

87th SOP: The OPS Check

There seems to be some confusion as to the SOP regarding OPS Checks. Some officers consider that reporting the Fuel Totalizer value alone constitutes a sufficient OPS Check, and are subsequently questioning why other pilots may call out something similar to "Cowboy12, 28, 32, Ten Point Seven, Tanks Feeding." There has even been a suggestion that such a call is just a waste of time. I could just use the 87th motto "As Real As It Gets" as an answer but I would not be doing justice to the BMS coders who have put countless hours into an outstanding F16 flight simulator we now have in our hands today in terms of avionics, systems, flight envelope and graphics.

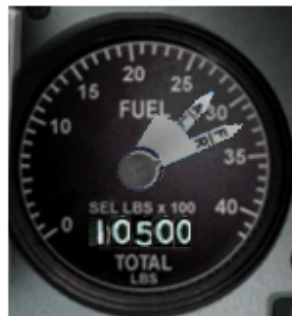
Such a position is partially true if you just hit commit to taxi or take-off for your hops. The aircraft's FUEL systems are tuned up to checklist standards, so you will have no problems whatsoever, unless random failures are set, or you forget to reset switches after air refueling is conducted.

But if you "cold start" the jet, and don't use the checklist regarding the Fuel system avionics, some pretty ugly things can happen. Fuel imbalance resulting in a shift of the jet's center of gravity will be the least of your worries, (although you are more prone to departures this way). More serious hazards may arise with the worst being engine fuel starvation, without any bingo warning.

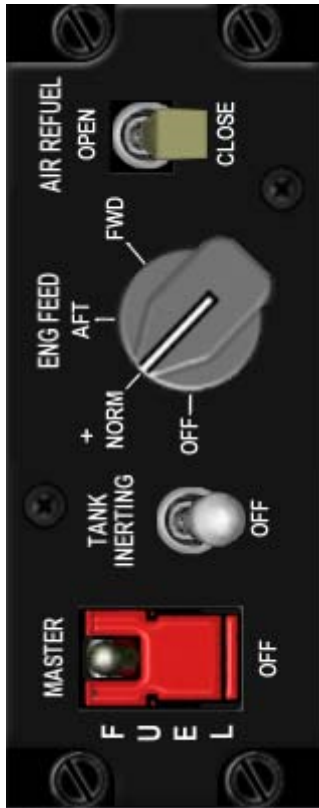
During an OPS check, the minimum items to check are engine instruments, total and internal fuel quantities / balance. You will set your FUEL QTY SEL knob to NORM and get the readings of the AL and FR pointers and call using the format:

"Callsign, AL pointer, FR pointer, Total fuel, tank(s) feeding / dry."

Example: "Viper12, 28, 32, 105 (or ten point five), tanks feeding."



If total fuel is over 7160±300 pounds, the AL pointer should read 2810±100 pounds and FR 3250±100 pounds. The difference between the two values for an F16C should be 0-600 pounds. If the difference is exceeded in any direction, a red portion on the AL pointer becomes visible signaling a fuel imbalance and you will have to change the fuel



distribution by rotating the ENG FEED knob to either the FWD or AFT position until the imbalance is corrected. A failure to do so will result in an out of center of gravity jet (yes trimming will be needed) and in a worse case scenario, if only one pump is operating, a FWD or AFT FUEL LOW caution light with an imminent engine fuel starvation.



If the total fuel is over 7160±300 pounds, and AL/FR pointers both show that their fuel quantity is less than their capacity, external fuel (if carried) is not feeding into the L/R wing tanks. You will get a TRP FUEL warning (ie. a Trapped Fuel warning) in this situation, but only when five conditions are met:

1. FUEL QTY SEL knob is in NORM
2. Aerial refueling has not occurred within the previous 30-90 seconds.
3. Total fuel has been at least 500 pounds greater than the fuselage fuel for 30 seconds
4. Fuselage fuel has been at least 500 pounds less than fuselage capacity for 30 seconds.
5. Fuel flow has been less than 18,000 pph for 30 seconds.

If you get a TRP FUEL warning, or AL/FR pointers show less value than they should when tanks are carried, the AIR SOURCE knob is in the OFF or RAM position. Tanks are not pressurized and external fuel cannot be fed into the left and right wing tanks. You will have to turn the AIR SOURCE knob to NORM (or less likely the DUMP position). External tank(s) are also depressurized when the Air Refuel (AR) door is open. If carrying external tanks, the AR door should be opened 3 to 5 minutes prior to commencing refueling, so they can depressurize and be filled.



Another way to check if the tanks are feeding is to place the FUEL QTY SEL knob to the INT WING position. AL/FR pointers should both read 550±100 pounds each corresponding to the capacity of the left and right internal wing tanks. If their value is lower and Total fuel reads more than 7160±300 pounds, the external tanks are not feeding the internal wing tanks.

There is also the option of checking if fuel quantity is decreasing from the external tank(s) by placing the FUEL QTY knob to EXT WING or EXT CTR positions and monitoring their fuel quantity directly.

If for some reason you have the ENG FEED knob in the OFF position be aware that a negative G maneuver will result in an immediate engine fuel starvation.

Some things to consider when setting Bingo fuel.

The Bingo fuel warning is based either on fuselage fuel (ie. internal fuel only) with the FUEL QTY SEL knob in NORM, or on the total fuel (ie. including the fuel remaining in external tanks) with the FUEL QTY SEL knob out of NORM.

With the FUEL QTY SEL knob in NORM, the bingo computation is based on the lesser of fuselage fuel weight or total fuel weight. That is, with the FUEL QTY SEL knob in NORM, bingo fuel warning will be triggered when either fuselage fuel or total fuel decreases below the bingo fuel value.

With the FUEL QTY SEL knob out of NORM, the warning will only be triggered when total fuel decreases below the bingo value. For the junkies amongst you, in fact it's somewhat worse than that. The fuselage fuel is considered to be fixed at 6667lbs, and so a Bingo value set below this will never trigger a Bingo warning. With trapped external fuel, this could lead to fuel starvation before the bingo warning is triggered.

Let's see an example of how disastrous this could be on a mission.

Consider a SEAD Escort flight of 2 F-16Cs, fully internal fuel loaded (7200lbs) with 2 external wing tanks (4800lbs) giving a total fuel weight of 12,000lbs. Lead has briefed Joker 4,000 and Bingo 3,000.

After the RAMP start and before take off, Lead checks his fuel quantities by rotating the FUEL QTY SEL knob and confirms total fuel reads 12000lbs, but makes his first critical mistake: he forgets to return the FUEL QTY SEL knob back to the NORM position. To make things worse, during the RAMP start, he left the AIR SOURCE knob in the OFF position, his second critical mistake.

Let's remind ourselves that when the AIR SOURCE knob is in OFF, tank pressurization is not available and external fuel cannot be transferred into the left and right wing tanks. It is "trapped." Unfortunately he will not get a TRP FUEL warning to alert him to the fact that fuel is not feeding from the wing tanks to the fuselage because the FUEL QTY SEL knob is not in NORM. So his fuel state is as follows:

INT Fuel	EXT Fuel	Total
7200	4800	12000

After take off and with his flight in formation flying TOS in their assigned altitude block, Lead initiates an OPS check, and calls: "Standby OPS Check: 1's Fuel State is 10800." (A bad call). So his fuel state now is as follows:

INT Fuel	EXT Fuel	Total
6000	4800	10800

In other words he's burned 1200lbs of internal fuel, and as fuel is fed initially from the wing tanks, whose combined capacity is around 1100lbs, these are now empty, and his forward and aft fuselage tanks start to empty.

Crossing the FLOT Lead fences in and calls out his new fuel state, 8800lbs. ie.

INT Fuel	EXT Fuel	Total
4000	4800	8800

Note that Lead is now at Joker, but gets no Bingo warning from the VMU, because his FUEL QTY SEL knob is out of NORM.

Approaching Target, Lead releases his AGM 88s on active SA6's but incomplete Intel results in the target area being better defended than expected, and his RWR shows several unexpected MUD Spikes. Looking down he sees his Total Fuel is at 5900lbs:

INT Fuel	EXT Fuel	Total
1100	4800	5900

and decides to jettison his external tanks, go combat jet, and ready himself to be in a better position to defend anything likely to give him a headache.

INT Fuel	EXT Fuel	Total
1100	0	1100

Immediately he gets his "Bingo .. Bingo .." warning, and with 1100lbs deep inside enemy territory, he is in big trouble

So, there's a good reason why you call out the position of the AL/FR pointers, and tanks feeding, when initiating or responding to an OPS check. Granted, in the heat of battle, Lead may just want an update on your total fuel after an engagement and you've turned COLD briefly.

However, at other times, remember there are good reasons why these knobs and switches exist and implemented, and hence the SOP on OPS Check.

It's as "Real As It Gets."

Now, if you like to breathe, eat and sleep avionics, you'll see that there's a problem with the example we've given here. If you leave the AIR SOURCE knob in OFF or RAM, there are subsequent degraded effects on the Environmental Control System (ECS). Not only do you lose fuel tank pressurization, but you'll also lose other pressurization functions such as G-suit, PBG (Pressure Breathing for G), canopy seal and OBOGS (Onboard Oxygen Generating System). As well you'll lose all air conditioning, all of which, you should notice in the real jet. ECS is not yet fully implemented in Falcon 4 but who knows what the future holds?

This example however still serves its purpose though, in illustrating the danger of not recognizing a trapped fuel situation (which can occur for a variety of reasons), the effect of the position of the FUEL QTY SEL on Bingo calculations and hence why it is important to follow the SOP on the OPS Check.

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Thanks to 2lt Nutty 873rd for avionics contributions and proof reading.