FS Load Master v2.5

Operating Guide

PegasusWeb Productions

Introduction

You have chosen a departure and a destination airport, your aircraft is ready at the ramp or gate and you have a flight plan before you. Now it's time to load the aircraft with fuel, passengers and cargo and take off.

But before you open the load screen interface , FS Load Master can help you to quickly determine your payload and cargo weights in a way consistent with the realistic operational conditions of the trip you about to fly.

If you are in hurry, just select aircraft, input trip distance and payload (passenger or freight) and you're done – see below the Quick Start Tutorial. Or if you have in mind some specific conditions – full or partial load, ferry flight (no payload), known or forecast weather conditions - you can modify all the parameters as shown in this manual and you will end up with the correct realistic weight numbers for your flight operation.

In any case LoadMaster is designed to be efficient and practical so as to spend as little time as necessary to compute your numbers and then off to the real thing: flying!

FS LoadMaster models fuel requirements for any flight from 70 NM up to to about 10,000 NM for most of the commercial aircraft currently in service, from light to widebodied.

The flight time and the consequent fuel requirements for a flight are computed by the internal "Fuel Burn Estimator" (FBE). FBE is an algorithm that models for each aircraft the fuel consumption curve relative to the distance to complete the trip according to the flight plan and the aircraft payload.

The FBE (Fuel Burn Estimator) assumes a typical vertical profile (takeoff, climb, cruise, descent and landing) to fly the distance indicated in the flight plan and accounts the type of aircraft and the actual takeoff weight.

While the dynamic data – e.g. trip time and trip fuel - is calculated by the Load Master FBE, the static weight data provided is taken from the official manufacturers data specifications.

For variations A and B are presented to account for the variance in critical parameters, but a third variation, U for user, is available for the user to match the numbers of the specific installed FS model. The list of modelled aircraft is presented at the end of this guide.

FS Load Master produces a standard report style "Load Sheet" that can be saved as a text file for easy consultation while in flight and for logging purposes.

Why fly with realistic weight and fuel?

In the real world it is the captain's responsibility to assure the safety of the flight before accepting takeoff , by checking all the data available about the flight. And here "all" means "everything relevant", from the actual and forecast metereological conditions to the political safety of the airspace the flight is about to invade.

A dispatching process, involving many people, is dedicated to gathering the flight plan data and the aircraft load weights and reporting them to the pilot crew.

A central role is played by the weight data, because the aircraft performance is very much dependent on the dynamically varying gross weight of the aircraft at all stages of flight. At takeoff the gross weight cannot exceed maximum takeoff weight, while at landing gross weight cannot exceed maximum landing weight. In climb, cruise and descent the weight of the aircraft determines climb and descent rate, fuel consumption and ultimately flight time.

The known technical structural limits of the aircraft must be therefore thoroughly checked against the actual conditions of the flight.

And as fuel is concerned, a balance must be found between economical returns and safety parameters. International regulations dictate that no flight can be dispatched or aircraft can takeoff unless it has enough fuel to fly to the airport to which it is dispatched, and thereafter, to fly to and land at the most distant alternate airport, and then to fly for 45 minutes at normal cruising fuel consumption.

In flight simulation the aircraft sim designers go to great lengths to insure that the aircraft performance respond realistically to weight changes, altitude, weather and weight balance. Flight command authority, rate of climb, aircraft speed, fuel consumption, aircraft attitude, to name a few, are effects that the sim user can directly experience as effects of aircraft load.

Therefore, a realistically loaded aircraft can dramatically improve the simulation experience, giving the user the "right feel" and the "right cues " for the pilot flying.

If your aircraft has an FMS (Flight Management System) you can input the FS Load Master estimated fuel and reserve, and monitor how fuel predictions change during the flight, and consider whether the actual weather conditions suggest an altitude change, or require a fuel emergency to be declared (a fuel reserve warning demands declaring an emergency at the destination airport).

Furthermore, knowing and controlling the weight load parameters, can extend your imagination to set up and understand different scenarios for a flight.

Suppose you are short of fuel because you are dispatched to return to base without refueling: although you are within the safety limits, any contingency or diversion can be a problem to be taken seriously.

Or suppose your cargo flight was delayed, the winds were against you, so when you arrive at the destination airport the night has fallen and the airport is closed, not being certified for night landing. A comfortable afternoon flight suddenly changes to a critical night time flight with limited fuel to the best alternate airport, which is 150 NM away.

Even for normal scheduled passenger flights the choice of the number of seat class, the available cabin weight, the cargo load can be adjusted based on distance and route: long haul flights compete for comfort and seat less passengers but provide for first and business class, while short economic flights are normally crowded and the baggage weight can be limited to carry-in personal items.

The FS Load Master Interface

01.Select the aircraft.

Click on the aircraft code on the left aircraft list.

02.Input Trip Distance

Input the flight plan distance in nautical miles - NM. Flight Time and optimal Cruise Altitude are computed and displayed. If the trip distance is greater than the (selected) aircraft maximum range, the Trip Distance background turns to red.

As soon as a trip distance is entered, the design parameters of the selected aircraft, configuration A (default) values are displayed.

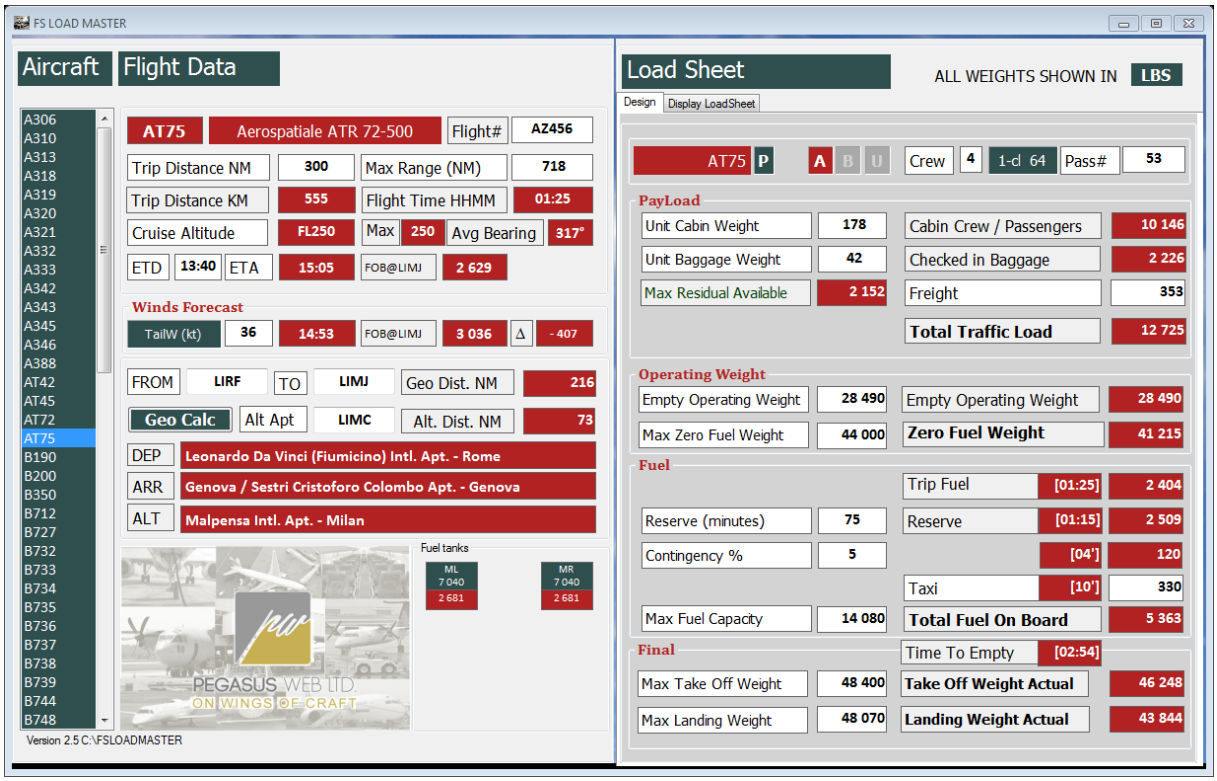
The "configuration values" – identified as A B or U -are a set of characteristic values that represent structural and design limits for the selected aircraft:

1. Max Range,
2. Max Flight Level (Service Ceiling)
3. Empty Operating Weight,
4. Max Zero Fuel Weight,
5. Max Landing Weight ,
6. Max Fuel Capacity, and
7. Max Takeoff Weight.

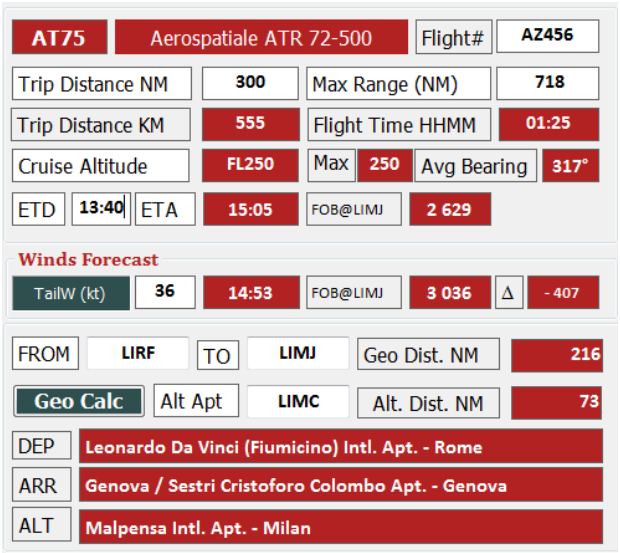
For the same aircraft type– for instance Boeing 767-200 - configuration A represents the values for the model variant with less power or capacity while the configuration B shows the design values for the more powerful or the more capable for the selected model – in this case B762 ER.

All these values can be user adjusted, but configurations A and B are not saved across different aircraft and between sessions. Use U –User configuration- to set your different – reasonably sim-

Design Load Sheet Line By Line



Flight Description



FROM
Input. ICAO 4 letter code of departure airport.

Aircraft
Info . Aircraft Code followed by Manufacturer Model Name

Flight #
Input. An optional Flight Number .

Trip Distance
Input. Flight Plan Distance

Max Range
Config/Input
Max range for the aircraft. As all configuration parameters can be changed by the user. (Configuration U is saved between sessions).

Trip Distance KM
Output/Computed . Converted from T rip distance NM.

Flight time HHMM
Output/ Computed . Calculated by FBE

Cruise Altitude
Config/Input . Optimal altitude, based on ceiling and distance.

Max (Flight Level)
Config. Aircraft Service Ceiling (FL) .

TO
Input. ICAO 4 letter code of destination airport

Geo Calc
Click. Click to calculate net geographical distances between departure and destination airports - and between destination and alternate airports

Geo Dist NM
Output/ Computed . Linear geographical distance between departure and destination airports .

Alt Dist NM .
Output/ Computed Distance from destination airport and alternate airport .

DEP
Output. Name of departure airport name and city.

ARR
Output. Name of arrival airport name and city.

DEP
Output. Name of alternate airport name and city.

Avg Bearing
Output/ Computed. Lossodromic initial bearing ± general direction of flight.

ETD
Input. Expected Time of Departure : Time of departure in hours and minutes

ETA
Output/ Computed . Expected Time of Arrival: Time of arrival as estimated by FBE

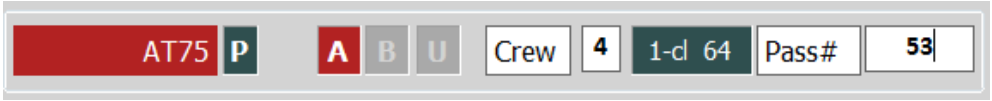
FOB @ Destination
Output/ Computed. Fuel on board at destination ± equals fuel on board at departure (excluding taxi fuel) minus trip fuel.

Winds Forecast
Toggle and Wind Speed
Input. Click on wind direction to select NONE, TAIL or HEAD winds. Insert wind speed in knots.

FOB@DSTN
Output/Computed. Wind dependent forecast of fuel on board at destination

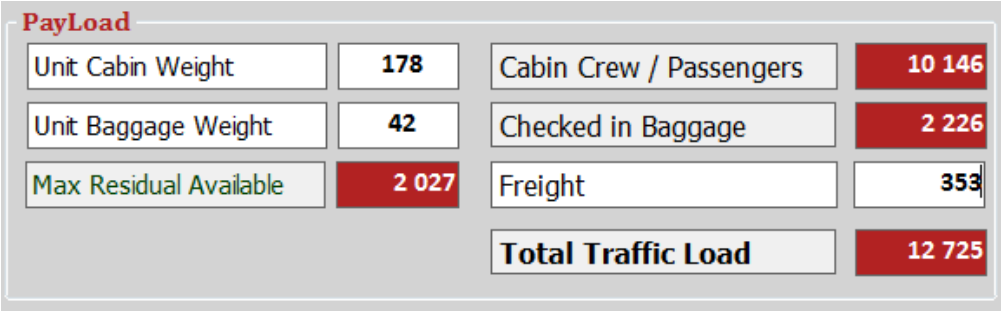
Δ
Output/Computed . Delta fuel due to wind forecast - negative number is fuel saved.

Flight Configuration



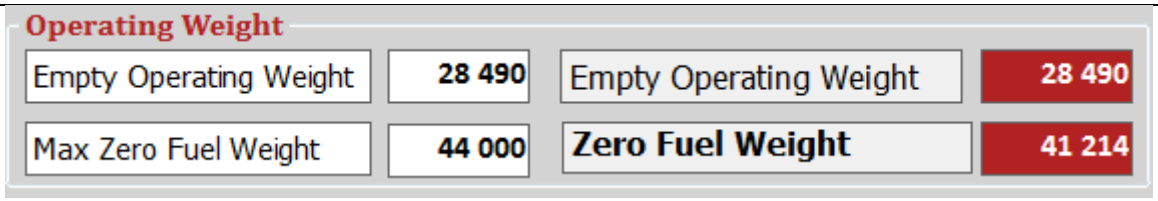
Aircraft Code	P/F	A B U	Crew	Seat Config	Pass#
Info .	Toggle P-Passenger or F-Freight If freight passengers crew is set to two and Pass# to zero.	Click Choose configuration A B or U .	Input Crew number including pilots and assistants .	Click Displays different available seat configurations, described as 1 2 or 3 classes followed by max number of seats .	Input Insert number of passengers. Typical: 70 - 80 % of max pass# in selected seat configuration

Payload



Unit Cabin Weight Input The weight of one Person, Crew or passenger, including Personal effects in cabin. Values vary from 75kgs (165lb) to 90 Kgs (198lbs).	**Cabin Crew / Passengers** Output / Computed The total passenger weight in cabin. = (Pass# + Crew#) x Person Weight
Unit Baggage Weight Input The weight each passenger is allowed as check in baggage. Typical: 15 to 30 Kgs. If	**Checked in Baggage** Output / Computed = Pass# x Baggage weight
Max Residual Available (Freight) INFO Output / Computed The available freight weight still available. This number is constantly updated, as soon as one of the numbers in the formula are updated. =Maximum Take Off Weight ± (Total Traffic Load + Take Off Fuel) If negative is set to zero.	**Freight** Input The weight of cargo to be loaded. If fre ighter the payload cargo weight. If passenger the a dditional cargo to be loaded as cargo.
Total Traffic Load Output / Computed The total payload weight. It updates continuously in response to any change in passenger or baggage weight, number of passengers and freight. = Passenger/Cabin + Checked in Baggage + Freight	

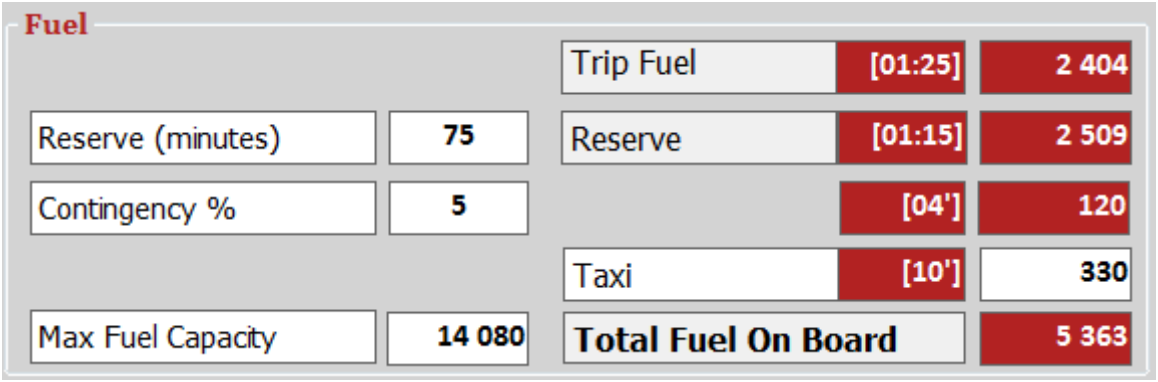
ZERO FUEL WEIGHT ACTUAL



Empty Operating Weight Config/ Input The weight of the empty aircraft. As all configuration parameters can be changed by the user. (Configuration U is saved between sessions) .	**Empty O perating Weight** Output / Computed = Empty Operating Weight

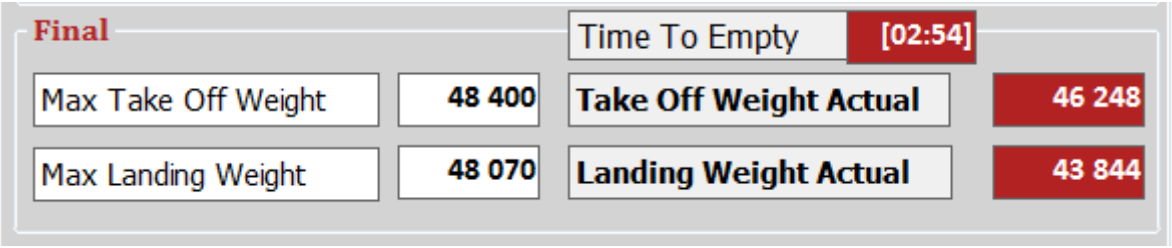
Max Zero Fuel Weight Config/Input. The MZFW. As all configuration parameters can be changed by the user. (Configuration U is saved between sessions).	**Zero Fuel Weight Actual** Output / Computed The actual aircraft weight excluding fuel. = Empty Operating Weight + Total Traffic Load

Fuel



	Trip Fuel Output / Computed The estimated fuel weight and the flight time for the trip according to the flight plan. 7KH ³)XHO %XUQ (VWLPDWRU´ DVV vertical profile (takeoff, climb, cruise, descent and landing) to fly the distance indicated in the flight plan and taking into account the type of aircraft and the actual takeoff weight - therefore it updates continuously in response to any change in the Total Traffic Load. = Computer by the Fuel Burn Estimator as a function of (Aircraft, Distance and Total Traffic Load)
Reserve (minutes) INPUT 7KH GHIDXOW LV PLQXWHV D(law reserve and 3 ¶ IOLJKW WR DOWH is reasonable for alternates within 100NM. For further away alternate airports consider XS WR ¶ IRU DOWHUQDWH IOL	**Reserve** Output / Computed The actual weight of the required fuel to satisfy the reserve minutes desired, as computed by the Fuel Burn Estimator . The part exceeding the 45 minutes reserve is computed as diversion consumption (regain altitude, fly to alternate, execute approach and l anding). = Computer by the fuel Burn Engine as a function of (Aircraft. and the number of minutes required by Reserve (minutes))
Contingency % Input A percentage Trip Fuel to account for unscheduled different contingencies (winds, flight plan diver VLRQV HWF«	**Contingency Fuel** Output/Computed The actual weight of the required fuel to satisfy the contingency percentage.
	Taxi (Fuel) Input Fuel estimated to be burned between engine start and takeoff run. To set look at the equivalent minutes: t \SLFDO YDOXHV DU IRU VPDOO DLUSRUWV XS WR ¶ where delays are expected.
Max Fuel Capacity Configuration Parameter	**Total Fuel On Board Fuel** Output/Computed The actual weight of the required fuel to satisfy the contingency percentage.

Final



Max Take Off Weight Configuration Parameter	**Time to Empty** Output / Computed The maximum autonomy of flight of the aircraft given the total amount of fuel on board at departure. = Trip Time + Reserve Time + Contingency Time+ Taxi Time
Max Landing Weight Configuration Parameter	**Take Off Weight Actual** Output/Computed The total weight of the airplane at takeoff. =Zero Fuel Weight + Total Fuel On Board ± Taxi Fuel Weight
	Landing Weight Actual Output/Computed The weight of the aircraft at landing . = Takeoff Weight Actual ± Trip Fuel

Loadsheet Report Information

EXAMPLE

```
ALL WEIGHTS IN LBS
------------------------------------------------------------
01 FROM/LIRF  TO/LIMJ    NM/300   ACFT/AT75P    CREW/04
02 FLIGHT/AZ456     LIRF.ETD/13:40     LIMJ.ETA/15:03
------------------------------------------------------------
03 DEP/LIRF-Leonardo Da Vinci (Fiumicino) Intl. Apt. - Rome
------------------------------------------------------------
                            WEIGHT    NOTES
------------------------------------------------------------
04 CHECKED-IN BAGGAGE/CARGO 002579    B53/042  C000353
05 CABIN / LOAD-IN COMP.    010146    Y53/178  MAX 64
06 TOTAL TRAFFIC LOAD       012725 *
07 OPERATING WEIGHT         028490
08 ZERO FUEL WEIGHT ACTUAL  041215    MAX 044000
09 TAKE OFF FUEL            005508 *  EFU 2404  RSV 2509
10 TAKE OFF WEIGHT ACTUAL   046373    MAX 048400
11 TRIP FUEL                002404
12 LANDING WEIGHT ACTUAL    043969    MAX 048070
------------------------------------------------------------
13 BLK[01:23]/RSV[01:15]/TTE[02:57]   FOB 002754 @LIMJ
14 ARR/LIMJ-Genova / Sestri Cristoforo Colombo Apt. - Genova
15 END LOADSHEET            [AT75]           [ LIRF/LIMJ]
------------------------------------------------------------

LEGEND.
04: B53/042: 53 items estimated at 19kgs
04: C000353: Cargo 353lbs
05: Y53/178: 53 passengers in class Y  (F=First, J=Business, Y=Economy)
05: MAX 64 Maximum number of passenger in class Y
06: 012725 * : Total traffic load to match payload weight in FS
09: 005508 * : Fuel weight to match in FS (lbs)
09: EFU : Estimated Trip Fuel
09: RSV : Reserve Fuel
13: BLK : Block Time - flight time
13: RSV : Reserve Time
13: TTE : Time To Empty
13: FOB :Fuel on Board @ destination
```

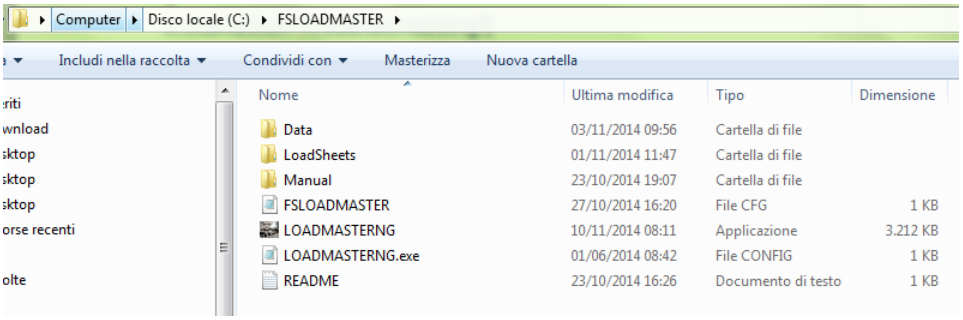
FAQ SECTION

Why doesn't FS Load Master automatically load fuel and payload directly into FSX or P3D?

Basically because every aircraft comes with its own different payload interface.
For example some aircraft require setting individual weight for each seat, some propose aggregate weights for different aircraft sections, some have a different interface for cargo or passengers. As for fuel, some aircraft require that fuel be set by its own load interface and would simply ignore the fuel loaded directly into FS. Consequently the philosophy of FS Load Master is to focus on the task of generating realistic fuel and payload values and then let him/her decide how to deal with them.

Installation Troubleshooting

FS Load Master before version 2.5 required necessarily unzipping the downloaded file into c:, so as to create a subdirectory C:\FSLOADMASTER, so that a correct installation would produce a result like this:



From version 2.5, although we recommend for uniformity to follow this standard, the downloaded zip file can be unzipped to any directory, and the program will assume the install directory as root for the Data and LoadSheets subdirectories.

For any other problem contact support@pegasuswebproductions.com.

How do FS Load Master and www.fuelplanner.com compare?

A popular and reliable source of flight simulation fuel requirements is provided free by the online service of www.fuelplanner.com . Select an aircraft, enter the airport codes for departure and destination and fuel planner calculates fuel requirements for the flight (trip fuel and reserve) and gives an estimate of flight time.

Main differences between the two estimates:

1. The fuelplanner.com algorithm assumes a typical load for each airplane in terms of crew and cabin weight., and therefore returns a single trip fuel estimate for flight.
   FS Load Master, in the other hand, returns a variable trip fuel estimate based on the actual load of the aircraft.
2. The fuelplanner.com algorithm returns a single "reference" flight time, based only on distance but independent of the aircraft performance characteristics.
   FS Load Master, on the other hand, returns a different flight time based both on distance and a different ground speed curve for each aircraft.

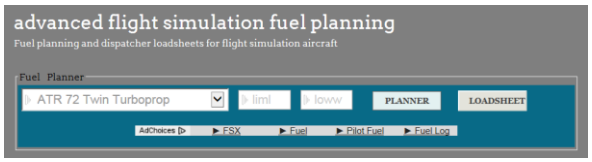
Obviously, when the FS Load Master aircraft load data are the same as the typical fuelplanner load for that aircraft, the two estimates are very near.

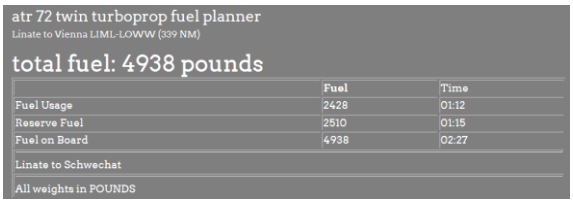
In terms of interface :

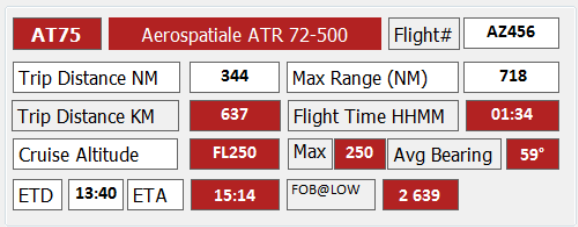
	FS Load Master	www.f uelplanner.com
Flight distance	User can input flight plan distance.	Trip distance is the geographical distance between departure and destination airports.
Weights	Can be displayed in lbs or kgs	All weights in pounds.
Aicraft Load	Can be passenger or freight.	Based on a standard passenger load for the selected plane.
Passenger Load	Calculated on user changeable number of passengers, cabin and cargo load	Based on standard weight and baggage.
Dry Operating Weight	User changeable.	Standard.
Trip Fuel	Estimate depends on aircraft load.	Estimate is given for standard load.
Flight Time	Depends on aircraft and weight.	Standard time independent of aircraft and load.

Comparison Example 1.

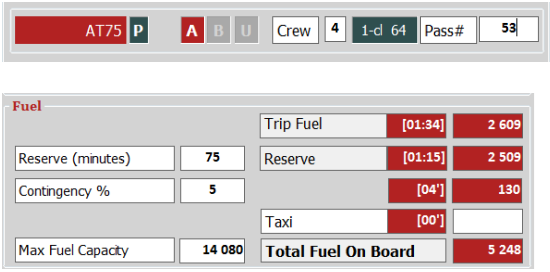
Let's setup a turboprop ATR72-500 trip from Milano Linate (LIML) to Vienna Schwechat (LOWW). The flight plan (**LIML** SID **OSKOR** UM985 **NIMDU** STAR **LOWW**) is 344 NM, while the geo distance is 339 NM.







The difference in flight time depends on the parameters of the aircraft .



The difference between 5.248 and 4.938 is dependent on the contingency fuel and the different loads of the aircraft: 53 assengers, 4 crew at 178 lbs and 53 baggage items at 42 lbs each, while the fuelplanner standard load is 50*195 lbs.

FUELPLANNER LOADSHEET

```
L O A D S H E E T          CHECKED        APPROVED                EDNO
                                                                     0
ALL WEIGHTS IN POUNDS

DATABASE JUN/12 // ATR 72 TWIN TURBOPROP

FROM/TO        FLIGHT     A/C-REG     VERSION    CREW   DATE     TIME
LIML/LOWW      0246       __HMH       12JN21     2/03   09NOV14  1123

                          WEIGHT  DISTRIBUTION
LOAD IN COMPARTMENTS      001408   B46/30
PASSENGER/CABIN BAG       009750   Y050/195
                                        EFU.2428/  RSV.2510
TOTAL TRAFFIC LOAD        011158
DRY OPERATING WEIGHT      019760
ZERO FUEL WEIGHT ACTUAL   030918    MAX  38500
TAKE OFF FUEL             004938
TAKE OFF WEIGHT ACTUAL    035856    MAX  49600
TRIP FUEL                 002428
LANDING WEIGHT ACTUAL     033428    MAX  49272
                                   ++--------------------------------+
                                   |            LAST MINUTE CHANGES |
                                   | DEST   SPEC  CL/CPT  + - WEIGHT |
                                   |                                |
                                   |                                |
                                   |                                |
                                   +--------------------------------+
UNDERLOAD BEFORE LMC       13743                LMC TOTAL + -
-----------------------------------------------------------------------
SI BLOCK TIME 01:12   RESERVE 01:15   TIME TO EMPTY 02:27   CI 26
SI LIML 090320Z VRB02KT 4000 BR SCT005 BKN020 14/14 Q1012 NOSIG
SI LOWW 090320Z 12007KT 4800 BR FEW002 SCT003 08/08 Q1013 TEMPO FEW
END LOADSHEET          [ AT72 ]        [ LIML-LOWW ]      [ 09NOV14 ]
=======================================================================
Copyright 2008-2014 by Garen Evans and FuelPlanner.com
```

NB. The PASSENGER/CABIN BAG distribution data (`Y050/195`) reveals that the number of standard passengers for this aircraft is fixed at 50, each stimated at 195 lbs.

FS Load Master LoadSheet

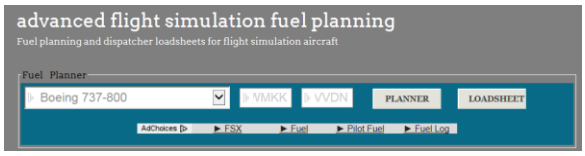
```
---------------------------  LOADSHEET  ----------------------
   ALL WEIGHTS IN LBS
01 FROM/LIML  TO/LOWW    NM/344   ACFT/AT75P    CREW/04
02 FLIGHT/AZ456     LIML.ETD/13:40     LOWW.ETA/15:14
03 DEP/LIML-Linate Apt. - Milan
-------------------------------------------------------------------
                            WEIGHT    NOTES

04 CHECKED-IN BAGGAGE/CARGO 002226    B53/042  C000000
05 CABIN / LOAD-IN COMP.    010146    Y53/178  MAX 64
06 TOTAL TRAFFIC LOAD       012372 *
07 OPERATING WEIGHT         028490
08 ZERO FUEL WEIGHT ACTUAL  040862    MAX 044000
09 TAKE OFF FUEL            005248 *  EFU 2609  RSV 2509
10 TAKE OFF WEIGHT ACTUAL   046110    MAX 048400
11 TRIP FUEL                002609
12 LANDING WEIGHT ACTUAL    043501    MAX 048070
-------------------------------------------------------------------
13 BLK[01:34]/RSV[01:15]/TTE[02:54]   FOB 002639 @LOWW
14 ARR/LOWW-Vienna Intl. Apt. - Vienna
15 END LOADSHEET            [AT75]            [ LIML/LOWW]
===================================================================
```

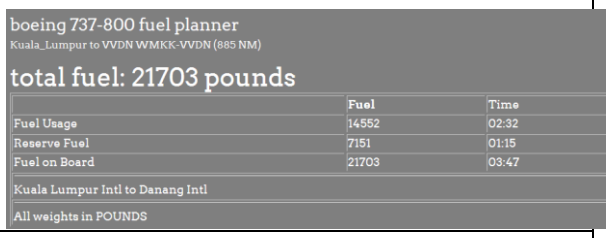
Traffic Load , Operating Weight differ, but these can be user adjusted in FS Load Master .
Both sheets confirm that the flight is within the safe performance limits of the aircraft.

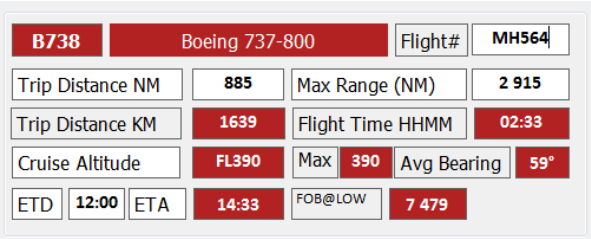
Comparison Example 2.

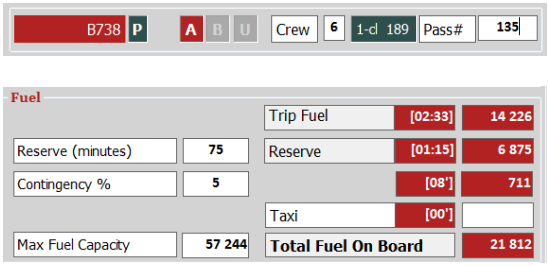
Let's setup a Boeing 737-800 trip from Kuala Lumpur (WMKK) to Da Nang Intl (VVDN). The flight plan (**WMKK** SID **PIBOS** R208 **IGARI** M765 **BITOD** L637 **TSN** W1 **PLK** W10 **BATEM** DCT **VVDN)** is 948 NM, while the geo distance is 885.

If we input 885 in FS Load Master we are confirmed that two estimates are very near: 21.703 vs 21.800 lbs and an estimate flight time of 2 hours and 32 minutes. By the way, the PASSENGER/CABIN BAG distribution data (Y115/195) reveals that the number of standard passengers for this aircraft is fixed at 115, each stimated at 195 lbs.



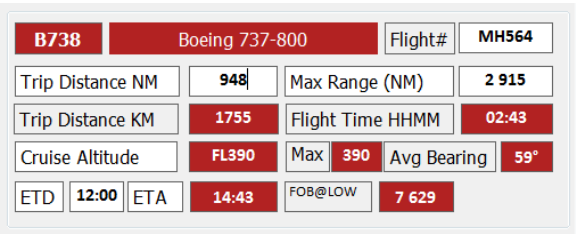


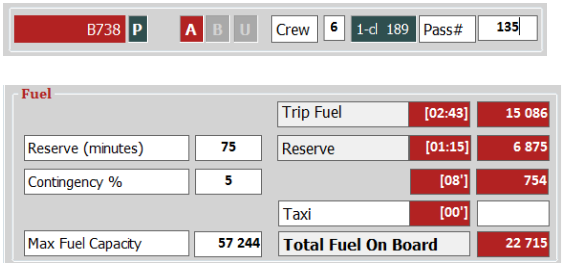




With 135 passenger the two estimates are very near: 21.703 vs 21.812 lbs.

With the actual flight plan distance of 948 we get from FS Load Master a more accurate estimate of 22.715 lbs and an estimated flight time of 2 hours and 43 minutes.





MODELLED AIRCRAFT

Airbus A300-600R
Airbus A310-200
Airbus A310-300
Airbus A318-100
Airbus A319-100
Airbus A320-200
Airbus A321-100/200
Airbus A330-200
Airbus A330-300
Airbus A340-200
Airbus A340-300
Airbus A340-500
Airbus A340-600
Airbus A380-800
Aerospatiale ATR 42-320
Aerospatiale ATR 42-500
Aerospatiale ATR 72-200
Aerospatiale ATR 72-500
Beechcraft 1900 C/D
Beechcraft B200
Beechcraft King Air 350
Boeing 717-200 / B712 HGW
Boeing 727-200 Advanced
Boeing 737-200
Boeing 737-300
Boeing 737-400
Boeing 737-500
Boeing 737-600
Boeing 737-700
Boeing 737-800
Boeing 737-900 / 737-900 ER
Boeing 747-400 /747-400 ER
Boeing 747-8i
Boeing 757-200
Boeing 757-300
Boeing 767-200 / 200 ER
Boeing 767-300 / 300 ER
Boeing 777-200ER
Boeing 777-200LR
Boeing 777-300
Boeing 777-300ER
Boeing 787-8 Dreamliner
Britten-Norman BN2 Islander
Cessna C208 Grand Caravan
Lockheed C-130 Hercules
Aeritalia/Alenia C27J Spartan
Canadair CRJ-100
Canadair CRJ-200 /CRJ-200LR
Canadair CRJ-700 / 700ER
Canadair CRJ-700LR
Canadair CRJ-900 CRJ-900 ER
Canadair CRJ-900LR
Bombardier Dash-8 Q300
Bombardier DASH-8 Q400
De Havilland Beaver I
De Havilland Twin Otter
Embraer ERJ-135 / ERJ-135 LR
Embraer ERJ-140 / ERJ-140 LR
Embraer ERJ-145 / ERJ-145 LR
Embraer ERJ-170 / E-170LR
Embraer ERJ-175 / E-175 LR
Embraer ERJ-190 / ERJ-190 LR
Embraer ERJ-195 / ERJ 195 LR
Fokker 50
Fokker 70
Fokker 100
British Aerospace JS-3100
British Aerospace JS-4100
Lockheed L1011-500 Tristar
McDonnel-Douglas MD11
McDonnel-Douglas MD80
McDonnel-Douglas MD90
BAe Avro RJ70 / 146-100
BAe Avro RJ85 / 146-200
BAe Avro RJ100 /146-300
SAAB-2000
SAAB-340B Plus
Fairchild Swearingen Metro 23