



green technology

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 thrust vectoring, along with its sister program, the F-18 HARV.

16
00:00:53,657 --> 00:00:55,826
>>An observation of an occultation 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 --> 00:01:40,900
[Music]

22
00:01:42,469 --> 00:01:45,271
>>The sun would first stir life on our planet...

23
00:01:45,738 --> 00:01:48,374

Gradual shiftings and upheavals would bury

24

00:01:48,374 --> 00:01:51,177

creatures and plants
beneath the surface of the earth.

25

00:01:51,578 --> 00:01:56,616

There, they would fossilize, eventually
turning into huge reservoirs of gas

26

00:01:56,783 --> 00:01:57,984

and coal...

27

00:01:57,984 --> 00:02:01,354

>>Oil made possible
one of the greatest inventions of history-

28

00:02:02,021 --> 00:02:05,525

the internal combustion engine,
which gave us mastery over the air.

29

00:02:06,159 --> 00:02:09,796

>>Pollution, grew around us
until one day, at last,

30

00:02:09,796 --> 00:02:15,635

we noticed that something had gone wrong
with our once pretty world...

31

00:02:15,735 --> 00:02:18,538

Just in time, the satellite
now gives us a view of pollution

32

00:02:18,805 --> 00:02:21,307

impossible to get in any other way.

33

00:02:22,108 --> 00:02:25,078

[Music]

34

00:02:25,512 --> 00:02:26,146

>>Scientists

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00:02:26,146 --> 00:02:29,349

and researchers

continue to develop various technologies

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00:02:29,516 --> 00:02:32,652

to cut fuel consumption,

through aircraft structure

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00:02:32,652 --> 00:02:34,954

and engine design.

38

00:02:34,954 --> 00:02:39,125

>>Lightweight wires and electronics replace

mechanical linkage.

39

00:02:39,859 --> 00:02:44,030

>>NASA researchers see vertical takeoff

aircraft as commercially useful.

40

00:02:44,264 --> 00:02:47,667

These types of aircraft use less room

for takeoff and landing

41

00:02:47,901 --> 00:02:52,172

and keep noise and air pollution lower

than our present commercial planes.

42

00:02:52,505 --> 00:02:55,475

[Music/Background Sound]

43

00:02:58,144 --> 00:03:00,613

>>One of

the most unusual and highly experimental

44

00:03:00,613 --> 00:03:04,784

aircraft ever tested at

Dryden was the Gossamer Albatross.

45

00:03:05,818 --> 00:03:07,787

The albatross was Human-Powered

46

00:03:07,787 --> 00:03:11,024

and pedaled like a bicycle.

47

00:03:11,858 --> 00:03:12,759

The man who designed

48

00:03:12,759 --> 00:03:17,163

the Albatross also built the Gossamer
Penguin, the world's first flight

49

00:03:17,163 --> 00:03:20,333

worthy sun-powered plane

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00:03:21,501 --> 00:03:29,642

[Music/Background Sound]

51

00:03:32,011 --> 00:03:33,546

>>ERAST is NASA's

52

00:03:33,546 --> 00:03:37,283

environmental research
aircraft and sensor technology program,

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00:03:37,584 --> 00:03:41,054

and its mission is to develop aircraft
that are capable of

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00:03:41,054 --> 00:03:44,824

flying very high and very slowly,
primarily to do

55

00:03:44,891 --> 00:03:48,661

atmospheric sampling
and monitoring of the global environment.

56
00:03:49,062 --> 00:03:53,533
>>Solar power offers some unique capability
for flying in the stratosphere.

57
00:03:53,833 --> 00:03:57,403
>>HELIOS should be able to stay aloft
for up to six months at a time

58
00:03:57,604 --> 00:04:01,140
to function
very much as an atmospheric satellite.

59
00:04:01,274 --> 00:04:04,677
>>What's very unique to the solar-powered
airplanes is that they are not polluting

60
00:04:04,677 --> 00:04:07,013
the very atmosphere
that they're trying to take samples from.

61
00:04:07,013 --> 00:04:09,148
So they're ideally suited
for that purpose.

62
00:04:09,182 --> 00:04:13,586
>>These vehicles can help us attain
a desirable balance between technology

63
00:04:13,586 --> 00:04:14,654
and nature.

64
00:04:14,654 --> 00:04:18,057
The stakes are high as we speed toward
a challenging future.

65
00:04:18,725 --> 00:04:21,194
>>Solar powered aircraft don't really work
well at nighttime.

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00:04:21,227 --> 00:04:26,032

This is a way of compensating
for the inability to get energy at night.

67

00:04:26,332 --> 00:04:29,736

The airplane flies off the energy
provided by the laser.

68

00:04:30,136 --> 00:04:33,773

>>This is the world's first demonstration
of the application of laser

69

00:04:33,773 --> 00:04:37,343

energy to a flight vehicle
to achieve truly fuel-less flight.

70

00:04:37,744 --> 00:04:41,814

>>NASA Aeronautics
continued its green aviation initiatives.

71

00:04:42,181 --> 00:04:44,851

Their goal? To make air travel quieter

72

00:04:45,351 --> 00:04:50,323

cleaner, and more efficient while
increasing the safety and comfort of passengers.

73

00:04:50,356 --> 00:04:54,327

>>With this mandate
to significantly lower noise and emissions

74

00:04:54,327 --> 00:04:57,463

and increase performance
for subsonic aircraft,

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00:04:57,764 --> 00:04:59,265

there will be a need to address

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00:04:59,265 --> 00:05:03,102

virtually every aspect

of the current aircraft configuration.

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00:05:03,670 --> 00:05:06,606

>>We're using a blended alternative fuel

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00:05:06,739 --> 00:05:10,977

to evaluate the impact of different fuels
on the emissions of the aircraft.

79

00:05:11,411 --> 00:05:14,914

>>People have done lifecycle studies
to look at the carbon balance,

80

00:05:14,914 --> 00:05:16,282

which takes into account

81

00:05:16,282 --> 00:05:20,553

the amount of energy that you use
in growing the plant, processing the oil...

82

00:05:20,586 --> 00:05:25,491

Some of the studies have shown
about a 75% reduction in the amount of CO₂

83

00:05:25,491 --> 00:05:30,663

that you get using camelina compared
to conventional petroleum based fuel.

84

00:05:31,364 --> 00:05:34,100

>>NASA started investigating
alternative fuels

85

00:05:34,100 --> 00:05:37,603

as a way of reducing the carbon emissions
from aircraft.

86

00:05:37,603 --> 00:05:40,273

But there's other benefits of these fuels.

87

00:05:40,273 --> 00:05:44,610

They produce much lower levels of soot,
and also they do not have

88

00:05:44,610 --> 00:05:45,945

sulfur contaminants.

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00:05:45,945 --> 00:05:49,949

Hopefully there will be a fairly
significant return on investment in terms of

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00:05:50,483 --> 00:05:53,820

improved public health and environment.

91

00:05:55,755 --> 00:05:56,823

>>Everything within

92

00:05:56,823 --> 00:05:59,992

subsonic aviation
now is looking for efficiency.

93

00:06:00,159 --> 00:06:02,729

We're looking at structures
to make aircraft lighter.

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00:06:02,729 --> 00:06:04,630

We're looking at various
propulsion systems

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00:06:04,630 --> 00:06:06,099

in order to make them more fuel efficient.

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00:06:06,099 --> 00:06:10,203

And we're looking at configurations
to lower the noise impact of community

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00:06:10,203 --> 00:06:13,639

noise, essentially looking at
an environmentally responsible aircraft.

98

00:06:13,673 --> 00:06:16,175

>>We really think this airplane is revolutionary.

99

00:06:16,175 --> 00:06:20,713

It's a big jump in technology from the tube and wing kind of airplanes

100

00:06:20,713 --> 00:06:21,748

that you see today.

101

00:06:21,748 --> 00:06:23,249

It's much more efficient

102

00:06:23,249 --> 00:06:26,652

I like to say it's like a hybrid car compared to a regular car.

103

00:06:26,652 --> 00:06:30,356

>>It's exciting to think that we're contributing to the green aircraft

104

00:06:30,356 --> 00:06:31,724

of the future.

105

00:06:31,724 --> 00:06:35,928

>>The aircraft now can be programmed to have, for example, engines that are more fuel

106

00:06:35,928 --> 00:06:40,366

efficient...control the engines separately and also more closely and carefully.

107

00:06:42,235 --> 00:06:49,675

[Music/Background Sound]

108

00:06:52,578 --> 00:06:56,082

>>This is NASA's first all electric crewed aircraft.

109

00:06:56,082 --> 00:07:01,754

>>We can use electric propulsion systems and aircraft design in an interactive way.

110

00:07:01,754 --> 00:07:03,356

The wing itself is designed

111

00:07:03,356 --> 00:07:07,393

so that the electric motors enable extra efficiency in the wing itself.

112

00:07:07,593 --> 00:07:08,261

>>There's several

113

00:07:08,261 --> 00:07:11,097

different types of airplanes that can benefit from electric propulsion.

114

00:07:11,397 --> 00:07:14,267

The one that's gaining a lot of interest right now is the smaller version,

115

00:07:14,267 --> 00:07:15,835

air taxi type vehicle.

116

00:07:15,835 --> 00:07:18,271

>>In doing the work of developing these systems,

117

00:07:18,271 --> 00:07:19,672

integrating these systems and so forth,

118

00:07:19,672 --> 00:07:21,741

we have helped industry along their path.

119

00:07:21,774 --> 00:07:26,012

We've been able to deliver lessons learned on batteries, on how you do the power electronics,

120

00:07:26,012 --> 00:07:27,380

how you build up the motors...

121

00:07:27,380 --> 00:07:31,217

And so X-57 really has been a pathfinder,
early on, for electric propulsion.

122

00:07:31,217 --> 00:07:33,152

>>The next generation of vehicles,

123

00:07:33,152 --> 00:07:36,456

they're going to be much greener
and much more efficient types of