Getting Started with PSX

Part 2 — PSX Preflight using PFPX and TOPCAT

by Brian Cowell
with additional material by Hardy Heinlin

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Introduction

Hello, and welcome to Part 2 of the gentle introduction to getting started with PSX.

The series was originally envisaged as a trilogy, with part 3 being the description of a full flight. However, it has pointed out to me by people whom I respect that the world has moved on since the days of PS1, and that the ready availability (via Google and elsewhere) of FCOM and FCTM documents renders an old-fashioned gentle walkthrough (fly-through?) of that kind both unnecessary and also redundant. Hence this will be the final part of the series.

Although this document also covers some other issues which I'll mention in a moment, it is principally for those who are relatively new to the business of flight planning in general, and in particular to using planners such as PFPX to generate a route and other information for a trip with PSX.

Whilst many flight planners both online and standalone are in use, the reasons for choosing to describe the planning process using PFPX lie in its ability to also exchange information with TOPCAT — so that it has never been easier to acquire *complete* information about your forthcoming flight, including an assumed temperature for the take-off in the current conditions — combined with the fact that PFPX is (at the time of writing) the only planner whose output can be directly used within PSX.

The other things included here are a description of what is different about the situation file (a.k.a. "situ") for this trip compared to the one we built in Part 1 (there are only two elements involved, so they can be summed up fairly briefly); and also I felt that it would be helpful to describe talk about creating your own distinctive 744 model for regular use; in addition to which I wanted to describe how to align the weights with your flight planning tools — and between them those topics will take quite a few pages of explanation. For the benefit of those whose flight planners don't produce a `.route` file directly usable by PSX, I have also included Appendix 4 describing how to type your route into the CDU; and, for the benefit of those who like working with lists, added Appendix 3 containing a summarised list of post-planning actions, together with a printer-friendly standalone version in the zip file.

So, in the words with which J.R.R. Tolkien began his Foreword to *The Lord of the Rings* — "This tale grew in the telling". Something which tutorials often tend to do, of course — there is always so much more that could be added. ☺

So, after the usual NOTARs (NOtices To A Reader), off we go....

NOTARS: preliminary comments and caveats

(If you saw this page in Part 1, well, I'm afraid it's much the same here). I had to start somewhere, so a certain amount of background in aviation terminology and concepts in general, and airliners in particular, has to be assumed on the part of the reader, or else I will have to spend a lot of time and tutorial space explaining what flaps are or what V_1 means. These days there are many sources from which information about such matters can be obtained, and I feel that the majority of my readers will prefer the newer (briefer) approach.

Also, I should explain that this is being written by an Englishman, using the sort of English that is spoken in England, and so the spelling will also be that of English in its original form. The same applies to weights and measures — in line with U.K. practice I will be using kg and feet, so if you are more accustomed to lbs and/or metres, or to a different dialect of English, please accept my apologies and convert as needed.

On the tiresome-but-necessary legal side, I retain the copyright in this material, which is entirely and exclusively for the personal use of licensed non-commercial users of PSX only; and the usual FreeWare caveats apply:

- No one is allowed to make any money from this (it may not be used in any published collections, and may not be uploaded to any web site without my written permission — which will in no case be granted if a charge is made for access).

- You read/use it at your own risk. I don't warrant that it's fit for any purpose whatsoever (other than occupying disk space).

- Therefore no responsibility is accepted if you think it has caused any harm whatsoever — to you, your computer, your marital status, mental stability, or *anything*.

- Finally, the traditional disclaimer: this Tutorial is under no circumstances to be used for real world flying! (Would anyone really be that stupid? Still, I suppose it has to be said). <sigh>

The descriptions which follow refer to the use of PSX on Windows. If there are any significant differences on other platforms, then please make the necessary adjustments.

Finally, I must place on record my huge thanks to Hardy Heinlin who has been kind enough to read through the PSX aspects of this stuff and suggest various changes and improvements — at a time just after release when he has been exceptionally busy with Alpha releases and forum questions. With his permission I have included some of his insights in the text, and I am deeply grateful to him for his kindness, and, of course, for the incredibly detailed simulation of the 747 which he has once again provided for us to explore.

Choice of flight planner

Since this intermediate part of the "Getting started with PSX" series concerns flight planning and related matters, it has to be specific or else it risks becoming so completely generic that it is of little use. I have opted to use PFPX (with TOPCAT) for my examples, since that is the planner with which I have become most familiar since its release, and which I can also heartily recommend — however, it should be stressed that other planners are available, whether online (RouteFinder *et. al.*) or standalone (FS Build, etc.). So as explained above, to assist those who don't possess PFPX, or TOPCAT, or either of them, then I will try to put the material which is not specifically related to either of those two programs mostly at the beginning, with a little more at the end in Appendix 4. Nonetheless, PFPX with TOPCAT may have an effect on some of the things I'll have to say throughout, so it is possible that references to them may appear in the first section too, from time to time.

Do you need your own 744 model within PSX?

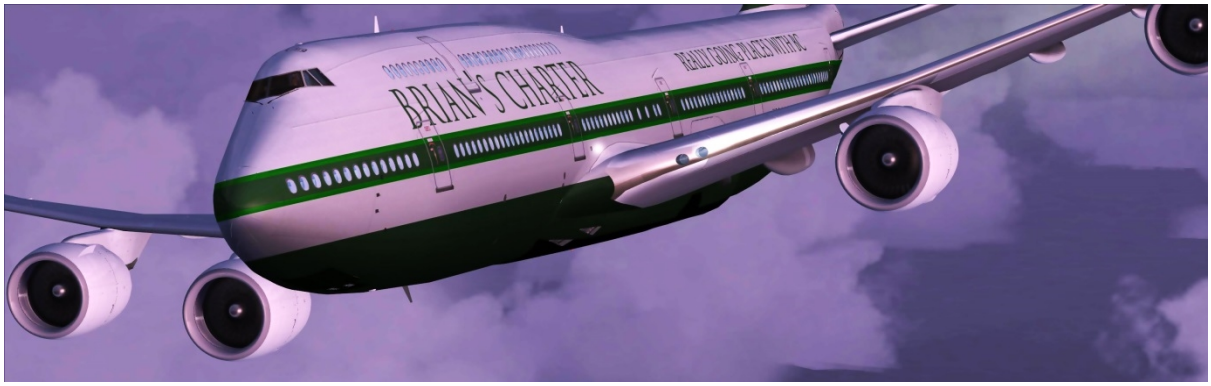
One of the joys of PSX is that it models so many (81, in fact) airline-specific variants of the 744. If you wish to emulate one of the models of your favourite airline, then you may well be able to find it in the following list [1]:

Aerowinx
Air Atlanta Icelandic TF-AMZ
Air Bridge Cargo VQ-BGY
Air China B-2456
Air France F-GEXB / F-GITF / F-GITH
Air India VT-ESM
Air New Zealand ZK-NBS / ZK-NBV / ZK-SUH / ZK-SUI / ZK-SUJ
Air Pacific DQ-FJK
Ansett Australia VH-ANA
Atlas Air N409MC
British Airways G-BNLA / G-BNLG / G-BNLH / G-BNLI / G-BNLY / G-BNLZ / G-BYGA / G-BYGG / G-CIVA / G-CIVC / G-CIVF / G-CIVG / G-CIVH / G-CIVI / G-CIVR / G-CIVZ
Cargolux Italia LX-KCV
Cargolux LX-OCV
Cathay Pacific B-HOO / B-HUF / B-HUG / B-HUH / B-LIA
China Airlines B-18201 / B-18210 / B-18722 /
Delta Air Lines N673US / N675NW

[1] This is a list of the aircraft models that were present in the release version of PSX.

El Al 4X-ELC / 4X-ELH
Emirates SkyCargo N40 MC
Japan Airlines JA8074 / JA8081
KLM Royal Dutch Airlines PH-BFG / PH-BFN / PH-BFY / PH-CKB
Korean Air 747-4B5B / 747-4B5F
Lufthansa D-ABTF / D-ABVN / D-ABVZ
Malaysia Airlines 9M-MPM / 9M-MPQ
Philippine Airlines RP-C8168
Qantas Airways VH-OEB / VH-OEE / VH-OEF / VH-OEJ / VH-OJL / VH-OJU
Singapore Airlines Cargo 9V-SFF / 9V-SFQ / 9V-SMU
South African Airways ZS-SAX
Thai Airways InternationaI HS-TGR / HS-TRG
Transaero VQ-BHW
United Airlines N128UA / N193UA
UPS Airlines N570UP / N581UP
Virgin Atlantic Airways G-VAST / G-VFAB / G-VROC

But what if you don't want to use one of those? Perhaps you fly for a Virtual Airline which has its own specification; or perhaps (like me) you prefer to set up, and often vly (virtually fly), a specific configuration. In fact, I suspect that most simmers get used to vlying with one particular model in PSX — which means that there's no need to wonder whether switches



are on when they're up or perhaps on when they're down, or whether the autobrake knob is on the lower console or below the ND, as well as remembering so many other details that can catch you out when you're under pressure.

However, if you use PFPX and perhaps TOPCAT, there may be an additional reason why you may wish to set up your own model. It's helpful to align the weights and engine specifications of the model you intend to vly as closely as possible to the one being used by those programs, so that their calculations are as accurate as possible — within the limits of predictive error, at least [2]. But I'll say more about that as we go along.

[2] Predictions have an unfortunate habit of being overtaken by real-world events, of course.

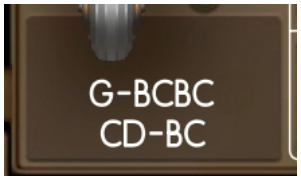
Setting up your own preferred 744 model

Hardy has made this process totally painless. As usual, we will cheat by starting with a known configuration and then altering it to suit our purposes. So if you know an airline config that's close to the one that you have in mind [3] choose that; otherwise, pick one at random on the Instructor page (the Situation tab | Load tab) and load it.

The next thing to do, as usual of course, is to *immediately save it under its new name*, to avoid accidentally overwriting the one you have chosen to start with. So click on the Save tab and type the name you want to use into the 'Save As' box, then click the long Save button **twice**.

OK, now you have a starting point, and the next part is largely up to you and your preferences. Explore the Model | Airframe; Model | Equipment; and Model | Programming tabs and have a ball. For once you're not paying for any of this kit, so if you fancy the latest and greatest — go for it! Let's look at a few points to be aware of during the process, though.

Model | Airframe tab



Choose an ICAO registration that is correct for the country you prefer (G prefix for Great Britain, D for Germany, 9V for Singapore, and so on). Then pick a SELCAL code that seems appropriate [4]. Be aware also that Hardy will kindly engrave your codes onto the forward instrument panel just below the landing gear handle, to remind you of them in the event that you need to use them quickly within a flight. ☺

Choice of engine

You also need to think carefully about which sort of engine to opt for, depending on your choice of flight planner.

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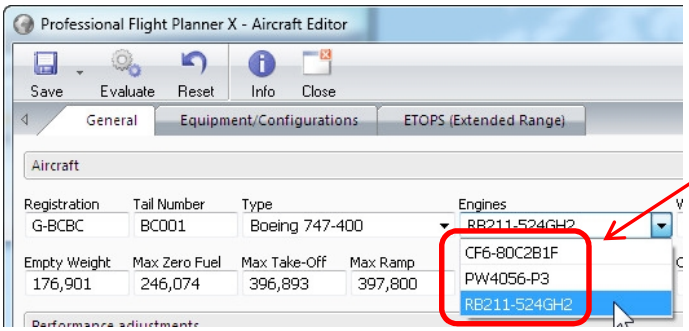
[3] Martin's PAMELA utility (free from http://aerowinx.com/html/addons.html) will help you choose.

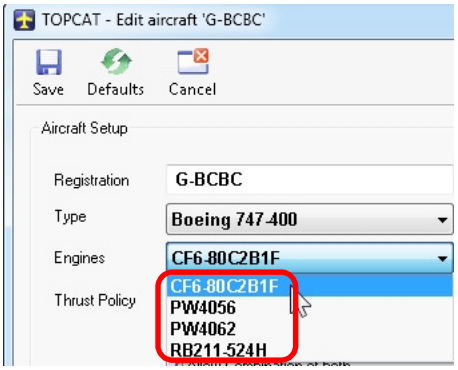
[4] A SELCAL (Selective Calling) code is made up of two 2-letter pairs between the letters A to S in the alphabet (although the letters I, N and O are excluded). The first letter of each pair must be earlier in the alphabet than the second, and duplicate letters are not permitted (although apparently there are <*cough*> a few exceptions to that rule), thus giving a total of 10,920 unique codes. Since there are allegedly over 23,000 individual aircraft SELCAL codes registered, then quite obviously there must be a lot of aircraft whose code is not unique to them; but ASRI (the SELCAL issuing body) makes every effort to ensure that the duplicate codes are allocated to operators that fly in areas that should seldom clash. (In the event that an operator sees that there are two aircraft with the same SELCAL code using the same frequency, one of them will be moved to a different frequency).



Here are the engine choices offered within PFPX.

Boeing 747-400	RB211-524H
Boeing 747-400	PW4062
Boeing 747-400	PW4056
Boeing 747-400	CF6-80C2B1F
Boeing 747-400 Freighter	RB211-524H
Boeing 747-400 Freighter	PW4062
Boeing 747-400 Freighter	PW4056
Boeing 747-400 Freighter	CF6-80C2B1F

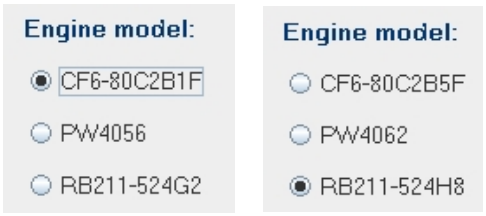
You will notice (this is still within PFPX) that the selectable "TOPCAT performance modes" for take-off and landing performance are similar:



Furthermore, the TOPCAT engine choices for the 747-400 are not too different, either, as shown (left) [5].

Finally, the engine choices within PSX are these:

(Non-ER on the left, ER on the right).



In summary then, here are the quoted engine types supported, in each case:

Application	**GE**	**P&W**	**RR**
PSX (non-ER/ER)	CF6-80C2B1F/ CF6-802CB5F	PW4056/PW4062	RB211-524G2/ RB211-524H8
PFPX	CF6-80C2B1F	PW4056-P3	RB211-524GH2
TOPCAT	CF6-80C2B1F	PW4056/PW4062	RB211-524H

Obviously, if you intend to use PFPX and/or TOPCAT with your new PSX 744 model, it would be helpful to choose an engine type that is compatible as possible — and as you can see from the above summary, General Electric's CF6-80C2B1F is the obvious safe choice, since that specific engine is explicitly supported by all three programs [6].

[5] Both PFPX and TOPCAT are written by the same person, Christian Grill.

[6] My thanks to Hardy for pointing out the engine differences between ER and non-ER models in PSX.

Having said that, whether there's much practical difference between the PW4056 and the PW4056-P3, or between the RB211-524G2 and the RB211-524GH2 and the RB211-524H, I had no idea. So I asked on the PSX forum, where we have real world experts in every aspect of the 744, and was delighted to receive a reply from Doug Snow [7] to the effect that any slight differences are imperceptible. So we're good to go. ☺

(However, if you are using different flight planning programs, you will need to carry out the same sort of research in your particular case).

Happily, the remainder of the choices on the Airframe tab are, by comparison, fairly self-explanatory. ☺

Model | Equipment tab

Again, all fairly straightforward stuff. (Of course, if you're not fully aware of what a specific item does, I would gently suggest that you should perhaps read up about it, before you select it).

Model | Programming tab

Once more, enjoy yourself. I'll just mention a couple of things —

1. If you make yourself a new Airline Identifier, you will need to also create it within PFPX. Here's how:
   - From the PFPX "Globe menu" choose Program Options | Airline Codes
   - Type the three-letter code and the description into the two boxes at the bottom, and then click Add and OK [8].

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[7] "The P3 motors have a cutback leading edge of the fan blade to prevent fan blade erosion (if I remember correctly from the B767-300). At a former airline, I had to create new performance data once for our flight planning system for the P3 motors when we incorporated a Boeing service bulletin, and the difference in performance in the real world was negligible.
Even with PSX, I don't know how close to the Performance Engineer's manual HH has gotten with the flight model, so for me the differences are a non-issue, and are irrelevant.
You'd never notice a difference". (http://aerowinx.de/forum/topic.php?post=20231#post20231)

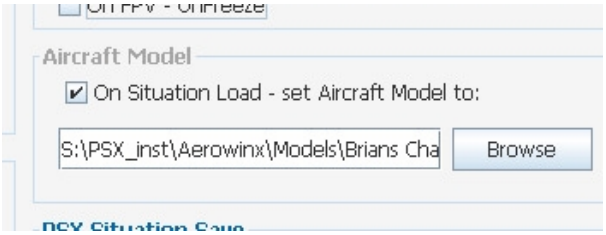
[8] When I tried to add BC for Brian's Charter, the Add button remained stubbornly greyed out — it appears that three-character airline codes are rigidly enforced. So I resorted to using a text editor on `C:\Users\Public\Documents\PFPX Data\Airlines.txt` and simply inserted BC and Brian's Charter into the alphabetic sequence of airline names. But although doing that didn't *seem* to break anything, naturally I couldn't possibly recommend you to follow such a non-standard procedure.

It's that simple. You'll find that PFPX will always prefix the airline code to whatever you type in the adjacent "Flight Number" box in order to form PFPX's flight number on the documentation. So for example, BC and 007, respectively, will yield a PFPX flight number of BC007.

2. Although the PSX database does contain all runways longer than 4,600 ft., I would perhaps suggest that you put something in the "Min rwy length to display on the ND" box (lower left) that you will find more achievable. Hardy can land on Mykonos (LGMK; Landing Distance Available 6,240 ft; no ILS) *but can you?* (Don't try it at home until you're seriously confident, folks... Oh yes, and be sure that you've practiced your VOR/DME procedures before you make your first attempt).

And when you've set up all those options, don't forget to save your work! ☺

AdaptPSX



Just before leaving the topic of making your own model, I should also mention that amongst the many useful tasks that AdaptPSX [9] can perform for you, there is an option to always load a specific model when a situ file is loaded. Thank you, John! ☺

A *very* brief note about PSX weather options in your situation file

Let's now turn to (or rather, reprise) a topic which continues to confuse people (judging by repeated questions on the forum): how to configure the weather in such a way that in a situation file you can get the weather that was active when the situ was created — or alternatively so that you get the weather which is current whenever the situ file might be loaded. I did cover this on p.41 of the first instalment in this series, but to save you having to look it up, here's what I said:

> "...move to the "Planet" tab [10] and ensure that the "Set zones by flight track and downloaded METARs" checkbox does **not** have a tick in it, otherwise the user will get their current weather, rather than the weather in the tutorial..."

[9] See Part 1 for more comments about AdaptPSX; and/or http://aerowinx.com/html/addons.html for a download link.

[10] That's Situation | Weather | Planet, just to clarify the reference.

That was because in the case of a tutorial we wanted the user to always get the weather that we had set up, of course [11]. But to cover the more usual case, I also added this footnote:

> "If you were making a situ file for your own use, you would probably always want to vly using the current weather, so in that event you would ensure that the checkbox **did** have a tick in it."

My apologies to those who understood that stuff the first time around, but just in case.... ☺

Aligning the aircraft weight

OK, this is where it starts to get a little more serious, or in other words — slightly more technical. Whilst talking about your choice of 744 model, I mentioned why it is helpful to align the performance of the engines you select within PSX to the engines in use with your flight planner. Although the examples I used were for PFPX and TOPCAT (partly on the basis that if you can work out how to manage those, you can manage any of the others), obviously you need to apply the same principles to whatever flight planner you are using.

But the other major factor affecting performance is, of course the aircraft's weight, and so you need to ensure that you get that right, too, when planning your flight with your particular flight planner.

Please forgive me if you learned all this stuff at your mother's knee, but just to be sure that we're all singing from the same hymn sheet when we come to discuss these things, I have taken the liberty of including a brief breakdown of the terminology in Appendix 1 (see p.37). So the terms I will be using will be as defined there.

In that appendix, I also mention the fact that PSX doesn't separate out the different elements — notably, pax (adult / child / infant), as well as the baggage (for the aforementioned pax) / cargo / mail — and hence we need to have that in mind when putting the data into whatever flight planner we use. Again, please forgive me if I use PFPX here, but the same principles will apply, regardless of your choice of planning tool.

So probably the first thing we need to do, after choosing either an in-built 744 model from PSX or else our own preferred standard model, is to establish the weights corresponding to that. We will then need to see how we can ensure that our flight planner uses weight data that is as close as possible to the model we have set up in PSX.

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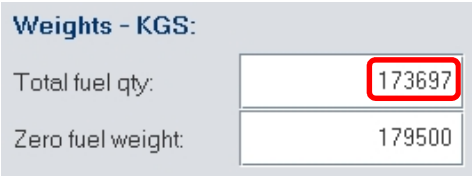
[11] Hardy confirms this: 'Set zones by flight track ...' should be off [for a tutorial]; otherwise it will change the weather each time the user runs this situ. Winds should be suitable to the runways used. And OAT, QNH changes etc. shouldn't disturb previous FMC settings.

What weights should we use, based on our model in PSX?

When we look in Hardy's superb manual, on p.350 it helpfully tells us that Gross Weight minus Fuel (i.e. ZFW [12], of course) must be "...in the range of 179.5 to 270.0 kg x 1000 (395.7 to 595.2 lb x 1000)".

Assumptions can be dangerous, but in spite of that I'm still going to assume that a good estimate for our DOW (Dry Operating Weight) figure will be the lowest ZFW that there can evidently be, which will therefore be 179,500 kg or 395,700 lb.

Now we have to torture our aircraft a little. As always, we do so from the Instructor's Station (which is often used for inflicting pain, but usually on the unfortunate pilot).



Load your selected model if you haven't already, and then go to the Situation | Service tab. Now type 999999 into the "Total fuel qty." box, and click back in the ZFW box to allow it to update. The Fuel Quantity box now contains [13] the maximum amount of fuel you can load [14] *for this model*.

OK, we have now established some useful figures that we can ask our flight planner to use in its calculations. Just before we fire up our flight planning software, though, there's one aspect of our planning that it might be useful to consider in advance.

The 747-400 and ETOPS

ETOPS originally was an acronym that was short for Extended range Twin OPerationS — in other words, something that applied only to aircraft with two engines, and hence on that basis we could forget about it when planning a trip for a 744. But things change, and the current ETOPS rules are now applicable to: "... All passenger-carrying airplanes with more than two engines and more than 180 minutes flying time from an adequate airport (at a one-engine-inoperative cruise speed under standard conditions in still air)."

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[12] If you are wondering what these terms and acronyms mean, please refer to Appendix 1 (p.37).
[13] From p.15 of the same manual: "...if the loaded aircraft's fuel tank capacity is smaller than the fuel quantity currently on board, the quantity will be reduced accordingly". And on p.39: "The slider scales of the fuel quantity and zero fuel weight are adjusted automatically when aircraft options or weight units are changed".
[14] On p.39, Hardy darkly observes: "It is possible to set a speed or altitude outside the currently allowed range. The simulation will model the respective consequences." The same may apply to fuel.

I did wonder whether in the case of some very long 744 trips mainly over water [15] we may have to concern ourselves with ETOPS in the planning process. So I resorted to the Aerowinx forum again, and once more Doug Snow was kind enough to supply the information I needed [16] — and once more the answer turned out to be less complex than I had feared. So (most of the time, at least) for our purposes we can forget about ETOPS. ☺

Since the only flight planner available to home simmers that can plan for ETOPS is PFPX, you will understand my reason for raising the question at the outset. But the ETOPS aspects of PFPX are without doubt the most complex to deal with [17], hence (happily) that means that our flight planning process will be somewhat simplified, and we can proceed on that basis.

PFPX and TOPCAT — either, neither, or both?

Questions are sometimes raised about PFPX and TOPCAT, notably in the realms of "Do I need them?" and/or "Why do I need them both?", so this seems a good place to briefly comment on that.

Strictly speaking, of course, you can probably manage without either of them. But if you are sufficiently serious about simulating aviation accurately to have bought PSX, then I suspect that in practice most readers of this document will aim to acquire both programs. But why are there two? (Especially when they were both written by the same person)....

To find the answer, we need to look at the historical development of flight planning software for the home simmer. Going back to 2008, say, whilst there were several flight planning programs around, they were of varying quality; and their calculations, especially when it came to fuel, were not very accurate. And when it came to the business of knowing the correct temperature for a derated take-off, then unless you had a copy of the official performance data (which was unlikely) so that you could consult all the arcane charts and graphs contained therein, you were playing guessing games.

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[15] I was thinking about trips such as ones from Sydney to Jo'burg or Buenos Aires, for example.

[16] "ETOPS for 4-engine aircraft occurs at 180 minutes beyond an adequate airport. So, from 90 minutes out to 180 minutes, you play the driftdown/decompression requirements of 121.193. Beyond 180 passenger aircraft play ETOPS requirements instead of the 121.193 requirements. Freighters can go beyond the 180 minute distance as the ETOPS requirement is for passenger 747s only.
There isn't one US B747-400 passenger aircraft who plan 747-400 ETOPS, they all plan for the 121.193 scenario, and restrict their 747s to the 'up to 180 minutes from an adequate airport' distance, so that's around 1600 nm from an adequate airport."
(http://aerowinx.com/forum/topic.php?post=20227#post20227)

[17] For a commented example of the full ETOPS process of planning a transatlantic flight from London Gatwick to Orlando FL using PFPX, please see my review of PFPX on the *Mutley's Hangar* site.

Therefore, Christian Grill wrote TOPCAT, which is all about take-off and landing data. Yes, it will provide an "estimate" of the fuel for you, but this is simply an approximation based on Great Circle distance plus an extra percentage to cover taxy, holding, APU burn and so on.

(The only problem that TOPCAT has is a self-inflicted one: the calculations it performs are extremely complex, requiring the use of a lot of data about the aircraft concerned, and so adding another aircraft to the range of those already supported is a very time-intensive business. Inevitably, therefore, when a simming company releases a new aircraft it will take the TOPCAT team quite some time to crunch all the numbers before that individual aircraft can be directly supported by TOPCAT).

Hence TOPCAT's strength lies in its careful calculation of take-off and landing data — the fuel estimate/approximation feature was added simply for the convenience for simmers who needed it, even if it was merely as a sanity-check of the figures they intended to use (many of the flight planners that existed at the time could probably do it better, anyway).

What none of the existing flight planners could do *at all* was advanced flight planning, notably for trips where ETOPS applied. So Christian then wrote PFPX to be the flight planner that could do everything, in detail — quite a feat, for a program meant for simmers!

But the main point of this section was to clarify the division of responsibilities: PFPX does the flight planning and the fuel; and it links to TOPCAT for those tricky calculations about take-off (and landing) performance. Together, the two programs give simmers access to amazingly accurate data upon which we can base our flights (providing that PFPX with TOPCAT are aligned with each other and with PSX in terms of weights, engine types, and so on). But, of course, we all know that in this imperfect world estimates will never perfectly match up to reality — which isn't the fault of the planning system, it's just the inevitable result of the action of random events (weather comes very firmly into that category, of course) and statistical probabilities.

Before starting the planning process with PFPX, please be aware that I haven't dealt with the various items which you will need to set up in advance in PFPX to suit your own circumstances (mostly in the Program Options section)— such as the dispatcher's name, preferred units, default fuel policy, and so on. These are discussed in the PFPX manual, but since they will be quite different for different simmers all I can do is to mention them here, and request you to set them appropriately for your own use, prior to using PFPX for the first time.

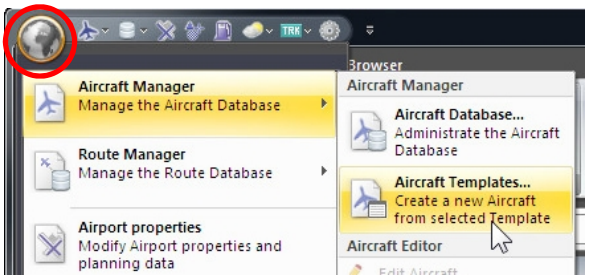
So once you're ready, it's time to plan a PSX route using PFPX....

Initial aspects of planning a flight with PFPX

We'll need a reasonably long trip to use an as example: let's choose a couple of fairly new airports, perhaps. So how about a trip from Hong Kong (VHHH) to Chubu Centrair International (RJGG) (which is a new route for me, so it will be a voyage of discovery)?

Having selected our model of 744 within PSX, the next thing we will need to do is to ensure that PFPX and TOPCAT know about it, too, so that the figures we arrive at will be as accurate as possible. We know our DOW, and we also now know the maximum amount of fuel that we can try to load — although the latter might not be applicable in a simplistic way.

There are also three maxima which we need to ensure that we never exceed — Maximum Zero Fuel Weight (MZFW), Maximum Takeoff Weight (MTW), and Maximum Landing Weight (MLW). But since we have no straightforward way of ascertaining what they are, as a best estimate we're probably going to have to use the figures that are already present in our flight planner.

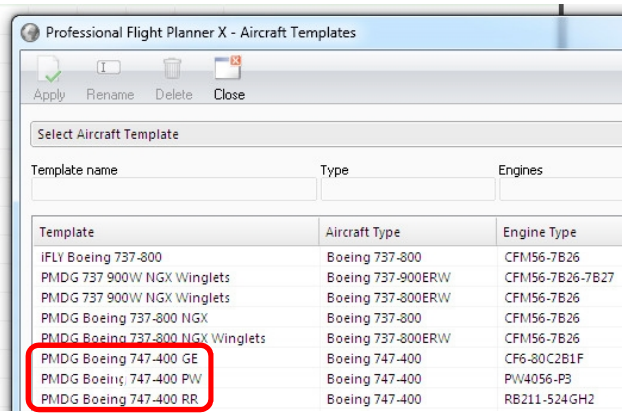


Adding a new model of 744 to PFPX

So let's open PFPX and add our new model, if we have one (if not, or if you have already done this, please skip ahead to the section about pax capacity on page 17). We click the globe in the top left corner of the PFPX screen and choose Aircraft Manager | Aircraft Templates.

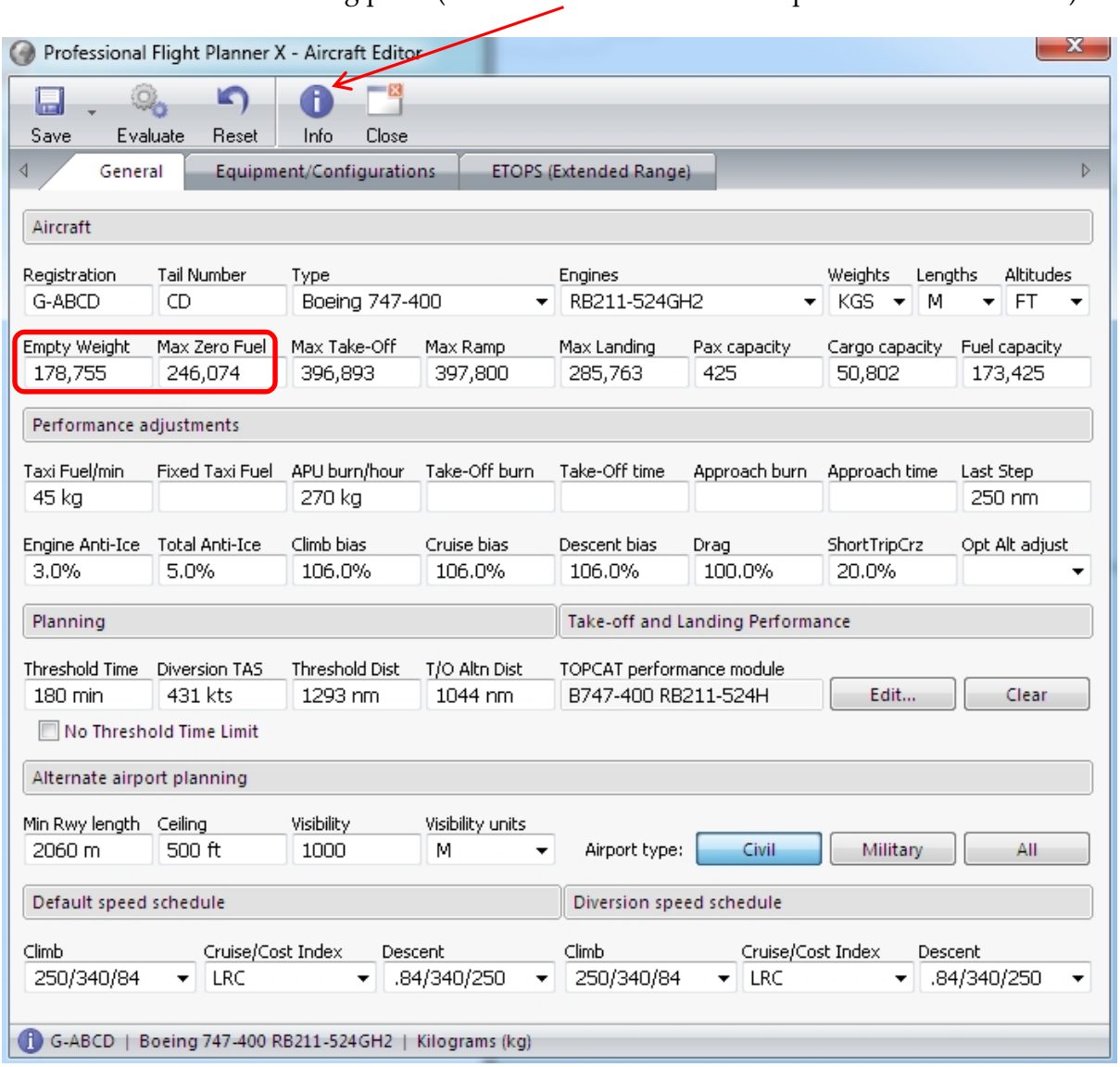
We're then presented with a selection of aircraft to use as a starting point. (Of course, if you're brave enough to prefer to set up everything from scratch you can do so, but I'm going to assume that you'll prefer to start with a model that's close to what you want, and then tweak it to suit your requirements).

The list of templates you can use isn't a long one, but luckily for us it does include Boeing 747-400s with the three engines types mentioned above. For my starting point, I'm going to use the version that has RR engines (but please feel free to choose differently), so I select it and then click on "Apply", top left. I am then taken to the Aircraft Editor screen, which has three tabs — General, Equipment/ Communications, and ETOPS (Extended Range) — although in this



document we will not concern ourselves with the ETOPS tab, for the reasons given above.

We are now presented with a screen that has a lot of information already filled in. In fact the only fields that we have to supply are the registration number, and perhaps tail number. The rest of the information was added by one of the PFPX developers, so we can be reasonably sure that it's OK for a starting point (click the Info button at the top for more information).



(We will need to change the "Empty Weight" (i.e. the DOW) and the Max Zero Fuel, soon).

Rather obviously, it's important to ensure that the registration number matches up with the "ICAO registration" that you chose when selecting your model in PSX (as well as the one which you will use when you install your model in TOPCAT). So enter the registration you chose: I'll use G-ABCD for the registration, and CD for the tail number.

The tail number, incidentally, is something that was only added in v1.15 of PFPX, and as far as I can see it's only there for completeness (someone must have requested it, presumably). If I understand matters correctly, the tail number (sometimes known as the FIN, for Fleet ID

Number) is usually a shortened form of the registration number for use within the company. But as long as the registration number you have supplied matches up with the registration specified in PSX (and TOPCAT), you'll be fine. Entering a tail number into PFPX is optional.

What else do we need to adjust? Well, you may wish to adjust the units for Weights, Lengths, and Altitudes (top right) according to your preference, but the first thing that we really must do is to change is the Empty weight, in other words the DOW. I'll enter the suggested figure of 179,500 kg (not hugely different from the current value, of course, but nonetheless...). We know the next figure too — Hardy's figures appear to suggest 270,000 kg for the Max ZFW, so that's what I'll use.

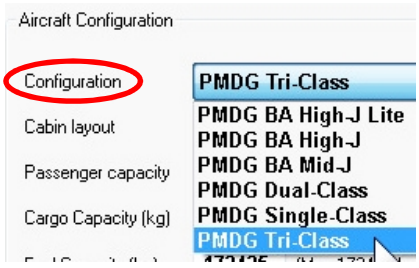
To get a figure for MTOW in the next field we might think of simple-mindedly adding the previous two entries together, but this is *not* a good idea: (a) because doing so would imply an unbelievably short taxy and zero APU usage, and (b) because there may well be operational and/or structural reasons that we know nothing about which demand that the figure should be significantly less. So I'm going to exercise maximum caution and leave the suggested figure as-is, along with the next two max weights as well. **Be sure to Save your changes, specifying a new name for your new model!**

Which brings us to the question of passenger (pax) capacity....

Pax capacity — TOPCAT considerations

When PFPX does our planning for us, we can ask it to choose a random payload: it will then enthusiastically specify the exact number of adults, children, and infants, together with the various categories of deadload. Which is all nice to know, but at the end of the day from a performance perspective we're only really interested in the resulting ZFW, since that is what will be used within PFPX and also TOPCAT [18] for the various calculations.

But there is something which we need to bear in mind about pax capacity which relates to options within TOPCAT — so if you are using PFPX without TOPCAT, please ignore this next paragraph and continue at "The PFPX 'Evaluate Bias' option" section on p.18.



We have already had a peep at TOPCAT concerning the question of engine type, and this is another situation where we need to keep the programs in line with each other.

When the PFPX information is sent to TOPCAT after the flight is released, the Configuration drop-down in TOPCAT will give us several different choices, which differ only in the seating

[18] And presumably, of course, within PSX.

configuration. (By this I mean that the rest of the associated figures given — cargo, max fuel, DOW, etc — are seemingly unaffected by this, since they remain constant. Hmm...).

Configuration	Cabin	Pax
PMDG BA High-J Lite	F14 C70 Y215	299
PMDG BA High-J	F14 C70 Y207	291
PMDG BA Mid-J	F14 C52 Y271	337
PMDG Dual-Class	C44 Y381	425
PMDG Single-Class	Y555	555
PMDG Tri-Class	F10 C35 Y381	426

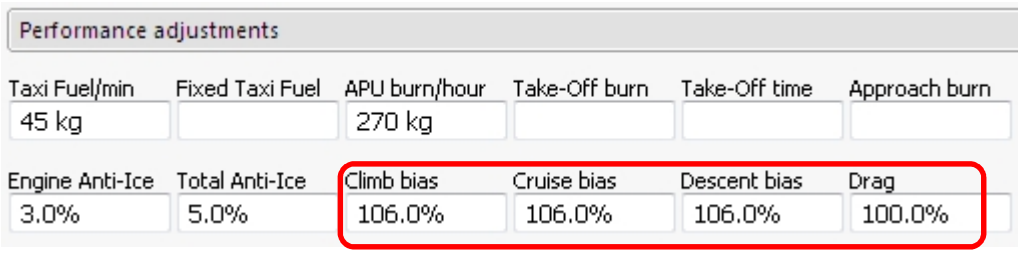
So in PFPX, when choosing the number of pax for your aircraft model, do also bear in mind which configuration you will use in TOPCAT, and then specify the number of pax accordingly. I'm use the Tri-Class option, so I set a Pax capacity of 426 in PFPX.

The PFPX 'Evaluate Bias' option

Back in PFPX, we're still on the Edit Aircraft screen, aligning our model as closely as possible with that program to get the best possible results. Now obviously, in the case of a simulated model of the 744 (as opposed to the actual aircraft in the so-called "real world") PFPX has the problem of having to deal with many different versions of the simulated 744, produced by a number of developers, each of which has emulated the performance of the real aircraft according to the developer's available information, and skill. So I have a theory that in the light of his experience with TOPCAT (where he has ended up having to undertake a huge amount of work to accommodate each newly-developed aircraft) Christian adopted a different strategy when it came to PFPX. (I must admit that my main reason for suspecting that he did it this way is because if I had been in his shoes I'd have done something very similar...).

The new strategy is termed the "Evaluate Bias" option, since it allows you to vly your virtual aircraft and then supply some figures to PFPX, which then adjusts its internal calculations to align with the figures you reported. However, there is only a single paragraph about it in the manual; and also the boxes which have to be completed include SAT and ISA Deviation — terms that many simmers are, shall we say, uncertain about.

On the Aircraft Editor page, you may have noticed a section called "Performance Adjustments", whose figures can — and arguably, should — be used to adjust PFPX's calculations for (in this case) your selected model within PSX. Within it, you will find a set of bias figures that will look something like this:



The boxes that I have ringed in red are the ones which affect the performance calculations that PFPX uses for the aircraft in question, and those are the ones that the "Evaluate Bias" option helps you to adjust. Since we started out with a template for the PMDG 744, the figures that you see in those boxes are designed for that simulated aircraft — but we want figures that will make PFPX work accurately with our newly-designed model, and in PSX.

Click on the Evaluate button in the screen's menu bar, and the Evaluation window will open. Don't worry if it looks a bit intimidating — I promise you it isn't.

There are various items of information that you need to enter into the boxes, but the only remotely scary ones are the ISA Deviation box, which PFPX very kindly works out for you so that in fact you don't have to enter anything in there, and the SAT (Static Air Temperature) that you can obtain from the CDU once you know where to look.

So start PSX and select (Situation | Load):

```
Basic 014 - Cruising at final cruise altitude.situ
```

Now use the Model | Load tab and select the model that you have created.

Thanks to Hardy's kindness you are now cruising happily along at FL370. Give the sim a few minutes to completely settle down before you start to collect the figures you need.

Now grab a pen and some paper, and, when you're ready, write down [19] the following information:

- (From the top-left corner of the ND) your Ground Speed and TAS.
- (From the PFD) your current Flight Level

On the CDU, press the PROG button and then the NEXT PAGE button to reach page 2/3

- Write down your SAT

[19] I'm suggesting that you write it down rather than typing it directly into the PFPX Evaluation screen simply because various figures are changing (notably your Gross Weight) so it may be helpful to collect the figures reasonably quickly (the PFPX manual baldly states: "An in-flight data reading should be done at optimum altitude and common speed schedule/cost index of the airplane desired."). Anyway, I have suggested an order whereby the ones which don't change (Flight Level, Cost Index, and so on) are at the top, with Gross Weight near the bottom of the list — just in case.

On the CDU, press the INIT REF button, followed by LSKs 6L and 3L, to open the PERF INIT page (just getting it ready — we'll use that in a minute). OK, this is where you may need to work fairly quickly, so write down —

- (From the FF line on the secondary EICAS) your fuel flow figure for each of the four engines
- (From the INIT REF page) your Gross Weight and Cost Index

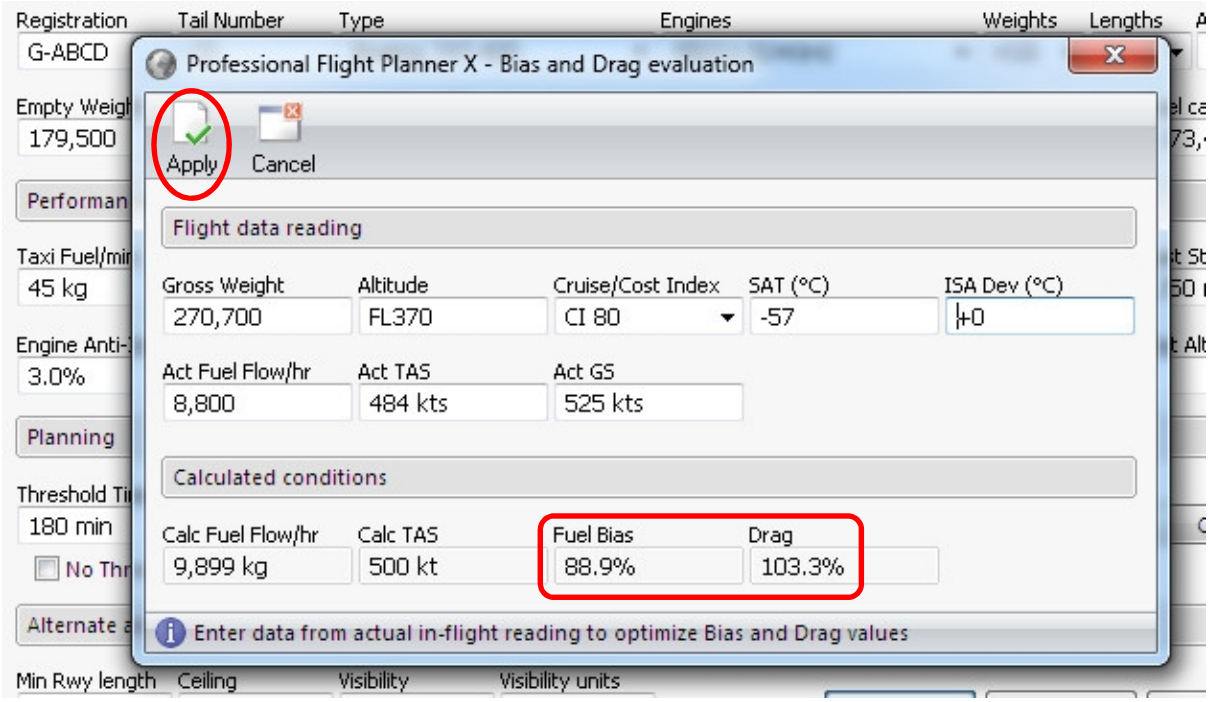
I've just tried that with my model of the 744, and obtained the following figures:

Ground Speed 525 kt and TAS 484 Kt — Altitude FL370 and SAT is -57 °C

Fuel flow: 2.2 + 2.2 + 2.2 + 2.2 = 8.8 (i.e. 8,800 kg/hr)

Cost Index is 80; Gross weight is 270.7 tonnes, i.e. 270,700 kg

So I typed those in to the Bias and Drag evaluation window, working along each row.



Starting at the Gross Weight box I typed in 270700, then clicked on the next window and changed the FL to 370. In the Cruise/Cost Index window I typed 80, and left the SAT alone since it was already correct (so there's no need for an ISA Dev correction, otherwise one would have been calculated for me: if you try it you'll get zero, as seen above). On the next line I typed in 8800, 484 and 525, and everything was done.

As you can see from the "Calculated conditions" section, PFPX suggested a fuel bias of 88.9%, and a drag figure of 103.3% in order to make its calculations more accurate.

I clicked the Apply button (top left).

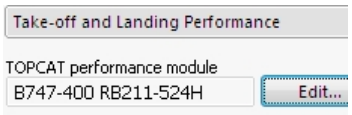
PFPX then entered the calculated figures into the three fields that I ringed on p.19, above:—

(**Remember to click Save, and Save Aircraft**). You may notice that you also have the ability to tune the climb, cruise, and descent bias figures individually, and if you choose to do that your figures have the potential to be more accurate. Suffice it to say [20] that to tune your figures it could be sensible — for the first few flights, at least — to monitor [21] your fuel usage during each flight (and perhaps separately during each *phase* of flight, if you want to hone your climb and descent bias separately), and then gently tweak your bias figures on the basis of experience until they become sufficiently accurate for you [22]. Regarding this, please notice that the PFPX manual states that "A Bias value of 105% means a fuel burn of 5% above default aircraft performance values.".

My main concern with this technique is that — as seen from the 744 cockpit — the fuel flow figures seem to lack a certain precision. If each engine's fuel flow should move from 2.3 to 2.2 (as shown in the FF line on the secondary EICAS) that's a difference of 400 kg an hour, which is a 5% jump [23].

But if that's all we have to work on, there's not much we can do....

The only other item to check on the Aircraft Editor page is the TOPCAT performance module in use [24]: if you want to use one of the other available profiles, click the Edit button and select it.



All the other figures on the Aircraft Editor page looked OK to me, so I clicked the Save button (top left) to save the tweaked aircraft model, which will now be applied each time I select that aircraft registration number as the aircraft to plan for.

The good news, of course, is that all the above preliminaries involving creating your own Model and getting better settings within PFPX only have to be done once [25].

So that's enough preparation work for now — let's plan a flight! ☺

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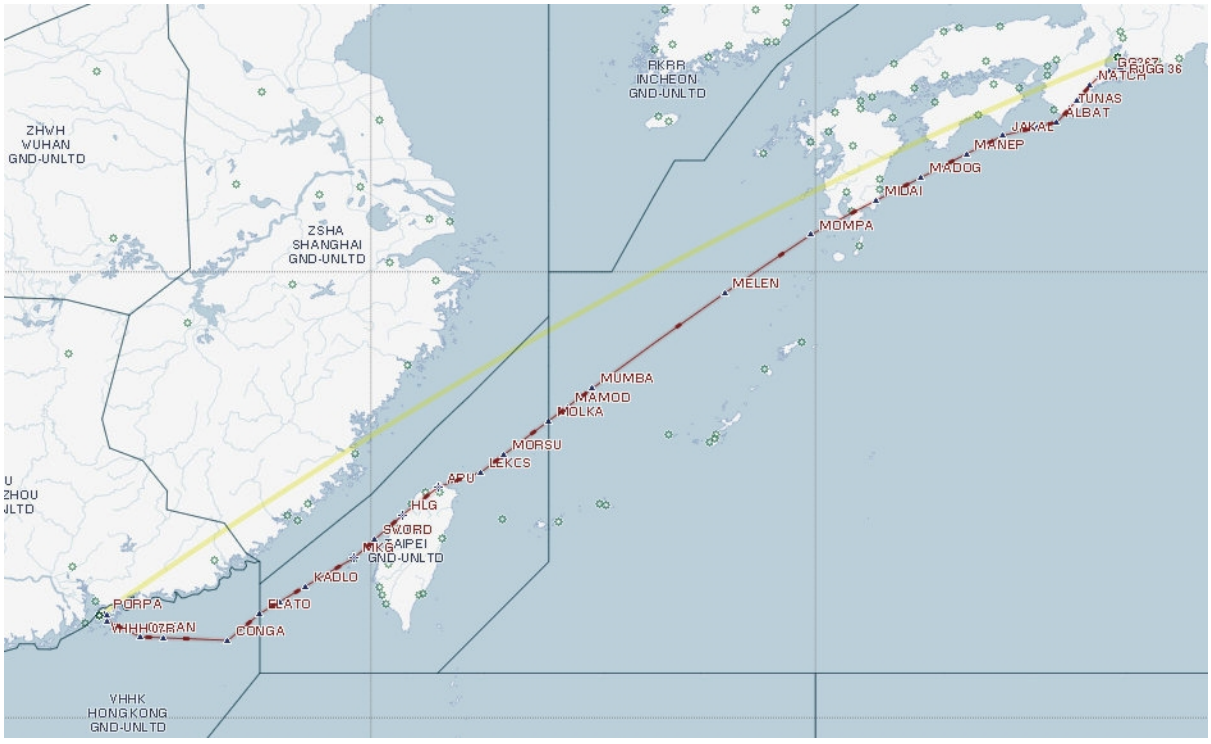
[20] (Since this tutorial is already going to be longer than I had intended...).
[21] I just print out the OFP pages and scribble down the fuel figure at each waypoint (& ToC & ToD).
[22] Some people will demand more accuracy than others, of course....
[23] I asked about this on the forum, and received a reply from one of the experts that "FF is measured very accurately, yet not shown to the pilot in its full accuracy because there is no reason for it. More numbers behind the decimal only distract more, and make it more difficult for you as a pilot."
[24] (You may recall that we initially looked at those options in the discussion on p.7).
[25] Unless you decide to iteratively refine your bias figures, of course. And there are also some things to set up in TOPCAT, but I'll mention those briefly when the time comes.

Planning an example flight

I suggested above that as an example I thought we might try planning a flight from Hong Kong (VHHH) to Chubu Centrair International (RJGG). You will have heard of the first, but perhaps not the second: nonetheless, these two airports have something in common....

Our departure airport (VHHH) is of course not the old Hong Kong Kai Tak airport (now, sadly — well sadly for simmers, anyway — consigned to history), but the newer Chek Lap Kok airport, which was built on an artificial island formed by levelling two small islands and reclaiming over 3½ square miles (9.8 sq. km) of the adjacent sea bed.

The common factor is that Chubu Centrair is also built on an artificial island (it is Japan's third offshore airport). Constructed as the main gateway to the Chūbu (central) region of Japan, however the airport seems to have proved less popular than had been hoped, with several airlines withdrawing in recent years — although it remains the 8th busiest in Japan.



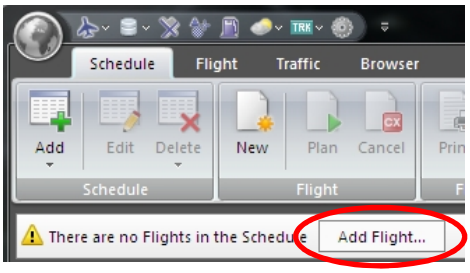
There are just two comments that I should make before we begin. The first is that there are many options and hence many different ways of planning your flight using PFPX (and TOPCAT), and indeed the method I am about to describe is by no means the only way — it's one that's relatively quick and straightforward, which also means that it doesn't take full advantage of some of the excellent features built in to PFPX — but it's fine for an introduction. So as you get to know the program(s), you will almost certainly start to develop a more elegant and/or more comprehensive planning method of your own.

The other comment is that I am writing this tutorial in September of 2014, and hence the software versions I am using are as follows —

- PSX release version (10.0.0) [26]
- PFPX v1.15, and
- TOPCAT v.2.74 beta 1.

(Just in case someone wishes to be able to follow this at some future date). ☺

Starting PFPX



One of the great features when you start to use PFPX is to learn to follow the good advice from what I call the "suggestion button"; and having just started PFPX its initial suggestion is "Add Flight".

Sure enough, clicking on the suggestion button launched me into the Schedule Editor dialogue. Or I could have used the Add icon on the toolbar — there's more than one way....

There isn't a lot to set up here — all I did was the following:

- Changed the airline (in my case, to Brian's Charter)
- Added a flight number (owing to imagination failure, I used the ever-popular 1234)
- Typed our departure airport into the "From" box (VHHH)
- Typed our destination into the "To" box (RJGG)

(At that point the 'Type of flight' was adjusted to read Int'l, and a Great Circle path for the flight was displayed on the Schedule Editor's World Map).

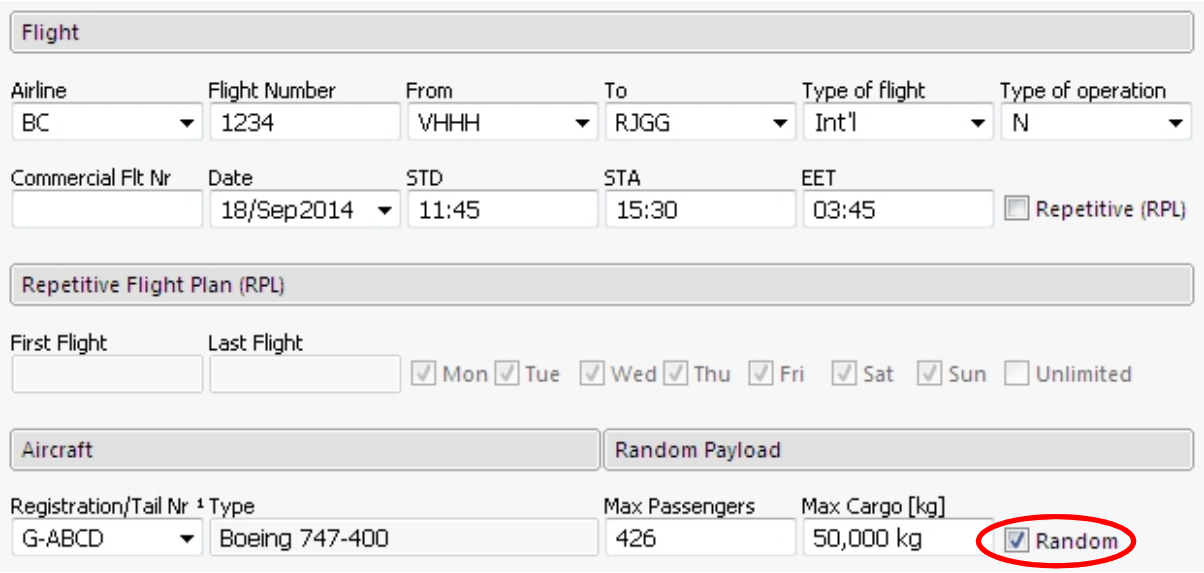
- I don't know of any associated real world flight, so I left the "Commercial Flt Nr" box blank.
- This is a "non-scheduled air transport operation", so I left the Type of operation as N
- Since I intend to plan and fly this as soon as I have finished I set the STD (scheduled time of departure and arrival) to an hour or so from now (UTC, of course): the STA (Scheduled Time of Arrival) and EET (Estimated En route Time) were filled in for me accordingly.

[26] There are also newer Alpha releases, designed to test specific features which may be incorporated into future versions (so they are not suitable for general use). But Hardy described one of the features introduced in Alpha 15 as "Aerodynamic drag curve now slightly steeper above 290 KIAS for idle descent; speedbrakes now seldom required": I would therefore suspect that if you have adjusted the Descent Bias using the release version of PSX (or any Alpha up to and including Alpha 14) there will be a difference in the applicable figures compared to the ones needed for Alpha 15 and beyond.

Since this isn't a repetitive flight, I then moved down to the Aircraft section.

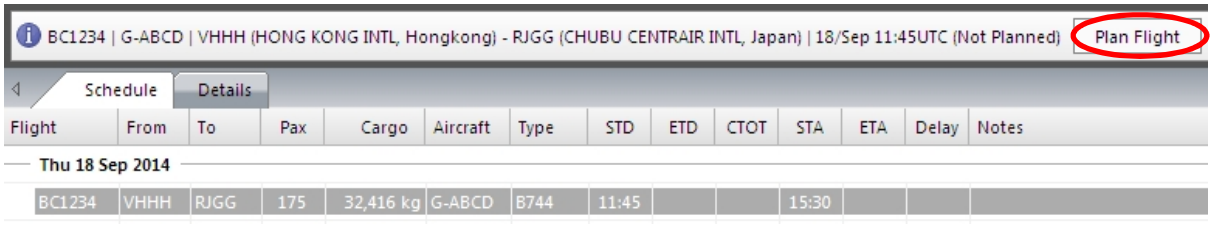
Using the dropdown, I chose the aircraft model and registration that I set up earlier (G-ABCD, in this case): I had also set the Airline Identifier in PSX to be BC.

I also clicked the checkbox for Random pax and cargo (see the discussion on page 17).

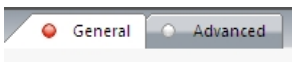


That's all we need to define the flight, so I clicked the Save button (top left of the window). The Schedule Editor window closed and the flight appeared in the schedule.

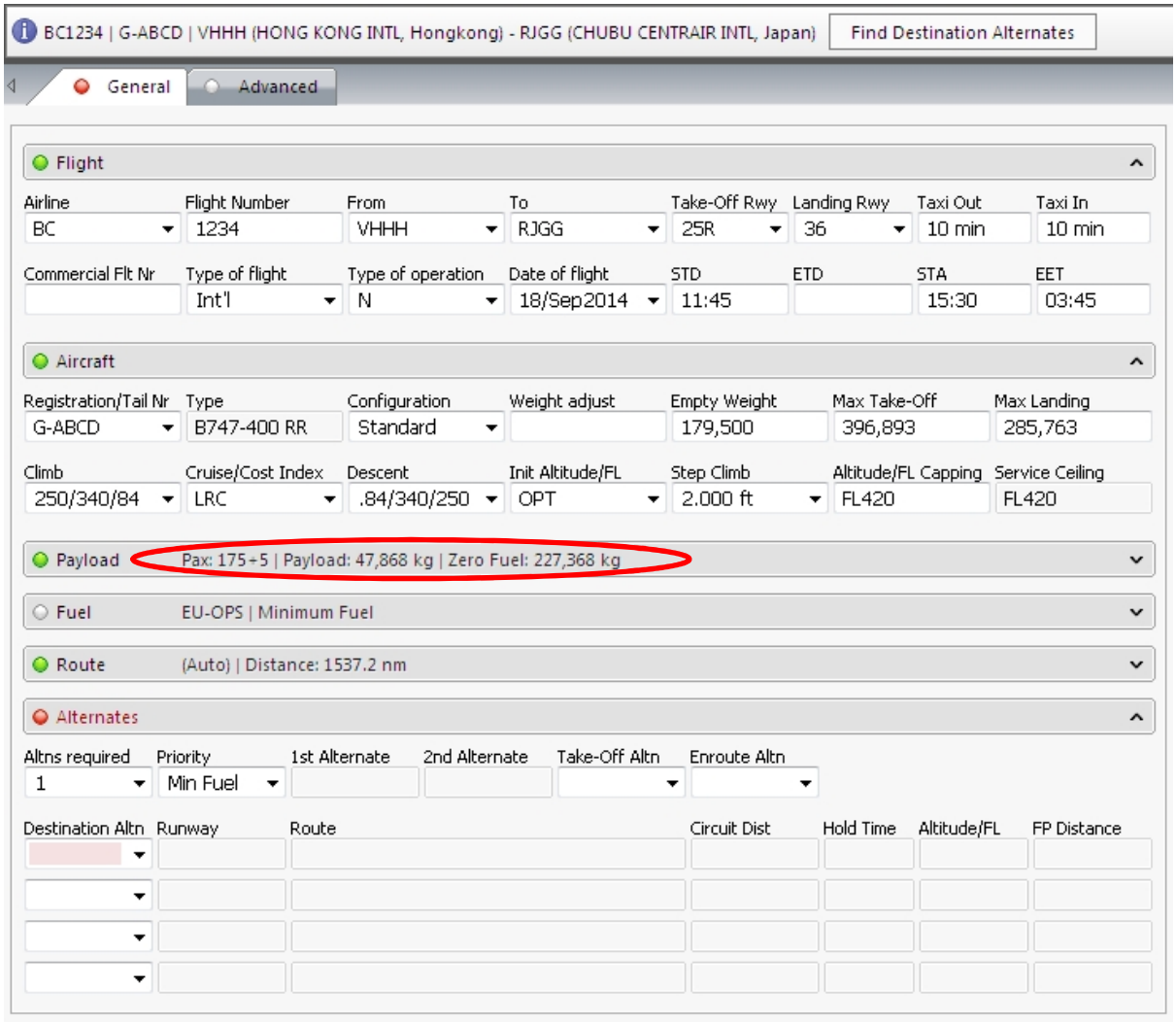
The suggestion button had now changed to say "Plan Flight".



So I clicked the button, and the PFPX Flight Panel appeared, to enable us to plan the flight. You will notice that the information that we have already entered has been carried across, so that all we have to do is add the additional information that the program needs in order to produce an OFP (Operational Flight Plan) for us.



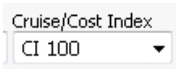
You will also notice that there are two tabs at the top of the panel. The General tab has a red button, indicating that more information needs to be supplied: the Advanced tab has a colourless button since it isn't in use. (Had we been planning an ETOPS flight we could and would have had all sorts of fun on that tab, but not on this occasion). At the moment the Flight Panel looks like this:



I would draw your attention to a few points before we proceed. First of all, the Payload section has a green button: you may recall that we checked the box for a random payload, so that action completed this section for us. The result is displayed in the grey Payload bar, but if you would like to know the details of what we got, you can click the small ⌄ at the opposite end of the grey bar to the word "Payload" to open the payload section.

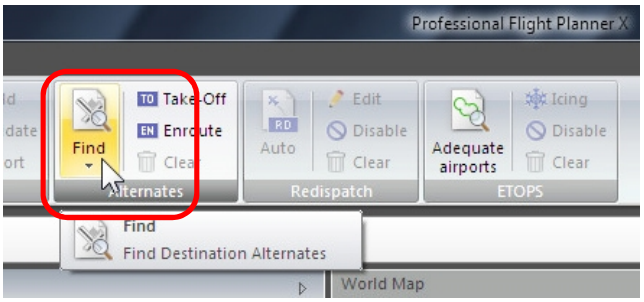
Hmm, unusually, none of the pax have brought any luggage with them. So I added 4,000 kg of baggage — the ZFW was automatically updated. (Click the ⌃ button to close the Payload section).

The Cruise/Cost Index field in the Aircraft section currently has LRC (Long Range Cruise) in it, but I prefer to use the actual Cost Index for our flight, so I typed 100 into the field (use whatever figure you intend to apply, of course), which duly updated itself to read "CI 100" when I clicked elsewhere.

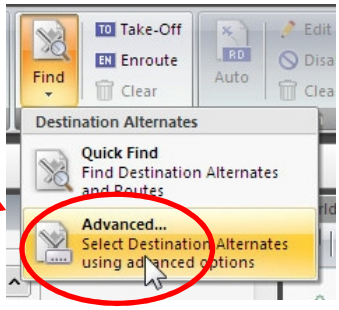


The Alternates section has a red button, and tells us that we must provide an Alternate airport (the program needs to know about this, since legally it has to include sufficient fuel

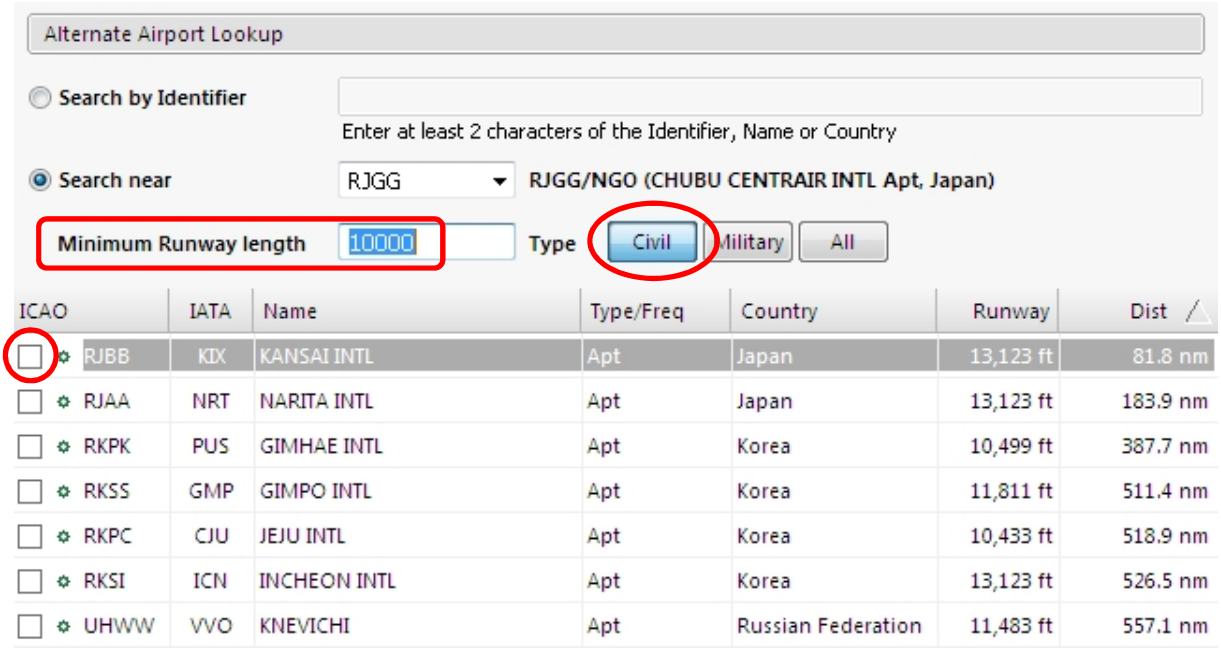
for a diversion to the Alternate). If the Alternates section isn't already open, click the arrow ⌄ to the right of the grey bar to open it.



Again, there are various ways of doing this, but here is one way. Go to the top menu bar and click on the Find button in the Alternates section. Then select the Advanced option:

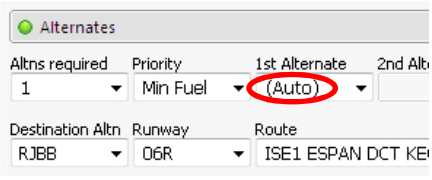


You are then taken to a special page for selecting an alternate airport. Since I prefer to make things simpler when I can, I'm going to opt for somewhere that has a runway at least 10,000 ft long (my apologies to those who measure runways in meters, please think in terms of 3,000m, or thereabouts). So I type the desired figure into the "minimum runway length" box, and PFPX then offers me a choice of airports with runways of at least that length [27] — with the nearest at the top of the list:



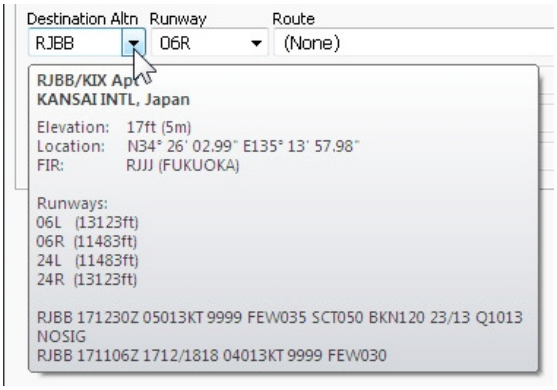
ICAO	IATA	Name	Type/Freq	Country	Runway	Dist
RJBB	KIX	KANSAI INTL	Apt	Japan	13,123 ft	81.8 nm
RJAA	NRT	NARITA INTL	Apt	Japan	13,123 ft	183.9 nm
RKPK	PUS	GIMHAE INTL	Apt	Korea	10,499 ft	387.7 nm
RKSS	GMP	GIMPO INTL	Apt	Korea	11,811 ft	511.4 nm
RKPC	CJU	JEJU INTL	Apt	Korea	10,433 ft	518.9 nm
RKSI	ICN	INCHEON INTL	Apt	Korea	13,123 ft	526.5 nm
UHWW	VVO	KNEVICHI	Apt	Russian Federation	11,483 ft	557.1 nm

So I'll choose the nearest, which is Kansai: when I click in the checkbox the map changes to show me its location relative to my destination. As far as I can see everything is looking fine, so I click on Apply.



The Alternates button has turned green, so have we finished, here? Well, not quite — Kansai is in the Alternates list but we haven't unambiguously selected it; and also we don't know yet how to get from RJGG to RJBB.

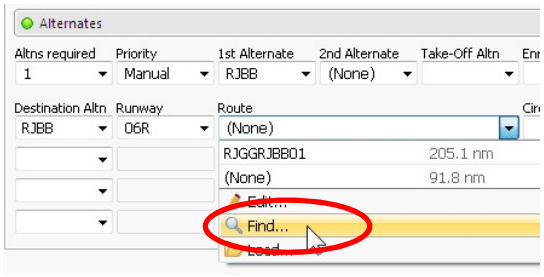
[27] If you want to include military airports in the list, you can click the button accordingly.



(Incidentally, if you hover the mouse over the arrow of the destination airport dropdown (see illustration, left) you are given some helpful information about that airport, including runway lengths — and even the weather. The weather has influenced the suggested choice of runway in the adjacent box, but if you want to use another one you can use the dropdown to select it).

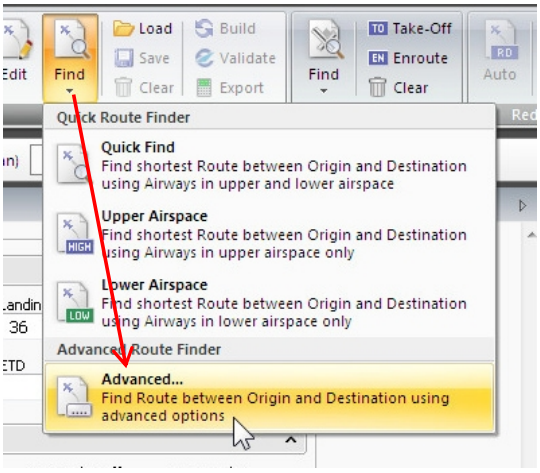
So the next thing to do is to firmly nominate Kansai by clicking the dropdown under "1st Alternate" and selecting it. You'll notice that PFPX has suggested runway 06R for this trip, but do bear in mind that if you use different weather it may be different when you try it.

Now we click the dropdown under Route and choose Find (this is still with respect to a route from our destination airport to the alternate, not our main route from Hong Kong to Chubu Centrair). In the blink of an eye, PFPX works out a route for you, inserts it into the box, and displays it on the map (you may need to click the  icon above the map to re-centre it and show your whole diversion route onscreen). You will notice that the FP distance from our destination to the Alternate is shown in red, but don't worry about that [28].



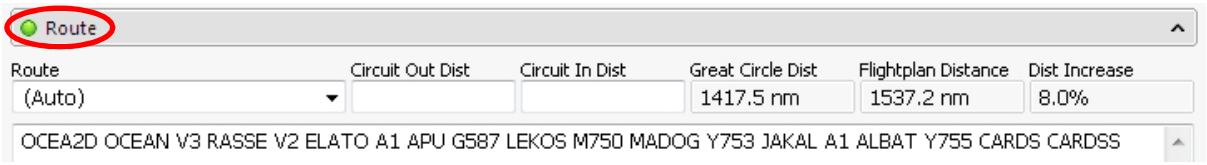
Right, hopefully that takes care of the Alternates section, so click the arrow to close it.

We are left with just two sections on the flight panel that don't have green buttons: fuel and route. But although fuel sits above route in the list, clearly until we have established our route we can't calculate how much fuel we'll need, so (as the suggestions button tells us) we need to click it to Quick Find Route. (Quick Find is what its name suggests (although quite often it's all you'll need), but there are, of course, other options. For example, to access the Advanced route finder, go to the Route group in the top toolbar (between Fuel and Alternates), click the Find button in that group, and select Advanced from the options available there. You can include Via points along your route, avoid certain waypoints or even FIRs/UIRs, and apply other useful tweaks).



[28] The distances turn red on an amber background to draw your attention to the fact that (in this case) the distance to the alternate is unusually long. In the context of your main route, red distances can also signify that the flight plan distance is more than 15% or 50nm greater than great circle distance.

But for now, let's use Quick Find (which works splendidly for most purposes): clicking on the suggestion box opens the Route section which now includes a route that works with the current weather (and the button turns green).



If you click the  icon above the map to refocus it you will see your whole route, with the waypoints. This is the time to check that your route doesn't take you through the airspace of any unfriendly régimes, and generally make any adjustments to it that you wish to include. (Hovering your mouse over any waypoint will give you the information about it, if needed).

Are you making a situation file, too?

One of the main decisions which you need to make is regarding whether you're simply making a route to fly now (when you get used to using PFPX, the entire planning process typically takes less than five minutes) or are you going to make a situ file for repeated use?

Back on page 10 we looked at the differences that this would make with respect to the weather settings within PSX; now we need to think about the traditional question of whether to include SID and STAR information within our route.

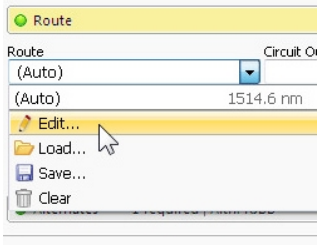
Looking at the example route which we are dealing with (above), it's clear that the route from 25R includes a SID (OCEA2D).

Similarly, we can also see that the route has a STAR (CARDSS, a.k.a. CARDS SOUTH) to rwy 36 at our destination.

At this point, our choices are typically as follows:

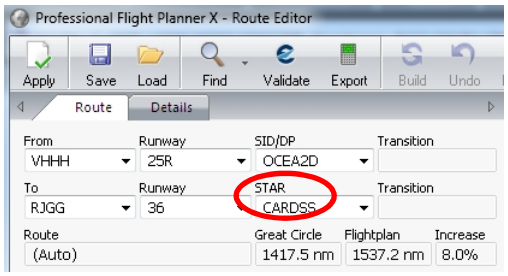
- If we are going to fly soon, so that the current weather applies and hence the runways (and the associated SIDs and STARs) are likely to be valid, and also the route is short so that the weather at our destination won't change too much from the forecast, we might leave both the SID and the STAR in place.
- If we would like to fly the route, but think there's a chance that the weather may well change during the duration of our flight, we should probably remove the STAR.
- If we're not sure when we will fly the route, and hence have no idea what runways will be in use, we need to remove both the SID *and* the STAR.

Removing the STAR and/or the SID



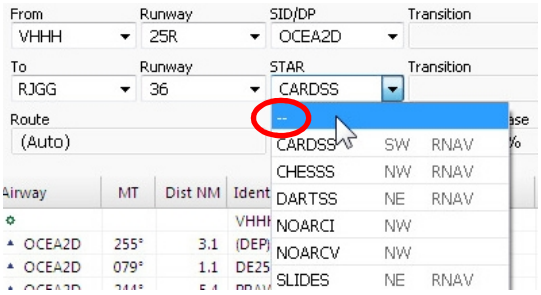
The way to do this within PFPX is simply to edit the route.

Click on the Route dropdown and select Edit.

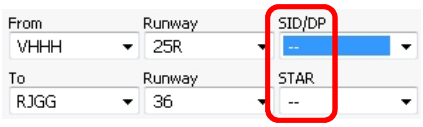


The Route Editor opens — from here you can make manual adjustments to your route to your heart's content. But let's assume that in this case we just want to remove the STAR. At the top of the Route Editor we see the summary (left). Clearly, we now need to remove the CARDSS STAR, which we do using the dropdown.

All you need to do is click on the dropdown arrow and then move the highlight from CARDSS to the double hyphen (- -) at the top of the list. No STAR now exists in the route.



To remove the SID, use exactly the same technique with the SID/DP dropdown. Both now show - - .

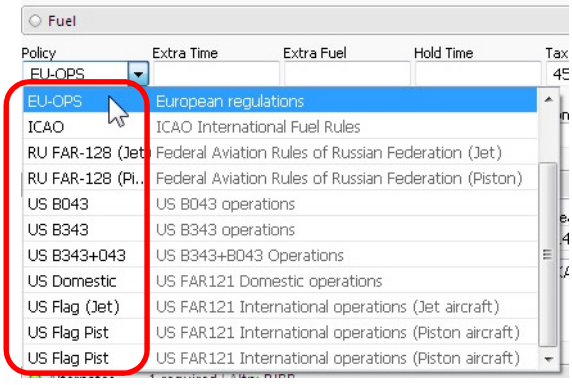


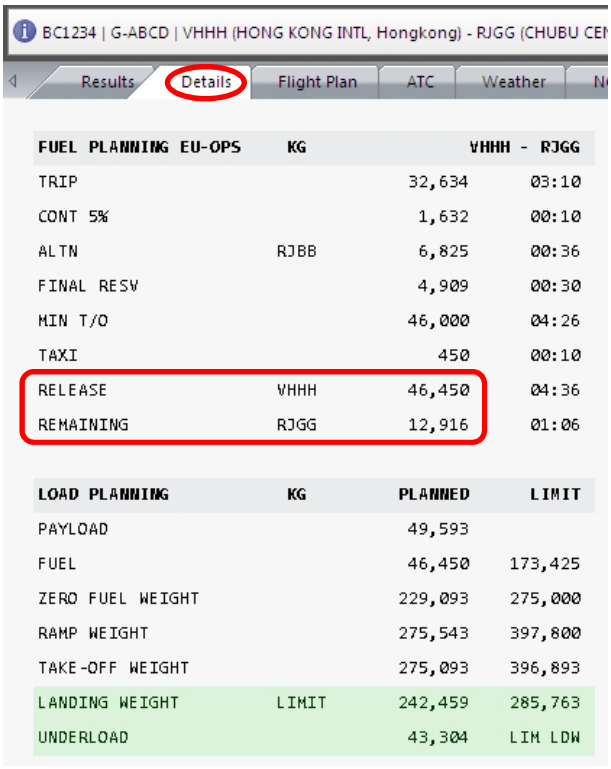
Click the Apply icon (top left) and you are returned to the Route section of the flight panel, with the route now edited to include neither a SID nor a STAR (but we can, of course, easily add ones that are appropriate for the current runways in use, using the DEP ARR button on the CDU once we find ourselves in the PSX cockpit).

All of which has taken an awful lot more time to explain than it takes to actually do, I promise you!

Just one section remains without a green button — Fuel. However, in this case just because there isn't a green button doesn't necessarily mean that we have to do something, in fact.

Back on p.14 I mentioned that I had to assume that you had done the preliminary setup of PFPX in the Program Options, and one of the items I was referring to was to set your Fuel Policy. In my case it's easy: since Brian's Charter is based in the U.K. I will be working to EU-OPS; however you will need to consult pp 74 – 77 in the PFPX manual to determine which fuel policy is appropriate for you. (The section on pp 55 – 56 is also helpful).





Having set your policy, all you have to do is to review the information in the fuel section and add or change any if you wish, and then go to our old friend the Suggestions Button — click on Compute Flight and the fuel will be taken care of for you. If you now click on the Details tab, you will see your fuel computed for you (as well as the other significant weights that you need to know about).

In the example on the left you can see that you would need to load 46,450 kg of fuel (using the Instructor Station in PSX), which should mean that you should arrive in Japan with around 12,916 kg remaining in the tanks.

Take a look at the Flight Plan tab to see your flight plan as it is so far — impressive!

The suggestion box is saying that you can now click on it to release the flight — but *don't do that just yet!* Well, not if you have TOPCAT, anyway.

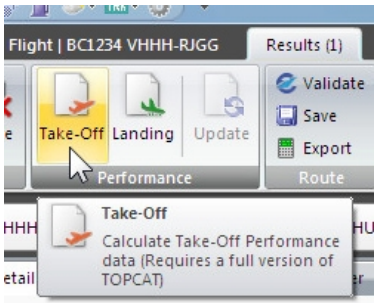
PFPX has done its utmost, but ideally we would like some more information to help us with our take-off and landing, and that information has to come from TOPCAT.

If you do have TOPCAT, then please continue at the "Time for TOPCAT (prior to flight release)" section, below..

If you don't have TOPCAT installed, then —

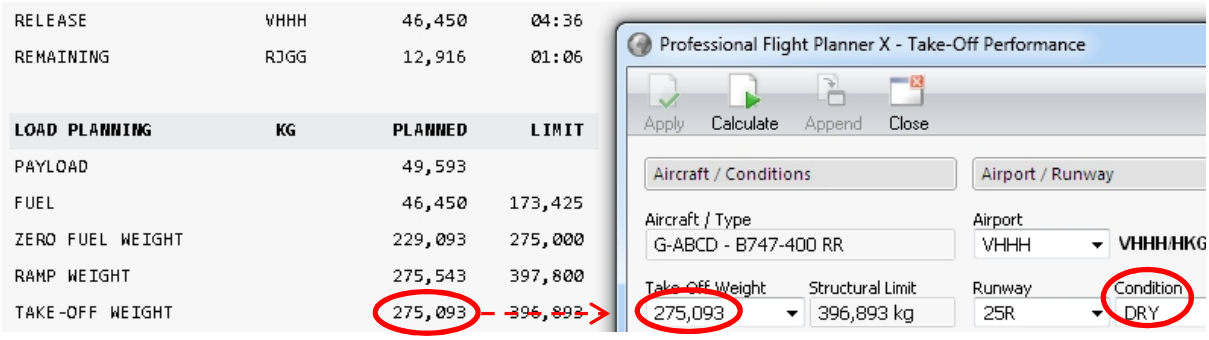
- Please click the button to release the flight.
- Then skip to "Now the flight is released" on p.34.

Time for TOPCAT (prior to flight release)



Let's begin by clicking on the Take-off icon in the Performance section of PFPX.

In the Take-Off Performance window that opens, note that the Take-Off Weight has been copied across from the previous calculations:



Notice also that the current weather is being taken into account, as shown in the lower box. There are several things that might be tweaked here (the runway condition could well be significant, for example), so once done let's click on the Calculate icon on the toolbar, which initialises the exchange of information between PFPX and TOPCAT.

After a brief pause (there are a *lot* of numbers to be crunched for this) the results are shown in the scrolling window. The window can't be resized, but the results can be copied and pasted, and this was the result in my case:

```
TAKE-OFF VHHH/HKG  RWY 25R  TORA 3800M
G-ABCD  BOEING 747-400 RB211-524H
HONG KONG INTL

TEMP +32C   QNH 1011   WIND 260/09 (08KT HW)

-----------------  CONDITIONS  -------------------
TOW 275093 KG   FLAPS 10   THRUST D-TO2   RWY DRY
AIR COND ON   ANTI ICE ON OR OFF

-----------------  FULL THRUST -------------------
  +32C 331753 FIELD  132-142 142 158   1685M   1.56

----------------  REDUCED THRUST  -----------------
  +55C 292791 CLIMB  141-146 148 157    763M   1.49
  +56C 289213 CLIMB  141-145 148 157    709M   1.49
  +57C 285634 CLIMB  142-145 149 157    656M   1.49
  +58C 282056 CLIMB  142-144 149 157    590M   1.49
//+59C 278477 CLIMB  143-144 150 157    525M   1.48     ← Assumed temp
  +60C NOT AUTH
  +61C NOT AUTH

**************************************************
DO NOT EXCEED MAX STRUCT TAKE-OFF WGHT OF 396893 KG
**************************************************

-----------------  ENGINE OUT  -------------------
AT 7.2 DME 'ITFR' 110.9 LT TO 'RUMSY' [15 DME R 239
'CH' 112.30] (182 INBD,RT)

---------------------- END  ----------------------
```

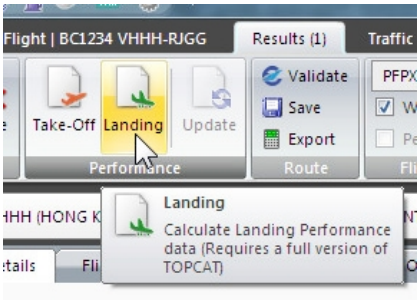
In the above 'reduced thrust' section, note in particular the line prefixed by a double slash:

```
//+59C 278477 CLIMB  143-144 150 157    525M   1.48
```


This is suggesting that the optimum assumed temperature for take-off is 59ºC.

But don't worry about the details, we'll be seeing them all again, soon. So click on Apply, which will insert a summary of the take-off data into the OFP for you.

We can now repeat the process for the Landing performance.



Here, you may wish to change the Landing Mode box if you will be opting for an autoland: the landing weight shown is, of course, the one calculated by PFPX.

When you click the Calculate icon, once again the flaps and other information becomes available:

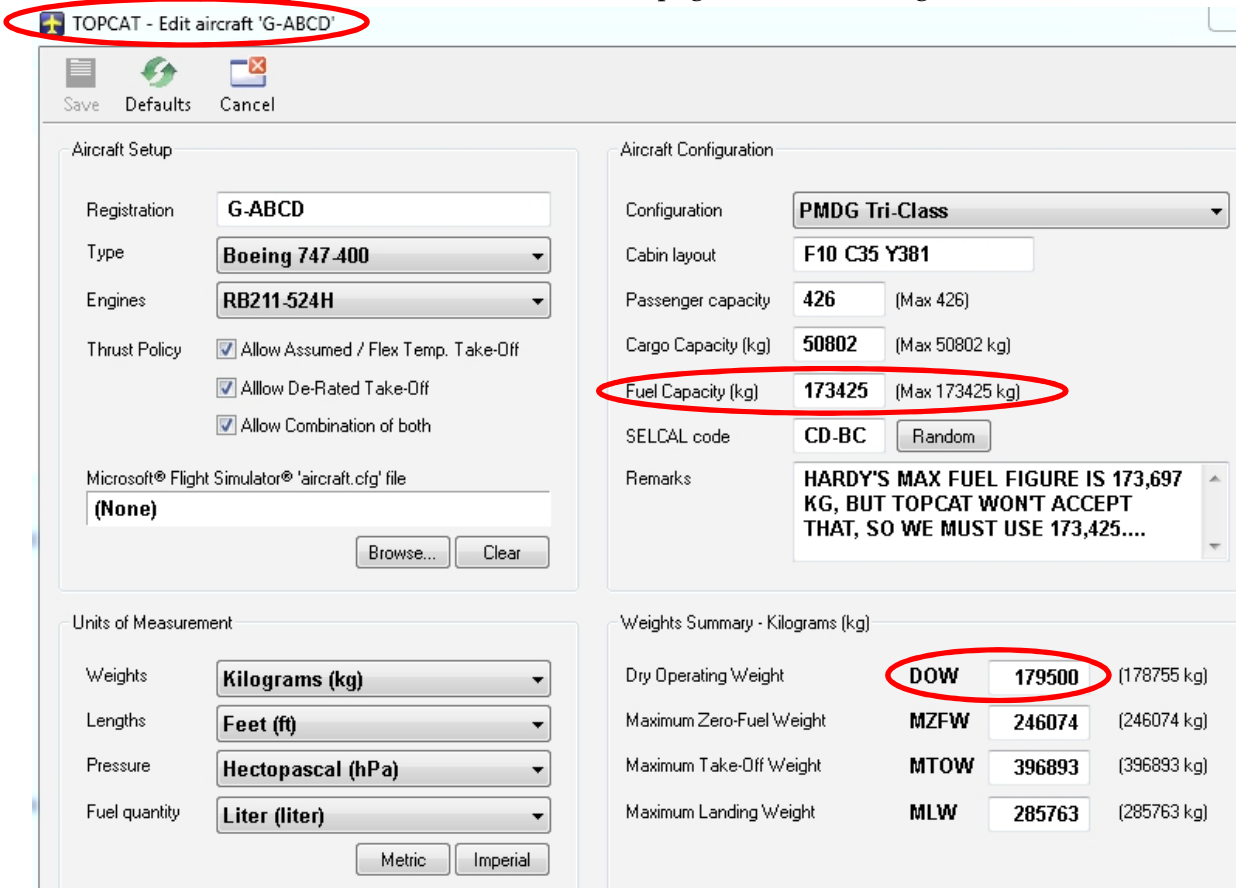
```
LANDING RJGG/NGO  RWY 36  LDA 3500M
G-ABCD  BOEING 747-400 RB211-524H
CHUBU CENTRAIR INTL

TEMP +24C   QNH 1010   WIND 300/20 (11KT HW)

--------------  DISPATCH CONDITIONS  --------------
LDW 242459 KG   FLAPS 30   RWY DRY
LDG MANUAL   AIR COND ON   ANTI ICE OFF

VREF=141KT   VAPP=146KT

----------------  MAXIMUM BRAKING  ----------------
//MAX MANUAL   400000 KG    1011M   (MARGIN  2489M)

--------------  AUTOBRAKE LDG DIST  ---------------
  AUTO 1       400000 KG    2799M   (MARGIN   701M)
  AUTO 2       400000 KG    2353M   (MARGIN  1147M)
  AUTO 3       400000 KG    2036M   (MARGIN  1464M)
  AUTO 4       400000 KG    1716M   (MARGIN  1784M)
  AUTO MAX     400000 KG    1418M   (MARGIN  2082M)

************************************************
DO NOT EXCEED MAX STRUCT LANDING WGHT OF  285763 KG
************************************************

---------------------- END  ----------------------
```

Notice also the estimated autobrake margins of runway length left (with the specified runway conditions — DRY, here — and for our calculated landing weight).

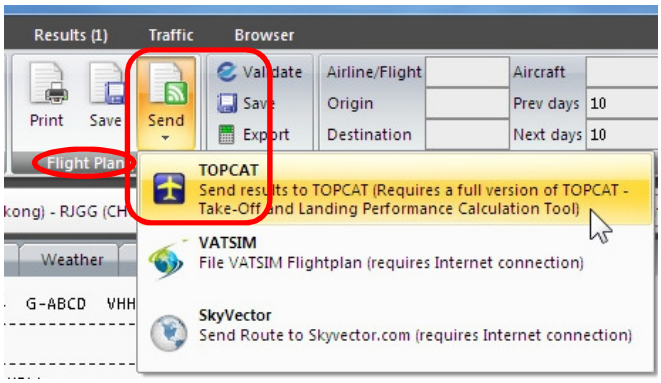
Once again, click the Apply icon to insert a summary of the data into the OFP, then Close.

We can now **release the flight**, so click on the suggestion box for the last time in this planning session. The main difference that you will notice is that your Flight Plan (Details tab) now contains the above additional take-off and landing summary information. An example of a PFPX OFP is included in the zip file, along with this tutorial.

We may also, however, opt to interact more directly with TOPCAT. *You can only do this once the flight is released*, and the process assumes that your aircraft (G-ABCD in this case) has been properly set up within TOPCAT's Aircraft page to match the figures within PFPX:—



Although I can't quite persuade TOPCAT to accept the maximum fuel figure suggested by PSX, we're talking about a difference of a mere 0.16%, so I'm not at all concerned about that.



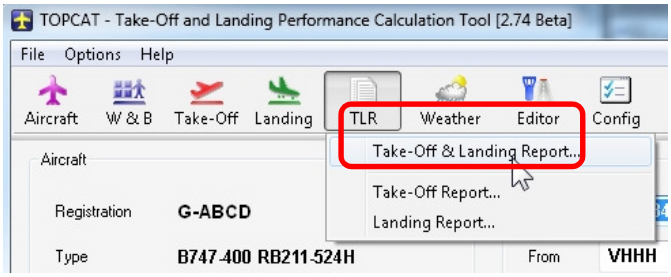
OK, so now let's fire up the complete version of TOPCAT: click on the Send icon in the "Flight Plan (OFP)" group of PFPX, and select TOPCAT from the three options available.

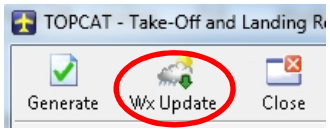
The full TOPCAT program then starts up, loads your aircraft's information [29], and moves to the Weight and Balance screen, where it loads in the remainder of your flight information for you to view in detail.

[29] May I for the last time (I promise!) stress the importance of having already set up your aircraft by entering the information about it on the Aircraft page of TOPCAT to agree with the information in PFPX. Ensure in particular that the Dry Operating Weight is set up to agree with both PFPX and Hardy's figure within PSX —179,500Kg (or 395,700 lbs) and the Fuel Capacity is correct **for your model** (see p.12).

On the weight and balance page you will see that all the weights agree with those on your Flight Plan, and that all the other details have been carried across, as well. ☺

Once again, there are several different routes we could take through the program at this point, but here's one way: click on the TLR icon in the menu bar and select the full "Take-Off & Landing Report".





Scan through the details on the screen that opens and check the details, then when you're happy click on "Wx Update" in the icon bar to add the weather details, too [30].

After a short pause, the weather will be added, so you then click the "Generate" icon to generate the take-off and landing report for you. Using the icons, you can print it (including to a pdf file, if you have a "pdf printer" app), save it to a file, or even email it to yourself if you would like to view it on your tablet or elsewhere [31].

Click Close, and Close, and Quit (or use the red crosses, top right) to leave TOPCAT.

Congratulations! Your flight is fully planned.

But *don't close PFPX*, because we're not quite finished yet....

Now the flight is released....

Now that your flight is planned, computed, and released, and you are in possession of all the information you need to enable the FMC to guide your flight as accurately as possible, there are just a few final tasks to be done.

A vital job that you will definitely want to do is to get a copy of the newly-generated `.route` file into PSX [32].

Proceed as follows:

a) Click the Save icon (be careful — this is *not the Save icon in the OFP group*, but the one in the Route group — between Validate and Export in the menu bar).

---

[30] PSX, PFPX, and TOPCAT all use METARs, so they will mostly agree — at least, as closely as you are likely to see in this imperfect world, especially considering the changeability of weather patterns.
[31] See Appendix 5 for an example of a TOPCAT Take-off and Landing Report.
[32] It will soon be possible to considerably simplify the technique shown below, once PFPX adds the ability to natively (i.e. within PFPX itself) Export the route directly to the stipulated PSX directory.

b) In the window that opens, ensure that the 10 character format is correct (it is by default, but you may want to check it anyway).

c) If desired, append an underscore to the route name, to make it available in the cockpit without having to request it from the CDU as a download. (i.e. make it `DEPRDESTnn_`). If there's a message that no route matches your filter criteria don't worry, it's just saying that there isn't one there.... yet.

d) Before saving, you may wish to copy and paste the contents of the "ATC Route" box somewhere, for your records [33]. Add any Remarks you wish, before clicking on Save (top left)

e) Click the Save icon, top left.

f) Go into Explorer or an equivalent and copy the saved route (`C:\Users\Public\Documents\PFPX Data\Routes\xxxxxxxxnn.route` or `xxxxxxxxnn_.route`) into your installed PSX \Routes directory.

Before closing PFPX (if needed) — take the option (the Print icon in the OFP group on the toolbar) to print the flight plan (either to paper or a pdf document).

Congratulations — you have now got a fully planned route, and are in possession of all the data you need to fully program the FMC for your forthcoming vlight.

I have included as Appendix 3 a summarised list of actions which you could use to create yourself a situ file (including the PFPX and TOPCAT stuff), which may perhaps be helpful: a printer-friendly version is also available as a separate pdf in the zip file.

In ending this rather long section on flight planning, please allow me to reiterate that although it has taken lots of words and many pages to explain the procedure, once you get the hang of how it all works you will soon be able to whizz through it in less than five minutes. ☺

[33] Although it will be included in the OFP, too. ☺

End of Part 2

So here we are at the end of Part 2.

As I gently warned you in the Introduction, inevitably the flight planning aspects have been more in evidence than the PSX aspects in this document — but nonetheless I felt that the information provided might be helpful to those who are meeting PSX for the first time, and might be finding the initial learning curve dauntingly steep.

I should also add that although I have concentrated on PFPX and TOPCAT for planning purposes, I have no connection with FlightSimSoft other than as a customer. My hope is that, even if you use a different planner (whether it be online or standalone), there might nonetheless be a few helpful tips for you in the foregoing — see also Appendix 4, starting on p.46, for guidance on typing a route (from any planner) into the FMC via the CDU.

Therefore, although Hardy has very kindly perused the PSX aspects of this (thank you, Hardy), the sole responsibility (or, blame if you like) for the majority of this Part 2 stuff (the non-PSX aspects) lies with me. But then, if Hardy had not produced such a wonderfully crafted simulator, I wouldn't have been writing this anyway, so my deepest thanks to him.

My thanks also go out to those experts on the Aerowinx forum who were kind enough to answer my questions (and whose answers I have quoted here for the convenience of the reader), and especially to Martin, whose sage advice saved you from enduring quantities of additional material, and who kindly drew my attention to various examples of fuzzy explanations and unclear text.

So my thanks to all of them — and also to you, dear reader, for reading this document: I sincerely hope that you have found at least some of it interesting and perhaps even useful.

Finally, with the hope that new PSX users are now a little better equipped than they were to deal with the background issues, it only remains for me to wish you many hours of fulfilling fun flying PSX!

Brian Cowell

Hampshire, England

September 2014

Appendix 1 — the various aircraft weights

Just some quick definitions (as I understand them, anyway), to refresh your memory:

Basic Weight (BW)
The completely empty weight: just the aircraft structure, engines and other systems, unremovable and standard loose equipment, and unusable liquids (engine oil, etc.).

Dry Operating Weight (DOW)
The "empty" weight for most practical purposes, meaning the aircraft itself (BW) plus the essential items such as crew, food and water, etc. (But not including any fuel, hence "dry").

Payload (sometimes also referred to as "**total traffic load**")
The stuff that gets carried and for which the airline gets paid: passengers (pax [34]), passenger baggage, cargo, and mail. (The non-passenger elements are sometimes referred to as "deadload", for obvious reasons).

If you add together the Dry Operating Weight and the Payload you get —

Zero fuel weight
Which is, as the name suggests, the Dry Operating Weight plus the Payload — but still without any fuel on board.

[*Note that in PSX you have no direct control over the payload weight as such. Instead you simply adjust the ZFW slider on Situation | Aerodynamics (or type a number into the "Zero fuel weight" box on Situation | Service). This can occasionally mean resorting to workarounds with some utilities that expect you to configure each aspect of the payload separately*.]

So far, so straightforward, but even before we consider the fuel there are other weight definitions too, including —

Ramp Weight (RW) — the weight of the fully-loaded aircraft before starting engines.
Take-off weight (TOW) — the weight of the aircraft at brake release for take-off. This is ZFW plus Take-off fuel (see the fuel section, below).
Landing weight (LW) — take-off weight minus the trip fuel; or to put it another way, the sum of the ZFW plus the unused fuel.

Then there are the maximum figures (don't ever exceed them!) —

[34] The pax are also light-heartedly referred to on occasions as SLF — Self-Loading Freight.

Maximum Zero Fuel Weight (MZFW) — there is obviously a limit to how much the aircraft's structure will support, or is designed to support.
Maximum Take-off Weight (MTW) — the maximum weight limitation for take-off. This is derived from structural and/or operational requirements.
Maximum Landing Weight (MLW) — the maximum weight limitation for landing. Again, this is derived from structural and/or operational requirements.

Finally, in order to be able to get anywhere we do need to add the fuel, of course. There are many definitions in this area, hence you will encounter several terms in use, including —

Block fuel (weight of fuel on board at 'off-block time', i.e. moments before starting to taxy).
Taxy fuel (APU consumption, engine start, and taxy to runway).
Trip fuel (precalculated fuel used between brake release for take-off and at touchdown. Like all such calculations this one will routinely be overtaken by random elements such as weather and ATC and other interventions, of course).
Burn-off fuel (the sum of taxy fuel and trip fuel).
Take-off fuel (TOF): the weight of usable fuel on board at the moment of brake release for take-off).
Reserve fuel (take-off fuel minus trip fuel: this is variously made up of fuel legally and/or operationally specified for 'route reserve', 'diversion', 'holding(s)', together with the Captain's choice of 'additional' fuel).

Finally, perhaps the most obvious definition of all: the **Gross weight** is the sum of the ZFW plus the amount of fuel remaining on board at any given moment.

Although the above represents my own (probably over-simplified) understanding of this complex area, happily there are many documents available online which deal with it much more comprehensively, and certainly more authoritatively. For example, the first one that happened to come up in my search engine was:
https://www.ivao.aero/training/documentation/books/SPP_aircraft_weight.pdf

But there are many, many others..... ☺

Appendix 2 — some resources for learning PFPX

(The following is an updated and condensed version of the list that I originally provided in my review of PFPX for Mutley's Hangar*, shortly after the PFPX release date).*

There can be no doubt that planning a flight to the full extent of which PFPX is capable will represent a challenge for most simmers, especially the first few times they use the program. This challenge derives from the complexity of PFPX itself, and also from the dispatch-oriented terminology used (EU-OPS, CFMU, re-dispatch, AUSOTS, and all the rest), not to mention the fact that being a real world flight dispatcher is a specialised technical job. Happily, however, there are now many sources from whence help may be obtained.

The most obvious place to start is, of course, the PFPX manual (which is downloadable prior to buying the program). The official manual comprises some 87 medium-sized pages, and it certainly gives an overview of the program. However, it suffers from the usual problem which is common to many such manuals: whilst it describes the program interface, and even spends a fairly terse 15 pages discussing the flight planning process, it doesn't really tell you why and when you would need the various program options, nor does it give more than a bare overview of the dispatcher's role. Most devastatingly of all, it suffers heavily from a lack of examples, so I looked elsewhere to supplement my flight planning knowledge.

I first of all found the "official" PFPX videos. At the time of writing there are nine of them in English and four in German, and the links can all be found on this page:

http://www.flightsimsoft.com/pfpx/?p=tutorials

Then there is the **two-part tutorial**. My prayers — and, I have no doubt, those of many others — were answered by the provision of a really excellent two-part tutorial (in pdf format), which goes a long way towards remedying the deficiencies of the official manual. Entitled "ETOPS and Oceanic Procedures" and written by Belisar Hoxholli, part 1 covers the activities in the dispatcher's office, whilst part 2 covers what happens on the flight deck subsequently.

Quite frankly, I learned more from reading carefully through this two-part tutorial than from the sum total of the videos and the official manual: Mr. Hoxholli has done the flight sim community a great service. The links are to be found pinned on the Aerosoft PFPX forum page here:

http://forum.aerosoft.com/index.php?/forum/592-pfpx-professional-flight-planner-x/

The names of the associated pinned posts are:

- "PFPX, ETOPS, PMDG777 - A short guide P1"

and

- "PFPX, ETOPS, PMDG777 - Part 2 (Flightdeck)"

You will also find other interesting stuff amongst the posts on the PFPX page (link given above). For example, there are links to more videos in these two pinned posts:

- "New Video tutorial"

(which concerns planning a flight which occurred in the past), and

- "Great videos"

(Three videos here — installation and setup, basic planning, and advanced planning. These were originally released in Spanish, incidentally, so those versions should be easily found by a search engine, for those who are happier hearing a Spanish version).

I would recommend anyone wishing to get the best out of PFPX to look at the above sources, but especially both parts of the "ETOPS and Oceanic Procedures" tutorial. Of course there are other PFPX tutorial videos on the Internet which can be easily found, but as usual these are of varying quality, so please exercise due caution. But if you like a laid back presentation, for example, you may find these PFPX videos by Kyle Rodgers helpful:—

Tutorial 1: (adding an aircraft and planning a route)
http://www.youtube.com/watch?v=BSX5FZ5fNMM

Tutorial 2: (adjusting fuel or route to meet various constraints — see also the video below)
http://www.youtube.com/watch?v=hgBv2dUry48

Once you understand the fundamentals, Kyle also has a video about delay information:
http://www.youtube.com/watch?v=3PYdCNQRWQw

Between them, the above collection should equip you well to learn and use PFPX. ☺ However, in the case of the 744, the process of using PFPX is simplified somewhat, since ETOPS will rarely be a factor, which helps. (See the ETOPS section on p.12).

Appendix 3 — summarised list of post-planning actions

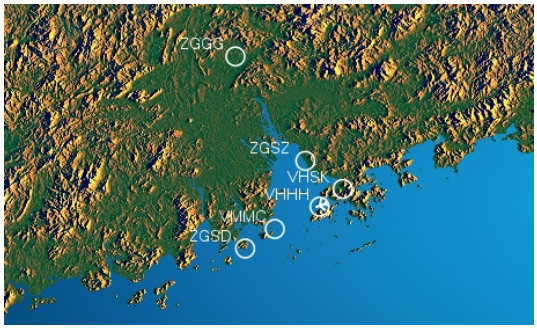
For the benefit of those who like to create a situ file, I'll now briefly describe the technique for doing so.

I covered creating a situ file in some detail in Part 1, but I will include a simple summary list of how to do it, this time also incorporating some additional material relating to utilising the information from PFPX and TOPCAT. If you're not sure about any of the entries in the list, please refer to Part 1, but don't forget also that if you hover your mouse over an item, Hardy has provided extremely helpful tooltips in the PSX Instructor Pages....

I am going to assume in this case that you intend to make a situ that is repeatable — in other words, every time you vly it you want the same weather (i.e. the weather that's in your printed OFP and Take-off and Landing Report). If you need a situ that will have the weather of the day each time you run it, then one or two things will be different (I'll mention them as we go along) but do please bear in mind that as the weather changes this may also cause changes to your flight plan. If, however, you followed my suggestion to remove the SID and STAR from your route before saving it, then at least changes to your departure and arrival runways won't matter, since you will be selecting the SID and STAR using the DEP ARR pages in the CDU as part of your cockpit prep, and hence the impact on your saved route should be minimal.

Of course, if you knew from the outset that you would be creating a situ which would always use the weather from your OFP, you could have considered leaving the SID in place — although for a long flight I always feel that predicting the assigned STAR, hours in advance of the arrival time, is definitely pushing my luck — but perhaps your luck is better than mine.....

The list follows: I hope you find it useful.

1	Collect together all you need for the trip (charts, QRH, Hardy's manual, Operational Flight Plan (OFP), Take-off and Landing Report (TLR), etc.), and check that your `.route` file is available in the Aerowinx\Routes directory.
2	Start PSX, as well as any ancillary programs you may need (AdaptPSX, TrafficPSX, PSXearth, etc.)
3	In the PSX Instructor Station select Situation | Load.
4	Load a situation appropriate for the state of the aircraft as you want to find it. [35]
5	Model | Load — load your desired model, and, if needed, view the details on the next three tabs to refresh your memory concerning the configuration. [36]
6	Situation | Time and set the daytime and season sliders (or press the "Copy real world UTC" button).
7	Situation | Position and move the map centre, and the aircraft, to your desired starting point.  You may also wish to set the Map's terrain type and initial zoom level, especially if you are going to take a peep at your progress on the moving map as the flight progresses.
8	Situation | Service: a) set the external supplies, and the doors, appropriately — i.e. to suit the starting point of your scenario. b) for long cold (e.g. trans-polar) trips, set the fuel type appropriately c) type the RELEASE fuel figure from the release page of your OFP into the "Total fuel qty" box d) type the ZERO FUEL WEIGHT figure from the release page of your OFP into the "Zero fuel weight" box (Check that the kg/lb units are aligned in both cases, naturally).
9	Situation |Weather | Planet (this is assuming that you are opting for the weather in your OFP) [37]: ensure that the "Set zones" checkbox (lower left) has (for the moment) **no** tick in it.
10	Situation | Human | Pilot: ensure that the "Makes call-outs", "Performs silent tasks", and "Sets S/C alt if VNAV PTH engaged" checkboxes are configured as you would like them to be.
11	Situation | Human | Dispatcher: find your route file in the list and make sure that when it is selected the "Requires route uplink" box remains clear (which it will do, if you appended an underscore to the route name as suggested above). Alternatively, if you wish to practice requesting the route from the cockpit and subsequently downloading it, check the box to remove the underscore.
12	Review the remaining Situation | Human sub-tabs to ensure they are all configured appropriately.
13	Set up the various tabs on the Situation | Malfunctions tabs to generate the frequency and severity of malfunctions that you feel you can handle. ☺
14	Analysis | Airport: click on the "Show nearest airport" button and review the information presented, note *inter alia* the TA, frequency information, and runway information.
15	Layout | Load: load your preferred 9pack, if not already in use.
16	Preferences | Basics: check all settings, but especially that the "Allow METAR files download from Internet" box is checked (if you need it). Check Main and Boost servers are enabled if required.

[35] The most common ones used as a starting point are Basic 000 (Cold and dark cockpit.situ), Basic 001 (On ground and IRS aligned.situ), Basic 002 (On ground and doors closing.situ), Basic 003 (On ground and cleared for engine start.situ), or perhaps if you're already on the runway (!!) Basic 004 (Cleared for take-off.situ).

[36] Originally, I had this activity further down the list, but Hardy kindly pointed out that it needs to be done prior to entering the weight values, so it now occurs here.

[37] (Obviously, the opposite applies if you want to ignore the weather in your OFP and use today's weather).

That should suffice for the PSX settings; now it's time to climb into the cockpit.

You may have significantly changed the amount of fuel in the aircraft's tanks, so perhaps the first thing to do is to review the main overhead centre panel's fuel tank panel [38] and reconfigure it to suit the amount of fuel you have loaded. Hardy has a very helpful section on this in his manual — see pp.445 – 447 (the following section on EICAS messages is very helpful, too).

The rest of the work is accomplished from the CDU, so depending on which Basic situ (000 – 004) you loaded you can either follow these steps at the appropriate point in your procedure flows, or else you may have no choice other than to do them retrospectively. So in order to make this list as generally applicable as possible, I will therefore confine myself to summarising what has to be done, and let you decide the appropriate point at which to do it. ☺

17	Note and action any EICAS messages; also check and clear any in the CDU scratchpad.
18	Press the INIT REF button, then LSK 6L, then LSK 1L to get to the IDENT page.
19	Click LSK 3R and then LSK 2R: this will clear the previous information from the FMC [39]. Use the CLR button to clear any messages which appear in the scratchpad following this process.
20	If needed, switch the FD switch off and on again to clear MCP settings.
21	If the IRSs are already aligned, you can press the RTE key to go directly to the RTE 1 page and then skip directly to step 22. Otherwise — a) Press LSK 6R to get to the position initialization page b) Type your current airport ICAO code into the scratchpad c) Press LSK 2L to upselect it to the REF AIRPORT line d) Then press LSK 6R to get to the RTE 1 page.
22	Type the ICAO code for your departure airport into the scratchpad, and press LSK 1L to upselect it to ORIGIN. (Ignore the RUNWAY prompt which appears — this is not the place to enter it).
23	Type the ICAO code for your destination airport into the scratchpad, and press LSK 1R to upselect it to DESTination.
24	Type the flight number (from your OFP) into the scratchpad, and upselect it to LSK 2R.
25	Type the name of your saved route into the scratchpad, not forgetting the two-digit numeric suffix (but not including any appended underscore), and upload it to the Company Route prompt at LSK 3R.
26	Click the LEGS button and verify that your route has loaded properly.
27	If no SID is present, click the DEP ARR button and then LSK 1L to view the SIDs for your departure airport. Click the right LSK adjacent to your departure runway (at large airports you may need to use the NEXT PAGE button to see them all): it will then appear as <SEL>ected, and the list of SIDs will be trimmed to include only those valid for that runway.
28	Click the left LSK adjacent to your chosen SID (again, use the NEXT PAGE button, if required).
29	If there are applicable TRANSitions, select the correct one in the same way. (TRANS NONE means exactly that, so move straight on to step 30).
30	If your trip is short enough for you to be able to make an educated guess at the runway and STAR that will be in use when you arrive, you could enter it now, by pressing DEP ARR and LSK 2R, and then using the same technique. But you will have plenty of time to do this in the cruise as you get near to your TOD, so why not wait until then?

[38] Assuming that your aircraft currently has sufficient power established to do so, of course — otherwise you will have to do this later.

[39] If the "Select valid FMC nav database" wasn't checked, the virtual engineer won't automatically reselect the current database for you, so you will have to revert to the previous situation yourself.

31	Press the LEGS button and scan through your route (using NEXT PAGE to see it all). You may find it necessary to heal any DISCOntinuities present, or perhaps simply make a note of them and defer doing so until the next step. Whilst looking through, also note any speed and altitude constraints that appear in large letters on the right and check them against the current charts, amending them if necessary, or inserting or deleting any that have changed.
32	Switch to a PSX layout where you can see these three items all on the same flightdeck frame: • the Navigation Display (ND) • the EFIS panel to the left of the Mode Control Panel (MCP) • the Captain's CDU
33	Turn the left-hand of the two lower knobs on the EFIS panel from MAP to PLaN, and reset the range knob to the right to 20 nm. Click the LEGS key again to return to the top of the list of waypoints.
34	Click the STEP > prompt at LSK 6R to step through your route whilst also watching the ND as you do so. Look for any unexpected deviations to your path as shown on the ND, or unusually large distances between waypoints on the CDU: investigate and make any required changes.
35	When you're absolutely sure that this is the route you want the aircraft to follow, return the EFIS selector knob back to MAP, and the range knob to whatever you like to use for take-off — perhaps 10nm.
36	Press the LEGS key again to return to the start of your route, and then press LSK 6R to Activate it, and the EXECute key to confirm. (You will notice that the line on the ND now becomes magenta in colour, and the headings on the Route and Legs pages now read **ACT**ive RTE 1).
37	Press INIT REF and then LSK 6L for the index page: now select PERFormance (LSK 3L).
38	Enter into the scratchpad your cost index [40] and upselect it to LSK 5L.
39	Enter into the scratchpad your initial cruise altitude (shown on your PFPX OFP immediately below Cost Index as "INITial ALT", since during a long cruise as you become lighter you may be able to step climb) and upselect it to LSK 1R.
40	Check the calculated Reserve figure from your OFP, convert to tonnes as required (my 4,909 kg thus becomes 4.9), enter it into the scratchpad and upselect it to LSK 4L. [41]
41	Whilst on that page, sanity-check the displayed Gross Weight, Fuel, and ZFW figures).
42	Press the VNAV key and then enter the Transition Altitude (from the latest charts, or failing that from the PSX Analysis | Airport page) into the scratchpad, and then upselect it to LSK 3R.
43	Press the INIT REF key followed by LSK 6L and LSK 4L to reach the THRUST LIMits page. We're now firmly in TOPCAT territory, so consult your TLR for the figures to use.
44	Depending on the options you selected for TOPCAT, it should have given you the figures for a reduced thrust and/or an assumed temperature take-off. I usually opt for an assumed temperature take-off to be kind to my engines, so I typed TOPCAT's suggested temperature into the scratchpad and upselected it to LSK 1L.
45	Press LSK 6R to get to the TAKEOFF page.
46	Check the take-off flap setting at LSK 1L with the one planned by TOPCAT, and if necessary type the setting to be used into the scratchpad and upselect it to 1L. Also check the all-engine flap retraction acceleration height (following the slash) and amend if required.
47	Similarly, check (and if necessary, amend) the engine out acceleration height at LSK 2L.
48	At LSK 3L check (and if necessary, amend) the altitude or flap setting at which the thrust limit will be reduced from take-off to climb. [42]
49	At LSK 5L check (and if necessary, amend) the runway condition, which defaults to dry. If wet, type W into the scratchpad and upselect it.
50	Confirm the FMC-calculated V-speeds by pressing LSKs 1R, 2R, and 3R.
51	If you included a Weight and Balance System in the options for your model of 744, then the CG computed by the system will be shown in small font adjacent to LSK 4R.

[40] If you followed my suggestion on p.24 to enter the CI into the Cruise/Cost Index field in the Aircraft section of PFPX, then it will be shown on your PFPX OFP.

[41] Transition Level at the destination airport is often set by ATC depending on current atmospheric conditions, so we'll probably need to wait until we are close to our destination in order to learn from them what to use as our TL.

[42] Providing VNAV and AT are engaged, and the aircraft has accelerated to V_{REF}+80 kt.

52	If you are starting your take-off run from a position significantly different from the landing threshold, enter the runway position shift value here — the number of hundreds of feet difference. (Relative to the landing threshold, you need to enter a positive number if a shorter runway is available, or a negative number if a longer runway is available). [43]

That should set up your FMC ready for your trip. But here's just a few examples of other important jobs to do, when you reach the correct stage of your cockpit prep.:

53	View the stab trim settings (just to the left of the speedbrake lever) and use the trim controls to adjust the stab trim until the end of the white bar is in the centre of the green band.
54	On the MCP, set the value in the IAS/MACH window to your V_2 speed, and the ALT window to your first constraint.
55	Set the Captain's and F/O's CDUs to the most appropriate pages for take-off.

(etc....).

Having completed all of the above, this might be a suitable moment to **save the situation**, just so that all that work is safe? ☺ Whilst it is very hard to save too often, it is very easy to forget to save often enough, so be generous with your save actions!

Incidentally, I haven't included anything about checklist items in the above list, since I assume that you will be following the appropriate flows and using the associated checklists built in to PSX — very much depending, of course, on the stage that your aircraft was in when you began (i.e. most likely, as inherited from the Basic situ 000 – 004).

[Later addition:] It has been suggested that I should provide a printable version of this summary list, and so you will find the pdf (called "`Printable summarised list of actions when creating a new Situation file.pdf`") in the zip file along with the main tutorial and the example OFP.

[43] For example — if you are using the full runway length for a departure from KEWR rwy 04L, the displaced threshold (your take-off position) is 2500 ft from the landing threshold (you may also notice: TORA 11000 ft, LDA 8460 ft).

Appendix 4 — if your flight planner cannot produce a .route file....

For the benefit of anyone who may be unsure about how to proceed in the event that their route planner cannot export a route in a format that can be read directly by PSX, may I assure you that inputting a route by hand is a very simple task.

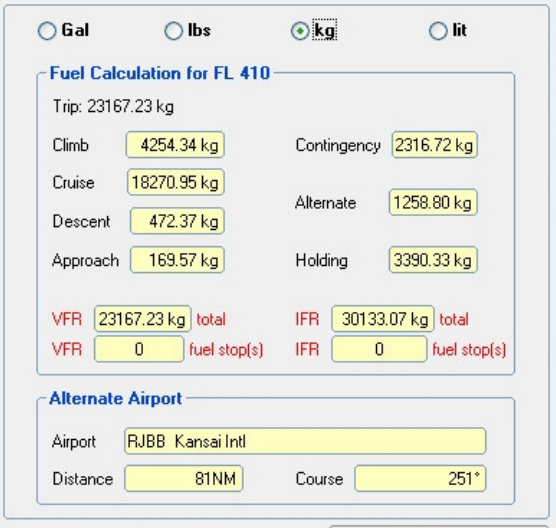
As an experiment, I asked a friend for another (i.e. one that isn't PFPX) planner's route for our example flight. After checking that the currently applicable aircraft was the B747, and then adding the origin, destination, and alternate airports, he requested a high level flight plan. The result was the following (I had asked him not to include a SID or a STAR):

Sym	Code	Name	Freq	Course	Distance	EET	ATO	GS	Altitude	Fuel (kg)
	VHHH	Hong Kong Intl	128.200							
	GLN	Guanlan	112.000	016°/018°	025 NM	00:03				
	VIPAP	Vipap (R200 0-0)		083°/086°	028 NM	00:07				
	OVGOT	Ovgot (R200 0-0)		084°/086°	012 NM	00:09				
	SUMDO	Sumdo (R200 0-0)		083°/086°	063 NM	00:17				
	BEBEM	Bebem (R200 0-0)		083°/086°	027 NM	00:21				
	OLDID	Oldid (R200 0-0)		087°/090°	063 NM	00:29				
	ANPOG	Anpog (R200 60-999)		133°/136°	035 NM	00:34				
	KADLO	Kadlo (A1 150-0)		057°/060°	039 NM	00:39				
	MKG	Magong Penghu I. (A1 100-0)	115.200	057°/060°	072 NM	00:48				
	SWORD	Sword (A1 50-0)		046°/049°	035 NM	00:53				
	HLG	Houlong (A1 50-0)	114.000	046°/049°	048 NM	00:59				
	APU	Anbu Taipei (W4 40-0)	112.500	049°/053°	057 NM	01:07				
	ANNNA	Annna (A1 50-0)		049°/053°	036 NM	01:12				
	DRAKE	Drake (A1 50-0)		049°/053°	004 NM	01:12				
	AISAR	Aisar (A1 50-0)		048°/052°	030 NM	01:16				
	OSTAR	Ostar (A1 50-0)		050°/054°	036 NM	01:21				
	BULAN	Bulan (A1 50-0)		049°/054°	070 NM	01:30				
	IGMON	Igmon (A1 50-0)		050°/055°	050 NM	01:37				
	SAPET	Sapet (Y50 160-0)		050°/055°	096 NM	01:50				
	URUMA	Uruma (Y50 160-0)		050°/055°	031 NM	01:54				
	AKVAS	Akvas (Y50 160-0)		051°/057°	059 NM	02:02				
	RUSAR	Rusar (Y50 160-0)		049°/055°	026 NM	02:05				
	JEDAI	Jedai (A1 60-0)		052°/058°	089 NM	02:17				
	KOSHI	Koshi (A1 150-0)		052°/058°	050 NM	02:24				
	KAZAN	Kazan (A1 150-0)		052°/058°	009 NM	02:25				
	HKC	Kagoshima (A1 80-0)	113.300	052°/058°	031 NM	02:29				
	JINGU	Jingu (A1 80-0)		062°/069°	027 NM	02:33				
	FENIX	Fenix (A1 90-0)		062°/069°	031 NM	02:37				
	SUC	Shimizu (A1 90-0)	115.200	062°/069°	080 NM	02:48				
	STORK	Stork (Y53 150-0)		047°/054°	017 NM	02:50				
	BRAVE	Brave (Y53 90-0)		047°/054°	044 NM	02:56				
	KARIN	Karin (Y53 90-0)		047°/054°	020 NM	02:59				
	BECKY	Becky (Y53 90-0)		047°/054°	022 NM	03:01				
	MIRIO	Mirio (Y231 70-0)		064°/071°	011 NM	03:03				
	KAINA	Kaina (Y401 110-0)		064°/071°	030 NM	03:07				
	SKE	Shinoda (Y753 50-0)	112.300	032°/039°	019 NM	03:09				
	LABEL	Label (V17 160-0)		081°/088°	037 NM	03:14				
	HIOTI	Hioti (V17 160-0)		081°/088°	021 NM	03:17				
	RJGG	Chubu Centrair International	127.075	037°/044°	016 NM	03:22				
	RJBB	Alternate								

The essential part of all that is, of course, the route itself:

```
VHHH GLN R200 ANPOG A1 HLG W4 APU A1 IGMON Y50 RUSAR A1 SUC Y53 BECKY Y231
MIRIO Y401 KAINA Y753 SKE V17 HIOTI RJGG
```

There is also, however, the important matter of the fuel, and in respect of that the planner produced the information shown below.



You will notice that the "Trip" figure is the total of the figures for Climb, Cruise, Descent, and Approach. If we then add the suggested figures for Contingency, Alternate, and Holding, we arrive at a total of 30,133.08 kg, as shown in the right-hand IFR box.

It appears to me that these figures are estimates of the fuel likely to be consumed (calculated to within a hundredth of a kg!) — but although they do include a generous 10% of the trip fuel [44] as contingency fuel, there is no indication of whether or how they are taking into consideration the requirements for dispatch, fuel needed for taxying or APU burn [45], or fuel required in the event of a go-around and missed approach, (and I have to say that the fuel to the Alternate looks suspiciously low to me, as though it's just the straight line distance) — and therefore I would gently suggest that it may be prudent for you to exercise caution when it comes to the recommendations of whatever fuel planner you may decide to use, and compare its estimates against the actual amount of fuel used, for future reference.

Within the airline industry, arriving with just fumes remaining in the tanks is not regarded as a career-enhancing move.

As for running out of fuel along the way.... ☹

Please understand that this is not intended as criticism of any particular planner, even though many of them appear to simply give you an estimate of fuel burn, add on an additional percentage, and leave it at that: I'm simply trying to make the point that you may want to look at your flight planner's fuel recommendations with close attention, and use some judicious adjustment if you feel it necessary [46]. Read up about real world flight planning and you will find a lot of information about how much fuel you need to have on board in reserve, for various purposes — for example, look at the fuel references here: http://fsims.faa.gov/WDocs/8900.1/V03%20Tech%20Admin/Chapter%2025/03_025_004.htm

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[44] That should certainly cover contingencies, although adding 10% of the fuel for a long-range flight in the 744 might result in a need to carry more fuel than your tanks can accommodate!

[45] Normally, something like 30 minutes of APU time, and also 10 minutes of taxy time would be included — but significantly longer taxy time at some airports at certain times of day!

[46] Let's face it, virtual fuel is cheap, and your approach to all this will depend on how serious you feel about approaching reality as closely as possible.

But let's now leave the question of fuel aside and return to a consideration of how to get our route into PSX. In the absence of any means of loading our route directly into PSX's FMC, we are going to have to type it in. Happily, that really isn't an arduous task, as you will see.

In step 25 of the summary list in Appendix 3, I wrote:

Type the name of your saved route into the scratchpad, not forgetting the two-digit numeric suffix (but not including any appended underscore), and upload it to the Company Route prompt at LSK 3R.

Unfortunately, we can't do that in this case, since we don't have a .route file; so instead we need to adopt the following procedure:

You are already on the RTE 1 page, so press the NEXT PAGE button to get to page 2/2, which is currently empty, of course. We're not going to enter any SID or STAR, so all we need do is to enter our route as a series of VIA (airways) and TO (waypoints) pairs. Just to remind you, the route provided was:

```
VHHH GLN R200 ANPOG A1 HLG W4 APU A1 IGMON Y50 RUSAR A1 SUC Y53 BECKY Y231
MIRIO Y401 KAINA Y753 SKE V17 HIOTI RJGG
```

We are already at VHHH, and our first waypoint is GLN. In other words we need to fly directly to GLN (since we don't yet know what our SID will be) and then start our series of airways and waypoints.

So enter GLN into the scratchpad, and upselect it to LSK 1R as our first waypoint. OK, now we can start to enter the rest of the information as a series of pairs of airways and waypoints.

Type R200 into the scratchpad and upselect it to LSK 2L; then type ANPOG and upselect it to LSK 2R. The CDU now looks like this:

We now continue typing pairs of airways and waypoints until the screen is full: as you can see, at that point we're no longer on screen 2 of 2, we're on screen 2 of 3, which is a pretty good hint that the thing to do to be able to enter more information is to press NEXT PAGE and carry on typing. So press NEXT PAGE and enter Y50.

But at that point I hit a snag in the form of an "INVALID ENTRY" message from the FMC. It is complaining that the last point we entered was IGMON, and according to its internal data there is no airway called Y50 there.

It's worth pausing at this point for a brief discussion about what's going on.

This is happening because airways occasionally change and waypoints can come and go, and hence every four weeks the relevant information is updated. PSX was released with data for AIRAC 1403 (the third update in 2014), but it turns out that my friend's planner was

using AIRAC 1409 (information which became current 24 weeks later), which will no doubt be the cause of the conflict [47].

So if there was no such airway as Y50 last April, we will have to simply ask the FMC to take us *directly* from IGMON to RUSAR. Type RUSAR into the scratchpad and upselect it to LSK 1R. Now the FMC will take us straight there (as the DIRECT in the VIA column indicates) and we can continue typing our route. Here's the complete page of information (right):

Press NEXT PAGE again and continue typing.... After HIOTI there is only one final waypoint left, which is our destination, RJGG — so just as we did for RUSAR we put RJGG in as a DIRECT waypoint for now [48]. The complete route has now been entered.

The next step (step 26) of the summary list says:

Click the LEGS button and verify that your route has loaded properly.

So we can now accomplish that step and continue with the summarised procedure. When we do look at the LEGS page, of course, we don't see any airways, just a list of waypoints. So at the beginning of the route instead of `GLN R200 ANPOG` we will see GLN, VIPAP, OVGOT, SUMDO, BEBEM, OLDID, and then ANPOG — so you can see how much quicker it was to enter it on the RTE page using airways, rather than typing every single waypoint!

P.S. I haven't tried flying that route, so I have no idea how it works in practice — I have flown the route from PFPX, though, and so I know that one works! ☺

[47] Experts on the Aerowinx forum maintain that this problem cannot occur with plans produced by PFPX, because its routes exported for PSX contain not only the names but also the coordinates of all the waypoints, and hence any AIRAC differences are immaterial.

[48] Depending on the runway in use (which in turn depends on the weather, notably the wind) it will hopefully be our STAR that will take us from HIOTI to the assigned runway at Chubu Centrair, but on a long trip we don't normally enter a STAR until we are nearing our Top of Descent point at the earliest — in fact we may not know our STAR for sure until ATC inform us whilst we are descending towards our destination. That's why there are two pilots — so that one can fly the aircraft while the other one changes frequencies and talks to ATC and presses keys on the CDU....

Appendix 5 — example TLR

For reference, here is an example Take-off and Landing Report generated by TOPCAT after the flight has been released (as discussed above, starting on page 33).

```
TAKE-OFF AND LANDING REPORT BC1234 VHHH-RJGG

TOPCAT 2.74 18SEP14 09:06Z

A/C G-ABCD B747-400 RB211-524H

ALL WEIGHTS IN KILOGRAMS

//////// AIRPORTS ////////

TAKEOFF: VHHH/HKG  HONG KONG INTL     RWY 07R FLAPS 10         ELEV.   28FT (    9M)

LANDING: RJGG/NGO  CHUBU CENTRAIR..   RWY 36 FLAPS 30         ELEV.   12FT (    4M)

ALTN 1:  RJBB/KIX  KANSAI INTL                                 ELEV.   17FT (    5M)


//////// WEATHER ////////

VHHH 180830Z 27008KT 9999 FEW030 33/24 Q1010 NOSIG

VHHH 180500Z 1806/1912 27010KT 7000 FEW020 TX33/1807Z TX34/1906Z TN28/1822Z

      BECMG 1809/1811 VRB05KT

      TEMPO 1809/1815 18010KT

      TEMPO 1818/1824 31010KT

      BECMG 1900/1902 30010KT

      TEMPO 1909/1912 VRB05KT 4000 SHRA FEW012CB SCT020


RJGG 180830Z 31020KT 9999 FEW030 BKN/// 24/13 Q1011 NOSIG

RJGG 180506Z 1806/1912 33022KT 9999 FEW030

      BECMG 1814/1816 34010KT

      BECMG 1903/1906 18008KT

      BECMG 1909/1912 33012KT


//////// TAKE-OFF ////////

APT  PRWY       POAT   PWIND  PQNH  PMRTW   FLP CONF  THRUST       V1  VR  V2  PTOW

VHHH 07R        +33°C 270/08 1010  219481  FLAPS 10  D-TO2 +74°C  117 122 142 179500
```



```
RMKS - CALCULATIONS VALID AT QNH 1005 AND ABOVE
     - SPEED/FLAPS SCHEDULE: VREF30=127  F10=147  F5=167  F1=187  UP=207  CLEAN=227

--------- ------ --------- ----- ----------- ----- ----- ----- ---------------------
 RWY/INT   OAT    WIND      QNH   RWY COND    V1    VR    V2    THRUST/FLAPS CONFIG


---------- REDUCED - DRY - OPT FLAPS - OPT THRUST - A/C ON - A/I ON OR OFF ---------
   RWY 07L                     RWY 07R                     RWY 25L
   12467 FT                    12467 FT                    12467 FT
   D-TO2                TW08   D-TO2                TW08   D-TO2                HW08
   AT EPR           FLAPS 10   AT EPR           FLAPS 10   AT EPR           FLAPS 10

 /+74  1.44 219519C 24-30-40 /+74  1.44 219481C 24-30-40 /+74  1.44 219481C 28-30-40
  +72  1.45 227536C 27-33-42  +72  1.45 227495C 27-33-42  +72  1.45 227495C 31-33-42
  +70  1.45 235658C 28-36-45  +70  1.45 235615C 28-36-45  +70  1.45 235615C 32-36-45
  +68  1.46 243558C 31-39-47  +68  1.46 243516C 31-39-47  +68  1.46 243516C 35-39-47
  +66  1.46 251202C 33-41-49  +66  1.46 251159C 33-41-49  +66  1.46 251159C 37-41-49

HW/10 KT         0                           0                           0
TW/15 KT    -10149                      -10181                      -10181

   RWY 25R
   12467 FT
   D-TO2                HW08
   AT EPR           FLAPS 10

 /+74  1.44 219519C 28-30-40
  +72  1.45 227536C 31-33-42
  +70  1.45 235658C 32-36-45
  +68  1.46 243558C 35-39-47
  +66  1.46 251202C 37-41-49

HW/10 KT         0
```



```
TW/15 KT    -10149

------------ FULL - DRY - OPT FLAPS - OPT THRUST - A/C ON - A/I ON OR OFF ----------

   RWY 07L                      RWY 07R                      RWY 25L

   12467 FT                     12467 FT                     12467 FT

   TO                    TW08   TO                    TW08   TO                    HW08

  OAT EPR           FLAPS 10   OAT EPR           FLAPS 10   OAT EPR           FLAPS 10

  +37  1.72 382653F 50-73-85   +37  1.72 382570F 50-73-85   +37  1.72 406249F 57-76-87

  +35  1.73 388040F 51-74-86   +35  1.73 387957F 51-74-86   +35  1.73 411629F 57-76-87

 /+33  1.74 393358F 51-75-86  /+33  1.74 393275F 51-75-86  /+33  1.74 416958F 56-75-87

  +31  1.75 395103F 52-75-87   +31  1.75 395039F 52-75-87   +31  1.75 418726F 56-75-87

  +29  1.76 396412F 52-75-87   +29  1.76 396348F 52-75-87   +29  1.76 420038F 56-75-87

HW/10 KT    +25184                       +25185                        +1513

TW/15 KT    -19226                       -19221                       -42911


   RWY 25R

   12467 FT

   TO                    HW08

  OAT EPR           FLAPS 10

  +37  1.72 406332F 57-76-87

  +35  1.73 411712F 57-76-87

 /+33  1.74 417041F 56-75-87

  +31  1.75 418790F 56-75-87

  +29  1.76 420102F 56-75-87

HW/10 KT     +1512

TW/15 KT    -42916

*******************************************************************************

*     MAX TAKE-OFF WEIGHT MUST NOT EXCEED MAX CERT TAKE-OFF WEIGHT OF 396893 KG    *

*******************************************************************************
```



```
---------------------- SPECIAL ENG FAIL TAKEOFF PROCEDURES ------------------------

RWY      LENGTH  PROCEDURE
07L     12467FT  AT 7 DME 'IZSL' 111.1 RT HDG 180 THEN RT TO JOIN 'TD' 116.1
                 RADIAL 250 TO 'SOKOE' (INBD 250, LT).
07R     12467FT  AT 7 DME 'IZSL' 111.1 RT HDG 180 THEN RT TO JOIN 'TD' 116.1
                 RADIAL 250.
25L     12467FT  AT 'PRAWN' [7 DME 'IFL' 108.9] LT TO 'RUMSY' [15 DME R 239 'CH'
                 112.30] (182 INBD,RT)
25R     12467FT  AT 7.2 DME 'ITFR' 110.9 LT TO 'RUMSY' [15 DME R 239 'CH' 112.30]
                 (182 INBD,RT)

//////// LANDING ////////

APT  PRWY       POAT  PWIND  PQNH  PMRLW     FLP CONF         VREF  VAPP  PLDW
RJGG 36         +24°C 310/20 1011  400000    FLAPS 30         127   134   179500

RMKS - CALCULATIONS VALID AT QNH 1006 AND ABOVE


--------- ------ --------- ----- ------------ ------ ------ --------------------
 RWY/INT   OAT    WIND      QNH    RWY COND    VREF   VAPP   FLAPS CONFIG/COND


---------------------- DISPATCH LIMITS - DRY - A/C ON - A/I OFF --------------------
  *** NORM VIS / LOW VIS ***
        RWY 18             RWY 36
        11483 FT   TW14    11483 FT   HW14
    OAT FLAPS 30           FLAPS 30

    +28 350503F/317764F    400000F/385328F
    +26 350503F/317764F    400000F/385328F
   / +24 350503F/317764F   / 400000F/385328F
    +22 350503F/317764F    400000F/385328F
    +20 350503F/317764F    400000F/385328F
```



```
HW/10 KT  +49497/ +62729           0/  -4836

TW/15 KT   -3772/  -3355      -53269/ -70920

*******************************************************************************

*      MAX LANDING WEIGHT MUST NOT EXCEED MAX CERT LANDING WEIGHT OF 285763 KG     *

*******************************************************************************


------------ REQUIRED LDG DIST - NORM VIS - FLAPS 30 - A/C ON - A/I OFF -----------

  *** VALID FOR ALL RWYS AT RJGG. BASED ON NO WIND ***

   LDW        DRY        WET     CONTAMIN.

  200000    5011FT     5763FT     5763FT

HW/10 KT    -313FT     -359FT     -359FT

TW/15 KT   +1480FT    +1702FT    +1829FT


--------------- AUTOBRAKE LDG DIST - DRY - FLAPS 30 - A/C ON - A/I OFF -------------

  *** VALID FOR ALL RWYS AT RJGG. BASED ON NO WIND ***

   LDW       AUTO 1        AUTO 2        AUTO 3        AUTO 4       AUTO MAX

  200000     7823FT        6506FT        5736FT        4926FT        4077FT

HW/10 KT        0FT           0FT           0FT           0FT           0FT

TW/15 KT    +3075FT       +2475FT       +2100FT       +1650FT       +1200FT

END TAKE-OFF AND LANDING REPORT BC1234 VHHH-RJGG 18SEP14
```

