LONDON to SINGAPORE

The Heathrow to Singapore route is a classic in the long-haul world. British Airways, Qantas and Singapore Airlines fly to Singapore daily from many European destinations using the Airbus A380, Boeing 747-400, Boeing 777-200 and Boeing 777-300 aircraft. With a track mileage of approximately 6000 nautical miles and a flight time in the region of 12 hours, it is also a flight that you should not undertake lightly.

What we plan to do here is give you an insight into how to safely plan and conduct this long and fairly complex flight. This flight briefing is based on the use of the **PMDG 747-400** or **747-400F**, but clearly there will be some variations from this if you are operating a big twin such as the **Boeing 767-300** or the **Boeing 777** and its variants, as well as the **MD 11 tri-jet** on the day.

On the subject of Technical Stops for the **Boeing 767-300,** may we suggest that pilots of this aircraft use the current route shown in this document and employ the Route Alternate **UTAA - Saparmurat Turkmenbashy International Airport** in **Ashgebat, Turkmenistan**. This airport has a 12,000-foot runway and full facilities and is already on the Route shown below and therefore will have online Air Traffic Control if you fly on IVAO and possibly VATSIM too. Using **OMDB Dubai** as the Route Alternate or refuel stop, which is a long way south of the planned route, will mean that pilots may not encounter ATC for significant portions of the flight. Also, flying via OMDB will actually *increase* the Track Distance considerably and therefore the flying time. Pilots flying the 767 should seriously consider this option. However, your own flight planning is the decision of the Commander of the flight – you!

We also advise you to use AIRAC Cycle 1008 or later - this will ensure that you are able to construct this route in your Flight Management Computer (FMC). If you are planning to use the 747-400 please download the **BAV 744-436 FCOM, QRH** and **Normal Checklist** from the British Airways Virtual 747 Training Hangar:

http://www.bavirtual.co.uk/training/b747

These documents have been created with you, the virtual pilot, in mind and they really will help you to complete the flight safely. You will also have sufficient time en-route to read them thoroughly!

Zero Fuel Weight (ZFW) - this is an important consideration prior to commencing your flight planning. As Heathrow to Singapore flights are normally fully booked, we suggest you carefully consider your ZFW and set this to a figure between 229-235 Metric Tonnes. This will then allow a sufficient weight margin for you to carry the fuel requirement for this trip. *This consideration is critical for those of you flying the Boeing 747 Freighter.* Set this prior to starting **Flight Simulator** using the PMDG Load Manager.

For the 747-400 and 747 Freighter, please use a COST INDEX (CI) of 90 when in the cruise.

Fuel Burn - A typical LHR-SIN flight in the 747-400 would plan to land with approximately 12t of fuel remaining. The total fuel load is normally calculated as follows:

(1) **TAXI Fuel** - in the 747-436 this is normally 1000kgs. For an online event such as this, we suggest you increase this to 1500kgs to take into account any Auxiliary Power Unit (APU) burn at the gate and holding delays during ground maneuvering before departure.

(2) **TRIP Fuel** - the distance in Nautical Air Miles (NAM) or Estimated Air Distance, which will be greater than or less than the Trip Distance depending on en-route winds, Flight Levels used, etc. As a rule of thumb, the PMDG 747-400 burns approximately 12 tonnes of fuel per hour of flight across the entire flight regime. So, for a 12 hour flight, you can expect to burn somewhere in the region of 144 tonnes or 144,000kgs of fuel; A higher than normal Static Air Temperature (SAT) at your cruise altitude will burn slightly less than this amount and a colder than normal SAT will incur a slightly higher fuel burn.

(3) **REServe Fuel** consisting of:

CONTingency Fuel – British Airways normally use a 3% or 5% CONT figure which is calculated as a percentage of the Trip Fuel. Up to 50% of this fuel can be used under normal operations.

ALTerNate Fuel - if a destination alternate is required, the Destination Alternate for Singapore is **WMKJ** or Sultan Ismail airport in Jahor Baru, Malaysia. This will require approximately 6.5 tonnes or 6500kgs of fuel and 13 minutes of flight time.

FINAL REServe fuel - JAR OPS determine this as fuel to fly for 30 minutes at holding speed at 1500ft above aerodrome elevation in standard conditions, calculated with the estimated mass on arrival at the alternate or the destination. For the 747-436:

30 minutes holding in CLEAN configuration at 1500ft and Gross Weight of 240t = 4200kgs;
30 minutes holding in FLAP 1 configuration at 1500ft and Gross Weight of 240t = 4725kgs;

This is the *absolute minimum fuel you should land with* following a diversion. Fuel will be sloshing around in the wing tanks and you may observe Yellow EICAS Fuel Advisory messages which will be transient as you manover the aircraft during turns and the fuel movement uncovers the Main Wing Tank Pumps from time to time.

(4) **Extra fuel if required by the commander** - experience helps here and a good knowledge of busy periods at the Destination airport comes into play. One of the reasons why most of the 744 drivers with four gold bars have grey hair! We would suggest that you may wish to consider loading some additional fuel as this is an online event and due to the volume of traffic you may experience some holding at the destination is likely. Bear in mind that if you want to carry into SIN say an extra 5 tonnes of fuel you will actually have to load almost 7.5 tonnes. Approximately 2.5 tonnes of fuel would be burnt carrying in that additional 5 tonnes to Singapore!

Initial Cruise Altitude - Heavy aircraft are limited in performance and in the 744 you should not expect to reach much more than FL290 or FL310 as your initial cruise altitude with FL310 being the most appropriate on this occasion. A **STEP CLIMB of 2000** should be entered into the FMC to cater for STEP Climbs down route.

Take Off Calculation - despite the fact that your aircraft will weigh somewhere between 385 tonnes and the Maximum Takeoff Weight (MTOW) of 396.6 tonnes, you will probably not require full rated Take Off Thrust to depart safely. FLAP 20 is the standard Flap setting for all BA 747-436 takeoffs. Use a tool such as **TOPCAT** to calculate your V-SPDs and Assumed Temperatures. Extract a scenario from TOPCAT which gives a margin in the region of 150-200m.

ATC clearance and Taxi Routing – make sure you understand it. Charts for Heathrow and Gatwick are available here:

http://www.nats-uk.ead-it.com/public/index.php%3Foption=com_content&task=blogcategory&id=1&Itemid=2.html

Departure - From Heathrow and Gatwick, expect the Dover departure with the runway in use depending on the weather and winds on the day and the Runway Alternation Programme in use (at Heathrow). Please peruse the charts and information available in the Flight Operations Thread within the BAV Forum and familiarize yourself with the procedures as applicable. Occupy the runway for the minimum amount of time in accordance with ATC instructions.

Noise Abatement - Discussed in the BAV 747-436 FCOM, familiarize yourself with this procedure as it will be required to safely and accurately comply with the vertical profile of the Heathrow and Gatwick Standard Instrument Departures (SIDs).

Climb - Where possible ask ATC to cancel the Speed Restriction of 250 knots below 10,000 feet (FL100). This will get you clear of other traffic and secondly put the aircraft into a configuration whereby it will climb in the most economical fashion. ATC can always deny this request so no harm in asking!

Once the aircraft is in the clean configuration, with Flaps UP, set CLIMB 1 (CLB 1) to preserve the engine life.

The Route

Ian Sealey has been tracking the real world BAW11/15 flights for over a month and we have decided to use the most common route which allows our VATSIM and IVAO colleagues to plan their ATC coverage for pilots in advance. Please use the following route. If you choose a different route you may find that you are outside of ATC coverage for large amounts of the flight. We ask B767 pilots to also consider this.

DVR L9 KONAN UL607 AMASI UM149 BOMBI UL984 RASPU UZ660 ROKEM UZ650 NARKA UL140 TOMET UL624 TLC UL99 SOBLO B143 IBERI UN77 BARUS UM747 LUSAL UM11 RODAR N644 ABDAN B371 LEMOD N644 DI A466 DPN L759 PUT B579 VPL W531 VIH A464 ARAMA P501 BOBAG

This routing takes us through European RVSM airspace, CIS Metric Airspace, CIS RVSM & Non-RVSM Airspace, Afghan Non-RVSM Airspace and then RVSM Airspace again in Pakistan for the remainder of the route. From Dover, through Belgium, into Germany (overhead Frankfurt), through central Europe (Germany, Czech Republic, Hungary, Romania, Southern Ukraine), across the Black Sea, through the southern CIS (Georgia and Azerbaijan), across the Caspian Sea just north of Baku, into Turkmenistan, Central Afghanistan, Northern Pakistan, Northern India (overhead Delhi), through central India, out over the Bay of Bengal, just north of the Andaman Islands, overhead Phuket, down the Malaysian Peninsular towards the Straits of Malacca, overhead Kuala Lumpur, then into Singapore.

The European RVSM/CIS Metric Transition point is on Airway UL99 at WPT SOBLO at the FIR Boundary between the Simferopol (Ukraine) & Rostov (Russian CIS). A Metric Conversion Chart can be found here:

http://www.bavirtual.co.uk/training

By this stage, you can expect to be at FL330, having probably climbed to FL330 as the aircraft weight reduces with fuel burn. The closest Metric Level is 10100M (FL331); expect to remain at 10100M through CIS Metric Airspace.

The transition to CIS RVSM Flight Levels again is on Airway B143 at waypoint **IDLER** and this point marks the FIR Boundary between the Rostov (Russian CIS) FIR and the Tiblisi (Georgia) FIR. Expect a descent here from 10100M (FL331) to FL330.

The transition to CIS Non-RVSM Flight Levels is at the commencement of Airway N644 at waypoint **RODAR** This is the FIR Boundary between the Baku (Azerbaijan) FIR and the Turkmenbashi (Turkmenistan) FIR. Flight Levels available here are FL290, FL330 and FL370, but expect the aircraft to be too heavy at this stage to SAFELY climb to FL370 so we suggest you remain at FL330. Expect to remain at FL330 across Turkmenistan & into Afghan Airspace.

The Kabul (Afghanistan) FIR Boundary commences at the end of Airway B371 at waypoint **LEMOD**. Afghan Airspace is controlled by the International Security Assistance Force (ISAF) and you can expect to relay your estimate for LEMOD to Turkmen ATC no later than 20 minutes prior to your arrival there.

The only special procedure required for Afghan Airspace is the use of lights during the hours of darkness. With many military aircraft movements here operating with and without night vision devices expect to switch on your Tail Logo, Landing and Wing Lights at **LEMOD** as a 'see and be seen' precaution.

Expect 10 minutes of horizontal separation between aircraft in the same direction within the Kabul FIR. If this is not possible then ATC may descend you to FL290. If you are unable to climb to FL370 due to performance reasons - pay close attention to the MAX ALT entry on the VNAV CRZ Page - advise ATC accordingly!

RVSM Airspace commences again at the Kabul (Afghanistan) FIR Boundary with the Lahore (Pakistan) FIR Boundary on Airway N644 at waypoint **PAVLO**. Expect to be released to climb here to FL350. RVSM Airspace then continues to the destination, so request further Step Climbs in line with FMC predictions further down route to FL370 as required and possibly FL390 dependant on aircraft weight and the ambient conditions. Remember to switch off your Logo, Landing and Wing Lights passing **PAVLO**.

The route then passes through northern Pakistan squeezing through the Wakhan corridor at waypoint **SAHIL** before heading southeast into the Delhi FIR towards Delhi. To the north lie the Himalayas with Clear Air Turbulence (CAT) being a regular occurrence in this area.

Between the BBS (Bubaneshwar) VOR on Airway L759 and the PUT VOR (Phuket) on Airway L759 you can also expect 10 minutes of horizontal separation due to a lack of radar coverage across the Bay of Bengal. If this is not achievable then expect climb or descent to achieve separation - pay attention to the MAX ALT entry on the VNAV CRZ Page and advise ATC accordingly if required!

Descent & Arrival

Charts for Singapore and Changi International Airport can be downloaded here:

http://www.caas.gov.sg/caasWeb/opencms/caas/en/Regulations_And_Guidelines/Rules_and_Regulations/ATS/AIP/aerodrome/ad_wsss.html

Familiarise yourself with these charts well before your VNAV Computed Top Of Descent. The Transition Level in the Singapore FIR is FL130, the Transition Altitude is 11000ft.

Singapore Airport is a modern and well-equipped airfield with two parallel runways facing Northeast-Southwest. Aircraft landing South West can expect to use the BOBAG 1B STAR and ILS for RWY 20R. This is a protracted procedure but it keeps arriving traffic away from departures. Aircraft landing North East can expect to use the BOBAG 1A STAR and ILS for RWY 02L. Heavy traffic levels may require late runway changes - ensure you have all the charts and frequencies to hand.

British Airways aircraft park at **Terminal 1**, normally using gates **C13, C15** and **C20-26**. Familiarise yourself with the probable taxi routings as per the charts and vacate the runway at the earliest opportunity as there is nothing worse after a 12 hour flight than an aircraft blocking the runway when YOU are on short finals!

Emergency Enroute Diversion – EnRoute Alternates (RALTs)

As with any flight it is prudent to plan for the worst.

Alternates (ALTN) are selected due to their commercial viability (Used regularly by the airline with maintenance and ground staff to assist) and in more remote areas by the amount of emergency fire cover and general suitability or their proximity to such things as medical facilities. In addition Twin Engined aircraft may be restricted to Extended Range Twin Operations or **ETOPS**.

We have selected the following RALTs for this flight which are all within 180 min ETOPs rules for the big twins:

EGLL - London Heathrow the departure airfield;

EDDF - Frankfurt is a BAV served airport and a viable commercial alternate;

LTBA - Istanbul is a BAV served airport and a viable commercial alternate;

Prior to waypoint **LUSAL** on Airway UM747, plan to divert back to LTBA in the event of a diversion due to cabin depressurisation as the Minimum Safe Altitude (MSA(is below 10,000 feet (FL100).

UTAA - Ashgabat has been selected as an Emergency Diversion airport or P1 and this would be used in the event of a cabin depressurisation due to high terrain. Ashgabat should be the active Emergency Diversion Airfield in the event of a cabin depressurisation on passing waypoint LUSAL on Airway UM747 until passing waypoint **VUVEN** on Airway N644. *Note that this airport is a useful technical stop for our Boeing 767-300 pilots who may want to re-fuel and continue on*.

Ashgabat sits on the eastern side of the Black Sea conveniently between areas of high terrain in the west over Southern Georgia and Azerbaijan (Maximum MSA FL151) and very high terrain in the east over Afghanistan and Western Pakistan (Maximum MSA FL169). Ashgabat airfield has two parallel runways (2989m & 3800m) and all are equipped with an ILS. After waypoint VUVEN on Airway N644, plan to continue onward to VIDP in the event of a cabin depressurisation as the MSA is below FL100.

VIDP - New Delhi is a BAV served airport and a viable commercial alternate;

VTBS - Bangkok is a BAV served airport and a viable commercial alternate;

WSSS - Singapore the destination