Appendices

Basic Aircraft Information

Required Flight Crew: Pilot, Co-pilot, and Second Officer.

Maximum Structural Weight Limits

Taxi	778,000 lb.
Take-off	775,000 lb.
Landing	585,000 lb.

Maximum Operating Limit Speed (VMO)

The maximum operating limit speed shall not be exceeded in any regime of flight.

Note: VMO is indicated by the limit speed hand on the airspeed indicator.

Maneuvering Speed (VA)

The maximum speed at which full deflection of the primary controls is permitted.

Flap Extend Speed (VFE)

Flaps 1	275 knots
Flaps 5	250 knots
Flaps 10	238 knots
Flaps 20	231 knots
Flaps 25	205 knots
Flaps 30	180 knots

Record in logbook when above speeds is exceeded.

Landing Gear Operation (VLO)

The landing gear must not be extended or retracted at speed above 270 KIAS/M .82

Landing Gear Extended (VLE)

The aircraft must not be operated with the landing gear extended at speeds above 320 KIAS/M .82

Automatic Flight

Do not use autopilot below 50 feet AGL unless ground speed is less than:

Flap 25 landing - 180 knots

Flap 30 landing - 163 knots

Flight Controls
Maximum altitude for flap extension is 20,000 feet

Speedbrakes must not be used in flight with flaps extended

Trim tolerance is + or - 0.5 aileron trim and + or - 2.0 rudder trim units from neutral at cruise speed.

Altimeters
On the ground all altimeters shall indicate published field elevation + or - 50 feet when set to the tower altimeter setting (QNH)

Ice and Rain Protection

Window Heat
Window heat must be on both number one and number two windows for all normal flight conditions.

Anti-Ice
Do not operate anti ice systems above 10° C ambient on ground or TAT in flight

Ignition
Ignition must be on for takeoff and landing. It must also be on while operating in heavy rain, severe turbulence or when entering icing conditions.

QUICK REFERENCE Takeoff Speeds using the standard 10 flap setting (Approx settings)

740,000 pounds	v1=156	vr=168	v2=174	5Flap=190
720,000 pounds	v1=153	vr=165	v2=171	5Flap=187
700,000 pounds	v1=150	vr=161	v2=168	5Flap=184
680,000 pounds	v1=147	vr=158	v2=165	5Flap=181
660,000 pounds	v1=144	vr=155	v2=163	5Flap=178
640,000 pounds	v1=141	vr=152	v2=160	5Flap=175
620,000 pounds	v1=138	vr=148	v2=157	5Flap=172
600,000 pounds	v1=135	vr=145	v2=154	5Flap=169
580,000 pounds	v1=131	vr=141	v2=151	5Flap=165
560,000 pounds	v1=128	vr=137	v2=148	5Flap=162
540,000 pounds	v1=125	vr=134	v2=145	5Flap=159

For a Flap 20 takeoff subtract 6 knots from above data

Fuel

Fuel over destination (Pre Flight Calculations) is a minimum of 10,000 pounds on landing.

TAKE-OFF DISTANCE (FT) - 10 FLAP

WEIGHT

This scale is based on a Press Alt of 0 Ft

OAT	780	760	740	720	700	680	660	640	620	600
0	11850	11050	10300	9550	8900	8250	7650	7100	6650	6200
5	12000	11200	10450	9700	9050	8400	7750	7250	6750	6300
10	12200	11350	10600	9850	9200	8500	7800	7350	6850	6400
15	12400	11550	10750	10000	9350	8650	8000	7450	6950	6500
20	12600	11750	10950	10200	9500	8800	8150	7550	7050	6600
25	12800	11900	11100	10350	9650	8950	8300	7700	7150	6700
30	13300	12450	11550	10750	9950	9250	8600	7950	7400	6850
35		13200	12350	11450	10600	9850	9100	8450	7850	7250
40			13150	12250	11350	10500	9700	9000	8300	7700
45				13050	12100	11200	10350	9600	8850	8200
50					12950	12000	11100	10250	9450	8750
55						12850	11900	10950	10100	9300

For each 500 feet of Press Altitude add about 400 feet and you will be safe.

Certification Speeds

Ground Minimum Control Speed, VMCG
The minimum speed on the ground at which the airplane is controllable, utilizing aerodynamic controls alone, when the critical engine suddenly becomes inoperative with the remaining engines at take-off thrust.

Air Minimum Control Speed, VMCA
The minimum flight speed at which the airplane is controllable with a maximum of 5° bank when the critical engine suddenly becomes inoperative with the remaining engines at take-off thrust.

Critical Engine Failure Speed, v1
With an engine failure at v1 the distance required to continue the take-off to a height of 35 feet will not exceed the available runway, nor the distance required to bring the airplane to a full stop will not exceed the runway available. V1 must not be less than VMCG nor greater than vR or greater than the VMBE.

Maximum Brake Energy Speed, VMBE
The maximum speed on the ground from which a stop can be accomplished within the energy capabilities of the brakes.

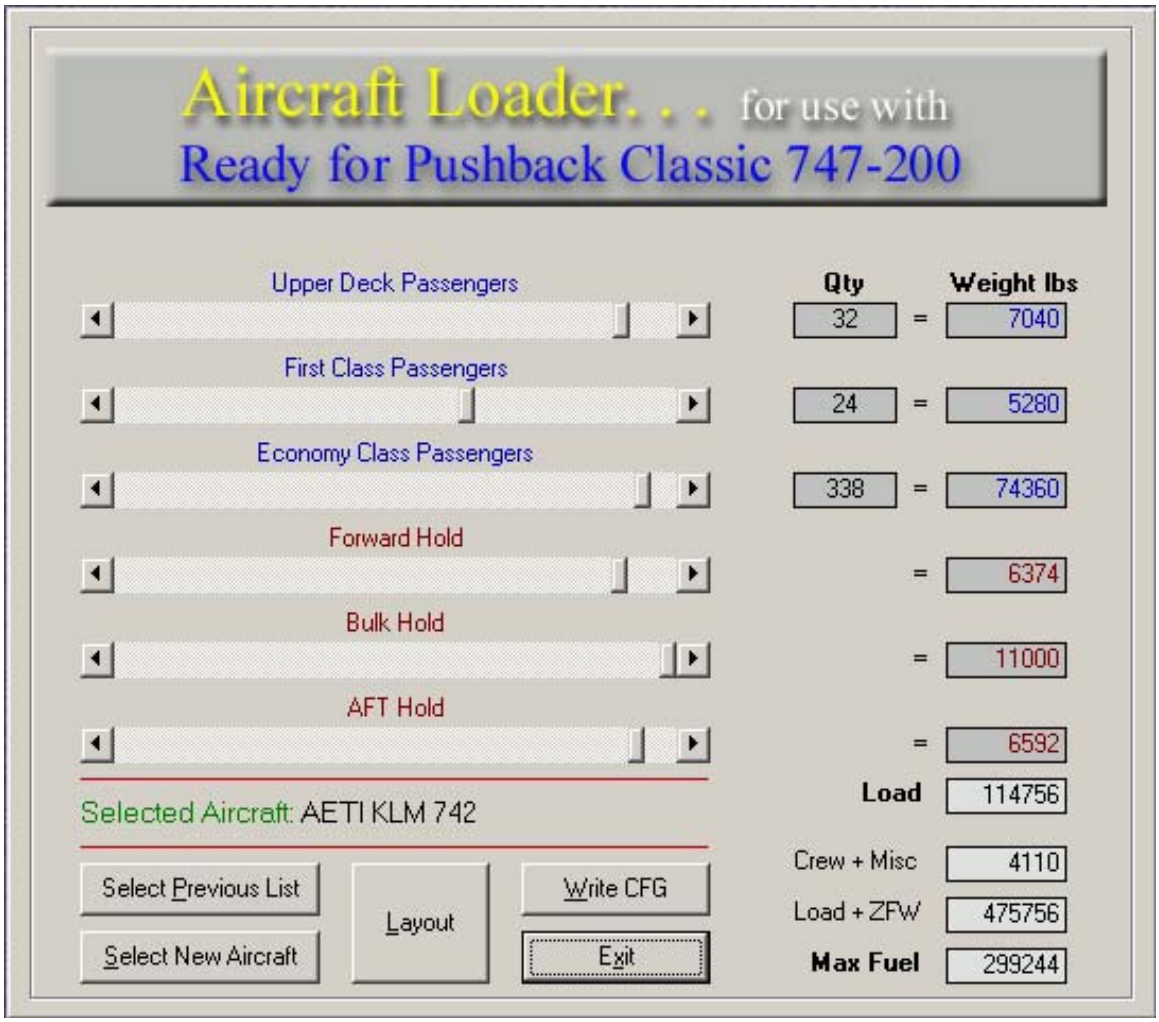
Rotation Speed, VR
The speed at which the rotation is initiated during the take-off.

Take-off Safety Speed, v2
The scheduled target speed to be attained at the 35-foot height with one engine inoperative.

Landing Reference Speed, VREF
The minimum speed at the 50-foot height in a 30 flap-landing configuration. This speed is equal to 1.3 times the stall speed.

Additional Information Matt Zagoren has prepared Performance Documentation for many aircraft, and has one for the 747-200B. Search for Zagoren at http://www.avsim/com file library

Aircraft Passenger Loader



When you installed the Vmax Classic 747, an icon for the Passenger and Cargo loader was placed on your desktop. This program is a separate executable that allows you to place passengers and cargo in your aircraft. These loads will have an affect on how your aircraft performs and make it necessary to use takeoff and landing charts once the weight of the aircraft has been determined. This program was designed to be easy to use and to add an extra element of realism to each flight.

CAUTION: This loader program will only work properly with Vmax Classic 747-200 Aircraft
Using the Aircraft Loader

When you are accessing an aircraft for the first time, left click on the **Select New Aircraft** button. From here, browse to the folder for the aircraft which will be in a Vmax folder. Select the aircraft.cfg file.

You are now ready to load passenger and cargo aboard your plane.

You will notice there are 3 sliders, which control and allow you to set how many passengers will be placed in each available area of the aircraft. When you move the slider you increase or

decrease the number of passengers. Notice it also displays the weight, which includes carry on baggage. Passengers and their carry on baggage are computed at 220 pounds per person, which is based on what a real world airline would use.

You also will be able to load cargo into the Forward Holds, Bulk Hold and the Aft Hold areas of the plane. These holds are used for non-carry on baggage and other cargo items.

On the lower right you can see the total PAX (passenger and cargo) weight you will have on board your flight. The weight for the crew, galley supplies etc. are also listed as is the Zero Fuel Weight of the aircraft and the PAX.

The bottom numbers show you the maximum amount of fuel that can be loaded on board for your flight.

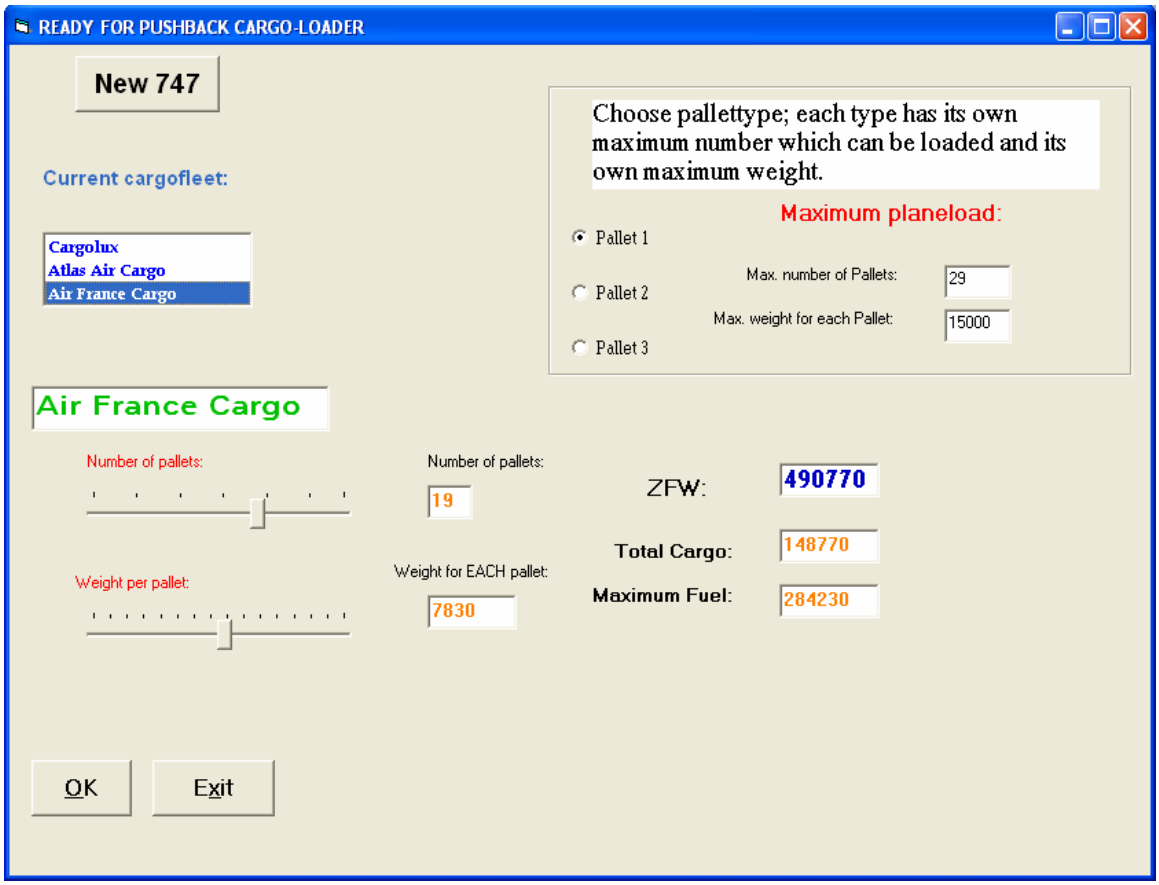
When you have completed setting the PAX, left click on the **Write CFG** button. This will write the PAX to the aircraft.cfg file you have selected.

The layout button shows you a diagram of the seating arrangement.

After the Loader has been used for the first time, the aircraft selected will appear in the **Select Previous Aircraft** area of the ***Aircraft Loader*** program. It will not be necessary to browse for the correct aircraft.cfg file again.

Note:
The aircraft loader can not be used to set up weights after Flight Simulator is running unless the specific aircraft you are going to fly, has not been loaded yet.

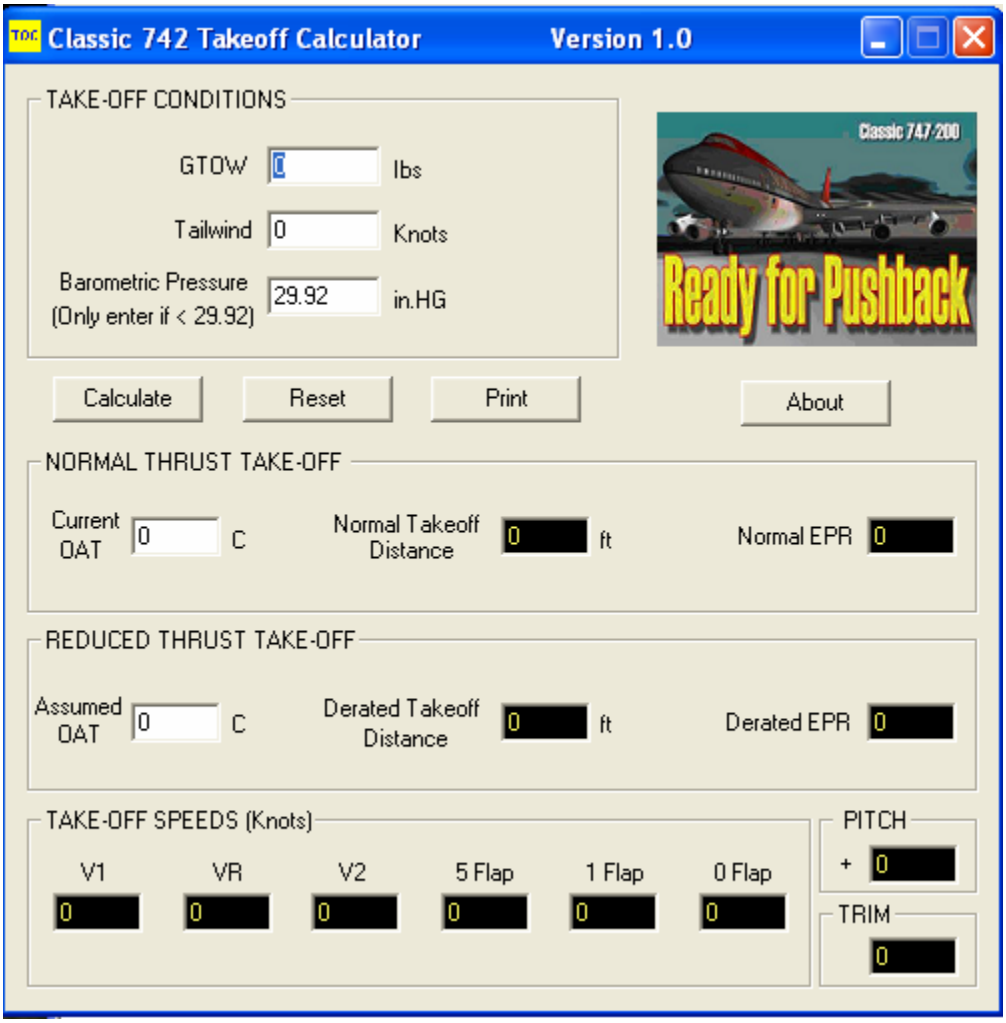
Aircraft Cargo Loader



The cargo loader is similar to use as is the passenger loader.

1. You must choose the freighter or combi aircraft you wish to load "NEW 747"
2. If you do this correctly, the aircraft name will appear in the box, as above.
3. Read the captions and choose the pallet type, adjust the weights to your liking
4. Move the sliders to indicate the number of pallets and the weight for each pallet
5. Make note of the ZFW (the weight of the "empty aircraft" plus payload. And **especially note the amount of fuel you can load**.
6. Click "OK" and the aircraft.cfg file for your aircraft will be updated.

RFP Takeoff Calculator



Assumed Temperature Reduced Thrust Takeoffs still seems to be a mystery to many so I will try to make it simple.

The object is to match your power to the weight of the aircraft, conditions and runway length available. In almost all cases the aircraft will give too much performance for the takeoff and climb because a Reduced Thrust is not properly calculated and used. This is not something new but is a consideration on every takeoff done by the airlines industry. It makes the aircraft easier to handle, reduces fuel burn and extends the life of the engines.

Often we hear Flight Simmers complaining that the aircraft is over powered and that is because the simmer is using too much power. This is not a guessing game when it comes to how much power should be used. There is a formula that the airlines use for specific aircraft that allows them to calculate the power required and still give a safe margin.

The mystery is unlocked below.

This does not replace the need to understand how you calculate these numbers so read up on it again.

For the majority of takeoffs, the use of full takeoff thrust would produce better aircraft performance than is actually required. Normal operating procedures use reduced thrust for takeoffs. The advantage is lower engine maintenance and improved engine reliability.

The FAA and DOT approved method for determining reduced thrust settings is called the "Assumed Temperature Method" and it matches the aircraft performance to that required by regulations. This method determines the highest ambient temperature at which takeoff is permissible (at the actual takeoff weight) and then this temperature is used to select the takeoff EPR.

As a conservative measure, an airlines procedure is based on the actual takeoff weight plus 30,000 lbs when determining the Assumed Temperature from the Weight Limitation chart. If a tail wind exists, an additional 5,000 lbs per knot tailwind component is added to the TOW.

Another aspect of the Assumed Temperature Method that seems to increase the margin is the fact that V1 (TAS) is lower than that of the elevated temperature which translates into shorter accelerate - stop distance.

Since the maximum temperature in the 747 certified takeoff data is +39 degrees C, assumed temperature will not exceed IAS + 39 degrees C. In addition, the -3A powered aircraft are further restricted to a maximum of 46 degrees C. This eliminates bleed air problems which are encountered if less than 1.33 EPR is used for take-off.

Low barometric pressures are accounted for by adding a further 2,500 lbs to the weight margin for every 0.10 inch of altimeter setting below 29.92 in. Hg.

There will be no credit taken for headwind when computing reduced take-off thrust.

Computing Reduced Thrust Takeoff EPR

- Using a runway in use chart and check the Flaps 10 takeoff weight plus 30,000 lbs (+5,000 lbs per knot if a tailwind exists and +2,500 lbs per 0.10 inch of altimeter setting below 29.92) and read the OAT. This is the assumed temperature.
- Find the take-off EPR for this assumed temperature.

Example - TO data Calculation
Conditions:

- YWG - Runway 36 (12,000 ft)
- Takeoff weight: 513,000 lbs
- OAT: 20 degrees C
- Barometric Pressure: 29.76 in. HG.
- Tailwind Component: 4 knots

Is Reduced Thrust Procedure Permitted?

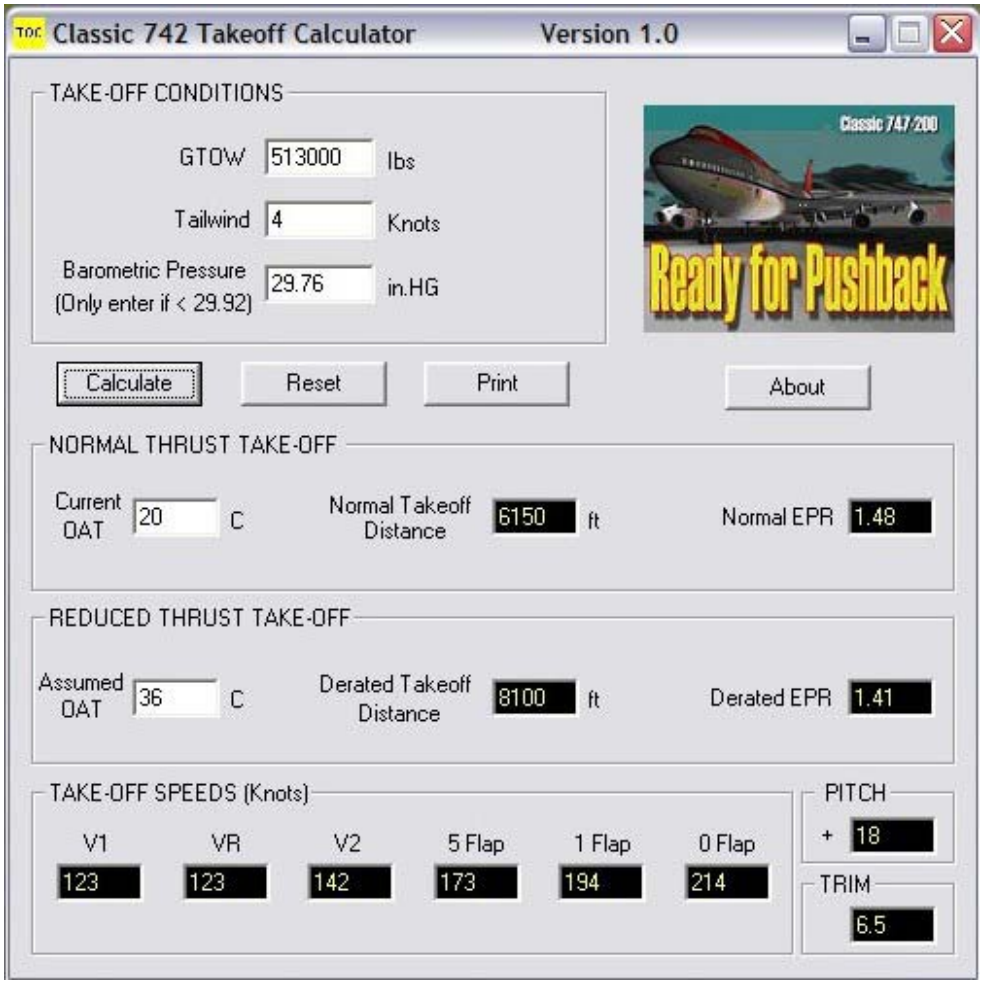
- Take-off Weight : 513,000 lbs
- Add: 30,000 lb Margin
- Add Tailwind Margin (5,000 lbs x 4 knot component) = 20,000 lbs
- Add pressure correction (29.92 - 29.76) = 0.16 (round up to 0.20) @ 2500 lb/.1 in. Hg. = 5,000 lbs
- Weight Used to determine Assumed Temperature is 568,000 lbs.

Enter the weight limitation chart (YWG 747/7, runway 36, 10 Flap) and obtain the temperature opposite 568,000 lbs., or the next higher weight, which in this case gives 36 degrees opposite 571,000 lbs. In this case the final assumed temperature is higher than the actual temperature and therefore a reduced thrust take-off is permitted.

T/O EPR Calculation:
Enter TAKE-OFF EPR Table from the bottom and proceed vertically to either the assumed temperature or the actual pressure altitude, whichever comes first. (If actual pressure altitude falls between two of the listed altitudes, use the higher altitude.)

Charts not shown in this documentation

Here is where we make it easy. No need for charts or a pencil and paper, just enter a few numbers and you will get the answer you need to fly as the airlines do.



Above is a screen shot of the screen where you make simple entries and it does the math for you. This one shows an assumed temperature of 36 degrees Celsius which has lowered our required power.

First enter your GTOW

Next enter the barometric pressure only if it is lower than 29.92 or otherwise leave it at 29.92
In our case it is 29.76 so we enter it.

If there is a tailwind, enter it in knots. You do not enter a headwind, only a tailwind if one exists. In our case there is a 4 knot tailwind component.

To check things out you can start by entering the actual OAT.

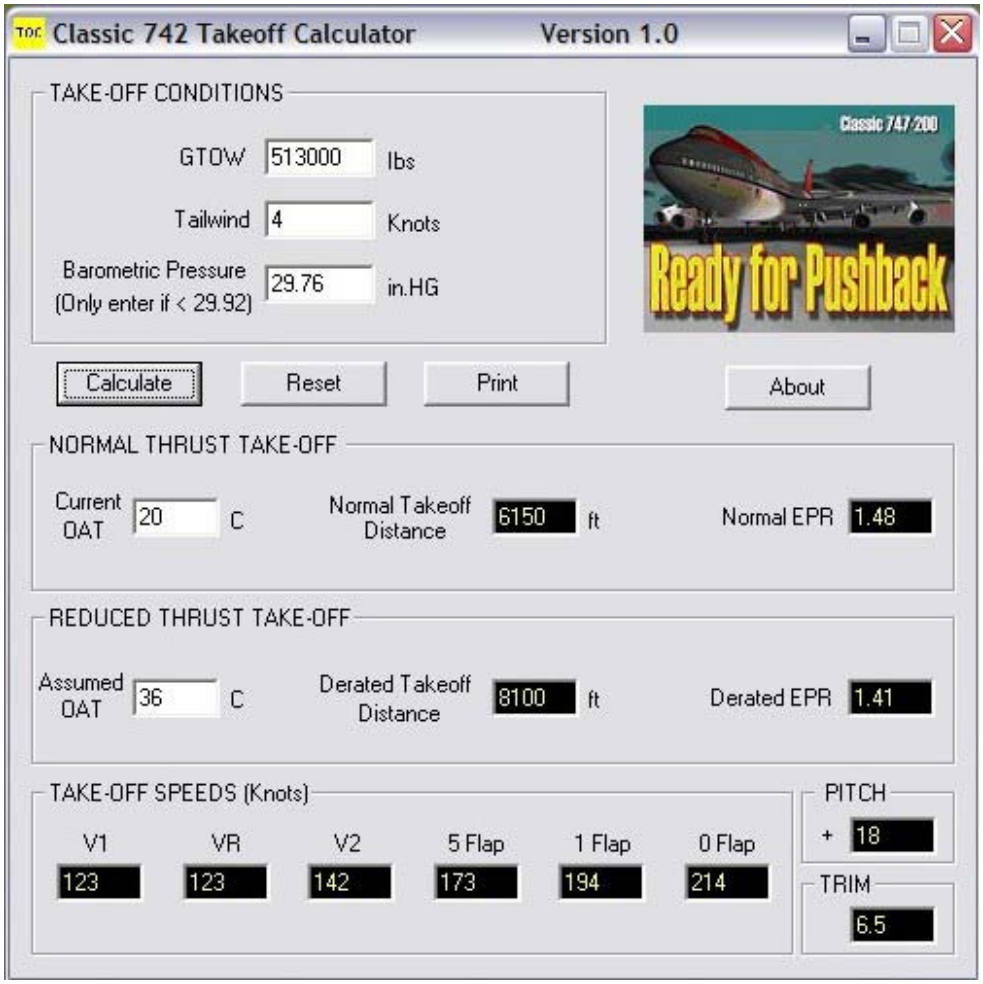
You will now see the required ERP and runway distance for this OAT.

Increasing the OAT (now we call it an Assumed Temperature because it is fictitious) and see what happens to the takeoff distance required and the EPR required. Of course you must press the calculate button to get the results.

Let's take a look at the standard or actual outside temperature. Note the takeoff distance is 7,150 feet and the EPR required for the takeoff is 1.48

Let's assume that our runway is 12,000 feet long so we want to derate.

Let's try it and see what it looks like.



I have entered an Assumed Temperature of 36 degrees Celsius and this shows that we will now require 8,100 feet of runway and that we should use an EPR of only 1.41

That will save fuel, wear and tear on the engines and still leave a lot of runway left over. It makes sense and this is what is done in the real world. The aircraft will not be over powered and will be easier to handle and that's what we as simmers are also looking for.

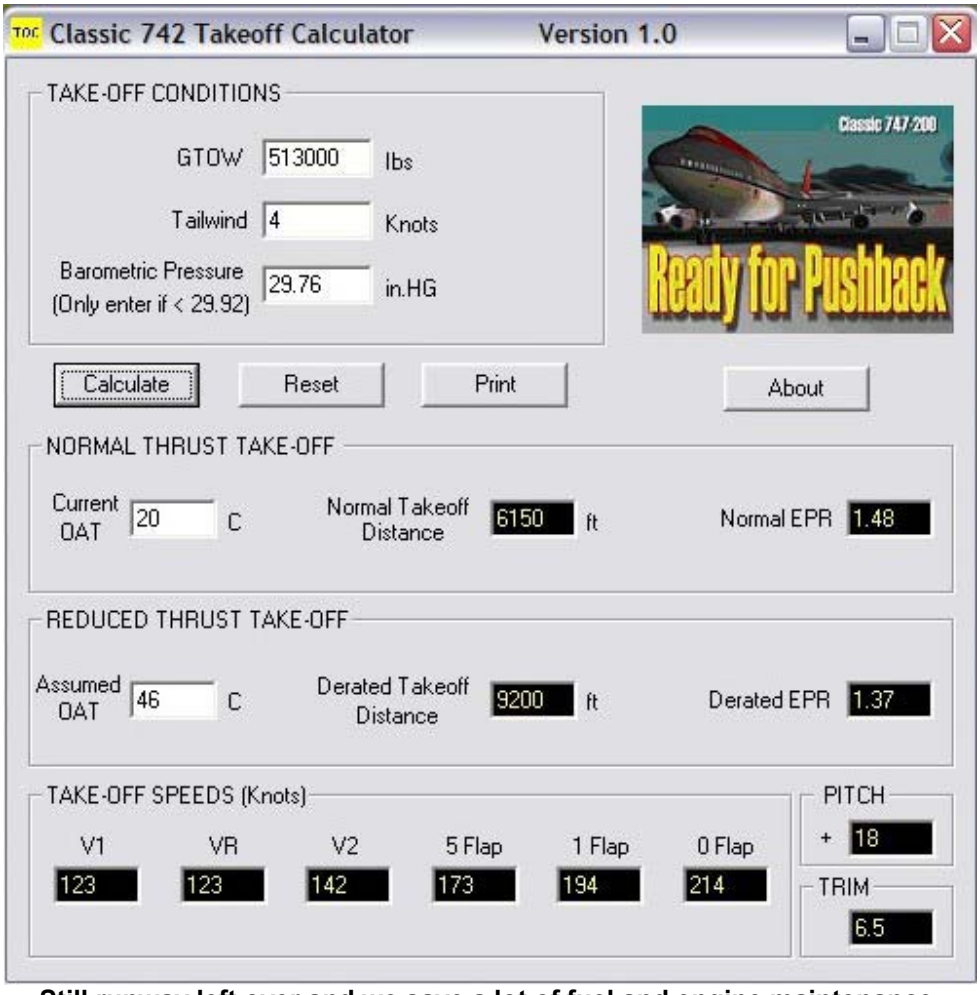
Now that you have a number you derate like this.

The FFRATS defaults to an EPR of 1.50 so by using the slew toggle switch I decrease by -.09 EPR which will give us the required EPR 1.41 that we need.

This calculator takes most of the guess work out and does the hard pencil pushing for you. You should now be able to make a wise decision on your takeoffs and fly closer to the way real airline pilots do. Note the calculator is also displaying V-Speeds and Flap Retraction speeds plus the correct pitch to use on rotation.

Simple enough? Sure it is.

Imagine what happens if we use a higher Assumed Temperature



Still runway left over and we save a lot of fuel and engine maintenance.

Expectations

Can you expect to make a reduced thrust takeoff on every flight?

Absolutely not!

Even though the airlines like to and want to conserve fuel and reduce maintenance costs, safety must come first. When ever you consider a reduced thrust takeoff that additional 30,000 lb margin is automatically added to your GTOW and this means that you will need to factor in additional runway length. Adding on to the OAT as an assumed temperature again means that you will require more runway length for the takeoff. For these reasons it is important that you know how much runway you have available and that you play it on the safe side.

More often than not you will find using reduced thrust takeoffs more accommodating with lower weight aircraft. When your GTOW approached 700,000 lbs you may find that you just do not have enough runway length to allow you to use a reduced thrust on your takeoff.

Is a Reduced Thrust Takeoff considered on every takeoff?

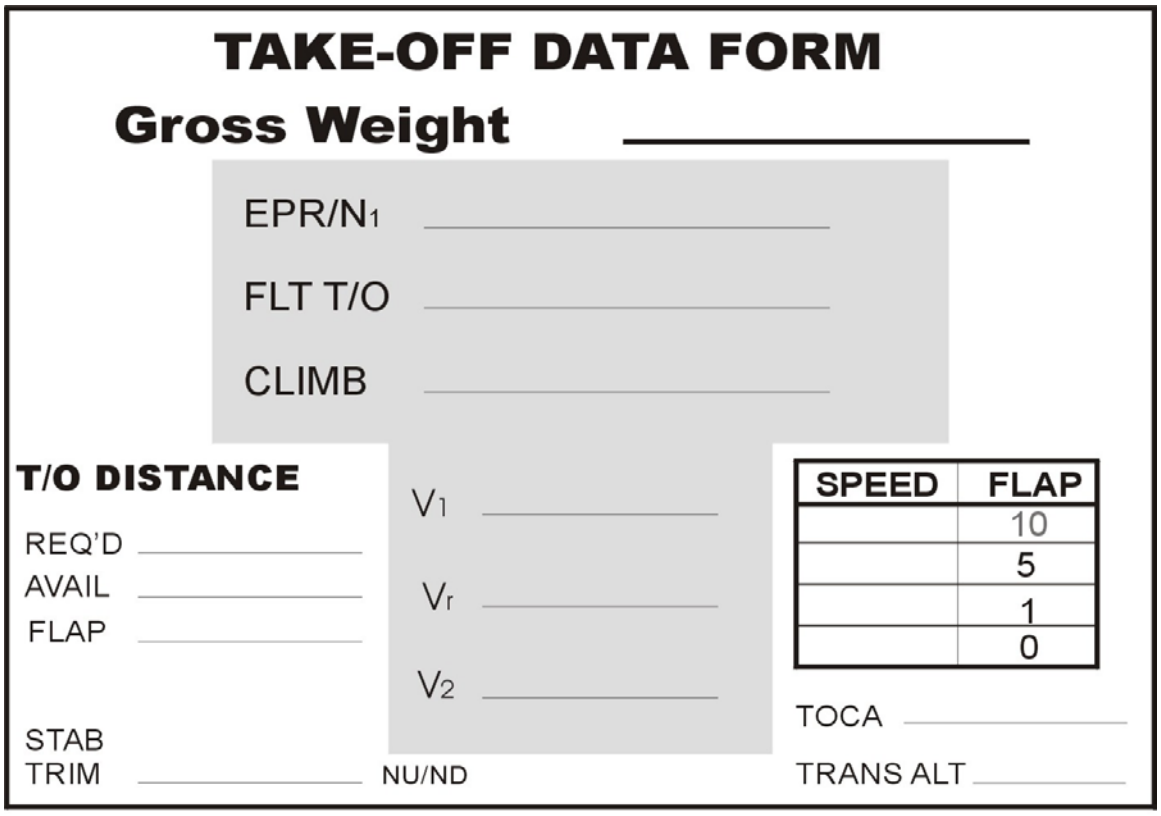
Absolutely!

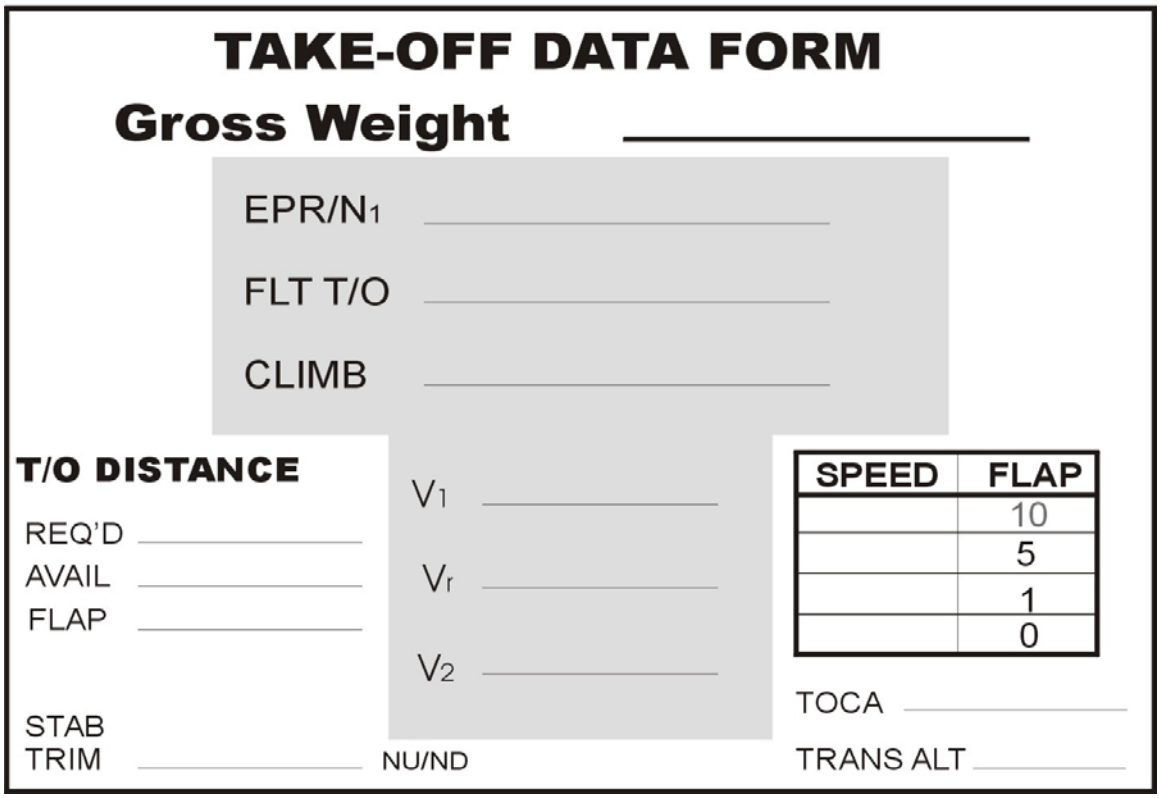
In many cases they are possible and are always used when they are possible.

Below you will find what a real world take-off data form looks like and is normally completed by the Second Officer prior to take-off. Copies are handed to the 2 pilots for their clipboards.

1. **GROSS WEIGHT** - Fill in the GTOW at the top
2. **EPR/N1** - area is the allowable full thrust takeoff EPR
3. **FLT T/O** - is the reduced thrust EPR value
4. **CLIMB** – Optional but is used to enter the initial climb EPR. Normally add 0.05 EPR if takeoff weight exceeds 710,000 lbs.
5. **V1, VR and V2** – The takeoff speeds interpolated to the nearest knot using actual weight.
6. **SPEED/FLAP** – Flap retraction speeds are interpolated to the nearest knot using actual weight. Flap 10 will only be entered if performing a flaps 20 takeoff.
7. **T/O DISTANCE REQUIRED** – Take this number from a Weight Limitations Chart of from the takeoff computer for this documentation.
8. **T/O DISTANCE AVAIL** – Take this information from airport charts external or within FS2004
9. **FLAP** – Flap setting used for takeoff upon which takeoff data is based.
10. **STAB TRIM** – Load Dispatch normally supplies this value based on center of gravity, weight etc.
11. **TOCA** – Takeoff (obstacle) Clearance Altitude
12. **TRANS ALT** – Transition altitude if other than 18,000 feet. Obtain from route manual.

On the following page you will find 2 take-off data forms like the airlines use. Print some copies and keep them handy. Fill them in as required before starting your flight so you will have the take-off information in front of you.





Okay, Okay, I know. There is one more question that you would all like to have answered.

If Load Dispatch supplies the Stab Trim numbers and FS2004 doesn't have a Load Dispatch office, what do we do?

Here is the scoop and the only way that I know of to handle this.

Load Dispatch bases this data on the center of gravity of the aircraft which changes depending on how passengers are loaded, cargo and baggage. We can not get different center of gravity numbers in FS2004 because this game is just not that sophisticated so I am supplying some numbers that will get you going. You may have to adjust them a little to suit your own needs but these are close and do work.

These numbers are based on the Center of Gravity (1% MAC) being 14 in the real world.

The calculator is also supplying this number for you.

One last thing, the Takeoff Calculator also prints this information on one sheet of paper.

WEIGHT	STAB TRIM
750,000	8
700,000	8
650,000	7.5
600,000	7
550,000	7
500,000	6.5
450,000	6

Classic S-Combo enhanced for the Vmax Classic

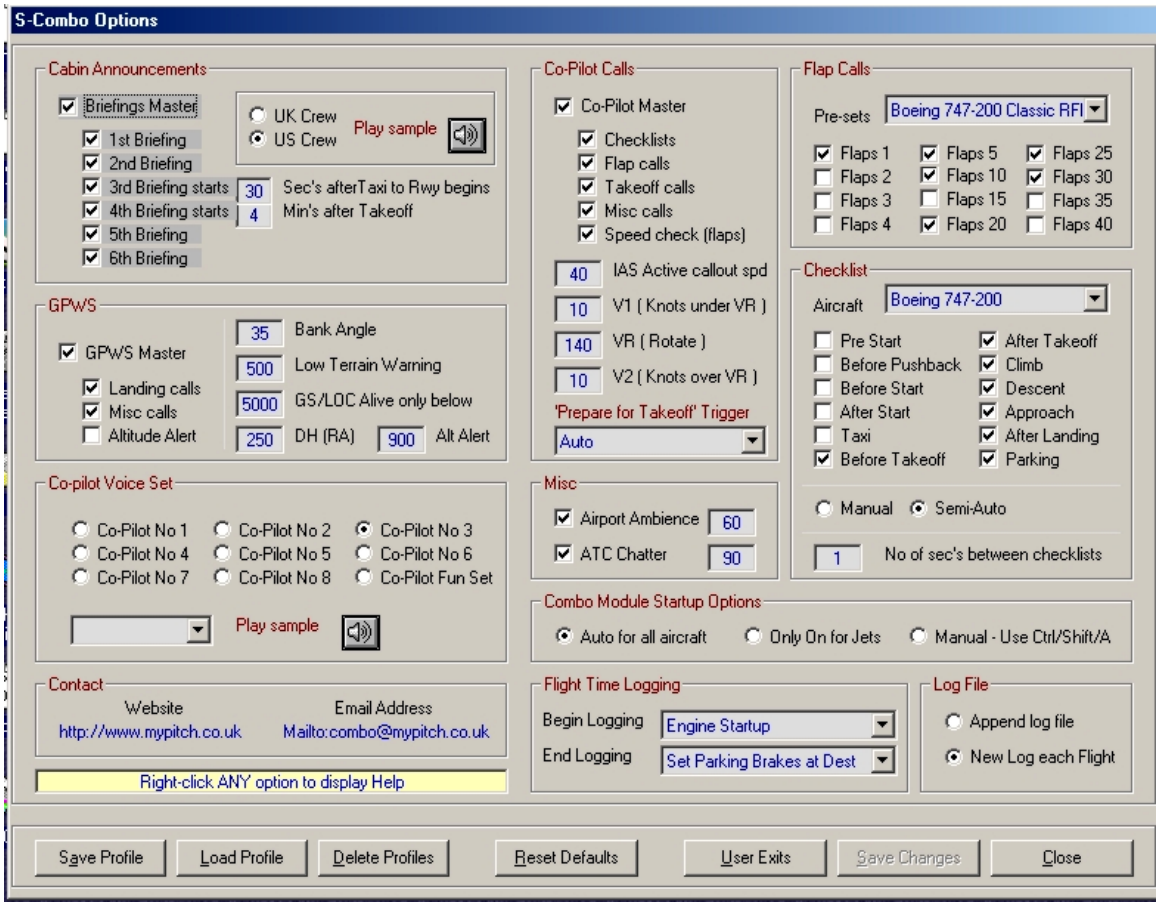
By Dave March

First of all, to enjoy and reap the benefits of ***S-Combo***, you must have ***S-Combo*** installed on your system. The original ***S-Combo*** add-on that is highly acclaimed is a free download from many Flight Simulator Web sites. A special upgrade is available at no charge to users of the Vmax Classic 747 package. For those of you with the Retail Boxed Version of the Vmax Classic, the complete **Classic *S-Combo*** including all enhancements are included on the CD.

S-Combo comes with complete documentation and the only documentation included in this manual pertains to the added enhancements for the **Classic *S-Combo*** Vmax Classic version.

What's been added to the **Classic *S-Combo*** to make it better when used with the Vmax Classic?

- Aural Checklist specific for the **Vmax Classic 747** from startup to shutdown
- Hear the 3-man crew calling out the commands as you start the engines.
- Hear the correct takeoff speed and flap calls based on calculated GTOW at time of departure and all based on real life data. Use the charts that are included to set the speed bugs accurately on the ASI
- **Classic *S-Combo*** knows when you are slowing for a descent and will again calculate your GLW and make the accurate Flap calls and gear call based on real life data.
- Receive on screen data of the flap speed that will be used to allow you to set your bugs properly on both takeoff and landing.
- Choose from two styles of takeoff and landing calls that are popular with airlines flying the Classic 747
- 100% user configurable and user friendly
- Supports multiple voice sets.
- Create your own voice set for the 3 man checklists.



Configuration

To configure the **Classic *S-Combo***, you must select **Options**. In the upper right corner of the Options screen, select the **Boeing 747-200 Classic RFP**. This is the only aircraft selection that will allow configuring the new features of **Classic *S-Combo***.

Loading Classic *S-Combo* to use with the Vmax Classic Ready for Pushback

It does not matter which gets loaded first, **Classic *S-Combo*** or Flight Simulator but I normally load Flight Simulator first. The reason I load Flight Simulator first is that **Classic *S-Combo*** can only be connected to Flight Simulator once Flight Simulator is running. This means you will only have to access **Classic *S-Combo*** one time. If you are not sure how to load another program once Flight Simulator is running, just minimize Flight Simulator or use the combination of **<ALT TAB>** to get to your desktop. Press <**Tab**> and hold it while now pressing the <**ALT**> key and then release the <**TAB**> key. You should now be at your desktop with Flight Simulator running in the background.

Shutting Down Classic *S-Combo*

Always shut down **Classic *S-Combo*** before closing Flight Simulator. Use the **<ALT TAB>** keys to get back to **Classic *S-Combo*** and click the **Disconnect** Button.

Using Classic *S-Combo* with the Vmax Classic

I think the best way for you to learn what Classic S-Combo can add to your 747 flight is to fly Ralph's Tutorial with Classic S-Combo loaded and running. When you are all setup and sitting on Runway 31 with Classic S-Combo connected, release your brakes. At this time, the GTOW is displayed along with a lot of other valuable information you will require to set up the speed bugs.

It will now be time to set the bugs and it's going to be pretty simple. The on screen readout will tell you where the bugs should be set at. Click on the upper right corner of the ASI to access the bug menu and set them. These are the reference points that you will require until your aircraft is clean. During the rotation and takeoff you will hear the calls for V1, VR, V2, Gear Up and Flaps being made. Not only are they being made but also they are accurate and correct for the weight of your aircraft. This is, as close to reality you will get.

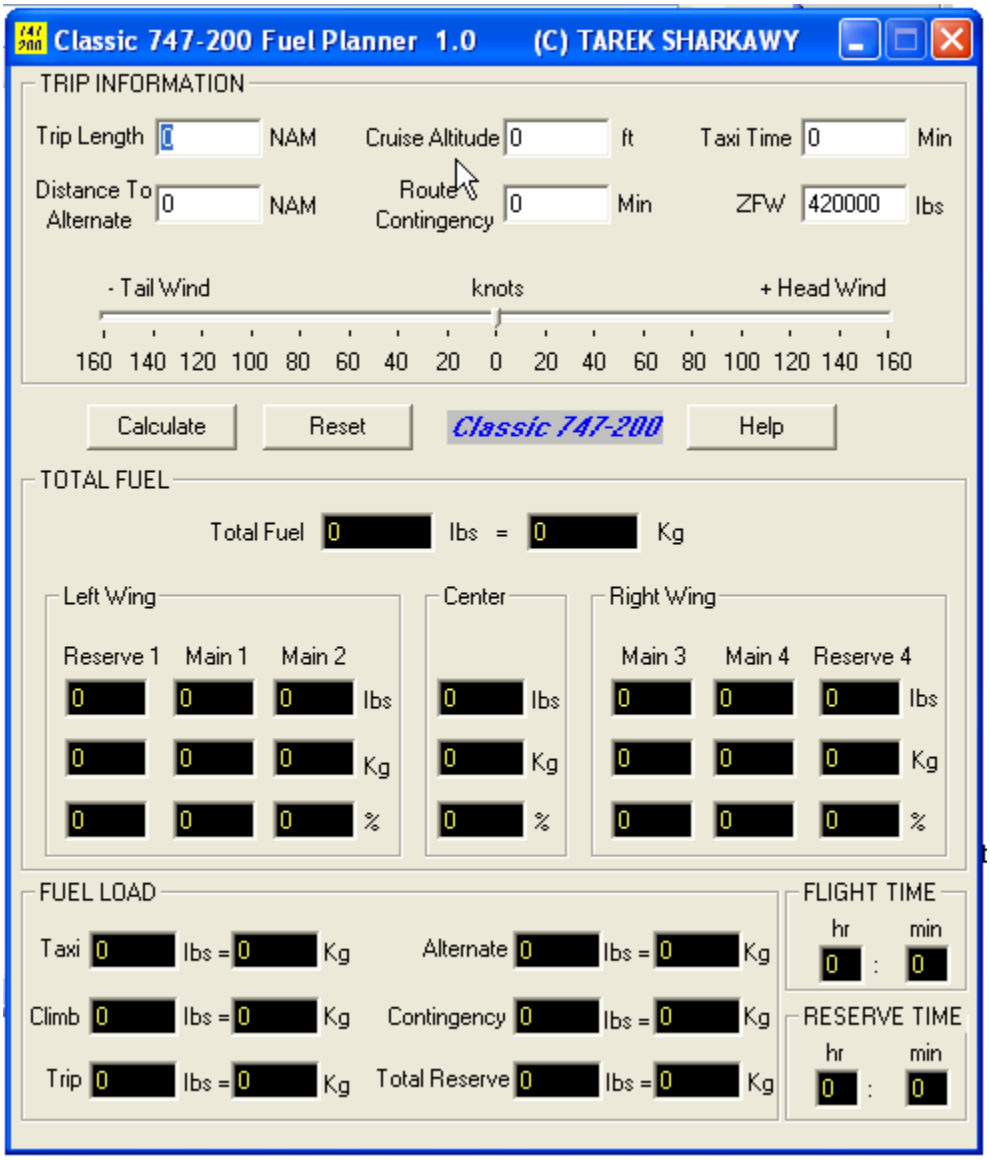
When you are turned around and on the downwind leg, you will get a visual readout of your GLW and speed bug settings. Open the bug menu and set the bugs as required. As you slow the aircraft to below the Clean Speed, you will start getting the correct and accurate flap calls based on your Gross Landing Weight. At the correct time you will get the Gear Down Call and your Flap 25 call. By the time you reach the FAF (*Final Approach Fix*) you will be in a full Landing Configuration.

Perhaps a good way to think about **Classic S-Combo** and the **Vmax Classic 747-200** Package working together is more like a mini-tutorial in flying a Classic 747. We are doing the calculations for you and passing on the required information verbally and/or written on the screen.

When you are in a climb mode and pass through 10,000 feet, you will get more on the screen prompts telling you your current climb weight, the correct speed to use in the climb, the maximum altitude you should fly to for the current weight and your maximum cruise IAS. As you level off at your maximum cruise altitude and burn off fuel, your weight will be recalculated and a new set of numbers will be shown. This is called a “Step Climb” and is how the real Classic 747-200 gets up to its highest assigned altitude for cruising. These numbers are all included in this manual so you can manage everything yourself or you can let Classic S-Combo do it for you.

Classic 747-200 Fuel Planner

By Tarek Sharkawy



The Classic 747-200 Fuel Planner is an easy to use tool that will provide you with a total fuel to load number. This number can be then used to load the tanks with the Pressure Fuel Loader automatically, or with the tank load recommendations, you can load each of the tanks manually.