

Gulfstream

FLIGHT OPERATIONS

Fuel Tankering

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Operations
Scope: G450/G550/G650/G650ER

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G450/G550/G650/G650ER | Fuel Tankering

Background

- Considering that fuel is a major percentage of variable cost, tankering fuel is an option for long-range aircraft when trying to take advantage of the best possible price.
- It is profitable to tanker any amount of fuel when the actual fuel cost ratio exceeds the break-even fuel cost ratio.
- This briefing includes Gulfstream source references, a spreadsheet calculator incorporating fuel pricing/fees to provide tankering go/no-go advice, discusses general rule of thumb guidance and concludes with additional operational considerations.
- Temper any decision to tanker fuel against the possibility of a mission change to a runway shorter than planned and/or a contaminated runway field conditions.

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GULFSTREAM G650 OPERATING MANUAL

FUEL TANKERING EVALUATION

11-07-10: Break-Even Fuel Cost Ratios

Cruise Mach	Flight Time - Hours								
	3	4	5	6	7	8	9	10	11
0.85	1.094	1.131	1.169	1.208	1.249	1.291	1.333	1.378	1.423
0.87	1.095	1.133	1.172	1.213	1.256	1.300	1.345	1.398	1.442
0.90	1.118	1.166	1.215	1.266	1.318	1.372	1.428	1.485	*****

Fuel Tankering Spreadsheet for G450/G550/G650/G650ER

NOTE: This spreadsheet is for advisory use only.

Gulfstream Guidance

- Gulfstream provides fuel tankering information for the G450/G550/G650/G50ER in the Airplane Operating Manual Chapter 11 (Preflight Planning and Performance) section 11-07.
- AOM section 11-07 includes guidance on determining the tankered fuel cost savings by evaluating break-even fuel-cost ratios between destination and origin for given route speeds and flight duration by subtracting the break-even fuel cost ratio from the actual fuel cost ratio and multiplying the difference by the gallons of tankered fuel times the departure point cost per gallon.

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Rules of Thumb

- Payload burns the equivalent of 2.5% to 5% of its own weight in fuel per flight hour (depending on the aircraft and the flight conditions).
- Using 4% of fuel burn / flight hour as a reference, every extra (not required for the actual flight leg) 100lbs. of fuel carried, will result in an extra 4lbs. of fuel burn per hour.
- For example, to carry 1,000lbs. of fuel for 2.0 hr. flight, it will cost $(4\% / \text{hr} * 2.0 \text{ hr}) = 8\%$ in carried fuel, or 80lbs. Therefore, the fuel at the arrival airport must be at least 8% cheaper than the price of the tankered fuel to justify tankering.
- Per the above formula, tankering favors shorter legs as opposed to longer ones as tankering has a lower impact on the overall cost of the flight. For a longer flight the cost impact of tankering necessarily is much higher, and the savings at the destination would have to be higher to justify tankering.
- Additional fuel economy consideration: slower aircraft cruise speed. Aircraft speed can influence 5% to 25% in total fuel used for the same trip.

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Fuel Tankering Operational Considerations

- The cost difference between the available fuel
 - FBO vs. Contract fuel suppliers
 - Cost of fuel at departure
 - Cost of fuel at destination
 - Cost of fuel at the next destination
- Destination Fuel Availability
- Alternate Fuel Availability/Requirements
- FBO price analysis based on the total service and total cost of the stop, not just the cost per fuel gallon (landing, ramp, facility, services, parking, handling fees) including:
 - Cost of the destination facility fee if no fuel is purchased
 - Amount of fuel upload required to waive the facility fee
 - Fuel prices based on uplift quantity (advertised price per gallon versus price relating to quantity).
- Trip length

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Excess Fuel Aircraft Performance Considerations

- More power to propel excess weight
- Elevated fuel burn
- Longer takeoff field length and landing distance
- External airport factors such as elevation, temperature, wind, runway gradient, takeoff runway requirements—conditions (dry, wet, contaminated runways), length (Part 25 FAR), landing requirements—conditions (dry, wet contaminated runways), length (Part 25 and 135), mountainous terrain
- Restricted climb performance and times, SIDs, STARs, flight route MORA
- Ability to reach optimum cruising altitudes at higher temperatures
- Possible additional wear on the landing gear
- Possible additional wear and increased temperatures on brakes
- Maintenance costs - running engines longer at higher power settings may result in more wear and tear
- Weight and balance
- Non-environmental icing i.e. wing frost at the destination airport depending on the cold soak, as well as ground temperature and dew point.
- Higher ref speed


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AvFuelSaver

By Specific Range Solutions Ltd.

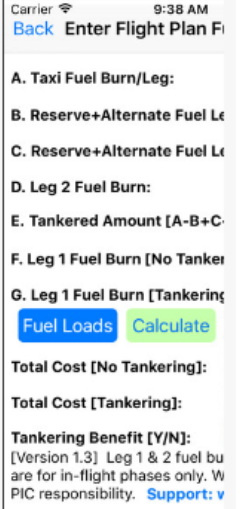
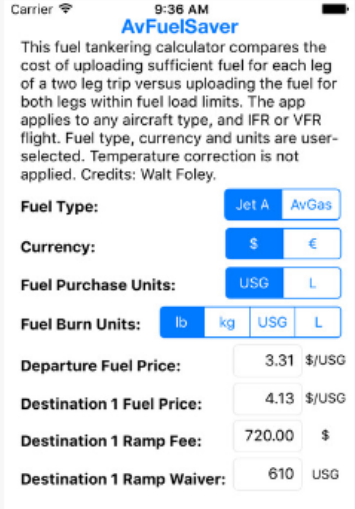
Open iTunes to buy and download apps.



Description
This iPhone fuel tankering calculator compares the cost of uploading sufficient fuel for each leg of a two leg trip versus uploading the fuel for both legs within fuel load limits. The app applies to any aircraft type, and IFR or VFR flight. Fuel type, currency and units are user-selected. Temperature correction is not applied to the fuel density

What's New in Version 1.3
1. Deployment Target: IOS 9.0.
2. Label fields adjusted.

iPhone Screenshots



Existing Tankering Calculation Companies

- **AvFuelSaver App**

Relatively simple app and calculates a tankering savings for a *two-leg trip*, comparing tankering fuel versus uploading fuel for each leg.

NOTE: These are merely a sampling of current tankering applications. Gulfstream does not explicitly endorse in any of these products.

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Existing Tankering Calculation Companies (Continued)

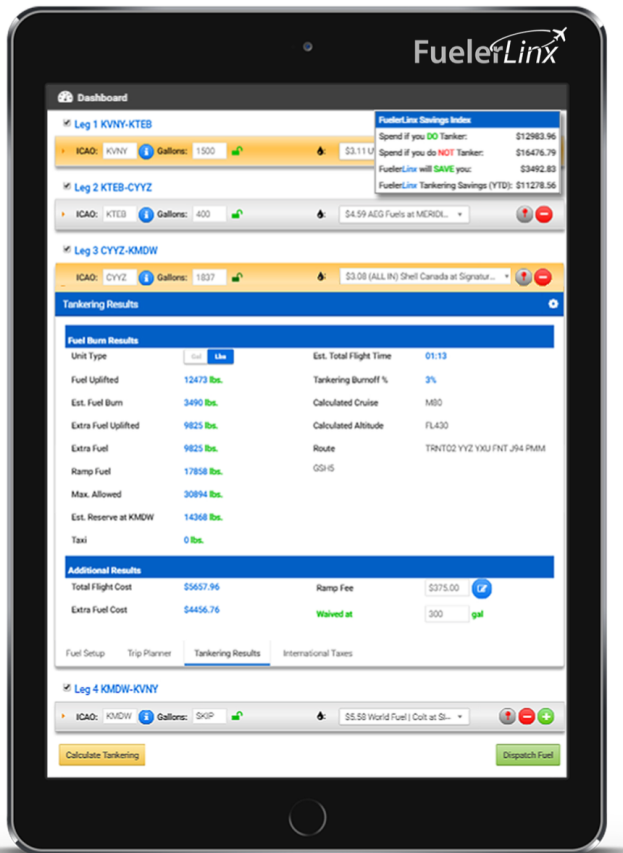
- **Fuelerlinx**

Integrates with SkyPlan's flight planning engine (using live or historical winds) to optimize routing, calculate flight times, predict fuel burns, and weigh the tankering penalty.

Participates with all major fuel resellers and large chains. The system is also capable of including direction FBO and fuel farm pricing. This enables real time world-wide automated customer specific quotes that are updated with each market change.

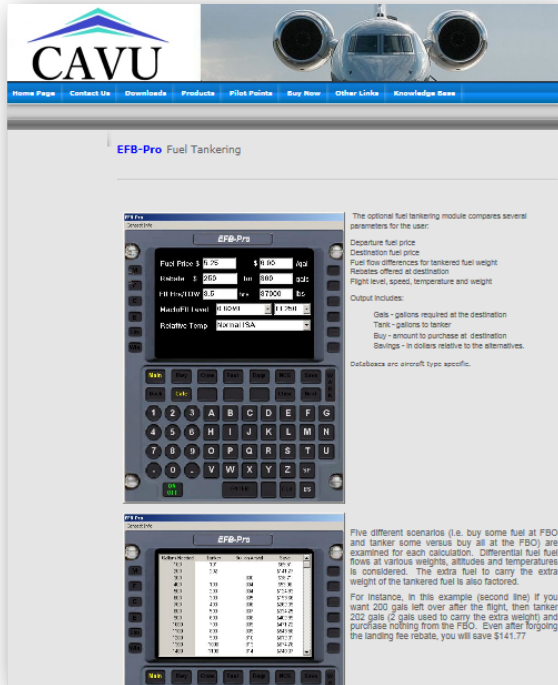
Works with all of the major scheduling software packages such as FOS, PFM, Bart, Camp, Avianis, Avmosys, aircraftlogs.com, FlightTrak, FltLogic, and SchedAero.

Fleet pricing discounts are available. Fuelerlinx currently has over 2,000 aircraft enrolled, and the customer base is split evenly between Part 91 and 135 operators.



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Existing Tankering Calculation Companies (Continued)

- **CAVU's EFB-Pro performance-calculating iPad App**

Includes a tankering module, and a relatively simple-to-use iPhone app—AvFuelSaver—developed by Specific Range Solutions.

CAVU Companies includes a tankering calculator in its EFB-Pro iPad app, keeping the process simple and avoiding adding too many variables by limiting the tankering calculation to a *single leg*.

EFB-Pro variables include takeoff weight, altitude, temperature, speed, destination fuel price and how much fuel must be purchased to eliminate a ramp fee providing a side-by-side analysis of what is the best solution for each number of gallons that remaining at destination.

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