of the pedestal has its guard closed.

The remaining items involving adjusting the seat, rudder pedals and seatbelt/harness are not applicable to the simulator environment and we'll skip them.

This concludes the first officer's preflight flow. We'll now move on to the captain's flow, which starts on the main panel.

- Move the LIGHTS switch above the right side of the captain's ND to the TEST position.
    - Look around the cockpit and verify all lights working as expected.
- Move the LIGHTS switch back to the center BRT position.

Now move up to the captain's EFIS control panel on the glareshield.

- Set the MINS selector to the BARO position. (right)
- Set it to 989 feet, which is our engine out acceleration height. (this accounts for EHAM's Runway 24 being -11 feet MSL) This will give us a visual representation of that altitude along the speedtape.
- We don't need the FPV or METERS switches today, so we'll ignore these items.
- Verify that the BARO selector is set to HPA.
    - Set the local altimeter setting – if you're flying without weather, it's the standard pressure of 1013. You can press the B key as a shortcut to set this to whatever the pressure actually is in the sim at the time if you are using.
- Set the left navaid pointer switch to VOR 1 and the right one to VOR 2.

This enables a virtual RMI on the ND that shows us radial and DME information for both VORs. You'll see the SPL and PAM VOR names and DME information in the lower corners of the ND in green. The two VORs are also drawn geographically on the map with radial lines corresponding to their respective MCP COURSE settings.

- Verify the ND is in MAP mode.
- Verify the ND range is 10nm.
- Press the TFC button so that we have TCAS traffic displayed.

Move over to the Mode Control Panel (MCP) next.

- Set the captain's side (VOR 1) course to 106.
- Set the first officer's side (VOR 2) course to 225.

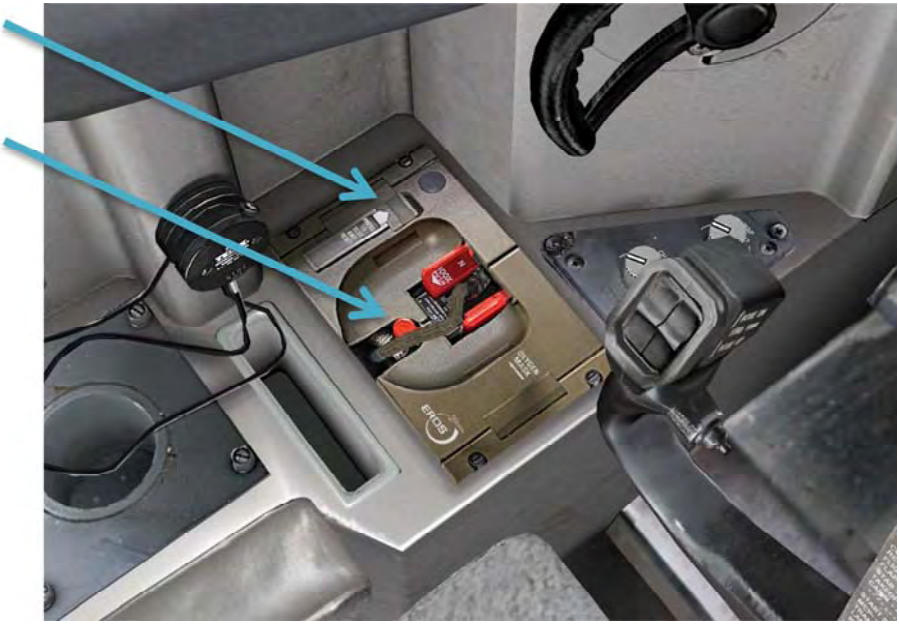
  These are the VOR radials that will serve as a check for us during the departure procedure.

- Turn on the captain's flight director (FD), followed by the first officer's.
  - Verify that the Captain's FD is selected as master via the green MA light above the switch.
- Verify the bank angle selector is in the 25 degree position (one click to the left of fully right).

  Note that this only applies in HDG SEL mode.

- Verify that the autopilot DISENGAGE bar is UP.

Pan the view down and to the left from the captain's seat until you can see the crew oxygen system.



- Press the test flap on the left side of the oxygen system.
- Verify that you hear air flowing and see a yellow X shape appear in the rubber flow indicator above the flap.
- Push the red circular EMERGENCY/TEST selector in the center of the oxygen system, near the hose, then push and hold on the test flap again.
- Verify that you hear air flowing and see a yellow X shape appear in the rubber flow indicator above the flap.
- Verify that the chronometer to the left of the PFD shows the same time as the FMC IDENT page. In the **PMDG 737NGX** they shouldn't ever be different as the chronometer is slaved to the FMC, but this can be an issue on older NGs where the two

clocks are separate.

- Verify that the NOSE WHEEL STEERING switch below the clock has its guard closed.

- Verify the MAIN PANEL DISPLAY UNITS selector and the LOWER DISPLAY UNIT selector at both in NORM.

- The **PMDG 737NGX** doesn't have the TAKEOFF CONFIG or CABIN ALTITUDE lights, so we'll skip those items.

- Right click the A/P, A/T, FMC disengage light TEST switch on the main panel above the ND and hold it in the 1 position.

    - Verify that all three lights, A/P, A/T and FMC are illuminated in amber.

- Left click the disengage light test switch and hold it in the 2 position.

    - Verify that the A/P and A/T lights are illuminated in red and the FMC light is illuminated in amber.

- Verify that the STAB OUT OF TRIM light below the disengage light test switch is extinguished.

Now look at the PFD and ND.

- Verify that only the TCAS off flag is shown on the ND.

- Verify the following on the PFD:

    - A/T FMA mode is blank
    - Roll FMA mode is blank
    - Pitch FMA mode is blank
    - AFDS status is FD

Since our aircraft today has an Integrated Standby Flight Display (ISFD) instead of analog gauges, we'll use that section instead of the analog one.

- Verify that the approach mode display is blank with no CDIs showing.
- Verify the ISFD altimeter is in HPA mode and set to 1013. (or actual pressure if using weather)
- Verify that indications are correct and no flags or error messages are show.
- Set both selectors on the analog standby RMI below the ISFD to ADF.

Move down to the pedestal.

- Verify that the SPEED BRAKE level is in its DOWN detent and verify the following:
    - The SPEED BRAKE ARMED, SPEED BRAKE DO NOT ARM and SPEEDBRAKES EXTENDED lights are all extinguished.
- Verify the reverse thrust levers are down and stowed.
- Verify the main thrust levers are closed. (press F1 to ensure they're fully back at the stops)
- Verify the flap lever matches the indicated flaps. (up in our case right now)
- Set the parking brake by clicking the lever on the pedestal.
- Go back to the CDU GROUND OPTIONS page and remove the CHOCKS.

- Set the CDU back to the TAKEOFF REF page 1.

- Verify that the engine start levers are in CUTOFF (down).

- Verify the STABILIZER TRIM cutout switches on the left side below the flap lever are in NORMAL.

We'll now set up the HGS for takeoff according to the HUD Preflight supplementary procedure on page SP.10.5 (page 227 in the PDF version).

- Lower the HGS combiner by clicking on the hidden clickspot on the left support post.

- Runway 27 is the most likely return runway for us, so we'll enter the data for it into the HGS controller on the pedestal.

    - Press the RWY button and enter 11329 for the runway length.

    - Press RWY again and leave the altitude at 0.

      The runway's actual elevation is -12 feet below sea level but the controller will not accept negative altitude numbers.

    - Press ENTER.

- Verify that the GS is set to -3.00 degrees.

- Verify that PRI mode is active.

- Press the CLR key to blank out the HGS display for taxiing.

The radios and the seat and rudder pedal adjustments were already discussed during the first officer flows.

- Run the PREFLIGHT CHECKLIST located on page NC.1 of the QRH. (page 25 of the pdf version)

BEFORE START PROCEDURE

The passengers are all on board, the cabin crew is closing the doors and we're almost ready to push and start the engines. A few more things need to be accomplished first though.

- Verify that the flight deck door is closed and the switch on the back of the pedestal is in the AUTO position.

- On a real life flight, the crew would check the performance data and make any necessary adjustments based on last minute weight changes. Since we know for sure what we're heading out with though, we'll skip this since we already did it earlier.

- Verify that the N1 limit bugs on the upper engine DU are correct. In our case they should be around 87.4-87.6%.

- Click the MCP AUTOTHROTTLE ARM switch into the ARM (up) position.

- Enter V2 into the MCP SPEED window – it should be 147-149 or so. (look on the TAKEOFF REF page)

- Arm the LNAV and VNAV modes by pressing their respective MCP buttons.

- Enter our initial heading into the MCP HEADING window, which will be the runway heading of 239. You can get this from TAKEOFF REF page 2 in the LSK 2L RW SLOPE/HDG field.

- Set the initial climb altitude in the MCP ALTITUDE window, which at EHAM is FL060. (6000) This is also our altitude restriction at IVLUT on the SID.

At this point the captain does a short briefing discussing the taxi, takeoff and departure procedures.

TAKEOFF/DEPARTURE BREIFING:

We'll be taxiing to Runway 24 via taxiways A and E1. It is a very short taxi.

Takeoff will be with the mandatory noise abatement procedures - takeoff thrust until 1500 feet AGL, climb thrust until 3000 feet AGL, then acceleration and flap retraction above 3000 AGL. If we lose an engine we'll climb to 1000 feet AGL before accelerating. Our initial cleared altitude is FL060.

We'll climb via the LUNIX 1S departure in LNAV and VNAV following the procedure's RNAV waypoints until EDUPO and then via airways as filed.

- Verify that the exterior doors and flight deck windows are closed.

In real life we'd now obtain our start and hydraulic pressurization clearances from the ramp controller, but since we're not flying with ATC, we'll assume we have them.

- On the lower overhead, turn all AFT and FWD main fuel pumps ON.

  Leave the two center pumps OFF because we have no fuel in the center tank .

- Turn the ELEC 1 and 2 hydraulic pumps on.

  - Verify that the electric pump LOW PRESSURE lights have extinguished.

  - Verify that the brake pressure is a minimum of 2800 psi.

  - Verify that the hydraulic system A and B pressures are a minimum of 2800 psi on the lower DU SYS page.

    One may be slightly off, this is normal and is a quirk of

the real life airplane.

- Press ENG to get back to the engine page.

- Turn the red ANTI COLLISION beacon switch ON. This light should always be on when the hydraulics are pressurized or the aircraft is moving or about to move in any way.

- Set the takeoff trim. It should be around 5.03 in our case. The value should be present at line 3 on the captain's CDU.

  - Verify that this trim value is in the green band.

    As with Tutorial #1 it's not important that this setting on the trim scale is 100% exactly what the FMC says, it just needs to be close to that value.

- Verify that the aileron and rudder trim settings on the pedestal are both 0.

- Run the BEFORE START CHECKLIST located on page NC.1 of the QRH. (page 25 in the pdf version)

PUSHBACK PROCEDURE

The **PMDG 737NGX** contains an integrated pushback feature that we'll now use for our pushback from the gate.

- On the captain's CDU, press MENU, then FS ACTIONS, then PUSHBACK.

This feature is a wrapper around the default FSX pushback system. Creating a custom pushback engine is outside the realm of what we do and there are multiple addons such as Aerosoft's Airport Enhancement Services that already do it very well.

For this reason, the numbers we're going to have to use to get a decent pushback out of this gate are a bit odd. In real life the turn angle would be a lot closer to 90 degrees, but the FSX system produces such a

shallow turn during the push that we'll end up out in the grass if we use 90.

- Set the STRAIGHT LENGTH at LSK 1L to 0.

- Set the DEGREES at LSK 4L to 30.

The page should look like this:

- Press the START prompt at LSK 5L.

  You'll now hear a series of voice conversations between yourself and the ground crew that comprise the pushback procedure. You'll need to release and then set the parking brake, so listen for those instructions.

  IMPORTANT – when the ground crew asks you to release and set the parking brake, you need to actually click the parking brake handle on the pedestal. If you use your joystick brakes button it will disarm the AUTO BRAKE RTO mode.

- When the pushback is completed, select the TAKEOFF REF page 1 on the captain's CDU and select the LEGS page on the first officer's CDU.

We're now finally ready to start the engines and get on our way!

ENGINE START PROCEDURE

You can actually begin the engine start sequence while pushback is ongoing but for the purpose of making everything clear in this tutorial, we've waited for the push to finish first.

- Press the ENG MFD button to bring up the secondary engine indications on the upper engine DU.

- Turn the air conditioning PACK switches on the lower overhead pneumatic panel OFF.

  This is done because the APU can't generate enough bleed pressure to rotate the engines to the speed they need to be at to start if the packs are on and siphoning air away.

- Press F1 on your keyboard to ensure that the thrust levers are fully closed in the event that your joystick's throttle is slightly off calibration. (most are)

Engine #2 on the right side is started first followed by engine #1 on the left side. The reasons for this are twofold. First the APU uses fuel from the left main tank and creates a slight imbalance between the left and right tanks. Starting the right engine first helps use some fuel from the right tank to account for the imbalance. Second, waiting to start engine #1 means that theoretically a last second passenger could be boarded through the forward entry door while the right engine is starting up or running.

- Move the engine #2 start selector into the GND position.

    - Verify N2 RPM increasing.

- When N1 rotation is observed and N2 reaches 25%, click the engine #2 start lever into the IDLE (up) position to give fuel to the engine.

- At around 56% N2, verify that the engine start switch moves to OFF when the starter cuts out. There is an audible click when this happens

- Monitor the engine's parameters as it accelerates to idle.

- Repeat the process to start the #1 engine.

BEFORE TAXI PROCEDURE

Now that the engines are running and stabilized, we need to reconfigure a few items.

- On the lower overhead electrical panel, turn the GENERATOR 1 and 2 switches to ON.

  This transfers electrical power from the APU generators to the engine driven generators.

- Turn the probe heat switches at the right top of the lower overhead on.

- We won't need wing or engine anti-ice today (unless you're using weather and you do), so we'll leave these off.

- Place both PACK switches back in AUTO.

- Place the ISOLATION VALVE switch in AUTO.

- Turn the APU BLEED switch off.

- Turn the APU start switch OFF.

- Place the engine start switches in the CONT. position.

- Verify both engine start levers are in IDLE (up).

- Set takeoff flaps – in our case this is Flaps 1.

- Check the motion/travel of the flight controls – you can use the SYS MFD button to show the flight control position on the lower engine DU to do this.

  The PMDG House Livery is equipped with this option, however not every airline livery is. In that case you'll just be relying on the feel and range of motion in the yoke and pedals.

  You want to move the yoke in all directions through its full range of travel. The same applies to the rudder pedals.

- Press the SYS button again to blank out the lower engine DU.

- Set the transponder on the pedestal to ALT since EHAM has ground radar and can track our position while taxiing.

- Press the MASTER CAUTION switch on the glareshield and verify that any annunciations that were present clear. (You'll have to raise and lower the HGS to do this – sim environment limitation)

- Turn the TAXI light ON on the front right part of the lower overhead.

- Run the BEFORE TAXI CHECKLIST located on page NC.2 of the QRH. (page 26 of the pdf version)

- Release the parking brake. Again, make sure you click the handle instead of using your FS brakes joystick button command.

We can now begin our taxi to Runway 24 – follow the short red path indicated on the image below.

While taxiing, use the rudder to steer. Unfortunately FSX limitations prevent us from realistically simulating the way the nosewheel steering tiller operates separately from the rudder. Both are linked in the sim at all times.

Use a small amount of thrust to taxi – the airplane should move reasonably well under idle thrust. The surface coefficient of friction in FSX is unfortunately higher than it is in real life and this causes the plane to slow at idle. We did everything we could to mitigate this and in most cases idle will work fine, but on some longer taxi routes, you may need to periodically give it some thrust to maintain speed.

Watch for the joystick throttle's lower end not returning to full idle during taxi – press F1 on your keyboard (or better yet bind a button on the throttle to F1 in the FSX settings) to correct an idle thrust setting that's too high due to this issue.

BEFORE TAKEOFF PROCEDURE

- As you enter the runway, set the POSITION lights switch to STROBE & STEADY.

- Verify that the brakes are released and align the airplane with the runway centerline.

- Set the transponder to TA/RA.

- Press CLR on the HGS to display the PRI symbology through the combiner glass.

TAKEOFF PROCEDURE

- Turn the LANDING lights ON with a left click on the gang-bar.

- Smoothly advance the thrust levers until N1 is around 40% and allow the engines to stabilize.

- Press the TO/GA switch. (Remember the hidden clickspot for this is below the captain's MCP COURSE knob)

  As the autothrottle brings the engines up, push your physical throttle all the way forward to avoid any issues with the pots returning you to idle when the A/T mode goes to ARM and disconnects the servos.

  Note – if you see a yellow master caution that lights but then clears quickly as you bring the thrust up for takeoff, this is most likely another quirk of the real plane we've modeled. Sometimes the latching system for the overwing emergency exit doors will fail to fully catch right away during takeoff. As long as the caution clears, you're fine and can continue the takeoff. If it remains illuminated then you should abort the takeoff prior to V1.

- Verify that the engines are stable at the takeoff N1 limit.

- At VR, rotate smoothly at around 2-3 degrees per second toward an initial target of 15 degrees nose up.

  Use the HGS's takeoff guidance symbology - the dashed line is your TOGA pitch target. If you rotate too quickly you'll see a

small solid line with two open circles on the ends (not shown in the screenshot, but you can see it in the FCOM Vol. 2's list of HGS symbols) – this is the tailstrike limit. Under no circumstances should you rotate past this line on a normal takeoff.

- Upon observing a positive rate of climb, move the LANDING GEAR handle to UP.

- Follow the flight director guidance cue on the HGS to maintain V2+20.

  This is a small circle or "donut" – you want to maneuver the aircraft so that this circle is inside the flight path vector's larger circle.

- At 400 feet, press CMD A to engage the autopilot.

Remember the "sanity checks" on the FMC position using the actual ground based VOR and NDB navaids that we set up during preflight?

We're coming up on our first one right away – the EH005 RNAV fix is collocated at right around the SPL VOR's 4 DME reading while on the Runway 24 heading. Looking at the SPL DME readout on the lower left of the ND confirms this when the airplane starts the left turn toward EH008.

If you look out the left window right now you'll see some of those neighborhoods we're trying to avoid bothering with our engines right now.

When we reach 3000 feet, the aircraft will pitch over and accelerate.

- Raise the HGS combiner by clicking on the left window support.

- Press the STD button on the captain's EFIS control panel to set the pressure to standard, we're now flying flight levels.

- Select 20nm on the ND range knob.

- Passing the "1" marker on the speed tape, select FLAPS UP.

- Set the AUTO BRAKES switch to OFF

- Set the LANDING GEAR lever to the middle OFF position after retraction is complete.

- Set both engine start switches on the lower overhead to OFF.

- We're above our engine out acceleration height with no engine failure present, so press the RST (reset) switch on the EFIS MINS knob to remove the 989 foot BARO height from the PFD.

- Select the LEGS page on the captain's CDU for easier reference and for any potential editing later. Select the PROG page on the first officer's CDU for monitoring.

- Run the AFTER TAKEOFF CHECKLIST located on page NC.2 of the QRH. (page 26 of the pdf version)

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Shortly after passing EH008, the aircraft levels out at FL060 to meet the restriction at IVLUT.

Notice the green 225 degree radial line coming off of the PAM VOR. This combined with the reading from the ADF is our second sanity check on the departure. We should be starting our turn toward IVLUT after crossing the PAM R-225 and we'll join the course line defined by the 253 bearing to the Schiphol (NV) NDB, which we can see on the standby RMI. Both of these match up as we pass them, so we know the FMC's position is correct.

After passing EH026, let's demonstrate the other feature of the ALT INTV button that was talked about but not used in Tutorial #1.

What would normally happen here even if we rolled the MCP ALTITUDE up to a higher level is that the plane would remain level in VNAV PTH until it passed IVLUT, at which point it would automatically resume the climb.

Now, pretend traffic is light and ATC just gave us a climb clearance that eliminates the restriction at IVLUT.

"Precision 738, climb and maintain flight level 230."

- Roll the MCP ALTITUDE window up to 23000.

- Press the ALT INTV button while watching the LEGS page carefully.

  The FL060 altitude restriction at IVLUT is automatically removed because we are not in VNAV ALT mode when we pressed the button. The climb resumes instantly and new predictions appear on the LEGS page.

  Be very careful with this function as every press of it when not in VNAV ALT deletes the next restriction along the route for the current phase of flight (climb or descent). You could seriously mess up your route if you pressed it a bunch of times and had a lot of restrictions get removed accidentally.

- Passing 10,000 feet turn off the landing lights with a right click on the gang-bar.

As we approach IVLUT we have our last check of the RNAV procedure using the ground based navaids. IVLUT should lie along the PAM R-106. We can easily see that this is the case on the ND – the green line goes dead through the center of IVLUT's star icon.

- We can now turn off both ND navaid pointers on the EFIS control panel since there are no further checks we can make with them.

- After IVLUT, increase the map range to whatever you prefer.

- If you want to remove the green VOR lines from the ND to declutter the ND display, simply find frequencies on both NAV radios for which there is no active VOR in range. Try 108.50 and 117.85.

- At a few thousand feet below FL230, roll the MCP ALTITUDE window up to FL390 (39000) to simulate ATC giving us our final altitude climb clearance. There is no need to press ALT INTV because we are not restricted and are not in VNAV ALT. The climb will automatically continue up to FL390 now.

- Once we’re into our high cruise climb phase and the air is smooth (if using weather), turn OFF the FASTEN BELTS sign so the passengers can move around the cabin.

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ADVANCED FMC ROUTE MODIFICATIONS

After passing the MISGO intersection fix let's pretend ATC gives us a small shortcut in our route, allowing us to bypass the Germinghausen (GMH) VOR and go direct to TESGA intersection. This is commonly called "cutting the corner" in ATC to pilot lingo.

"Precision 738, direct TESGA when able"

- Press LSK 2L to copy TESGA into the scratchpad.

- Now press LSK 1L to enter TESGA over top of the currently active waypoint. This is the procedure for setting up a direct to.

- Verify the modification on the LEGS page and on the ND. If something were to appear, you'd be able to revert the modification by using the ERASE prompt at LSK 6L.

- Press the illuminated EXEC key to execute the modification. The plane will immediately begin a turn direct to TESGA.

Wait until TESGA is visible on the 80nm ND range and then proceed to the next section.

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There are several other route modification features that are somewhat commonly used. You should know how to do these if you're planning to fly on VATSIM or IVAO with live human ATC.

Let's try creating an along-track waypoint. This would be used if ATC gave you a command to cross a certain mileage before or after a waypoint at a certain altitude.

- Press LSK 1L to copy TESGA to the scratchpad.
- Type /-20 after it - the full entry looks like TESGA/-20
- Press LSK 1L to enter the new waypoint.

  TES01 is created – this waypoint is 20nm before TESGA along our current flightpath. The negative sign makes it before – to place one after TESGA, the syntax would be TESGA/20. You can see the new waypoint on the ND as well.

This waypoint functions like any other, you can assign it a speed and altitude restriction on the right side of the CDU and so on.

If we wanted to actually insert this waypoint, we'd press the illuminated EXEC button, but there's no reason to do this right now since it's just a teaching example.

- Press LSK 6L to ERASE the modification, cancelling it.

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We can also create what's known as a "place bearing distance" waypoint. These have numerous frequent uses in IFR flying.

- Press LSK 1L to copy TESGA into the scratchpad.

- Type 270/20 after it - the full entry looks like TESGA270/20

- Press LSK 1L to insert the new waypoint.

  We now have a TES01 waypoint that is located on the 270 degree bearing from TESGA at 20nm. A discontinuity is automatically inserted when creating this type of waypoint. The new waypoint also appears on the ND. Notice that putting it into LSK 1L would send us direct to it as well.

- Again, press LSK 6L to ERASE this modification since we don't actually want to do this.

We can also create a “bearing bearing” waypoint defined by the crossing point of two bearings. Many terminal procedures use this type of nomenclature to define fixes.

- Type TESGA270/BOMBI300 into the scratchpad.

- Line select it to LSK 1L to enter it.

  We now have a TES01 waypoint that is at the location defined by the point where the TESGA 270 degree bearing and the BOMBI 300 degree bearing meet.

- Press LSK 6L to ERASE.

TUTORIAL #2

In instances such as weather avoidance it may be necessary to offset your route of flight to the left or right of the planned route. This is easy to do with the **PMDG 737NGX** FMC.

- Press INIT REF, then LSK 6L for INDEX.
- Press LSK 6L again for the OFFSET page.
- Enter L10 into LSK 2L for a 10nm offset to the left of our course. (for right you'd type R10)

  Notice the dashed white line on the ND showing the parallel course.

Right now we've told it to offset the entire route. However we can be more specific than this and define the offset as happening between two waypoints.

- Set the ND to 80nm range.

- Enter TESGA into the START WAYPOINT field at LSK 3L and enter ELMOX into the END WAYPOINT field at LSK 4L.

  Notice now that the white line on the ND only goes between TESGA and ELMOX.

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- Go to the LEGS page.

  Notice here that we have an OFFSET indication on the left side of the page for both BOMBI and HAREM, the two waypoints between TESGA and ELMOX that we're flying an offset on.

  These waypoints fully take into account their new offset nature and you can perform all the same normal waypoint modifications to them while still maintaining that offset state. The programming math involved in making this feature as robust as the real thing was one of the most difficult and time consuming parts of the **PMDG 737NGX** FMC's development.

- Once again, press LSK 6L to ERASE the modification.

Let's now take a look at some useful things you can do with the FIX page.

The FIX page allows you to set up to 6 reference positions that are drawn on the ND in map mode. They can be anything – VORs, NDBs, airspace fixes, airport ICAO identifiers, runways, ILS identifiers and so on. You can then use the page's lines to draw radial bearings and distance rings using those points. This is extremely useful for drawing a graphical depiction of complex radial and DME procedures in a SID, STAR or approach. We'll use it when we get to Innsbruck in fact.

- Press the CDU FIX button.

- Enter TESGA into LSK 1L.

- A few things happen immediately.

    - You see your current radial and distance to/from the FIX on the CDU's line 1.

    - TESGA now shows up on the ND as a blue triangle with a green circle around it. The TESGA name is also now in blue.

- Type 270 and insert it into LSK 2L.

  This draws the 270 degree radial on the ND, extending out to infinity from TESGA.

- Type /20 and insert it at LSK 3L.

  This creates a 20nm dashed green ring around TESGA on the ND.

  You also get some useful information on line 3. The new data that appears tells you the exact radial you'll be on when you intersect the 20nm ring, how far (distance to go – DTG) you have until you reach it, what time in zulu/GMT you'll get there, and what altitude you're predicted to be at.

  This same info will also show for a radial entry if the radial crosses the aircraft's current flight path.

- Enter the Taunus VOR (TAU) into LSK 1L.

- Set the ND to 40nm.

- Press the ABM (abeam) prompt at LSK 5L.

  Notice we now have the radial and distance from the FIX to the point where we'll be directly abeam (perpendicular) to it on our current route of flight. We also have the time we'll arrive at the point, the distance to go and the predicated altitude, just like the radial and ring entries.

  On the ND, we can now see a green dashed line drawn from the FIX to our flightpath, showing us where the abeam point is.

- Press LSK 5L.

  This copies the abeam point in place bearing distance format to the scratchpad. We could then insert it into the LEGS page to make an actual flightplan waypoint out of it.

- Delete the waypoint identifier in the scratchpad with the CLR key and then press DEL and line select it to LSK 1L, clearing the FIX.

- Go back to the LEGS page.

At around 35nm from TESGA we have around 25 minutes to go before reaching our top of descent point. We need to start planning for the descent and approach very soon given the complexity of the procedure.

If you're interested in sightseeing though, at around 5 miles from BOMBI we pass EDDF - Frankfurt am Main Airport off to the right and just below us. This is Germany's largest airport and one of the top three busiest in all of Europe along with EGLL London Heathrow and LFPG Paris-Charles de Gaulle.

DESCENT & APPROACH DISCUSSION

Innsbruck is located in a narrow valley that runs east to west between two very high mountain ranges along the river Inn. There is very little room for error once we commence the approach.

The descent from cruise up until just before the start of the approach is actually very easy – we have a 9500 foot crossing restriction at Rattenberg NDB (RTTNB) already set in the FMC. VNAV will get us there without a problem.

We need to add the Flaps 15 maneuvering speed restriction to the OEV18 waypoint however. This is the point where we'll commence the steep descent on the approach and we need to be at Flaps 15 with the gear down just before it starts to avoid overspeeding. Adding this restriction to the LEGS page causes VNAV to slow us down in time prior to reaching OEV18.

Note – normally at Innsbruck a 737-800 will use Flaps 30 with gear down at OEV18, but due to our relatively light gross weight and lack of weather in the sim, we can use Flaps 15 and save some fuel. If you're using weather, I recommend use of Flaps 30 instead.

If you recall from Tutorial #1, our Flaps 15 maneuvering speed is

defined as VREF 40 + 20 knots. We can use this to determine exactly what speed restriction to set at OEV18.

- Press the CDU PROG button and look at the currently predicted fuel at LOWI. For me it's 8900 lbs (4037 kg).

- Add this value to the airplane's ZFW (for me it's 122600 lbs or 55610 kg):

  122600 lbs + 8900 lbs = **131500 lbs**
  (55610 kg + 4037 kg = **59647 kg**

- Press INIT REF on the captain's CDU to get to the APPROACH REF page.

- Enter 131.5 lbs (59.6 kg) into the GW field at LSK 1L.

  This is a calculator essentially, when you change the GW, it'll update all the V speeds and such to be accurate at the assumed weight.

  The Flaps 40 V speed at this weight is 135 for me.

  135 + 20 = 155.

- Go back to the LEGS page and press NEXT PAGE twice, you should see OEV18. For me it's currently at row 6.

- Type 155/ and enter it at LSK 6R (or whichever right side key OEV18 is currently at for you)

- Press the illuminated EXEC button to accept the route modification.

- Press LEGS again to get back to page 1.

  The VNAV predictions now recalculate and we get a new T/D point. If you use PLAN mode or zoom out, you can see that there's a DECEL circle near RTTNB now. Fortunately this is a

flat 9500 foot segment from RTTNB all the way to OEV18, so we shouldn't have any trouble slowing down provided we extend the flaps promptly as soon as we reach each maneuvering speed.

The approach charts that help you visualize the following approach narrative are located at the end of this document:

APPROACH EXPLANATION/BREIFING:

The first part of the approach, the LOC/DME EAST procedure, consists of following an offset localizer DME (OEV) and a steep 3.8 degree glideslope down the valley. We will fly this in LNAV and VNAV while monitoring the raw data signals to sanity check the FMC and autopilot in a very similar way to how we checked ourselves on the departure.

We start at Rattenberg NDB (RTT) at 9500 feet and fly a 210 degree heading until intercepting the localizer at 21 DME. As we just accounted for, we'll be at Flaps 15 and gear down before the glideslope intercept. High drag is very important on this approach due the steep angle and because of a unique wind condition called the *Föhn* that occurs on the downward side of mountain ridges like those that surround Innsbruck. This wind combined with the steep descent rate mandate the use of flaps and gear much earlier than normal.

Once we reach the ABSAM (AB) NDB, which is located at 6.3 DME along the localizer, we will break off to the left on a 230 degree heading visually using HDG SEL mode.

Upon reaching the mouth of a small north-south valley directly ahead (also collocated with the Innsbruck (INN) NDB), we'll turn right downwind on a 264 heading. At this point we are at 3700 feet MSL and we're just a few hundred feet above the terrain on the ridge below us. It is common and normal to get EGPWS warnings on this part of the procedure due to the abnormal proximity to the terrain compared to most standard approaches. We'll select landing flaps on this leg.

At 3.5 DME from OEV / 14.1 DME from OEJ (the missed approach localizer), we'll lower the HGS, disengage the autopilot and autothrottle and begin a steep descending turn to the right toward the runway. This

is technically a right base leg, but you'll be in the turn the entire way. Be careful not to descend too far until you've cleared the edge of the ridge we're flying over!

You should see the runway as you roll out of the turn – if you did the turn tight enough, you'll be more or less aligned with the runway and will have an easy manual landing. If you've overshot it by some, just turn back to the right and line up. The HGS flight path vector can really help with this.

In the event we have to do a missed approach, we'll perform a max gradient climb while tracking the 067 degree course of the OEJ localizer, which is located northeast of the airport. Passing over OEJ, we'll continue tracking the localizer's 065 backcourse to 9500 feet, then turn direct RTT and hold. (Note this procedure actually comes from the LOC/DME WEST chart, which is not included here)

If you're not there yet, wait until we're about 10 miles or so from the Top of Descent (T/D) point and then continue on. T/D should be located just prior to the XERUM intersection fix.

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DESCENT

Just before we reach our T/D point, we'll use a trick that helps lessen the uncomfortable negative g acceleration forces on the passengers that can result from immediately going into the full rate descent.

- Pull your physical joystick throttle back to idle.
- Roll the MCP ALTITUDE window down to 9500.
- On the captain's CDU, press the DES button to bring up our DESCENT page.
- At around 5 miles or so from T/D, press the DES NOW button at LSK 6R and then press the illuminated EXEC light.

DES NOW mode starts the plane down at a shallow 1000FPM until it intercepts the VNAV path. Going from 0 to 1000FPM is far less noticeable to the passengers than quickly going from 0 to 3000FPM is. DES NOW is also what you would press if ATC

gave you a descent clearance prior to your T/D. (assuming they don't need a particular rate of descent)

Watch the path deviation indicator – it'll initially climb, but then once you pass the T/D point, it'll start converging again as you approach the path. After a few miles the plane will intercept the normal path.

Another variant of this technique is to go to V/S mode and very slowly roll the wheel up, gradually increasing the descent rate by 100FPM per click. Once on the VNAV path, reengage VNAV mode. If done right, this technique results in a nearly imperceptible onset of the descent.

- Once established in the normal VNAV PTH descent with ARM showing in the thrust mode field, press F1 to make sure your throttles are at true idle.

Let's now start configuring the systems for the approach.

- Press INIT REF on the captain's CDU, which will take us to the APPROACH REF page.

- As we did earlier, type 131.5 lbs (59.6 kg) into LSK 1L to reflect our actual landing weight.

- Press LSK 3R twice to input the flaps 40 VREF. It should be around 135 +/- 1 knot or so depending on your exact weight.

- Press the DES button, then LSK 6L to get to the DES FORECASTS page.

- Enter FL120 for the transition level at LSK 1L.

  LOWI's transition altitude is 11000 feet, so add 1000 and we get FL120.

- Verify the MINS knob is still set to BARO and dial in 3700 feet, which is the minimum descent altitude for the Runway 8 circling procedure.

Now move to the radios.

- Tune NAV 1's active field to the OEV localizer frequency, 111.10.

- Tune NAV 1's standby field to the OEJ localizer frequency, 109.70.

- Tune NAV 2's active field to the OEJ localizer frequency, 109.70.

- Tune NAV 2's standby field to the OEV localizer frequency, 111.10.

- Tune the ADF's active frequency to Rattenberg (RTT) NDB, 303.0.

- Tune the ADF's standby frequency to Absam (AB) NDB, 313.0.

- While we're here, set the HGS to VMC mode for use in the approach by clicking the MODE button twice.

  VMC mode eliminates all navigation data and FD guidance in favor of a simplified interface designed for visual approaches.

- Just for the sake of being thorough, set the elevation (1906) and runway length (6562) into the HGS control panel as well.

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The radio panel should now look like this:

Note – in real life where you have two crew members this radio and ND setup would likely be different, but for the single pilot simming experience, this setup will work best in the event we have to do a missed approach. We need to be able to see both localizers plus the NDBs all from the captain's seat and this is the best way to do that.

- On the captain's EFIS panel, turn on both VOR radio (localizer in this case) pointers and DME information.

- Press the TERR button at the lower right of the captain's EFIS panel to display the terrain on the ND.

Go back to the CDU and let's set up the FIX page with some helpful radial drawings on the ND.

- Press the FIX button.

    - Type AB and enter it into LSK 1L.

- Press LSK 1L on the SEL DESIRED AB page to select the proper location. Notice that it says INNSBRUCK-ABSAM and has the 313.0 frequency shown.

- Type 230 into LSK 2L to show the 230 degree radial coming off the NDB, this will help us guide our turn onto the visual leg at the NDB.

- Press NEXT PAGE.

  - Type INN and enter it intl LSK 1L.

    This is the Innsbruck NDB at the mouth of the north/south valley and will serve as another reference point.

  - On the SEL DESIRED INN page, select the LSK 1L option.

  - Type 264 into LSK 2L to show the 264 degree radial line off the NDB for our downwind leg.

- Press NEXT PAGE

  - Type OEV and enter it at LSK 1L.

  - On the SEL DESIRED OEV page, select the LSK 1L option.

  - Type /3.5 into LSK 2L to draw a 3.5nm ring around the localizer.

- Press NEXT PAGE

  - Type OEJ and enter it at LSK 1L.

    This is the localizer DME to the northeast of the airport that is used in the missed approach procedure.

- On the SEL DESIRED OEJ page, select the LSK 2L option.

- Type 247 and enter it at LSK 2L. (reciprocal of the 067 radial TO OEJ)

- Type 065 and enter it at LSK 3L

  These last two lines set up the two course lines needed for the missed approach procedure. We need two entries to show both sides of the course that is used.

- Press NEXT PAGE

  - Type RTT and enter it at LSK 1L.

    This is so we have RTT as a reference point during the missed procedure as we need to hold there as the final step in it.

We should now have the following FIX drawings set up:

- Absam (AB) NDB with a 230 degree radial.
- Innsbruck (INN) NDB with a 264 degree radial.
- OEV localizer with a 3.5nm ring.
- OEJ localizer with 247 degree and 065 degree radials.
- RTT NDB, position only.

- Return the captain's CDU to the LEGS page.

- Set the captain's side MCP COURSE to 254 (OEV localizer) and the first officer's MCP COURSE to 067 (OEJ localizer for the missed approach)

Just a few more items now and we be ready.

- Select AUTO BRAKES 2 on the main panel.

- We've already briefed the approach during cruise.

- Run the DESCENT CHECKLIST located on page NC.3 of the QRH. (page 27 of the pdf version)

As we turn toward the mountains at BAVAX, you should begin to see terrain contours appear on the ND. The **PMDG 737NGX** features an extremely sophisticated EGPWS (Enhanced Ground Proximity Warning System) simulation. Since we are still more than 2000 feet above any terrain feature, the system is in what's known as "peaks mode". The numbers at the lower left of the ND are the highest and lowest terrain features currently displayed on the map in feet * 100 above mean sea level. So for example 080 is 8000 feet.

Once we get low enough on the approach, you will begin to see red, yellow and green bands indicating the terrain altitude relative to your own.

When in the "band" mode:

Green terrain is between 2000 feet below and 500 feet below the airplane. (250 feet with gear down)

Amber terrain is within 500 feet below and 2000 feet above the airplane.

Red terrain is more than 2000 feet above the airplane.

- Turn ON the FASTEN BELTS switch on the lower overhead prior to crossing over the mountains – it's likely to get bumpy and we want everyone seated by this point.

- At around 9nm from MANAL at FL190 or so you'll start to pick up the RTT NDB on the ADF.

  Notice the needle realistically swinging and wandering on the RMI. This was custom programmed based on the real life behavior and physics of these kinds of radio signals.

- Set the ND range as required during the approach. 20nm and 10nm are good values for the initial approach and then you can switch to 5nm if need be during the later sections.

- Passing our transition level of FL120, press the STD button on the BARO knob to switch to flying altitudes instead of flight levels.

- The plane will level out at 10000 feet to slow to 240 knots somewhere between TULSI and RTTNB.

- Passing 10000 feet, turn on the landing lights with a left click of the gang-bar.

- Run the APPROACH CHECKLIST located on page NC.3 of the QRH. (page 27 of the pdf version)

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THE APPROACH

First off, this is a very challenging approach, even more so in a single pilot simulated environment. You very well may not get it right the first time (I certainly didn't). In the event that this happens, we've included a number of saved flights that will restore the sim to various points in the flight – these are:

- Before Pushback
- Before Takeoff
- Before Top of Descent
- Before Approach
- Before Visual Approach
- End of flight, fully shut down in Innsbruck

Access these from the FSX Load menu and you'll be able to start over if something doesn't go quite right.

Now…

- After passing RTT, flip the ADF transfer switch, selecting Absam (AB) NDB on 313.0.

- When we reach the DECEL circle just after RTTNB, get ready to monitor the airspeed very carefully. The plane will first slow to Flaps Up maneuvering speed, at which point you should lower Flaps 1, then Flaps 5 at the Flaps 1 maneuvering speed and so on according to the standard 1, 5, 15, landing flaps (40 in this case) schedule. Drop the landing gear when selecting Flaps 15. You should reach 155 knots just prior to OEV18.

- Just before OEV18, lower the MCP ALTITUDE window to 3700 feet, which is the minimum descent altitude (MDA) for the circling procedure.

- Monitor the airspeed and the LOC and GS deviation as we descend. We'll likely be slightly to the left of the localizer course – this has to do with magnetic variation issues and navdata location in FSX and is not a major problem. The main thing is just to make sure there's no gross error in agreement between

the FMC and the actual LOC signal.

- Flip the first officer's ND mode control to APP (approach). This is set for the missed approach procedure and will allow us to easily follow the 067 course to the OEJ LOC/DME station in the event we go missed.

- As we approach 6.3DME and the ABSAM NDB (AB), set the MCP HEADING window to 230 to preparing for the left turn turn.

- Just before passing AB, press HDG SEL. Pressing it just slightly beforehand accounts for the turn radius and should put us right on the 230 degree radial outbound from it.

We level out at 3700 feet about halfway to the Innsbruck NBD (INN).

- Press DEP ARR and select the LOWI ARRIVALS page.

    - Select Runway 08, which clears out the LOC/DME EAST procedure. We're doing this because we don't want the missed approach procedure for runway 26 to be in the FMC in the event of a go-around. This isn't entirely realistic, but the Navigraph navdata does not contain a procedure for the circle to land's missed approach.

    - Press LSK 3L to copy RW08 and then press LSK 1L to enter a direct to. Then enter the extended runway centerline course, 079 into the LSK 6R DIR INTC field.

      This sets up a magenta line to infinity along the runway's centerline on the ND that can be used for situational awareness during the turn to final.

- Engage LVL CHG by pushing the MCP button to continue down to 3700 feet. Make sure the MCP SPEED window is set to 155 when it opens. (When we did the above MCP steps, it changed the VNAV path and we can't use it any longer)

- At around 1 mile before INN, turn right with the MCP HEADING knob to 264. (Use the inner ring of the 5nm ND range setting to judge this.)

  You'll likely start hearing EGPWS terrain warnings and seeing solid amber squares on the ND now. Provided you start the turn early enough (do not wait until overhead INN), there shouldn't be a problem. This is a visual approach though and if you've overshot it and things don't look right, feel free to turn further to the right to get back on the correct path over the ground.

  Ideally you want to be toward the left edge of the green terrain strip on the ND.

It should be noted though that the terrain display is not to be used as a primary navigation aid, this is only for situational awareness and reference.

This will look VERY close to the side of the mountain to the left.

We need to be this close though to give ourselves enough room to do the 180 degree turn to final. In real life it is not unusual to see people outside some of the buildings on this ridge waving at us - we're that close.

With weather enabled it is extremely important to watch for the *Föhn* wind in this area as it can easily blow you off course and make it so you don't have enough room to the right to make the turn at the end of valley.

- Once established on the correct downwind path, select Flaps 40 and reduce the MCP SPEED window to our VREF + 5, which should be 140 or so.

- Set both engine start selectors on the lower overhead to CONT.

- Arm the ground auto-spoilers with the clickspot or by pressing Shift-/

- Run the LANDING CHECKLIST located on page NC.3 of the QRH. (page 27 of the pdf version)

- Carefully monitor the DME on the ND and watch for the dashed green 3.5 DME circle around OEV. A bit prior to reaching 3.5DME OEV / 14.1 DME OEJ do the following:

    - Lower the HGS.

    - Disconnect the autopilot and autothrottle.

    - Turn off both flight director switches.

    - Set the missed approach altitude (9500) in the MCP ALTITUDE window.

At 3.5 DME OEV, begin a descending steep turn to the right to line up with Runway 8. Use around 30 degrees of bank (the last tic mark on the HGS bank scale). Pay careful attention to thrust during this maneuver, it's very easy to speed up after you start descending – you need to

reduce thrust as you start descending. Your current airspeed is located to the left and just below the flight path vector.

Again, be very careful not to descend too far too early, there is a ridge about 800 feet below you until you get out far enough into the valley. In real life the first officer assists with this, but here we are on our own.

- Hopefully if you've done the turn correctly, you'll roll out and see the runway straight ahead. From here it's a normal landing.

- Come over the threshold with the power still on and begin reducing it around the 50 foot GPWS callout. Flare gently and land.

- Press F1 and then press and hold F2 quickly to engage the thrust reversers. We'll plan to exit the runway to the right at taxiway B, which is actually the only one available. If we pass it we'll have to turn around at the 26 end of the runway and backtaxi.

- Brake manually below 80 knots, which will disengage the autobrakes.

  Note that due to an issue with FSX, you will need to tap the brakes several times or press and hold them to get the autobrakes to disengage.

- Turn off to the right at Taxiway B and hold.

- Raise the HGS by clicking on the left cockpit window support.

AFTER LANDING

- Place the SPD BRK lever in its DOWN position, which stows the spoilers.

- Start the APU by left clicking twice on the switch at the front of the overhead.

- Set the overhead PROBE HEAT switches to off.

Note that you will get a master caution for ANTI-ICE when doing this. This is normal and you can clear it by pushing on the master caution button.

- Turn off the LANDING LIGHTS, turn on the TAXI LIGHT, and set the POSITION lights switch to STEADY.
- Set the engine start selectors from CONT to off.
- Set the AUTOBRAKES knob to OFF.
- Select FLAPS UP.
- Set the TRANSPONDER mode to standby – LOWI is not equipped with ground radar.

LOWI is a very small airport and does not have gates or a complicated taxiway structure. Simply taxi to the right and park anywhere near the terminal. Park with the nose facing the terminal building.

Now that we're parked, it's time to perform the Shutdown Procedure which starts at FCOM Vol. 1 page NP.21.82 (page 158 of the PDF version)

SHUTDOWN PROCEDURE:

- Set the parking brake either by clicking the handle on the pedestal.
- Set both APU generator bus switches to on.

Verify that the GEN OFF BUS lights for the engine driven generators are lit and the APU GEN OFF BUS light is extinguished – the plane is now receiving its electrical power solely from the APU generators.

- On the pedestal view, move both engine start levers below the throttles to the cutoff position (down) by left clicking them.

This is the action that actually shuts down the engines.

- Turn the fasten seat belts switch on the overhead off.

- Turn the red anti-collision beacon and the taxi light switches off.

- Turn all FUEL PUMP switches except for the left forward one off. (APU usage)

- Leave the engine hydraulic pump switches ON and set the electric demand pump switches to off.

- Set the pneumatic panel isolation valve to open and set the APU bleed air switch to on.

- Turn the TERR mode, TFC mode and both NAV pointers OFF on the EFIS control panel.

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- Press MENU, FS ACTIONS, and then GROUND CONNECTIONS. Set the CHOCKS with LSK 1L.

- Disengage the PARKING BRAKE by clicking the lever since we're now held in place by the chocks.

- Press LSK 6L for RETURN and then press LSK 4L for DOORS.

- Open the L ENTRY FWD door by pressing LSK 1L.

- Press NEXT page and then LSK 1L and 2L to open both cargo doors.

- Press PREV PAGE.

- After the entry door is open, extend the airstairs by pressing LSK 4L. This is a very cool animation, be sure to go out to spot view to watch it.

As with Tutorial #1, at this point some time would pass at the end of a real flight - the passengers are being deplaned, the catering and cleaning crews are beginning to perform their jobs and so on. We're going to pretend that some amount of time for those activities has passed and proceed with the final Shutdown Procedure items after our passengers have left the airplane.

- Move the APU switch to the off position.

  The APU shutdown process will take approximately 60 seconds to begin.

- Turn the left FWD fuel pump off.

- Perform the SHUTDOWN checklist, which is located on page NC.3 of the QRH (page 27 of the PDF version)

This completes the shutdown and we'll now move on to the Secure Procedure, which is performed before the crew leaves the aircraft.

SECURE PROCEDURE:

The Secure Procedure's purpose is to get the airplane into a condition ready for servicing by the ground crews, but without completely powering it down – we of course will be completely powering it down, but the Secure Checklist has to be done first.

- Rotate both IRS mode selectors on the rear overhead to OFF.

  This powers down the inertial reference system's laser gyros. They will now lose alignment and we'll need to fully realign them during our preflight for Tutorial Flight #2.

- Set the EMERGENCY EXIT LIGHTS SWITCH in the center of the forward overhead to OFF. This disarms the cabin exit lighting since there's no longer any chance of a passenger evacuation.

- Set all four WINDOW HEAT switches at the top of the forward overhead panel to OFF.

- Set both PACK switches on the pneumatic panel to OFF.

- Perform the SECURE checklist, located on page NC.4 of the QRH (page 28 of the PDF version). As with the SHUTDOWN checklist, we're just checking the items we've already performed as part of the procedure here.

ELECTRICAL POWER DOWN:

The final step that will actually put the aircraft into a cold & dark state is the Electrical Power Down procedure, which is located in FCOM 1's Supplemental Procedures section on page SP.6.4 (page 212 of the PDF version).

- Verify that both the APU and GRD POWER switches are OFF.

Ensure that at least 2 minutes has elapsed since the APU was turned off during the Shutdown Procedure before continuing.

- Set the overhead BATTERY switch to OFF.

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THE END!

Welcome to Innsbruck and congratulations on completing a very challenging flight. If you can do this flight you can do almost anything in the **PMDG 737NGX**.

You're officially promoted to Captain!

ADDENDUM – WEATHER/WINDS ALOFT USE

This addendum shows you how to use ActiveSky 2012 or a similar weather addon to create winds aloft and temperature data that we'll input into the FMC so that it can take into account the weather's effect on our flight.

PRELIMINARY WEATHER SETUP:

This section explains how to set up Active Sky 2012 for this flight. I'm showing the procedure for AS2012 because it's what I personally use – other weather addons including earlier versions of AS should have similar functions.

The first step involves the use of a flight planner and route export tool called FSBuild 2. This is not critical, but it allows us to easily export an FSX flightplan containing our exact route waypoints, which we can then import into AS2012 for weather interpolation processing. If you don't have FSBuild 2, skip this subsection and go to the next one, which shows an alternate method that only requires AS2012 itself.

I am using the latest available version 2.4.0.18 with Navigraph's 1108 navdata cycle loaded into it to match the NGX's.

- Start FSBuild 2.
- Type EHAM into the yellow DEPARTURE box.
- Type LOWI into the yellow DESTINATION box.
- Type EDDM (Munich, Germany) into the white ALT (alternate) box.
- Now copy our route using Ctrl+C:

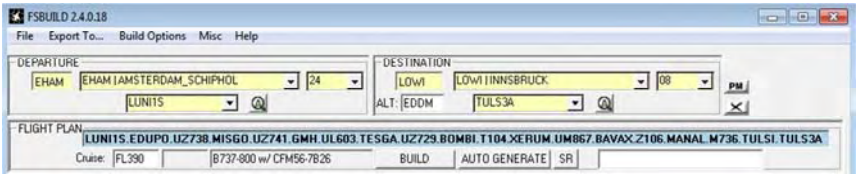
  LUNI1S.EDUPO.UZ738.MISGO.UZ741.GMH.UL603.TESGA.UZ729.BOMBI.T104.XERUM.UM867.BAVAX.Z106.MANAL.M736.TULSI.TULS3A

  Be careful here, you may need to copy both lines separately due to the formatting.

- Paste the route using Ctrl+V into FSBuild 2's blue FLIGHT PLAN box.

- Enter FL390 into the white Cruise: box below the blue FLIGHT PLAN box.

  FSBuild 2 should now look like this:



- Select “FSX (xml)” in the “Export to…” menu at the top of the application.

  Note - Make sure you have selected your FSX root folder in FSBuild 2’s Options or it won’t know where on your PC to export to.

- Click the BUILD button below the blue FLIGHT PLAN box.

You now have an FSX flightplan with this route sitting in your My Documents/Flight Simulator X files folder called EHAM-LOWI.pln that we can load into AS2012 for processing.

- Pull up the AS2012 window and click the blue Flight Plan button on the left side.

- Click the green Enter Plan button at the top.

- Click the blue Import button at the bottom.

- Select the EHAM-LOWI.PLN file from the next window and click Open or press Enter.

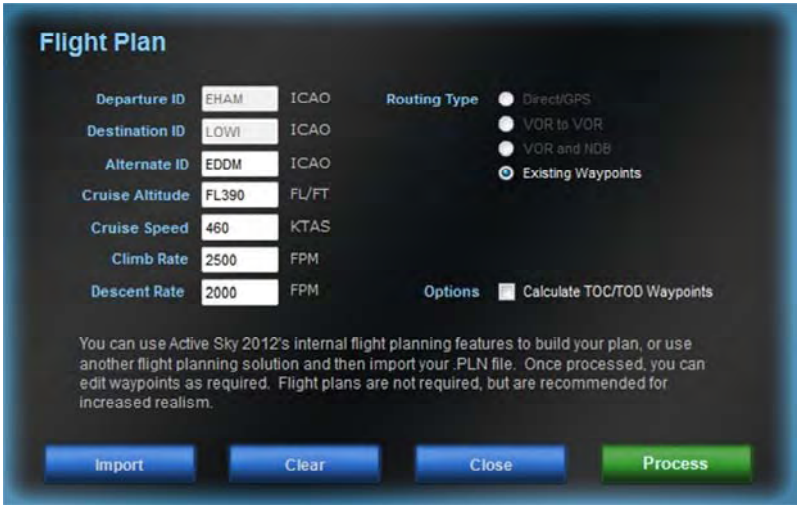
- Type EDDM into the Alternate ID box.

- Type 460 into the Cruise Speed box.

- Type 2500 into the Climb Rate box.

- Type 2000 into the Descent Rate box.

The window should look like this:



- Click the green Process button.
- Cancel out of the graphics install dialog.

AS2012 is now set to correctly interpolate FSX weather stations along our exact route of flight and we now have some extremely useful wind information on this screen that we can use to give the FMC predictions.

If you do not have FSBuild 2 to create an FSX flight plan file to import, here's another way, however it will be less accurate.

Starting from the AS2012 main window:

- Click the blue Flight Plan button on the left side.
- Type EHAM into the Departure ID box.
- Type LOWI into the Destination ID box.
- Type EDDM into the Alternate ID box.
- Type FL390 into the Cruise Altitude box.
- Type 460 into the Cruise Speed box.

- Type 2500 into the Climb Rate box.
- Type 2000 into the Descent Rate box.
- Verify that the Direct/GPS Routing Type is selected.

The window should look like this:

- Click the green process button.
- Cancel out of the graphics install dialog.

We now have a direct flight plan between EHAM and LOWI loaded into AS2012. We can now make it a bit better by adding waypoints to it. AS2012 only allows you to add VORs or NDBs directly however, which is why this will be slightly less accurate than the method using the flightplan file from FSBuild 2.

- Click on the line that says DEST LOWI to select it.
- Press the blue Add Waypoint button and type GMH into the ID box and press OK.
- Repeat these last two steps to add the following three waypoints – DKB, WLD and RTT.

The plan part of the window should look like this:

Enter Plan

Departure ID: EHAM
Destination ID: LOWI
Alternate ID: EDDM
Cruise Altitude (FT): 39000
Cruise Speed (KTAS): 460
Waypoints: 3

Way Point	ID	Dist	True	Mag Var	Wind Dir	Wind Spd	Temp	GS	TAS	Hdg to Fly	ETE
DEP	EHAM				260	7	-1.0				
		134	119	1.3				465	460	118	17
1	GMH				319	33	-53.9				
		151	143	2.0				493	460	141	18
2	DKB				291	25	-53.1				
		49	134	2.2				483	460	133	6
3	WLD				279	29	-53.5				
		76	154	2.4				476	460	155	9
4	RTT				263	35	-54.6				
		27	248	2.2				426	460	247	3
DEST	LOWI				270	6	-1.0				

- Click the blue Refresh Plan button at the bottom of the window to take the new waypoints into account.

We now have a pretty good approximation of the flightplan entered into AS2012 using the two VORs and one NDB that are part of the route. The rest of the route's waypoints are intersection fixes and cannot be entered directly in AS2012's interface.

CRUISE WIND ENTRY:

Once a flightplan is loaded and processed, AS2012 gives us a wealth of information on the flightplan screen. Of particular importance however is the bottom line of the top window pane, which shows us the average wind direction, speed and air temperature along our route at our cruise altitude.

Note – uncheck the box that says "Show Surface Wind Information for Dep, Dest and Alt (vs. Aloft)" – in this case we actually do want the aloft average without any surface information.

In my case, the values are wind 312 at 31 knots and a temperature of -54.2C.

During the initial FMC PERF INIT setup phrase prior to calculating fuel load, we can make entries based on these values that will cause the FMC to take them into account and show the effect on our fuel burn.

There is a simplified but less accurate way and a more complicated but also more accurate way to enter the wind predictions.

TUTORIAL #2

The Simple Way:

Because the 737 generally flies short to medium range routes, it is often sufficient to just enter the winds aloft average for the whole route.

You do this on the PERF INIT page at LSK 3R. When I put my current wind average of 312/31 into it, the fuel prediction at LOWI goes from 3.2 to 3.4, which indicates that I've got a tailwind component and I'm going to burn about 200 lbs (90.7 kg) less fuel than I would in a no-wind situation.

Do the simple way first even if you're planning to do the complex way.

The Complex Way:

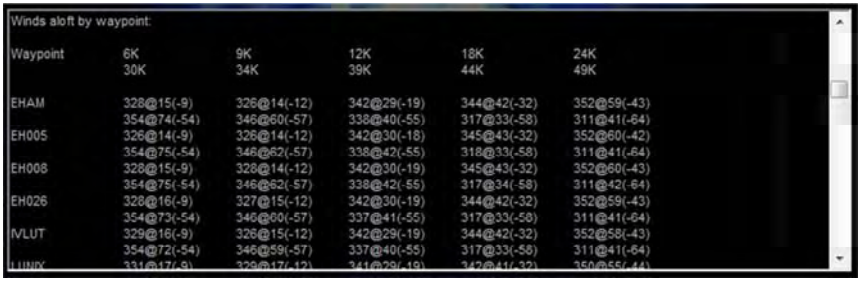
- Press the LEGS button, then press LSK 6R to go to the RTE DATA pages. This is a list of the waypoints in the route and their corresponding winds aloft predictions.

- Press NEXT PAGE twice until page 3/9 is shown.

The FMC only allows direct wind entries for cruise waypoints – in our case the first waypoint considered cruise is the Germinghausen (GMH) VOR on page 3 and the last one is Dinkelsbuhl (DKB) VOR on page 4. The rest of the waypoints on the 9 pages are climb or descent waypoints. The FMC does not account for climb wind and it takes descent wind into account in a different way that we'll get to shortly.

We can insert a winds aloft prediction specific to each cruise waypoint in our flight and this will make the prediction as accurate as it can be. This is more important to do on longer flights where a significant error versus the average could result in a fuel problem.

- Pull AS2012 back up and scroll the bottom pane down a bit until you see data that looks like this:



Winds aloft by waypoint:

Waypoint	6K 30K	9K 34K	12K 39K	18K 44K	24K 49K
EHAM	328@15(-9) 354@74(-54)	326@14(-12) 346@60(-57)	342@29(-19) 338@40(-55)	344@42(-32) 317@33(-58)	352@59(-43) 311@41(-64)
EH005	326@14(-9) 354@75(-54)	326@14(-12) 346@62(-57)	342@30(-18) 338@42(-55)	345@43(-32) 318@33(-58)	352@60(-42) 311@41(-64)
EH008	328@15(-9) 354@75(-54)	328@14(-12) 346@62(-57)	342@30(-19) 338@42(-55)	345@43(-32) 317@34(-58)	352@60(-43) 311@42(-64)
EH026	328@16(-9) 354@73(-54)	327@15(-12) 346@60(-57)	342@30(-19) 337@41(-55)	344@42(-32) 317@33(-58)	352@59(-43) 311@41(-64)
IVLUT	329@16(-9) 354@72(-54)	326@15(-12) 346@59(-57)	342@29(-19) 337@40(-55)	344@42(-32) 317@33(-58)	352@58(-43) 311@41(-64)
LUNIX	331@17(-9)	329@17(-12)	341@29(-19)	342@41(-32)	350@55(-44)

This is a chart of the winds aloft and temperatures from 6000 feet all the way up to FL490. We're interested in the bottom entry in the third column for all of these, which is for our cruise altitude of FL390. If your cruise altitude is between two of these columns, then take an average of the two to get that waypoint's value.

- Scroll down until you see GMH through DKB. For me the values are:
    - GMH – 319/33
    - TESGA – 308/30
    - BOMBI – 307/30
    - HAREM – 299/27
    - ELMOX – 299/27
    - DKB – 289/27

- Enter these values into the RTE DATA page with the right side LSKs. Notice that every waypoint below the one you just

entered inherits the wind data from above. This is useful when you have a string of waypoints that all have the same or very similar winds. In actual real life practice, the pilots will not enter a wind change unless it is +/- 10 degrees or +/- 10 knots from the value that preceded it in the list.

- Press the illuminated EXEC button to commit the wind entries.

When I check the PROG page after doing this, it now shows 3.3 instead of 3.4 with the complex method vs. the simple one. Small difference, but a difference nonetheless. Multiply this out by many hours on a long haul flight in a 777 and you could have a real problem if you'd just used the simple way with the average.

CRUISE TEMPERATURE ISA DEVIATION:

ISA stands for International Standard Atmosphere and is defined as a pressure of 1013.25 hPa (29.92 inHg) and a temperature of +15C (+59F) at sea level. This is where the standard altimeter setting we use above transition altitude actually comes from.

The ISA deviation is how far away the actual temperature is on either side of the expected standard temperature for the altitude we're flying at.

There's a simplified formula for calculating what the ISA temperature is for the altitudes that airliners normally fly at – this is not 100% exact, but it's close enough for aviation purposes.

- 15C - (first two digits of the altitude x 2)

  So for our cruise altitude of FL390 its:

  15C - (39 / 2) = 15C – 78 = -63C

  We'd be done here if our cruise altitude was below FL360, but above FL360 a phenomenon known as the tropopause limits ISA temp to -58.5C. The tropopause is a thermal boundary later between the troposphere and the stratosphere.

Thus the ISA deviation is the actual air temperature minus the ISA temperature for that altitude:

-54.2C - (-58.5C) = **+4.3C ISA deviation**

There's only one place in the FMC to enter this for cruise, so go back to the PERF INIT page.

- Enter the actual average temperature (-54) into LSK 4L. The FMC does the calculation and we see that the ISA deviation in the 3R field changes from 0 to 3C.

  As I said before, the way of estimating that I used to show you how this actually works is not exact. The FMC has the exact calculation built into it and that along with the rounding up to -54 results in it being +3C instead of +4.3C. Again, this makes a very small difference and it's not important on the 737 to have it 100% exact. You can see this by entering really high numbers like 30 or 40 and seeing how the fuel burn changes very little.

DESCENT WIND ENTRY:

The FMC allows for the entry of descent wind predictions for three different altitudes of the pilot's choosing on the DES FORECASTS page. Ideally you want to split these up so you have predictions spacing out the range between Top of Descent and where you'd start maneuvering or getting vectored for the approach where it no longer matters. In our case this is going to be between FL390 and 9500 feet where we start the approach.

These entries are often not done until prior to Top of Descent in cruise – the primary purpose here since descent is usually at idle thrust is not fuel burn related, but instead to give VNAV the corrections it needs to stay on path instead of getting high or low due to the winds. Failure to enter these descent wind forecasts is a primary cause of VNAV appearing to get off the path.

To figure out which altitudes to use, we can look at the predictions on the LEGS page to match up winds aloft forecasts to our waypoints.

- Press LEGS and then NEXT PAGE until you see the start of the descent, which should be between DKB and XERUM. On the ground this is page 4/9.

It wouldn't make sense to use FL390 as one of our three altitudes because we already have a prediction for that altitude at DKB, which is just before our T/D. We cross BURAM at around FL351 (on my run at least) – this is a good first choice.

- The winds aloft in AS2012 for BURAM show 280/29 at FL390 and 262/34 at FL340. Let's average these to get something we can actually input for FL350.

  (280 + 262) / 2 = 271

  (29 + 34) / 2 = 31.5 (round up to 32)

  FL350 271/32 will be our first entry.

BAVAX at close to FL230 looks like another good choice.

- The AS2012 predictions for BAVAX show 239/39 at FL240 and 234@30 at FL180.

  (239 + 234) / 2 = 236.5 (round to 237)

  (39 + 30) / 2 = 34.5 (round to 35)

  FL230 237/35 will be our second entry.

For the next one let's use RTT at close to 10000 feet since it's the end of the main descent.

- The AS2012 predictions for RTT show 274/12 at FL120 and 314/08 at 9000 feet.

  (274 + 314) / 2 = 294

  (12 + 8) / 2 = 10

  10000 feet 294/10 will be our third entry.

Now we can actually get these values into the FMC:

- Press the DES button, then LSK 6L to go to the DES FORECASTS page.

- Type FL350 and enter it at LSK 3L.
- Type 271/32 and enter it at LSK 3R.
- Repeat the process for:
    - FL230 237/35
    - 10000 294/10

DESCENT ISA DEVIATION:

The LSK 2R field, ISA DEV/QNH, is the final entry we need to make on the DES FORECASTS page.

In real life, this field should be the ISA deviation on the ground at the destination airport. Because of limitations in the FSX weather system

however, it works best if you input the FL180 ISA deviation. The FSX weather engine does a bunch of sudden shifts in pressure and temperature as you descent instead of a smooth continuum like it is in the real world. Thus FL180 serves as sort of a midpoint for the whole descent.

Looking at the LEGS page again, we pass FL180 somewhere between BAVAX and MANAL. Let's average the FL180 temperatures for both BAVAX and MANAL to come up with something that's probably very close.

- In this case the averaging is easy – both waypoints are -32C in AS2012's data. That's our value for the actual temperature.

- The temperature at FL180 on an ISA day should be:

  15C – (18 * 2) = 15C – 36 = -21C

- The deviation thus is:

  -32C - (-21C) = **-11C ISA deviation**

Looking in AS2012, the current QNH at LOWI is 1029 hPA.

- Enter -11/1029 into LSK 2L.

The DES FORECASTS page should look like this when everything's done:

The TAI ON/OFF field at LSK 1R is for entering a range of altitudes where you expect to have the thermal anti-ice system on. Doing this increases the engine thrust and the FMC will use this range to recalculate a new “idle” for constructing its path segments. This does work, try it sometime!

- Press the illuminated EXEC button to execute the DES FORECASTS entries.

From this point, you’d move on to the fuel planning section and use the new fuel burn values on the PROG and ALTERNATE DESTS pages to do your fuel planning.

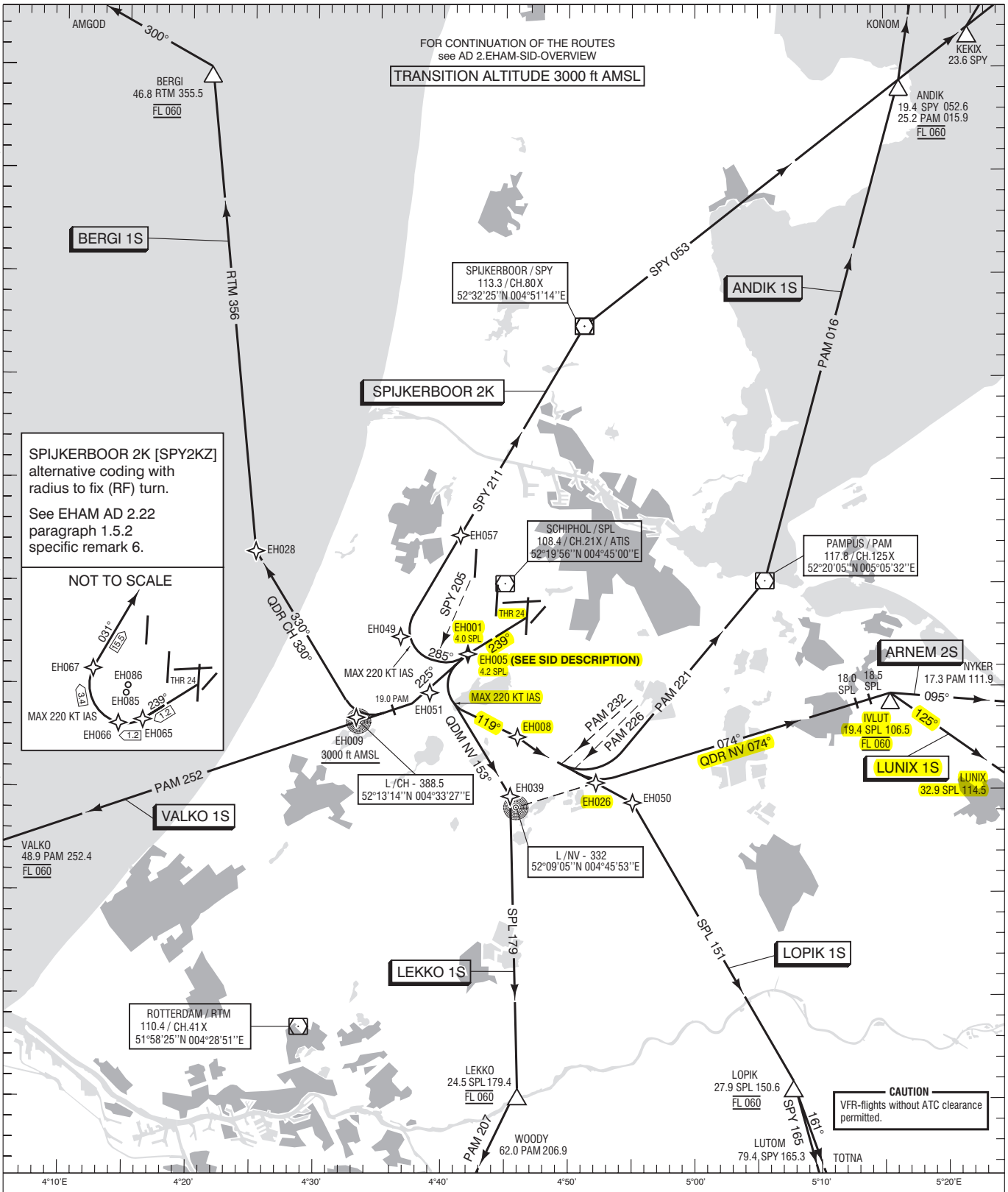
TAKEOFF WIND:

The one other wind related entry is at LSK 1L of the TAKEOFF REF page 2, the RW WIND field. This is simply the wind as it is expected right at takeoff.

For this you would want to check the “Show Surface Wind Information for Dep, Dest and Alt (vs. Aloft)” box on the AS2012 page, which will cause it to show the surface wind at EHAM. We’d unchecked it earlier to get the accurate winds aloft average.

- In my case this is 200/8, so I’d enter that into LSK 1L and that’d be it.

Happy windy flying!



DISTANCES IN NM
ALTITUDES IN FEET
DIRECTIONS ARE MAGNETIC

23 SPY 304 — DME SPY 23 NM, VOR SPY RADIAL 304

AVERAGE VAR 1° W (2005)

- SID
- SID ATC DISCRETION
- VOR RADIAL
- BEARING

THR24	52°18'16''N	004°46'39''E
EH001	52°16'31''N	004°42'04''E
EH005	52°16'26''N	004°41'51''E
EH008	52°12'30''N	004°46'00''E
EH009	52°13'25''N	004°33'16''E
EH026	52°10'17''N	004°52'11''E
EH028	52°21'28''N	004°25'16''E
EH039	52°09'37''N	004°45'26''E
EH049	52°17'21''N	004°36'45''E
EH050	52°09'19''N	004°55'05''E
EH051	52°14'38''N	004°39'04''E
EH057	52°22'16''N	004°41'27''E
EH065	52°16'37''N	004°42'20''E
EH066	52°16'26''N	004°40'24''E
EH067	52°19'05''N	004°38'24''E
EH085	52°17'54''N	004°41'01''E
EH086	52°18'15''N	004°41'10''E

TWR	119.225	Schiphol	Primary
	118.100	Schiphol Tower	
	121.975	Schiphol Delivery	Clearance delivery
	121.650	Schiphol Start-up	Start-up Control
	121.700	Schiphol Ground	Ground Control
	121.800	Schiphol Ground	Ground Control
APP (TAR)	119.050	Schiphol Approach / Departure	
	121.200	Schiphol Approach / Departure	
	121.500	General Emergency	
	243.000	in Amsterdam FIR	
ATIS	122.200	Departure Information	

CHANGE : SPIJKERBOOR SID alternative coding with radius to fix (RF) turn added, editorial.

Detailed information concerning ATS-ROUTES and WPTs see ENR 3, 4 and 6.
For ATS-ROUTE restrictions see AD 2.22 paragraph 1.5.3.

TRANSITION ALTITUDE : 3000 ft AMSL
Below FL 100 : MAX 250 KT IAS

Gunfiring up to 48000 ft AMSL
EHD 41D FL 055 / MSL
EHD 41A-C FL 480 / MSL
EHD 41E FL 055 / MSL

OUTLINE SID CHARTS
SEE AD 2.EHAM-SID-04 up to and incl. -SID-SUP-3

SPIJKERBOOR / SPY
113.3 / CH.80 X
52°32'25''N 004°51'14''E

SCHIPHOL / SPL
108.4 / CH.21 X / ATIS
52°19'56''N 004°45'00''E

PAMPUS / PAM
117.8 / CH.125 X
52°20'05''N 005°05'32''E

EELDE / EEL
112.4 / CH.71X
53°09'50''N 006°40'00''E

EINDHOVEN / EHN - 397
51°28'04''N 005°23'42''E

AMGOD BERGI

ANDIK BETUS NOPSU SPIJKERBOOR TORGA

GORLO

DENAG VALKO

LARAS LEKKO WOODY

LOPIK OGINA ROVEN

ARNEM ELPAT NYKER

EDUPO IVLUT LUNIX

PAM 112

125°

131°

GODOS, MIMVA, KOLAG, SUPUR, AMGOD, KONOM, AGISU, BEDUM, SOMPO, DOBAK, GRONY, BERGI, KEKIX, ANDIK, IVLUT, NYKER, ELPAT 34.0 PAM, ARNEM 39.0 PAM, LUNIX, RENDI 37.8 SPL, EDUPO 45.5 SPL, SONEB, TEBRO, NAPRO, VALKO, DENAG, GORLO, RINIS, PEVAD, XAMAN, REFSO, RIMBU, LEKKO, LOPIK, LARAS, TOTNA, WOODY, LUTOM, SOPVI, OSGOS

(U)P1, (U)L602, (U)L60, (U)L602, (U)L602, (U)Z733, (U)Z708, (U)N873, (U)M105, (U)N873, UZ700, UP603, (U)P174, (U)P999, (U)N125, (U)L620, (U)T196, (U)Z738, (U)L980, (U)P20, (U)P20, (U)L980, (U)L980, (U)Y76, (U)N872, (U)N852, V33, V33, P57, P57

LONDON FIR, AMSTERDAM FIR, BRUSSELS FIR, AMSTERDAM FIR, BREMEN FIR, LANGEN FIR, BREMEN FIR, AMSTERDAM FIR, LANGEN FIR, AMSTERDAM FIR

53° N, 52°, 51° N, 2° E, 3°, 4°, 5°, 6°, 7° E

AVERAGE VAR 1°W (2005)
DISTANCES IN NM
ALTITUDES IN FEET
DIRECTIONS ARE MAGNETIC

23 SPY 304 — DME SPY 23 NM, VOR SPY RADIAL 304
SID ROUTE
SID ROUTE AS DESCRIBED
ATS ROUTE
CDR

TWR	119.225	Schiphol Tower	Primary
	118.100	Schiphol Tower	
	118.275	Schiphol Tower	
	121.975	Schiphol Delivery	Clearance Delivery
	121.650	Schiphol Start-up	Start-up Control
	121.700	Schiphol Ground	Ground Control
	121.800	Schiphol Ground	Ground Control
	121.900	Schiphol Ground	Ground Control
APP (TAR)	119.050	Schiphol Approach / Departure	
	121.200	Schiphol Approach / Departure	
	121.500	General Emergency	
ATIS	122.200	Departure Information	

CHANGE : ATS RTEs north of ANDIK, BOLGA SID renamed TORGA and GRONY SID renamed NOPSU, editorial.

SCHIPHOL
STANDARD DEPARTURE CHART - INSTRUMENT

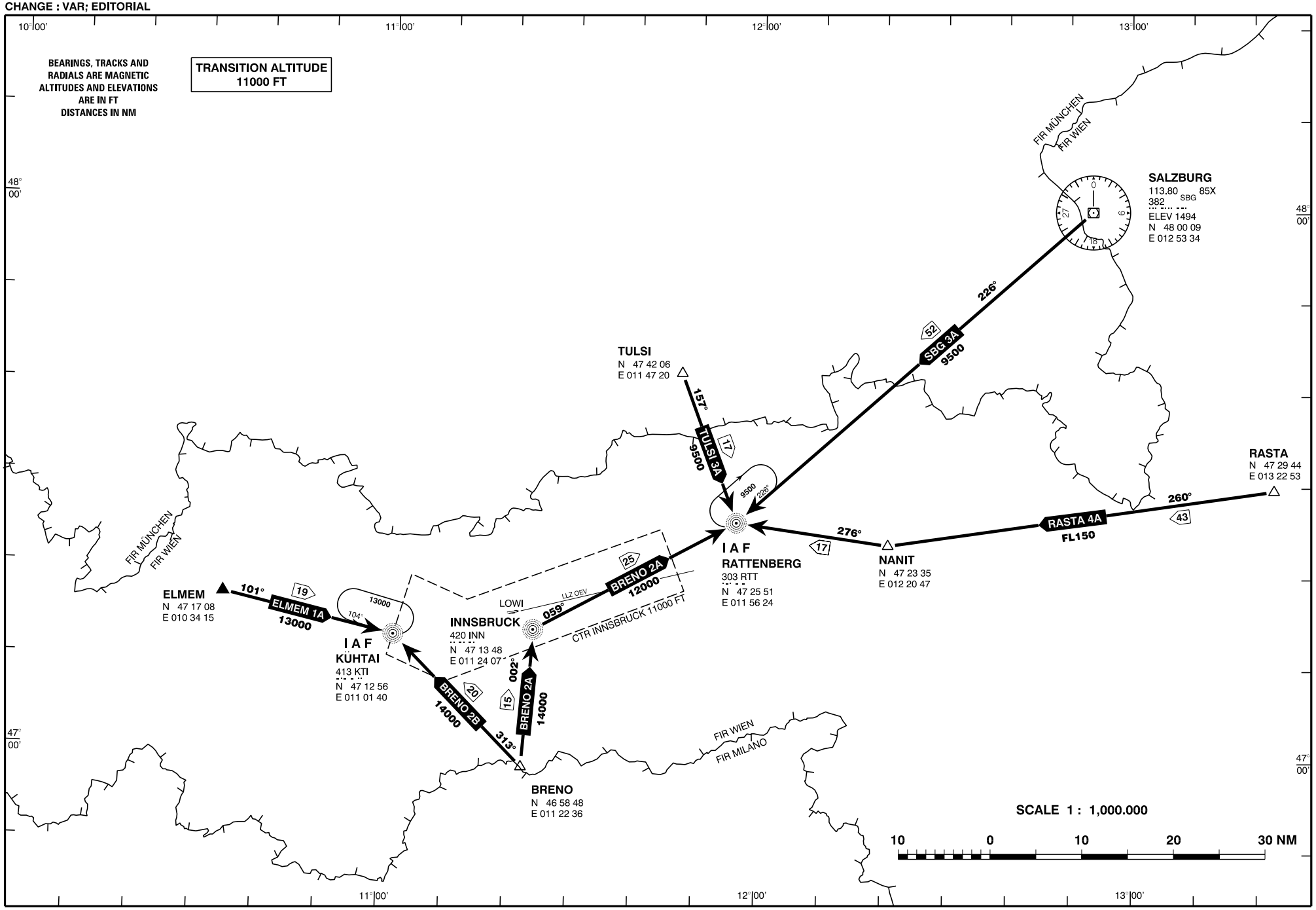
AD 2.EHAM-SID-OVERVIEW
10 MAR 11

CHANGE : VAR; EDITORIAL

STANDARD ARRIVAL CHART - INSTRUMENT (STAR) - ICAO

VAR 2° E

INNSBRUCK
ÖSTERREICH AUSTRIA

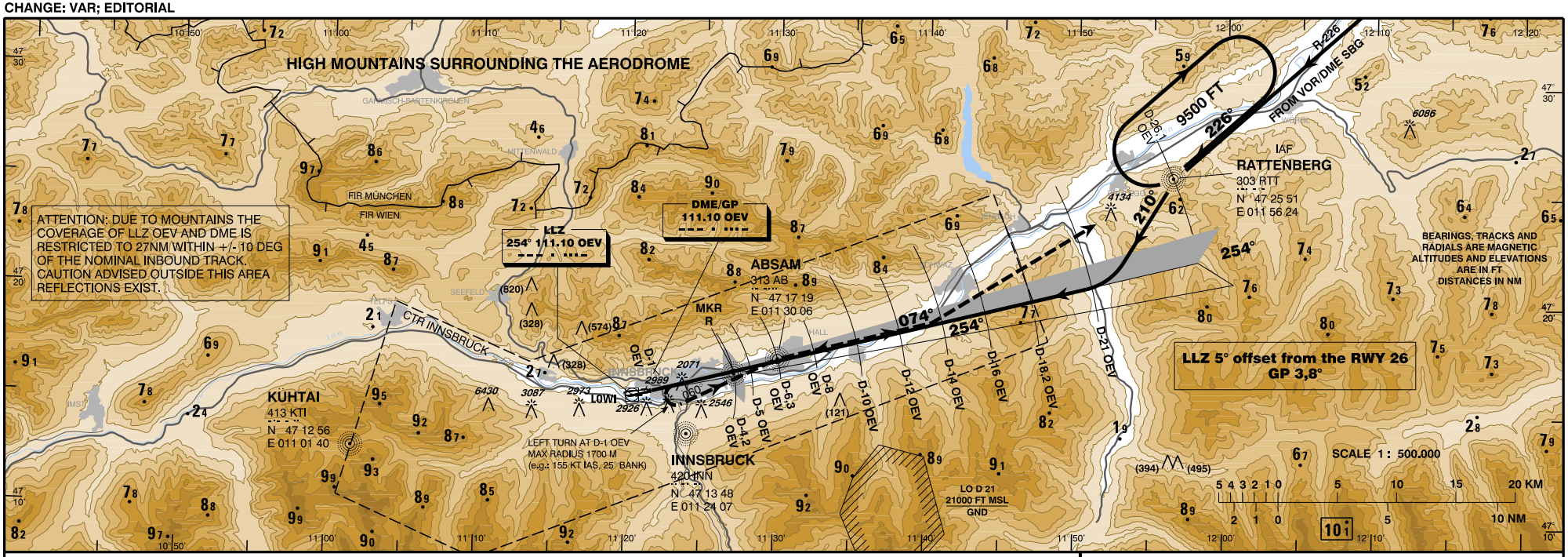


CHANGE: VAR; EDITORIAL

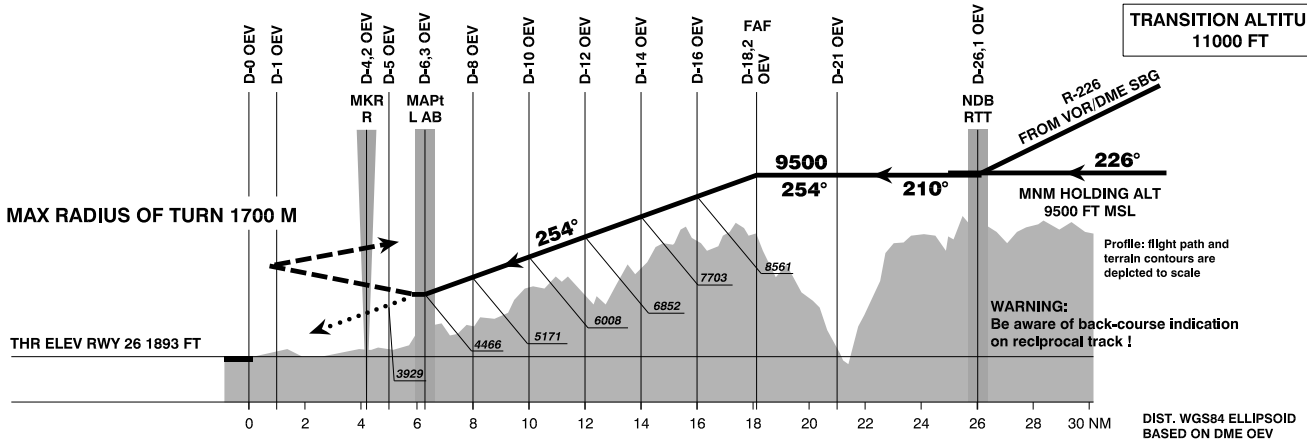
INSTRUMENT APPROACH CHART - ICAO

VAR 2° E

AD ELEV 1900 FT
OCA RELATED TO
THR 26 ELEV 1893 FT



TRANSITION ALTITUDE
11000 FT



NEW: DME OEJ & OEV SET TO ZERO AT THE STATION !

Missed Approach:
Climb on LLZ with MAX GRADIENT; at D-1 LT and follow QDM 060° in direction to locator "AB", rejoin LLZ-OEV outbound over locator "AB" and continue on LLZ 074° with MAX GRADIENT. When crossing D-14 OEV LT to RTT and enter the holding in 9500 AMSL.

FOR VISUAL PART SEE LOWI AD 2.24-7-1

RADAR	119.275 MHZ
TOWER	120.100 MHZ
ATIS	126.025 MHZ

MDA/MDH	MA CLIMB GRADIENT	REQUIRED FLIGHT VISIBILITY IN THE AREA OF VISUAL OPERATIONS A	B	C	D	CEILING REQUIRED AT THE MDA
	3,1%	4400 FT (2507 FT) D-6,0				
	4,0%	3900 FT (2007 FT) D-4,8				
	5,0%	3400 FT (1507 FT) D-3,6				
		2800 M		3700 M	4500 M	

VISUAL SEGMENT AND CEILING PROCEDURE SEE AD 2.24-7-1

NDB RTT TO L AB - DISTANCE 21 NM

GS (KT)	60	80	100	120	140
MIN : SEC	21:00	15:45	12:36	10:30	09:00

The chart may only be used in connection with the description of the procedure !

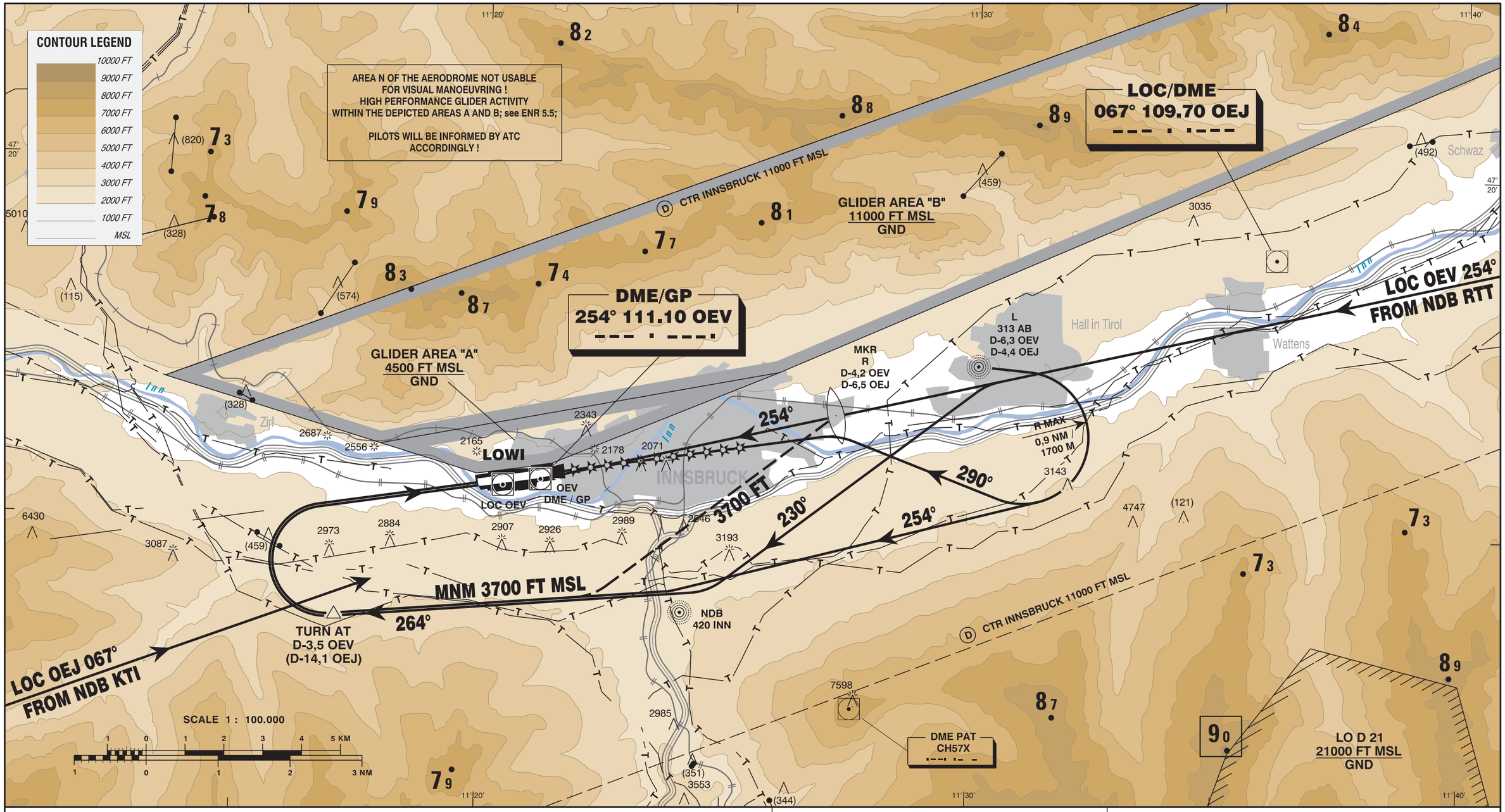
INNSBRUCK
ÖSTERREICH AUSTRIA
LLZ/DME PROCEDURE EAST
(3,8° GP available)

VAR 2° E

AD ELEV 1907 FT

RADAR	119.275 MHZ
TOWER	120.100 MHZ
ATIS	126.025 MHZ

INNSBRUCK
ÖSTERREICH AUSTRIA



CHANGE: AD ELEV; EDITORIAL

OCA CIRCLING							MINIMA IN THE AREA OF VISUAL OPERATIONS	
LOC/DME PROCEDURE WEST via NDB KTI	LOC/DME PROCEDURE to RWY 26				SPECIAL LOC/DME EAST to RWY 26	RNP RNAV to RWY 26	FLIGHT VISIBILITY: CAT A AND B 3 KM CAT C AND D 5 KM	For calculation of flight profile Aerodrome Obstacle Chart - ICAO Type A (LOWI AD 2.24-2-1) and Aerodrome Obstacle Chart - ICAO Type B (LOWI AD 2.24-2-2) shall be used.
	MA-CLIMB GRADIENT							
	2,5 %	3,1 %	4,0 %	4,5 %				
5000 FT MSL	4600 FT MSL	4400 FT MSL	3900 FT MSL	3700 FT MSL	3700 FT MSL	3700 FT MSL		