About the 747-8 Fuel System Model
by John Williams

1. APU
   -The APU draws fuel from Tank #2, the inboard left main wing tank.
   - It is supplied by the Main #2 boost pump(s) if they are running. Otherwise, it has it's own DC pump to supply it with fuel.
   - The DC pump will overheat and shut itself off after about 15-20 minutes (depending on fuel temperature and fuel flow rate). If you plan to run the APU for longer, turn on the APU generators and use the Main #2 boost pumps.
   - Nominally, the APU should consume about 900-1000 lbs of fuel per hour.
   - Each APU generator increases the APU fuel consumption by 0.3%.
   - Each air conditioning pack increases the APU fuel consumption by 2%.
   - Packs High-Flow adds a 6% surcharge to the fuel consumption by the packs.
   - Engine starts increase the APU fuel consumption by 20% per engine.

2. Boost Pumps
   - Each wing has 2 main fuel tanks, one for each engine. The boost pumps in each tank #1 to 4 supply fuel pressure to the corresponding engine. Drawdown of fuel in each tank depends on these pumps and on the fuel x-feeds.

3. Transfer/Override Pumps
   - The center tank and the inboard main wing tanks have pumps that supply fuel to the x-feed manifold. Any one of these systems can supply fuel for all 4 engines (as long as the individual boost pumps are running) via the x-feed. The overhead panel buttons for the inboard main wing tank override pumps arm the pumps, but they are activated automatically by aircraft system logic.
   - The horizontal stabilizer tank also has two transfer pumps that move fuel from this tank into the center tank (Intercontinental only). These pumps must be armed by depressing the STAB TANK buttons on the overhead panel. The pumps will not run until the center tank drops below 80,000 lbs, at which point the pumps start automatically.

4. Horizontal Stabilizer Tank
   - Up to 3300 gallons of fuel stored in the horizontal stabilizer can be transferred to the center tank. This will start automatically when the center tank drops below 80,000 lbs. The 747-8F (freighter variant) is not equipped with a fuel tank in the horizontal stabilizer.

5. Center Tank
   - When the center tank drops below 800 lbs, the pumps will shut off and it will no longer supply fuel to the x-feed manifold. Two scavenger pumps will evacuate the remaining fuel from the center tank to the inboard wing tanks, tanks #2 and 3.

6. Reserve Tanks
   - Main tanks #1 and 4 each have a reserve tank. When the fuel level in one of the outboard main tanks drops below 13,500 lbs, fuel is gravity fed from the corresponding reserve tank into the main tank.

7. X-Feed Manifold
   - Fuel is supplied to the x-feed manifold by the center tank and main wing tank #2 and 3 override pumps.
   - When its x-feed valve is open, each engine's boost pumps can also supply fuel to the x-feed manifold (though this behavior is not directly modeled).
   - When override pumps are running, opening an engine's x-feed valve allows the engine to be supplied with fuel from the x-feed manifold instead of its corresponding fuel tank. This is the only way fuel can be drawn from the center tank (except the last 800 lbs, which are scavenged to Tanks #2 and 3).

8. Outboard to Inboard Gravity Feed
   - Fuel can be gravity fed from the outboard main wing tanks (#1 and 4) to the inboard main wing tanks (#2 and 3) leaving a minimum of 7000 lbs in each of the outboard tanks. The "Fuel Xfer" button at the top of the overhead panel opens the valves.
   - During fuel jettison, this happens automatically when the fuel level on the inboard tank drops below 20,000 lbs.

9. Fuel Jettison
   - The 747-8 is equipped with a fuel jettison system. Activating it will automatically close all the x-feed valves and open the fuel jettison port.
   - The center override pumps must be running to dump fuel from the center tank.
   - The override pumps in tanks #2 and 3 must be armed to dump fuel from the wing tanks.
   - Dumping fuel will stop automatically when the fuel quantity satisfies the maximum landing weight of the aircraft plus 1500 lbs.

10. Fuel Balancing
   - When the #2 and 3 cross feeds and the #2 and 3 override pumps are armed, system logic will maintain balance between the inboard main tanks automatically. Cross feeds are manually activated on the outboard tanks, and these can be used to manually balance the fuel between the outboard tanks by drawing fuel from the cross feed manifold on the engine with the low tank.

11. Control Panel Dialog (747-8i(F) > Control Panel)
   - You can set the target total fuel level (in pounds).
   - Click the Load Fuel button to start loading (or unloading) fuel. It takes about 40 minutes to go from totally empty to totally full.
   - The Show Fuel Trucks check box does what you think it would. The number of fuel trucks shown depends on the amount of fuel that needs to be loaded onto the aircraft, from 2 to 6 trucks.
   - Fuel loading is disabled when the aircraft is not on the ground with the parking brake engaged. Releasing the parking brake will immediately stop fuel transfer and make the fuel trucks disappear.
   - The In-Flight Tank Management check box allows the fuel tanks to switch automatically during your flight to maintain proper distribution. This feature is automatically activated when you use the Autostart in the 747-8i/F menu.
   - If you choose to manage the tanks manually, see below for fuel tank management guidelines.
   - The Quick Balance button is a non-realistic cheat that instantly redistributes the total fuel on board in an optimal way. This button is disabled when there is less than 4500 lbs of fuel on board. Clicking this button will immediately stop any fuel transfer operations. The main purpose of this button is to quickly and easily distribute your fuel load when you don’t want to wait for 40 minutes to fuel from the trucks. If you use it to rebalance the load after the APU has depleted fuel from #2 Main, you’re cheating. But, who am I to judge?

12. Fuel Tank Management Guidelines
   - Fuel stored in the center tank (and the horizontal stabilizer tank) should be consumed first.
   - When the center tank is empty, fuel stored in the inboard main wing tanks (#2 and 3) should be consumed next.
   - When the fuel level in the inboard main wing tanks (#2 and 3) is roughly equal to, but not less than the sum of the levels in the outboard main and reserve wing tanks (#1 and 4), fuel should be consumed by all 4 main wing tanks.
   - Fuel tanks can be managed with the overhead panel switches. As mentioned above, the center tank shuts off automatically when it drops below 800 lbs.