1
00:00:01,850 --> 00:00:04,800
Narrator: The space shuttle could get all the way to space on its own power whenever it

2
00:00:04,800 --> 00:00:10,460
launched from NASA's Kennedy Space Center in Florida. But when a shuttle orbiter travels from

3
00:00:10,460 --> 00:00:16,010
one place to another here on Earth, it needs a lift -- a piggyback ride, or "ferry flight,"

4
00:00:16,010 --> 00:00:18,930
aboard the Shuttle Carrier Aircraft.

5
00:00:18,930 --> 00:00:25,050
It's an unusual sight -- a low-flying jumbo jet, with a spaceship bolted onto its back.

6
00:00:25,050 --> 00:00:31,640
"And it's really amazing to see, first, the orbiter in person. It's almost surreal."

7
00:00:31,640 --> 00:00:37,300
Narrator: The Shuttle Carrier Aircraft is actually a Boeing 747 modified to handle the weight and

8
00:00:37,300 --> 00:00:43,630
drag of the shuttle orbiter on its back. It's been supporting the Space Shuttle Program ever

9
00:00:43,630 --> 00:00:51,000
since the approach and landing tests during the late 1970s. In 1990, NASA added an additional

10
00:00:51,000 --> 00:00:58,640
modified 747 to its SCA "fleet" to make a total of two aircraft available for ferry flights.

11
00:00:58,640 --> 00:01:03,140
The shuttles began all their space careers with ferry flights when they were first delivered to

12
00:01:03,140 --> 00:01:07,900
Kennedy from the manufacturing plant in Palmdale, Calif.

13
00:01:07,900 --> 00:01:12,340

But most of the time, a ferry flight was needed to bring a shuttle back from Edwards Air Force

14
00:01:12,340 --> 00:01:18,550
Base in California following a landing on the west coast due to poor weather in Florida.

15
00:01:18,550 --> 00:01:27,880
"When they built the 747, they built a very nice airplane. It does what you want when you fly it.

16
00:01:27,880 --> 00:01:32,090
The only thing that's different is when you're carrying an orbiter, there is a very noticeable

17
00:01:32,090 --> 00:01:39,950
vibration, and of course speeds are quite a bit higher. But as far as the feel in the aircraft,

18
00:01:39,950 --> 00:01:45,540
and the ease with which the aircraft flies, it is deceptively easy."

19
00:01:45,540 --> 00:01:50,650
Narrator: After an end-of-mission landing at Edwards, it took the landing team about a week,

20
00:01:50,650 --> 00:01:54,291
weather permitting, to prepare it for its upcoming cross-country trip.

21
00:02:00,807 --> 00:02:06,870
A tail cone was installed to reduce aerodynamic drag and turbulence during the ferry flight.

22
00:02:06,870 --> 00:02:13,770
The spacecraft was lifted inside a large, gantry-like device called the Mate/Demate device... the

23
00:02:13,770 --> 00:02:18,940
aircraft rolled underneath... and the orbiter was lowered and bolted into place.

24
00:02:18,940 --> 00:02:24,640
The team simply reversed the process to remove the shuttle from the plane.

25
00:02:24,640 --> 00:02:29,880
Sometimes, just getting the shuttle and aircraft ready for the trip could be a test in itself.

26
00:02:29,880 --> 00:02:35,040
NASA Flow Director Stephanie Stilson recalls the challenges the ferry flight team encountered in

27
00:02:35,040 --> 00:02:41,370
2005, after space shuttle Discovery landed at Edwards at the end of the return-to-flight mission,

28
00:02:41,370 --> 00:02:43,590
STS-114.

29
00:02:43,590 --> 00:02:49,250
"And everybody thinks the desert, dry, no issues, no rain. Well, we had snow in the mountains,

30
00:02:49,250 --> 00:02:54,740
we had rain, we had lightning that actually struck the Mate/Demate device, and we had locusts.

31
00:02:54,740 --> 00:02:59,110
So it was like everything that could possibly happen outside of our control happened.

32
00:02:59,110 --> 00:03:03,180
But once again, that just gave us a chance to show how we can react to changes and things that

33
00:03:03,180 --> 00:03:05,020
we're not expecting."

34
00:03:05,020 --> 00:03:08,800
Narrator: But the toughest part of a ferry flight is keeping the shuttle safe from harmful

35
00:03:08,800 --> 00:03:15,960
weather or other conditions during flight. So, a "pathfinder" aircraft flies 100 miles ahead of the

36
00:03:15,960 --> 00:03:21,480
attached pair, making sure the flight path is safe and dry.

37
00:03:21,480 --> 00:03:22,909
"You don't want to bring it through any turbulence.

38
00:03:23,678 --> 00:03:24,581

No visible moisture.

39
00:03:24,581 --> 00:03:26,534
There's some temperature limitations.

40
00:03:26,534 --> 00:03:33,360
And essentially, we're the plane to make sure we don't bring the orbiter through there.

41
00:03:33,360 --> 00:03:37,310
So our job is to be very vigilant of any change in weather conditions,

42
00:03:37,310 --> 00:03:41,990
and to make sure the orbiter is brought on a safe flight path."

43
00:03:41,990 --> 00:03:47,540
Narrator: There were 87 ferry flights throughout the Space Shuttle Program, including flights for

44
00:03:47,540 --> 00:03:52,990
testing, delivery, orbiter upgrades, and of course, end-of-mission landings.

45
00:03:52,990 --> 00:03:58,760
Today, the shuttles are being prepared at Kennedy to go on public display at sites across the

46
00:03:58,760 --> 00:04:03,640
country. Atlantis won't need an aircraft to move to its new home at the

47
00:04:03,640 --> 00:04:06,700
Kennedy Space Center Visitor Complex.

48
00:04:06,700 --> 00:04:13,690
But Discovery, Endeavour and the test orbiter, Enterprise, will each take one last ride.

49
00:04:13,690 --> 00:04:19,090
Discovery will be flown to Dulles International Airport in Virginia and then moved to the nearby

50
00:04:19,090 --> 00:04:25,130
Smithsonian Udvar-Hazy Center. It will take the place of Enterprise, which will be flown from

51
00:04:25,130 --> 00:04:30,470
there to the John F. Kennedy International Airport and then on to the Intrepid Air, Sea and

52
00:04:30,470 --> 00:04:39,150
Space Museum in New York City. Endeavour will be flown to Los Angeles International Airport,

53
00:04:39,150 --> 00:04:45,090
before making its way to the California Science Center in Los Angeles.

54
00:04:45,090 --> 00:04:50,460
The bulky combination of orbiter and aircraft is unmistakable, and usually attracts attention

55
00:04:50,460 --> 00:04:55,350
from onlookers on the ground as it makes its way across the sky.

56
00:04:55,350 --> 00:05:01,650
NASA plans to keep one of the modified 747 for its Stratospheric Observatory for Infrared

57
00:05:01,650 --> 00:05:05,390
Astronomy, or SOFIA, science program.

58
00:05:05,390 --> 00:05:10,890
But as the shuttles make their final ferry flights, space fans along the way may be able to catch

59
00:05:10,890 --> 00:05:15,720
a glimpse of the duo making one more pass overhead.

60
00:05:15,720 --> 00:05:19,680
"So that's a great thing, to be able to do that, and then if we have any stops along the way,