
TESS
COUNTDOWN
TO
T-ZERO

1
00:00:01,949 --> 00:00:04,500
These are not the best of conditions.

2
00:00:04,500 --> 00:00:10,130
But for these knights of the highway, hauling
a multimillion-dollar spacecraft more than

3
00:00:10,130 --> 00:00:13,160
800 miles is all in a day’s work.

4
00:00:13,160 --> 00:00:16,250
They’re carrying NASA’s next planet-hunter,
TESS.

5
00:00:16,250 --> 00:00:21,190
TESS stands for Transiting Exoplanet Survey
Satellite.

6
00:00:21,190 --> 00:00:26,170
Its job is to search for habitable planets
outside our solar system -- but close enough

7
00:00:26,170 --> 00:00:27,170
to study.

8
00:00:27,170 --> 00:00:33,040
That’s because we’re not just looking
for planets, we’re looking for life.

9
00:00:37,160 --> 00:00:41,620
And the first leg of this spacecraft's journey
to orbit is the ride to the NASA’s Kennedy

10
00:00:41,620 --> 00:00:42,620
Space Center.

11
00:00:42,620 --> 00:00:44,000
"So we left yesterday for Dulles.

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00:00:44,000 --> 00:00:47,870
We left at 10:15 in the morning.

13
00:00:47,870 --> 00:00:50,280
Ran into an accident on I-95.

14
00:00:50,280 --> 00:00:55,130
Horrible weather, rain down through Richmond."

15
00:00:55,130 --> 00:01:01,610
The 16-hour road trip from Virginia to Florida
wasn’t easy, and protecting this one-of-a-kind

16
00:01:01,610 --> 00:01:03,530
spacecraft during its move was vital.

17
00:01:03,530 --> 00:01:08,100
Its shipping container is designed to keep
TESS safe on the road.

18
00:01:08,100 --> 00:01:10,200
"The case gets used for a number of missions.

19
00:01:10,200 --> 00:01:14,380
It’s mounted on shock-absorbing bumpers
so that we don’t see a lot of the road noise

20
00:01:14,380 --> 00:01:16,399
getting into the spacecraft while in transit.

21
00:01:16,399 --> 00:01:17,609
We don’t want any humidity inside.

22
00:01:17,609 --> 00:01:21,110
We don’t want the temperature to change,
so we have an air conditioning system as well.

23
00:01:21,110 --> 00:01:24,850

So we're just trying to keep it environmentally
stable on the trip.

24
00:01:24,850 --> 00:01:27,619
And then we have very sensitive science instruments.

25
00:01:27,619 --> 00:01:32,429
So we actually provide a nitrogen purge, in
which we spray nitrogen gas in to make sure

26
00:01:32,429 --> 00:01:35,380
no air gets in contact with some of the sensitive
components."

27
00:01:35,380 --> 00:01:40,789
TESS has safely made it to Kennedy, where
it is immediately taken to the Payload Hazardous

28
00:01:40,789 --> 00:01:42,740
Servicing Facility.

29
00:01:42,740 --> 00:01:46,009
But the job of keeping it clean is far from
over.

30
00:01:46,009 --> 00:01:49,280
"TESS has really strict contamination control
requirements.

31
00:01:49,280 --> 00:01:54,350
So what we've done is created a clean enclosure
inside the high bay that acts like a cleanroom

32
00:01:54,350 --> 00:01:56,090
within a cleanroom, basically."

33
00:01:56,090 --> 00:02:01,380
This is a unique mission full of first-time
events that are sure to be a challenge.

34
00:02:01,380 --> 00:02:03,209
"TESS isn’t like another mission.

35
00:02:03,209 --> 00:02:04,209
We haven’t done another TESS.

36
00:02:04,209 --> 00:02:05,479
It’s the first of its kind."

37
00:02:05,479 --> 00:02:10,579
The time has come for this diverse team to
put years of planning into practice as they

38
00:02:10,579 --> 00:02:12,930
begin the countdown to T-Zero.

39
00:02:12,930 --> 00:02:16,349
"We’ve had a period of hard work that lasted
for years.

40
00:02:16,349 --> 00:02:18,790
And when we finally get to point of launch,
that’s very exciting.

41
00:02:18,790 --> 00:02:22,920
This is where the fun begins, after we’ve
gotten through all the early legwork and planning

42
00:02:22,920 --> 00:02:27,989
– that we are actually going to now prepare
a spacecraft for launch."

43
00:02:27,989 --> 00:02:32,849
Building on the groundbreaking discoveries
of the Kepler mission, TESS has scientists

44
00:02:32,849 --> 00:02:36,040
across the world excited about its possibilities.

45
00:02:36,040 --> 00:02:40,510
"ESS is probably one of the most interesting
spacecraft that I've ever worked on in my

46
00:02:40,510 --> 00:02:43,819
career, because of the science it's bringing
back down to Earth.

47
00:02:43,819 --> 00:02:47,069
It's taking science fiction to science fact."

48
00:02:47,069 --> 00:02:53,000
TESS will use the transit method to hunt for
the telltale signs of planets orbiting other

49
00:02:53,000 --> 00:02:54,000
stars.

50
00:02:54,000 --> 00:02:58,909
In the transit method, the spacecraft watches
the sky, and when a planet passes in front

51
00:02:58,909 --> 00:03:02,410
of a star, the star's light briefly dims.

52
00:03:02,410 --> 00:03:05,690
But Kepler only looked at one portion of the
sky.

53
00:03:05,690 --> 00:03:09,159
TESS is taking this search to a whole new
level.

54
00:03:09,159 --> 00:03:16,920
"What TESS is going to do is look around entire
sky around us to find stars nearby, much closer

55
00:03:16,920 --> 00:03:19,560
– ten times closer – than Kepler."

56
00:03:19,560 --> 00:03:26,200
"The really exciting part about this is it’s
the first all-sky survey of this type, using

57
00:03:26,200 --> 00:03:30,769
the transiting method to look for Earth-sized
and super-Earth planets."

58
00:03:30,769 --> 00:03:39,909
"I think the real interest by the public in
exoplanets is that everyone has a dream there’s

59
00:03:39,909 --> 00:03:46,040
an Earth analog out there, another planet
that has the ability to have an atmosphere,

60
00:03:46,040 --> 00:03:48,549
water, and sustain life on it.

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00:03:48,549 --> 00:03:53,499
That, of course, is the ultimate sort of goal
of exoplanet science."

62
00:03:53,499 --> 00:03:59,040
When all the prelaunch tests, inspections,
cleaning and checkouts are done, it’s time

63
00:03:59,040 --> 00:04:04,879
for TESS to join up with its launch vehicle:
the SpaceX Falcon 9 rocket.

64
00:04:04,879 --> 00:04:06,530
This is a critical process.

65
00:04:06,530 --> 00:04:09,470
And it begins with encapsulation.

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00:04:09,470 --> 00:04:12,249

This is the Falcon 9 payload fairing.

67
00:04:12,249 --> 00:04:18,440
Its smooth, aerodynamic profile will give
TESS a safe ride through the extreme heat

68
00:04:18,440 --> 00:04:22,000
and pressure of the climb to space.

69
00:04:22,000 --> 00:04:27,970
The vehicle systems engineer in NASA’s Launch
Services Program plays a critical role in

70
00:04:27,970 --> 00:04:30,620
bringing the spacecraft and rocket together.

71
00:04:30,620 --> 00:04:32,580
"We have our hands on just about everything.

72
00:04:32,580 --> 00:04:36,020
We have to know about each system to know
how they all interact together.

73
00:04:36,020 --> 00:04:41,530
We have to know how the vehicle operates as
a whole, so that’s how critical vehicle

74
00:04:41,530 --> 00:04:43,380
systems engineering is in this whole process.

75
00:04:43,380 --> 00:04:45,820
We’ve been working very closely with SpaceX
from the start.

76
00:04:45,820 --> 00:04:50,240
Even during the design phase and going through
the whole certification process, the vehicle

77
00:04:50,240 --> 00:04:53,780

systems engineer is integral in that role,
to understand what’s going on with the SpaceX

78
00:04:53,780 --> 00:04:57,350
launch vehicle and how the NASA team can supplement
a lot of what’s going on."

79
00:04:57,350 --> 00:05:02,110
The fairing is in one piece as it arrives
at the door to the high bay.

80
00:05:02,110 --> 00:05:07,470
Inside, the TESS spacecraft is ready and waiting
for encapsulation.

81
00:05:07,470 --> 00:05:12,060
"What’s exciting about encapsulation is,
it’s one of last few things we do to prepare

82
00:05:12,060 --> 00:05:14,700
the spacecraft to get ready to go on the launch
vehicle.

83
00:05:14,700 --> 00:05:18,680
It’s exciting, because you know we’re
launching in a few days, which is the most

84
00:05:18,680 --> 00:05:22,520
exciting part of working this mission the
past couple years."

85
00:05:22,520 --> 00:05:27,531
TESS has to be ready for prime time when it
gets into orbit – which means the last of

86
00:05:27,531 --> 00:05:31,380
its covers used during processing have to
come off.

87
00:05:31,380 --> 00:05:35,960

Once TESS is inside the fairing, it won't
be seen again on Earth.

88
00:05:35,960 --> 00:05:40,720
The payload fairing has been opened into two
halves, and they're positioned on either

89
00:05:40,720 --> 00:05:42,100
side of TESS.

90
00:05:42,100 --> 00:05:44,050
The spacecraft is surrounded.

91
00:05:44,050 --> 00:05:51,610
Slowly and carefully, the fairings are moved
into position, until TESS is locked inside.

92
00:05:51,610 --> 00:05:53,500
"Encapsulation's just been completed.

93
00:05:53,500 --> 00:05:56,560
Right now they're getting ready to lift
the spacecraft – the encapsulated spacecraft

94
00:05:56,560 --> 00:05:59,990
– on the trailer, which will then transport
it to the launch site.

95
00:05:59,990 --> 00:06:03,360
From there they'll mate the encapsulated
spacecraft to the launch vehicle, and at that

96
00:06:03,360 --> 00:06:06,000
point, that's the last major thing before
we get ready to launch.

97
00:06:06,000 --> 00:06:07,210
And that is exciting."

98

00:06:07,210 --> 00:06:11,860
A specialized transporter rolls into the processing facility’s high bay.

99
00:06:11,860 --> 00:06:17,810
It’s here to take the payload fairing and its precious cargo to be attached to the Falcon

100
00:06:17,810 --> 00:06:20,180
9 rocket.

101
00:06:20,180 --> 00:06:22,920
Getting TESS to this point was no small feat.

102
00:06:22,920 --> 00:06:29,060
It took several teams working closely together to ensure every system and every piece of

103
00:06:29,060 --> 00:06:32,380
hardware are ready for this mission.

104
00:06:32,380 --> 00:06:37,020
With the crane doing the heavy lifting, the fairing rises off the floor.

105
00:06:37,020 --> 00:06:43,840
It’s guided toward the transporter, with team members helping, every inch of the way.

106
00:06:43,840 --> 00:06:49,160
The fairing must be attached securely to the transporter for the final miles of its journey

107
00:06:49,160 --> 00:06:50,300
on Earth.

108
00:06:50,300 --> 00:06:53,120
There is no margin for error.

109

00:06:53,120 --> 00:06:54,830
The Falcon 9 rocket is waiting.

110
00:06:54,830 --> 00:06:58,060
"The Falcon 9 for the TESS mission is a new
launch vehicle.

111
00:06:58,060 --> 00:07:01,910
We are planning to recover the first stage
from the TESS mission on the drone ship Of

112
00:07:01,910 --> 00:07:03,110
Course I Still Love You.

113
00:07:03,110 --> 00:07:08,080
If successful, this will be the 24th successful
booster landing for SpaceX.

114
00:07:08,080 --> 00:07:12,430
By recovering first stages, not only do we
understand more about our launch vehicle,

115
00:07:12,430 --> 00:07:16,990
it also enables us to reuse and re-fly that
hardware, which is a key part of the SpaceX

116
00:07:16,990 --> 00:07:17,990
mission."

117
00:07:17,990 --> 00:07:23,190
The fully assembled Falcon 9 rocket, with
TESS on board, rolls out of the hanger at

118
00:07:23,190 --> 00:07:27,440
Space Launch Complex 40 at Cape Canaveral
Air Force Station.

119
00:07:27,440 --> 00:07:29,690
It's final stop - the launch pad.

120
00:07:29,690 --> 00:07:33,810
"The SpaceX team is really proud to be part
of such a cool mission, the TESS mission.

121
00:07:33,810 --> 00:07:38,740
The TESS satellite is looking for planets
outside of our solar system in our galaxy,

122
00:07:38,740 --> 00:07:42,960
which aligns very well with the SpaceX vision
to make life multiplanetary.

123
00:07:42,960 --> 00:07:47,760
To prepare for rocket to be vertical on pad
today, the engineering team in hangar did

124
00:07:47,760 --> 00:07:52,840
those final, last checks; mated the fairing
to the rocket; and once the launch vehicle

125
00:07:52,840 --> 00:07:57,240
was finally checked out, the rocket rolled
out of hangar late last night and went vertical

126
00:07:57,240 --> 00:07:58,410
early this morning.

127
00:07:58,410 --> 00:07:59,410
TESS is healthy.

128
00:07:59,410 --> 00:08:01,850
The Falcon 9 rocket stands ready.

129
00:08:01,850 --> 00:08:03,480
It’s time for the final count.

130
00:08:03,480 --> 00:08:04,480
T-Zero is just seconds away.

131
00:08:04,480 --> 00:08:07,080
"So launch day is a pretty incredible day.

132
00:08:07,080 --> 00:08:09,720
Those last few minutes, you're holding your
breath – you find yourself holding your

133
00:08:09,720 --> 00:08:13,120
breath until you get that T-Zero count.

134
00:08:13,120 --> 00:08:19,370
I lead a team of LSP engineers to successfully
launch our spacecraft into orbit."

135
00:08:19,370 --> 00:08:24,030
"The SpaceX team has partnered with the NASA
Launch Services Program, NASA Goddard [Space

136
00:08:24,030 --> 00:08:27,380
Flight Center], Orbital ATK and MIT [Massachusetts
Institute of Technology] to enable that planet-finding

137
00:08:27,380 --> 00:08:28,380
mission."

138
00:08:28,380 --> 00:08:32,399
"We go on console three-and-a-half or four
hours before launch.

139
00:08:32,399 --> 00:08:37,560
We do our voice checks to be sure we can activate
all the voice channels that we'll need to

140
00:08:37,560 --> 00:08:39,870
listen to at any one point in time.

141
00:08:39,870 --> 00:08:43,500
We listen to six or seven voice channels at
same time so you're kind of training your

142
00:08:43,500 --> 00:08:46,460
ears to listen for your call sign.

143
00:08:46,460 --> 00:08:50,920
The team has a great responsibility to look
at all this data and say yes, we are go for

144
00:08:52,560 --> 00:08:51,920
launch."

145
00:08:52,840 --> 00:08:53,540
"Falcon 9 is in startup.

146
00:08:55,620 --> 00:08:57,600
Falcon 9 is configured for flight."