tracking

1
00:00:00,003 --> 00:00:03,440
>>Flashing across California desert skies, the airplanes you see

2
00:00:03,440 --> 00:00:07,544
here are writing new chapters in the story
of man made flight....there she goes!

3
00:00:07,544 --> 00:00:12,082
>>This is my first opportunity
to greet you as deputy administrator

4
00:00:12,082 --> 00:00:15,752
of the National Aeronautics
and Space Administration.

5
00:00:16,086 --> 00:00:18,722
>>Together, you and I must make our new agency

6
00:00:18,722 --> 00:00:20,056
>>A most unusual place

7
00:00:20,090 --> 00:00:22,926
>>An organization that can challenge
conventional wisdom.

8
00:00:22,926 --> 00:00:26,530
>>We can engineer anything we can write the requirements for.

9
00:00:26,530 --> 00:00:27,931
>>We're going to make your idea work.

10
00:00:27,931 --> 00:00:30,500
This particular idea is quite disruptive.

11
00:00:31,168 --> 00:00:35,439
>>A typical flight, of course, starts
under the wing of the B-52 mothership.

12

00:00:35,605 --> 00:00:41,044
>>This sleek, high speed machine
would have made Rube Goldberg proud.

13
00:00:41,178 --> 00:00:44,047
>>The manner in which we fly
reentry from space,

14
00:00:44,047 --> 00:00:48,051
on the space shuttle was
pioneered on the X-15.

15
00:00:48,051 --> 00:00:53,657
>>The X-31 pretty much wrote the book on thurst vectoring, along with its sister program, the F-18 HARV.

16
00:00:53,657 --> 00:00:55,826
>>An observation of an occulation is

17
00:00:55,826 --> 00:00:58,795
one of the more challenging
missions that SOFIA can do.

18
00:00:59,596 --> 00:01:18,782
[Music/Background sound]

19
00:01:19,616 --> 00:01:23,987
>>Right now, we are looking
at the dawn of a new era of aviation.

20
00:01:27,023 --> 00:01:31,361
[Music/Background sound]

21
00:01:37,931 --> 00:01:40,867
[Music]

22
00:01:40,867 --> 00:01:42,235
>>Electrical pulses,

23
00:01:42,235 --> 00:01:43,837

transmitted with the speed of light...

24
00:01:43,870 --> 00:01:45,338
>>...to help man to see,

25
00:01:45,338 --> 00:01:48,975
to control, and tame the environment
of hurtling speed

26
00:01:49,008 --> 00:01:50,543
his science has created.

27
00:01:50,577 --> 00:01:51,644
>>Called telemetry,

28
00:01:51,644 --> 00:01:54,781
each craft has its own signature,
a unique tone

29
00:01:54,781 --> 00:01:56,983
[Music/Electrical sounds]

30
00:01:56,983 --> 00:01:59,519
>>Tracking
radar is designed to keep one target

31
00:01:59,519 --> 00:02:01,454
continuously centered in its beam.

32
00:02:01,454 --> 00:02:03,456
>>...facilities and equipment for air to ground

33
00:02:03,456 --> 00:02:05,258
monitoring of test flights were primitive.

34
00:02:05,258 --> 00:02:08,561
>>When I got here, they had just
barely converted from one where the guy

35
00:02:08,595 --> 00:02:12,132
sat there
and he actually looked at the airplane

36
00:02:12,765 --> 00:02:15,101
and steered that thing by hand.

37
00:02:15,635 --> 00:02:18,671
>>The radars are accurate
to within three meters.

38
00:02:18,705 --> 00:02:21,875
We know that
if the radar is locked on to the airplane,

39
00:02:22,108 --> 00:02:25,411
that if we slave the telemetry dish
or the LRO to it,

40
00:02:25,979 --> 00:02:29,182
that that dish will also be right
on the airplane.

41
00:02:29,916 --> 00:02:33,019
>>Flight research results
depended mostly on air to air chase

42
00:02:33,019 --> 00:02:36,389
observations and onboard data
recording for later examination.

43
00:02:37,290 --> 00:02:42,695
>>When I came here, they were taking data
from the airplanes on these oscilloscopes.

44
00:02:42,729 --> 00:02:46,599
We had to read the times off of ticks
on the film.

45

00:02:46,966 --> 00:02:50,803
Now there is onboard computers
that uplink and downlink...

46
00:02:51,004 --> 00:02:55,308
>>...real time data rather than coming down
and analyzing data between flights...

47
00:02:55,308 --> 00:02:59,312
>>...large computational problems are resolved
in real time

48
00:02:59,445 --> 00:03:01,814
as opposed to waiting
until the data gets down.

49
00:03:02,582 --> 00:03:07,887
>>Radar coverage is limited to line of sight
and is unable to see over the horizon

50
00:03:07,887 --> 00:03:09,589
or behind mountainous terrain...

51
00:03:09,989 --> 00:03:11,124
>>Before the X-15,

52
00:03:11,124 --> 00:03:14,160
all of that coverage could be accomplished
from a single location.

53
00:03:14,160 --> 00:03:19,265
The X-15 didn't allow that
because it had to extend much farther away

54
00:03:19,265 --> 00:03:19,933
from the base.

55
00:03:19,933 --> 00:03:23,336
>>Dryden engineers developed
a complex system for flight monitoring

56
00:03:23,336 --> 00:03:25,705
that went far beyond anything yet
known.

57
00:03:25,705 --> 00:03:27,240
>>The range allowed researchers

58
00:03:27,240 --> 00:03:30,510
on the ground to track the X-15
throughout its entire mission.

59
00:03:31,010 --> 00:03:35,748
>>My experience with the implementation
and operation of the high range was in line

60
00:03:35,748 --> 00:03:40,086
with the extension of flight profiles
from some few hundred miles

61
00:03:40,086 --> 00:03:41,754
through circling the Earth.

62
00:03:41,788 --> 00:03:43,156
>>A hypersonic research

63
00:03:43,156 --> 00:03:46,726
vehicle or
trans-atmospheric research vehicle;

64
00:03:47,093 --> 00:03:52,298
You are going to be completely dependent
on the range for a successful mission.

65
00:03:52,332 --> 00:03:56,236
>>The Western Aeronautical Test
Range of today is the high range grown up,

66
00:03:56,936 --> 00:03:59,772

a functioning integration
of state of the art communications,

67
00:04:00,106 --> 00:04:04,244
tracking equipment,
computers and electronic display systems.

68
00:04:04,277 --> 00:04:08,047
>>Every critical function of the X-29
is monitored from the ground.

69
00:04:08,081 --> 00:04:12,252
>>We actually collect on the order of 250
to 300 pieces of data

70
00:04:12,552 --> 00:04:13,820
telemetered to the ground.

71
00:04:13,820 --> 00:04:16,122
>>AFTI's total dependence on computers

72
00:04:16,122 --> 00:04:19,826
and enormous data output require
a great deal of range support.

73
00:04:19,859 --> 00:04:23,029
>>The shuttle's safe return depends
heavily on the range's precision

74
00:04:23,062 --> 00:04:26,132
operation monitoring the space plane
during its return to Earth.

75
00:04:26,532 --> 00:04:30,436
>>Pilots fly remotely piloted research
vehicles from cockpits on the ground,

76
00:04:30,603 --> 00:04:34,574
depending completely on telemetry
provided by the range to receive sensory

77
00:04:34,574 --> 00:04:37,877
information
from and send commands to the airplane.

78
00:04:39,178 --> 00:04:41,047
>>The key to a successful research

79
00:04:41,047 --> 00:04:44,984
mission is uninterrupted communications
and data links with test vehicles.

80
00:04:46,085 --> 00:04:49,422
>>The capability that we have here
is probably better

81
00:04:49,422 --> 00:04:52,392
than any existing capability
anywhere in the country.

82
00:04:52,392 --> 00:04:55,161
>>We have radar, we have telemetry, video,

83
00:04:55,628 --> 00:05:00,166
communications, flight termination,
long range optics, ramp cameras.