



PHOTO: USAF

E-4B with air refueling receptacle doors open, about to be 'plugged' by a KC-135 tanker.

SHE'S GOT LEGS

This is a tale of three Boeing 747s, each on a separate journey from Washington, D.C., to Sydney, Australia. All three aircraft have incredibly long ranges. But Washington to Sydney is about 8,500 nautical miles, depending on which airport you choose. Sounds impossible—but it's not.

Chronicle by JAMES ALBRIGHT

IN DECEMBER OF 1991, an Air Force VC-25 (Boeing 747-200) flew President George H. W. Bush from Washington to Sydney with a ground-refueling stop in Honolulu. It was one of two VC-25s based out of Andrews Air Force Base, Maryland. The airplanes are usually flown as Air Force One and can average around 500 knots, true airspeed. Considering a 20-knot headwind, the trip would have taken around 20 hours. (First leg: 8 hours 45 minutes; refuel time: 2 hours; second leg: 9 hours 15 minutes.)

Let's say you wanted to follow the President on his journey Down Under and had booked a ticket asking for the fastest airplane and shortest en route

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time. If you were lucky, you would have found yourself on a Boeing 747 from Washington Dulles to Los Angeles (5 hours 30 minutes), would have changed to another Boeing 747 and then jetted non-stop to Sydney (15 hours 15 minutes). If you were really lucky, your LAX layover would have lasted no more than an hour, so your total travel time could have been of as little as 22 hours.

Not bad, I hear you say. In less than a day, you would have flown almost halfway around the world. Of course there would have been that pesky ground time, either waiting for the fuel truck or racing through the terminal to make the connection. Could you have done better? Yes.

The United States Air Force also operates four Boeing 747-200s designated as E-4Bs, based out of Offutt Air Force Base, Omaha, Nebraska. The E-4Bs serve as National Airborne Operations Centers (or NAOCs) for the President, Secretary of Defense and Chairman of the Joint Chiefs of Staff or CJCS. On the same day Air Force One was making its journey Down Under, an E-4B was flying the same trip from Nebraska to Darwin, Australia. Although this trip was only about 700 nautical miles shorter, the E-4B flew non-stop.

How was this possible? The E-4B has a trick up its sleeve that the other two aircraft do not: air-refueling.

True, the VC-25s have the plumbing necessary for air refueling but, at the time, none of their Pilots were qualified. Air refueling is a demanding task on any airplane, but much more so for one this size. The tanker tends to fly a steady platform at around 25,000 feet and 275 knots indicated airspeed. The receiver is hand-flown and the Pilots must position their aircraft inside an air-refueling envelope that is barely eight feet by eight feet by eight feet. As the tanker offloads fuel, its weight decreases and its Pilots must smoothly reduce power to avoid accelerating away from the receiver. The receiver's task



PHOTO: BEN WANG

A Boeing E-4B takes off from San Francisco International Airport.

is even more demanding; as it takes on fuel, its Pilots must constantly add thrust, which completely upsets the aircraft's pitch. This requires a fine touch with the controls.

No Pilot is allowed to air refuel the E-4B without having mastered the art as a receiver air-refueling instructor on other large aircraft, such as the B-52 bomber, the RC-135 reconnaissance aircraft, or the E-3 AWACS.

So the E-4B had this advantage over the VC-25. But it wasn't necessarily an advantage in time. While the E-4B was every bit as fast as the other two Boeing 747s, it had to slow considerably for the air refueling procedure.

On the flight to Australia, the E-4B's crew was able to cruise at the airplane's best range speed of Mach 0.86, but had to descend and slow down for each of the three air-refuelings. The other two Boeing 747s were able to average a true airspeed of nearly 500 knots; with the three air-refuelings thrown in, the E-4B's average for the trip was down to 410 knots.

To make an 'apples-to-apples' comparison, one would need to add the two hours of flying time from Washington to Omaha. This means that the D.C.-to-Sydney flying time of the E-4B would have been 21 hours, making it an hour longer than the VC-25's (with one ground refueling) and only an hour shorter than that of your hypothetical commercial flight (with an airplane change).



PHOTO: USAF

A Boeing KC-135 Stratotanker refueling a Boeing E-4 Advanced Airborne Command Post

Another disadvantage of air refueling is that it is expensive. Pilots are said to require an hour of training for every hour of operational duty. Tanker crews also need significant training and, because it takes fuel to carry fuel, the costs are very high.

So, does this mean the E-4Bs' air-refueling capability is wasted? Not at all. While the VC-25s and commercial Boeing 747s will typically be down to an hour or two of fuel after their very long flights, the E-4Bs will plan to land with enough fuel to carry on for much longer. In its role of backup to Air Force One, the E-4Bs give the President guaranteed air transportation, no matter how long he or she had already been in the air.

Major Keith Rumohr served as the aircraft commander on the 19-hour trip (the 'AC' is what civilians would call the Captain, which is more a rank than a crew position in the Air Force). He was accompanied by Pilot Lieutenant Colonel Michael Shannon, Navigator Captain Robert Mills, and Flight Engineer Technical Sergeant David Wright. Of course, because of the duration of the trip, there was a second crew on board.

They needed three air-refuelings to make the long distance trip—but there was more to it than that.

"Fuel was never an issue," said Major Rumohr. "The AR south of Hawaii was the most demanding. We took two KC-10s worth of fuel and I remember being very power-limited on the final tanker because we were so heavy. If we didn't get the Marshall Island tanker, we wouldn't have the fuel to go immediately airborne after landing. We still could have made Darwin."

The tanker was on time—and so was the airplane for its arrival Down Under. "We chased the sun the entire way from Omaha to Darwin and landed as it was setting," Lieutenant Colonel Shannon said. "It was a beautiful evening and a perfect way to end the 19 hours."

A typical Boeing 747-200 has a basic operating weight of just over 380,000 lb and a maximum weight of 833,000 lb. With a fuel capacity of over 52,000 USg, these airplanes can fly nearly 6,900 nautical miles, and plan on ending the journey with just over an hour of flying time left in the tanks.

The E-4B is about 20,000 lb heavier when empty and tops out at 803,000 lb. With a lower fuel capacity and a higher profile drag, the E-4B has an unrefueled range of 6,200 nautical miles. But, with a fleet of tankers at its disposal, the range of the airplane is thought to be limited only by the engines' oil consumption (the airplane was once flown for 35 hours in a single flight). The E-4B can land safely at 630,000 lb, still carrying 20,000 USg of fuel, enough for five more hours of flight and on to the next tanker.

So, with the added capability of air-refueling, the E-4B will never find itself unable to carry out its primary mission: to provide "a highly survivable command, control and communications center to direct US forces, execute emergency war orders and coordinate actions by civil authorities," as described in the official US Air Force fact sheet.

And it can do that even after having flown 19 hours around the world. —JA