Narrator: The space shuttle could get all the way to space on its own power whenever it
launched from NASA's Kennedy Space Center in Florida. But when a shuttle orbiter travels from
one place to another here on Earth, it needs a lift -- a piggyback ride, or "ferry flight,"
aboard the Shuttle Carrier Aircraft.

It's an unusual sight -- a low-flying jumbo jet, with a spaceship bolted onto its back.

"And it's really amazing to see, first, the orbiter in person. It's almost surreal."

Narrator: The Shuttle Carrier Aircraft is actually a Boeing 747 modified to handle the weight and
drag of the shuttle orbiter on its back. It's been supporting the Space Shuttle Program ever
since the approach and landing tests during the late 1970s. In 1990, NASA added an additional
modified 747 to its SCA "fleet" to make a total of two aircraft available for ferry flights.

The shuttles began all their space careers with ferry flights when they were first delivered to
Kennedy from the manufacturing plant in Palmdale, Calif.

But most of the time, a ferry flight was needed to bring a shuttle back from Edwards Air Force
Base in California following a landing on the west coast due to poor weather in Florida.
"When they built the 747, they built a very nice airplane. It does what you want when you fly it.

The only thing that's different is when you're carrying an orbiter, there is a very noticeable vibration, and of course speeds are quite a bit higher. But as far as the feel in the aircraft, and the ease with which the aircraft flies, it is deceptively easy."

Narrator: After an end-of-mission landing at Edwards, it took the landing team about a week, weather permitting, to prepare it for its upcoming cross-country trip.

A tail cone was installed to reduce aerodynamic drag and turbulence during the ferry flight.

The spacecraft was lifted inside a large, gantry-like device called the Mate/Demate device... the aircraft rolled underneath... and the orbiter was lowered and bolted into place.

The team simply reversed the process to remove the shuttle from the plane.

Sometimes, just getting the shuttle and aircraft ready for the trip could be a test in itself.

NASA Flow Director Stephanie Stilson recalls the challenges the ferry flight team encountered in 2005, after space shuttle Discovery landed at Edwards at the end of the return-to-flight mission, STS-114.
"And everybody thinks the desert, dry, no issues, no rain. Well, we had snow in the mountains, we had rain, we had lightning that actually struck the Mate/Demate device, and we had locusts. So it was like everything that could possibly happen outside of our control happened.

But once again, that just gave us a chance to show how we can react to changes and things that we're not expecting."

Narrator: But the toughest part of a ferry flight is keeping the shuttle safe from harmful weather or other conditions during flight. So, a "pathfinder" aircraft flies 100 miles ahead of the attached pair, making sure the flight path is safe and dry.

"You don't want to bring it through any turbulence."

No visible moisture.

There's some temperature limitations.

And essentially, we're the plane to make sure we don't bring the orbiter through there.

So our job is to be very vigilant of any change in weather conditions, and to make sure the orbiter is brought on a safe flight path."
Narrator: There were 87 ferry flights throughout the Space Shuttle Program, including flights for testing, delivery, orbiter upgrades, and of course, end-of-mission landings.

Today, the shuttles are being prepared at Kennedy to go on public display at sites across the country. Atlantis won't need an aircraft to move to its new home at the Kennedy Space Center Visitor Complex.

But Discovery, Endeavour and the test orbiter, Enterprise, will each take one last ride.

Discovery will be flown to Dulles International Airport in Virginia and then moved to the nearby Smithsonian Udvar-Hazy Center. It will take the place of Enterprise, which will be flown from there to the John F. Kennedy International Airport and then on to the Intrepid Air, Sea and Space Museum in New York City. Endeavour will be flown to Los Angeles International Airport, before making its way to the California Science Center in Los Angeles.

The bulky combination of orbiter and aircraft is unmistakable, and usually attracts attention from onlookers on the ground as it makes its way across the sky.

NASA plans to keep one of the modified 747 for its Stratospheric Observatory for Infrared Astronomy, or SOFIA, science program.
But as the shuttles make their final ferry flights, space fans along the way may be able to catch a glimpse of the duo making one more pass overhead. "So that's a great thing, to be able to do that, and then if we have any stops along the way, it's a chance for us to share the orbiter with the public in an area that most likely has never even seen a space shuttle that close."