



CAUTION
CHECK ANTENNA POSITION
PRIOR TO FULL
EXTENSION OF RAADPE

REMOVE

REMOVE

1
00:00:00,840 --> 00:00:08,300
[Jet engine revving up]

2
00:00:08,300 --> 00:00:10,300
[Sonic boom]

3
00:00:13,000 --> 00:00:23,146
[Music]

4
00:00:23,646 --> 00:00:25,936
>> From an early age, I found
that I had a fair amount

5
00:00:25,936 --> 00:00:27,816
of mechanical intellect
just from playing

6
00:00:27,856 --> 00:00:28,826
with Legos and K'Nex.

7
00:00:29,016 --> 00:00:31,016
From the crazy designs that
I used to come up with,

8
00:00:31,066 --> 00:00:32,906
it was pretty obvious to
me that I needed to go

9
00:00:32,906 --> 00:00:34,526
into something with design.

10
00:00:35,516 --> 00:00:42,066
[Music]

11
00:00:42,566 --> 00:00:44,006
>> When I was a kid,
I raised birds,

12

00:00:44,156 --> 00:00:45,746
and I also liked
everything mechanical.

13

00:00:45,876 --> 00:00:48,506
I got a car from my grandpa,
and I took it completely apart

14

00:00:48,506 --> 00:00:49,646
and put it back together again.

15

00:00:50,076 --> 00:00:51,976
Here's the HUD
camera prototype.

16

00:00:52,066 --> 00:00:53,026
I want to see if it fits.

17

00:00:53,026 --> 00:00:54,716
That's way too big.

18

00:00:54,716 --> 00:00:55,876
This is the HUD right there.

19

00:00:55,946 --> 00:00:56,096
>> Yeah.

20

00:00:56,526 --> 00:00:58,986
>> So, yeah, we don't
have much room at all.

21

00:00:59,456 --> 00:01:00,776
I've always liked
mechanical things,

22

00:01:00,776 --> 00:01:02,776
and I think engineering was
just the perfect fit for me.

23

00:01:02,926 --> 00:01:04,166

I think I was born to do this.

24

00:01:04,460 --> 00:01:06,460

[Music]

25

00:01:06,766 --> 00:01:09,636

>> I went to air shows when I
was a kid where you could fly

26

00:01:09,636 --> 00:01:11,276

in the plane for a penny a pound

27

00:01:11,276 --> 00:01:13,106

so it was a pretty good
deal when you're little.

28

00:01:13,356 --> 00:01:15,066

And I think, at that
point in time,

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00:01:15,066 --> 00:01:18,226

I always thought I'd be working
on aircraft in the future.

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00:01:18,860 --> 00:01:23,580

Aero mechanical design group
integrates hardware and systems

31

00:01:23,580 --> 00:01:28,520

into typical military
and commercial aircraft

32

00:01:28,520 --> 00:01:31,320

to make them flight
research vehicles.

33

00:01:31,320 --> 00:01:33,610

>> A common task for the
design group is creating

34

00:01:33,610 --> 00:01:36,760

and designing a bracket
or a fixtures

35

00:01:36,760 --> 00:01:40,800

to hold a research instrument
on one of our airplanes.

36

00:01:40,800 --> 00:01:42,820

>> You might have a new probe
that goes on an airplane

37

00:01:42,820 --> 00:01:45,930

and they want to fly it on an
F-15, we'll help build a probe

38

00:01:45,930 --> 00:01:47,450

or tell them where
they can put it

39

00:01:47,450 --> 00:01:50,440

or tell them what their limits
are and what we can do for them.

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00:01:51,380 --> 00:01:53,190

>> Generally, it'll
be an instrument

41

00:01:53,190 --> 00:01:56,470

that measures something
in the air or some sort

42

00:01:56,470 --> 00:01:59,100

of camera system, that
kind of thing as far

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00:01:59,100 --> 00:02:00,770

as taking what somebody
already did

44

00:02:00,770 --> 00:02:02,880
and integrating it
into the aircraft.

45

00:02:02,880 --> 00:02:05,690
>> We are the middleman
in coming up with the data

46

00:02:05,690 --> 00:02:06,960
for research projects.

47

00:02:08,000 --> 00:02:10,050
>> A lot of the design work
that we do has to account

48

00:02:10,050 --> 00:02:12,920
for the environment that
airplanes operate in.

49

00:02:12,920 --> 00:02:15,510
That might include climate,
where it gets very cold

50

00:02:15,520 --> 00:02:19,960
and very hot, and being able to
function well in the air stream

51

00:02:19,960 --> 00:02:22,400
if something is mounted on
the outside of the airplane.

52

00:02:22,400 --> 00:02:24,640
It also has to account
for precipitation

53

00:02:24,640 --> 00:02:27,760
and corrosive effects of
the environment to make sure

54

00:02:27,760 --> 00:02:28,880
that the air worthiness

55

00:02:28,880 --> 00:02:32,440
of the part isn't
compromised during its mission.

56

00:02:32,440 --> 00:02:37,150
For example, if a sensor is
being mounted to the skin

57

00:02:37,160 --> 00:02:41,150
of a wing, we might have to
design or change the shape

58

00:02:41,160 --> 00:02:44,480
of the wing to allow for proper
airflow around it during flight.

59

00:02:45,400 --> 00:02:47,150
>> This is our Gulfstream
aircraft.

60

00:02:47,160 --> 00:02:50,100
And right now we're
testing a morphing flap.

61

00:02:50,100 --> 00:02:54,030
Basically, this flap flexes
instead of actuates downwards.

62

00:02:54,040 --> 00:02:57,720
My job in this project was to
facilitate the installation

63

00:02:57,720 --> 00:02:58,990
of the flap into the wing.

64

00:02:59,000 --> 00:03:01,560

Some of those roles
include creating drawings

65

00:03:01,560 --> 00:03:05,030

for structural components
that attach the two together

66

00:03:05,040 --> 00:03:07,450

and providing up-to-date
inspections,

67

00:03:07,450 --> 00:03:10,750

verifying that the flap
surfaces align well

68

00:03:10,760 --> 00:03:14,560

with the predicted flap data.

69

00:03:14,560 --> 00:03:16,390

Right now, I'm going to
bring in the reference model

70

00:03:16,400 --> 00:03:21,120

for the right wing that the
scan will be compared to.

71

00:03:21,120 --> 00:03:22,790

And you can see that we
have a really good match.

72

00:03:22,800 --> 00:03:24,680

Basically, the green shows

73

00:03:24,680 --> 00:03:26,600

that the two surfaces
are aligned very well.

74

00:03:26,600 --> 00:03:29,760

The blue surface is showing that
the surface is slightly below

75

00:03:29,760 --> 00:03:32,840
where we predicted
and red slightly above.

76

00:03:32,840 --> 00:03:34,040
It's important for us to know

77

00:03:34,040 --> 00:03:35,940
that the two surfaces
are aligned well

78

00:03:35,940 --> 00:03:39,660
because previous
predictions were based off

79

00:03:39,660 --> 00:03:41,240
of an idealized model.

80

00:03:41,240 --> 00:03:44,030
The idealized model tells
us that the plane is safe.

81

00:03:44,040 --> 00:03:45,550
However, if we go
back and we find

82

00:03:45,560 --> 00:03:50,440
out that the actual airplane
is not joining up well

83

00:03:50,440 --> 00:03:52,440
with that idealized
model, our predictions

84

00:03:52,440 --> 00:03:54,110
for flight safety
are no longer valid.

85

00:03:55,720 --> 00:04:04,680
[Airplane Sounds] [Music]

86

00:04:10,840 --> 00:04:13,320
[Background conversation]

87

00:04:13,320 --> 00:04:16,640
>>If we can-- if we put the cone
on and then just leave it.

88

00:04:16,640 --> 00:04:17,530
Can we leave it for a while?

89

00:04:17,530 --> 00:04:18,670
We'll come up with the design

90

00:04:18,680 --> 00:04:22,320
and then we'll often times
run it by the crew and decide

91

00:04:22,320 --> 00:04:25,420
if it's okay with them
as to where we put it

92

00:04:25,420 --> 00:04:26,940
and how it's going
to be mounted.

93

00:04:26,940 --> 00:04:28,710
And then we'll have
structures people look at it.

94

00:04:28,720 --> 00:04:29,880
Knock, knock.

95

00:04:29,880 --> 00:04:30,920
>> Yeah?

96

00:04:30,920 --> 00:04:33,240

>> We'll take the preliminary drawings down to the shop,

97

00:04:33,240 --> 00:04:35,680

either sheet-metal or the machine shop, and have them look

98

00:04:35,680 --> 00:04:37,840

at it-- see how manufacturable it is.

99

00:04:37,840 --> 00:04:40,660

Is there a lot of difference between manufacturability as far

100

00:04:40,660 --> 00:04:41,980

as aluminum vs. stainless-?

101

00:04:41,980 --> 00:04:42,480

>> Absolutely.

102

00:04:42,480 --> 00:04:42,980

>> On these parts?

103

00:04:42,980 --> 00:04:43,340

>> Oh, yeah.

104

00:04:43,340 --> 00:04:46,410

>> Aluminum would give us a good trial maybe.

105

00:04:46,410 --> 00:04:48,850

>> That's fine. We could always come back and make another one.

106

00:04:48,850 --> 00:04:49,430

>> Right.

107

00:04:49,440 --> 00:04:50,500

>> Are you redrawing

this now, then?

108

00:04:50,520 --> 00:04:51,850

Are you making
some modifications?

109

00:04:51,850 --> 00:04:53,190

>> I'm just making the fixes.

110

00:04:53,190 --> 00:04:54,180

>> Okay.

111

00:04:54,180 --> 00:04:55,320

>> All right.

112

00:04:55,320 --> 00:04:56,900

>> And then when you
do, bring it back over.

113

00:04:56,900 --> 00:04:57,556

>> Yeah, I will.

114

00:04:57,560 --> 00:04:58,300

>> So we can look it over again.

115

00:04:58,300 --> 00:04:59,040

>> That sounds good.

116

00:04:59,040 --> 00:04:59,400

>> Okay.

117

00:04:59,400 --> 00:04:59,800

>> Thank you sir.

118

00:04:59,800 --> 00:05:00,470

>> All righty.

119

00:05:00,480 --> 00:05:01,930

>> All right.

120

00:05:01,930 --> 00:05:03,820

This is the inside
of that nose cone

121

00:05:03,820 --> 00:05:04,750

that we're looking to put on.

122

00:05:04,760 --> 00:05:07,760

We've gotten the nominal
sizes of the equipment

123

00:05:07,760 --> 00:05:10,220

from instrumentation and
we put that on the pallet.

124

00:05:10,220 --> 00:05:12,480

We only have so much real estate
so we have to just make sure

125

00:05:12,480 --> 00:05:15,250

that everything is adequately
spaced, we know how big it is.

126

00:05:15,250 --> 00:05:17,860

And we're just taking those
components and doing a--

127

00:05:17,860 --> 00:05:20,300

just making sure we have
enough room for everything.

128

00:05:20,300 --> 00:05:22,180

[Airplane taking off]

129

00:05:22,180 --> 00:05:26,500

>> In SOFIA, we added all kinds
of things to the aircraft inside

130

00:05:26,500 --> 00:05:31,680

and outside, pretty extensive modifications on that aircraft.

131

00:05:31,680 --> 00:05:35,410

We had to install large thermal insulation blankets

132

00:05:35,410 --> 00:05:38,330

and foam insulation into the telescope cavity.

133

00:05:38,330 --> 00:05:41,610

We added maintenance stairways and scaffolding

134

00:05:41,610 --> 00:05:45,880

into the cavity, added all the racks.

135

00:05:45,890 --> 00:05:48,930

[Airplane landing]

136

00:05:48,960 --> 00:05:51,500

>> After the part has been installed

137

00:05:51,520 --> 00:05:54,580

and it's been signed off, we may be called back to do revisions

138

00:05:54,580 --> 00:05:57,630

if the project requirements change while the part is

139

00:05:57,630 --> 00:05:59,440

being used.

140

00:05:59,440 --> 00:06:02,590

For example, we found that
the cameras on the back

141
00:06:02,590 --> 00:06:04,720
of the aircraft were
getting way too cold.

142
00:06:04,720 --> 00:06:05,710
Because they were getting cold,

143
00:06:05,710 --> 00:06:07,870
they were distorting
the lens and, thus,

144
00:06:07,870 --> 00:06:08,810
distorting the picture

145
00:06:08,810 --> 00:06:11,210
that people were seeing
in the control room.

146
00:06:11,210 --> 00:06:13,610
I'll be taking a look at that
and trying to find out a way

147
00:06:13,610 --> 00:06:15,450
to prevent the cameras
from getting too cold

148
00:06:15,450 --> 00:06:18,490
so we don't have this
problem in the future.

149
00:06:18,490 --> 00:06:22,680
>> The HD camera goes to minus
22 degrees when we're at 40,000.

150
00:06:22,680 --> 00:06:25,310
>> I think what's happening
is you've got an aluminum body

151

00:06:25,310 --> 00:06:27,470
which contracts a lot with cold.

152

00:06:27,470 --> 00:06:28,350
>> Exactly. Yeah.

153

00:06:28,350 --> 00:06:29,570
>> And it's just
crushing the lands.

154

00:06:29,600 --> 00:06:31,060
>> So it's not even
the polycarbonate that's the problem,

155

00:06:31,060 --> 00:06:32,480
It's the body.

156

00:06:32,480 --> 00:06:34,860
>> If we take the
case that you can--

157

00:06:34,880 --> 00:06:38,620
you're talking about and
we cut it in such a way

158

00:06:38,640 --> 00:06:42,530
that we fit it into--
like take-out--

159

00:06:42,560 --> 00:06:43,360
>> This RTV.

160

00:06:43,360 --> 00:06:45,024
Make this hole a
little bit bigger

161

00:06:45,040 --> 00:06:53,040
and then glue the case to the panel, so that the camera's still not really touching the case...

162

00:06:53,040 --> 00:06:53,520

>> That sounds good.

163

00:06:53,520 --> 00:06:55,090

Okay. We'll do that.

164

00:06:55,090 --> 00:06:57,810

>> I like designing because I
get to try to be imaginative,

165

00:06:57,840 --> 00:07:04,640

try to figure out things, develop my own ideas on how to do something.

166

00:07:04,640 --> 00:07:08,000

It's interesting to me.

167

00:07:08,000 --> 00:07:12,780

>> You never know what good idea is going to turn into something great.

168

00:07:12,780 --> 00:07:14,540

>> One of the coolest things
about my job is I get to work

169

00:07:14,540 --> 00:07:17,460

on nearly all the
airplanes at the center.

170

00:07:17,460 --> 00:07:19,460

On one particular day,
I might be working

171

00:07:19,460 --> 00:07:22,880

on a remote control airplane, a
glider, and a fighter aircraft.

172

00:07:22,880 --> 00:07:26,880

On another, it might be a 747
or a small propellered airplane.

173

00:07:26,880 --> 00:07:29,880

What keeps the job interesting
is the great amount of variety

174

00:07:29,880 --> 00:07:31,880

of design tasks that
are always required.

175

00:07:31,880 --> 00:07:33,880

We provide support in many
engineering areas kind

176

00:07:33,880 --> 00:07:38,200

of like handymen for
the engineering world.

177

00:07:38,200 --> 00:07:41,340

>> I think a lot of people think that engineering isn't creative as art or something,

178

00:07:41,340 --> 00:07:44,360

but there's a lot of different things you can do with the facts you have.

179

00:07:44,360 --> 00:07:48,720

And that's what I like about engineering. We're doing good science and we're trying to make the world a

180

00:07:48,720 --> 00:07:50,040

better place.