
MISSION CONTROL CENTER
PAO

1
00:00:02,440 --> 00:00:04,820
>> Okay then, thanks a lot for joining us today.

2
00:00:04,820 --> 00:00:10,130
I appreciate you taking time out, I know
you've been busy with Space Shuttle Discovery,

3
00:00:10,130 --> 00:00:14,840
and joining us over here in the
International Space State flight control room.

4
00:00:14,840 --> 00:00:17,690
I know you've had a bunch
of reviews and, you know,

5
00:00:17,690 --> 00:00:21,560
Discovery finished its flight
about a year ago actually.

6
00:00:21,560 --> 00:00:22,250
>> That's right.

7
00:00:22,250 --> 00:00:25,520
>> And, you know, now there's
been a ton of work going on,

8
00:00:25,520 --> 00:00:28,340
even though the vehicle obviously
is not flying any more, and --

9
00:00:28,340 --> 00:00:28,710
>> Right.

10
00:00:28,710 --> 00:00:33,310
>> -- I thought it'd be a great opportunity to
kind of update folks on Discovery, what we --

11
00:00:33,310 --> 00:00:37,820
what we kind of did to the vehicle, and

to get it ready for Ferry [phonetic].

12
00:00:37,820 --> 00:00:43,500
And of course you're the Integration Manager
for the special programs, Integration Officer

13
00:00:43,500 --> 00:00:45,240
at the Transition and Retirement Office.

14
00:00:45,240 --> 00:00:45,330
>> Mm-hmm.

15
00:00:45,330 --> 00:00:48,560
>> And you're the perfect candidate
to kind of give an overall --

16
00:00:48,560 --> 00:00:53,910
overarching synopsis of what's
been going on in the last year.

17
00:00:53,910 --> 00:00:58,910
And of course we're getting ready to Ferry
Discover 2 to the Aerospace Museum, so --

18
00:00:58,910 --> 00:01:01,690
but before we do that, I kind
of wanted to set the stage

19
00:01:01,690 --> 00:01:03,930
with a little biographical
information, 'cause --

20
00:01:03,930 --> 00:01:04,270
>> Mm-hmm.

21
00:01:04,270 --> 00:01:06,950
>> -- you've been around
for quite a while, and --

22

00:01:06,950 --> 00:01:09,290
and, you know, how did you
-- where'd you come from?

23
00:01:09,290 --> 00:01:13,080
And -- and talk about how you got
involved in NASA in the first place.

24
00:01:13,080 --> 00:01:15,320
>> Well, actually grew up in the Houston area --

25
00:01:15,320 --> 00:01:21,540
one of the probably rare folks that work
here that actually come from Houston.

26
00:01:21,540 --> 00:01:25,160
Grew up always liking aircraft, always
thought I'd grow up to -- to build aircraft.

27
00:01:25,160 --> 00:01:29,390
And so when I went to college, I studied
aerospace engineering with that in mind,

28
00:01:29,390 --> 00:01:31,690
but found out about a co-op
program here at NASA.

29
00:01:31,690 --> 00:01:32,860
>> And you went -- you want to --

30
00:01:32,860 --> 00:01:33,800
>> Went to Texas A&M.

31
00:01:33,800 --> 00:01:34,190
>> A&M.

32
00:01:34,190 --> 00:01:36,720
>> I'm a proud fighting Texas Aggie.

33

00:01:36,720 --> 00:01:42,610
Have a degree in aerospace
engineering, I co-op'd here three tours,

34
00:01:42,610 --> 00:01:44,710
and fell in love with the
space business and everything.

35
00:01:44,710 --> 00:01:48,180
And was fortunate enough to get an offer,
and came to work here right out of college,

36
00:01:48,180 --> 00:01:50,770
and went into the engineering directorate.

37
00:01:50,770 --> 00:01:54,520
Thought that's what I would do,
supporting programs like Shuttle.

38
00:01:54,520 --> 00:02:00,080
But about mid-career I had the opportunity
to actually go and -- and work on a vehicle.

39
00:02:00,080 --> 00:02:02,440
And that became my new passion.

40
00:02:02,440 --> 00:02:05,520
So for -- since about 1999 I have been

41
00:02:05,520 --> 00:02:08,870
in the Space Shuttle program,
primarily working on Orbiter.

42
00:02:08,870 --> 00:02:13,250
And didn't think that I would be around long
enough to actually help shut this program down,

43
00:02:13,250 --> 00:02:19,170
but that's what I do now is transition and
retirement, and trying to get things closed out.

44
00:02:19,170 --> 00:02:21,850
>> Yeah, so -- so, you know,
that sets the stage.

45
00:02:21,850 --> 00:02:26,000
But of course with Discovery kind
of being the focus right now,

46
00:02:26,000 --> 00:02:29,070
but it's really all three
of the Orbiters that --

47
00:02:29,070 --> 00:02:33,110
>> It's actually in -- in -- well, in present
on a full orbiter, it's actually four vehicles

48
00:02:33,110 --> 00:02:34,440
that we're trying to get ready to -- to --

49
00:02:34,440 --> 00:02:34,690
>> Correct.

50
00:02:34,690 --> 00:02:36,720
You've made a bunch of trips
and we'll talk about that --

51
00:02:36,720 --> 00:02:36,810
>> Mm-hmm.

52
00:02:36,810 --> 00:02:38,240
>> -- you know, in a second or two.

53
00:02:38,240 --> 00:02:43,010
But -- and kind of tell people
exactly what the --

54
00:02:43,010 --> 00:02:47,730
what you do, how you coordinate all this as the

Transition Integration Manager for the office.

55
00:02:47,730 --> 00:02:49,120
>> Well, you know, a little background.

56
00:02:49,120 --> 00:02:53,190
Everybody's aware that we -- we
stopped flying Shuttle last summer,

57
00:02:53,190 --> 00:02:56,360
when we landed Atlantis and -- in July.

58
00:02:56,360 --> 00:03:00,570
But that was really the beginning of a lot
of activity for transition and retirement.

59
00:03:00,570 --> 00:03:05,630
And it's not as visible, obviously, as
flight, but a lot of activity going on there.

60
00:03:05,630 --> 00:03:07,330
And it actually has a -- quite a history.

61
00:03:07,330 --> 00:03:10,640
When the -- President Bush announced the end
of the Space Shuttle program was going to be

62
00:03:10,640 --> 00:03:15,280
in 2010 -- he announced that in
2004 -- a lot of planning started.

63
00:03:15,280 --> 00:03:19,490
And without all of that teamwork and
planning that had gone into -- to place --

64
00:03:19,490 --> 00:03:24,010
because this is such a large program, and -- and
NASA's not in the mode of shutting down things

65

00:03:24,010 --> 00:03:26,880
like this very often, we had
to do a lot of benchmarking,

66
00:03:26,880 --> 00:03:29,530
a lot of planning that led
us up to where we are today.

67
00:03:29,530 --> 00:03:35,410
And so we're in the execution phase now,
and the orbiters are the most visible pieces

68
00:03:35,410 --> 00:03:36,970
of property that we're going to transition.

69
00:03:36,970 --> 00:03:40,730
But there's actually over a million line items
of property that we have to do something with.

70
00:03:40,730 --> 00:03:40,860
>> Really.

71
00:03:40,860 --> 00:03:42,200
>> Over a million.

72
00:03:42,200 --> 00:03:47,460
So we're working with other programs within
the agency, we're working with other agencies,

73
00:03:47,460 --> 00:03:51,760
and then we're also looking at trying
to preserve artifacts and things

74
00:03:51,760 --> 00:03:55,000
for future educational purposes,
and -- and things like that.

75
00:03:55,000 --> 00:03:58,350
So we're working with museums,
universities, and things as well

76
00:03:58,350 --> 00:04:00,620
to -- to work with all that property.

77
00:04:00,620 --> 00:04:05,040
A lot of records -- we have tens of
thousands of boxes of physical records,

78
00:04:05,040 --> 00:04:10,130
by law in some cases we have to preserve, and
others we are preserving for other programs.

79
00:04:10,130 --> 00:04:15,290
We also have a lot of electronic
records, IT-type things, many gigabytes --

80
00:04:15,290 --> 00:04:18,790
and I'm probably underestimating 'cause
I'm sure it's in the terabyte range.

81
00:04:18,790 --> 00:04:21,840
This program ranges over 30
years, and so the technology --

82
00:04:21,840 --> 00:04:22,010
>> Right.

83
00:04:22,010 --> 00:04:22,550
>> -- has really changed --

84
00:04:22,550 --> 00:04:22,640
>> Right.

85
00:04:22,640 --> 00:04:23,060
>> -- in that span.

86
00:04:23,060 --> 00:04:28,210
So we go from having actual drawings to a
lot of CAD at the latter end of the program.

87
00:04:28,210 --> 00:04:32,170
So we've -- we're having to deal with all
of that, and like I say, not real glamorous,

88
00:04:32,170 --> 00:04:36,940
not something people think about a lot of --
a lot, but in order to preserve a lot of that

89
00:04:36,940 --> 00:04:40,920
and -- and handle that properly, that -- that's
what's going on at transition and retirement.

90
00:04:40,920 --> 00:04:44,660
>> Based on what you just said, you know, that
leads to the question -- I'm not sure that it --

91
00:04:44,660 --> 00:04:51,060
you can really give a true estimate, but, you
know, how many people must be involved in --

92
00:04:51,060 --> 00:04:53,180
in this activity, because we're not talk --

93
00:04:53,180 --> 00:04:55,010
and we're talking about people
kind of in the background,

94
00:04:55,010 --> 00:04:58,270
but there's operational people,
there's the ground ops people.

95
00:04:58,270 --> 00:05:01,760
Can you even estimate the -- the
numbers of people that are --

96
00:05:01,760 --> 00:05:03,900
have been working on this
since Orbiter's retirement?

97
00:05:03,900 --> 00:05:07,570
>> No, I mean over the span it's been
hundreds, and -- and the team has been larger.

98
00:05:07,570 --> 00:05:10,340
Because when we were operational
we were able to tap into more

99
00:05:10,340 --> 00:05:12,140
of those resources to do the planning.

100
00:05:12,140 --> 00:05:14,490
And that's what we wanted to do, we
wanted to take advantage of a lot

101
00:05:14,490 --> 00:05:17,380
of the expertise while it
was here to do the planning.

102
00:05:17,380 --> 00:05:22,760
And so the -- the -- the headcount today is
much smaller than it was under operations.

103
00:05:22,760 --> 00:05:26,500
It's in the hundreds that's doing this,
but it's still spread across the country.

104
00:05:26,500 --> 00:05:27,920
Because we have contractors --

105
00:05:27,920 --> 00:05:28,490
>> Alright.

106
00:05:28,490 --> 00:05:31,390
>> -- across the country, lot
of activity obviously done in --

107
00:05:31,390 --> 00:05:34,520
at the Kennedy Space Center

where we're processing vehicles.

108
00:05:34,520 --> 00:05:37,620
But I would say it's, you know,
it's less than 500 people today

109
00:05:37,620 --> 00:05:40,080
that are involved doing this sort
of activity, where, you know,

110
00:05:40,080 --> 00:05:42,980
at the peak we had 10,000
people or -- or more --

111
00:05:42,980 --> 00:05:43,100
>> Right.

112
00:05:43,100 --> 00:05:43,830
>> -- working shuttles.

113
00:05:43,830 --> 00:05:46,210
So you can see the scale there.

114
00:05:46,210 --> 00:05:49,340
It -- it's a lot of work for
the -- those people though.

115
00:05:49,340 --> 00:05:54,420
>> Well, you know, you talked about the
records, and all -- preserving all of that, but,

116
00:05:54,420 --> 00:05:58,230
you know, as we finished flying
these vehicles, of course Discovery

117
00:05:58,230 --> 00:06:01,140
and then its career for a year ago --

118
00:06:01,140 --> 00:06:01,520

>> Mm-hmm.

119
00:06:01,520 --> 00:06:02,870
>> -- this past Friday --

120
00:06:02,870 --> 00:06:04,820
>> Mm-hmm.

121
00:06:04,820 --> 00:06:09,570
>> -- you know, there's got to be all this
hardware, how you safe the vehicle and things

122
00:06:09,570 --> 00:06:14,180
like that, that an extensive amount
of thought must had to go into --

123
00:06:14,180 --> 00:06:14,980
>> It did.

124
00:06:14,980 --> 00:06:21,120
>> -- what we decided was
prudent to protect for future --

125
00:06:21,120 --> 00:06:21,280
>> Mm-hmm.

126
00:06:21,280 --> 00:06:22,630
>> -- use or study.

127
00:06:22,630 --> 00:06:24,930
And I know you've got some
pictures that you -- you --

128
00:06:24,930 --> 00:06:27,890
you're going to show a few representative items.

129
00:06:27,890 --> 00:06:32,200
But can you talk about the
-- the numbers of components?

130
00:06:32,200 --> 00:06:35,340
We can focus on Discovery, but it's
pretty much all three vehicles,

131
00:06:35,340 --> 00:06:36,440
right, that they had to work on.

132
00:06:36,440 --> 00:06:37,520
>> Kind of set the stage for that.

133
00:06:37,520 --> 00:06:38,570
You're -- you're exactly right.

134
00:06:38,570 --> 00:06:42,050
The program is really good
at processing for flight.

135
00:06:42,050 --> 00:06:43,440
We really know how to do that.

136
00:06:43,440 --> 00:06:47,020
And when you sit down and you look
at a spacecraft that's been --

137
00:06:47,020 --> 00:06:51,040
that's flown 30 or 40 times,
some -- has some systems on --

138
00:06:51,040 --> 00:06:55,910
onboard that are toxic, that NASA knows
how to handle in our facilities and that.

139
00:06:55,910 --> 00:06:58,710
But, you know, when you start thinking in
terms of I'm going to put this in a museum,

140
00:06:58,710 --> 00:07:02,390
I want the public to get up close

and -- and really experience this,

141
00:07:02,390 --> 00:07:04,090
you had to think differently about this.

142
00:07:04,090 --> 00:07:09,990
And our order project office and vehicle
processing offices had to sit down and --

143
00:07:09,990 --> 00:07:12,850
almost with a clean sheet and
look at this vehicle, and --

144
00:07:12,850 --> 00:07:17,600
and say what do I do to safe
the vehicle, to make it,

145
00:07:17,600 --> 00:07:19,120
you know, safe enough for public display.

146
00:07:19,120 --> 00:07:22,860
And in some cases that required
systems to be removed completely,

147
00:07:22,860 --> 00:07:26,030
others it just required a --
a good purge and cleaning.

148
00:07:26,030 --> 00:07:29,870
And so that was really the
start of how we did this.

149
00:07:29,870 --> 00:07:32,010
And we did come up with some
requirements documents that --

150
00:07:32,010 --> 00:07:35,110
that the, you know, we could write
procedures towards to actually go

151
00:07:35,110 --> 00:07:37,470
and process that vehicle just for that.

152
00:07:37,470 --> 00:07:41,000
On top of that, the agency looked
at this and said, you know,

153
00:07:41,000 --> 00:07:42,570
we have some valuable assets here.

154
00:07:42,570 --> 00:07:45,930
Some -- in some cases some -- some
components that have been through some things

155
00:07:45,930 --> 00:07:48,690
that we'd never put hardware through.

156
00:07:48,690 --> 00:07:51,500
We should retain that, we should look
at that, and -- and learn from that.

157
00:07:51,500 --> 00:07:56,140
And -- and so a list of hardware was
put together that we wanted to remove

158
00:07:56,140 --> 00:07:57,910
from the vehicles for that
-- that purpose, for --

159
00:07:57,910 --> 00:08:00,830
for either knowledge, or
actually even for future use.

160
00:08:00,830 --> 00:08:04,650
We've got -- the space launch
system has approached us and --

161
00:08:04,650 --> 00:08:07,570
and requested some main propulsion

hardware that we have removed from some

162
00:08:07,570 --> 00:08:09,970
of the orbiters for -- for reuse actually.

163
00:08:09,970 --> 00:08:11,080
>> Right.

164
00:08:11,080 --> 00:08:11,940
>> So it'll fly on.

165
00:08:11,940 --> 00:08:13,480
>> I know you've got a -- a couple of --

166
00:08:13,480 --> 00:08:13,670
>> Mm-hmm.

167
00:08:13,670 --> 00:08:15,460
>> I know you want to show
a couple of pictures --

168
00:08:15,460 --> 00:08:15,730
>> Sure.

169
00:08:15,730 --> 00:08:19,420
>> -- that are representative of kind
of what you're talking about there.

170
00:08:19,420 --> 00:08:23,550
>> Yeah, so if we can call up the first picture.

171
00:08:23,550 --> 00:08:26,640
>> Yeah, that's -- okay,
yeah that's up there now.

172
00:08:26,640 --> 00:08:28,430
>> So we have a liquid hydrogen pre-valve here.

173

00:08:28,430 --> 00:08:30,850
This is part of the main
propulsion system in the orbiters,

174
00:08:30,850 --> 00:08:35,700
and the space launch system actually
requested that to be retained.

175
00:08:35,700 --> 00:08:38,170
Another major component that's being retained

176
00:08:38,170 --> 00:08:40,510
for space launch system is
the space shuttle main engine.

177
00:08:40,510 --> 00:08:45,250
So some of the components that go along
with that system were pulled out of the --

178
00:08:45,250 --> 00:08:48,570
into the orbiters to go along with the
engines for use on the space launch system.

179
00:08:48,570 --> 00:08:51,440
>> Right. Now when you -- when
you removed that pre-valve, you --

180
00:08:51,440 --> 00:08:53,580
of course you had to fill that gap.

181
00:08:53,580 --> 00:08:54,060
>> Right.

182
00:08:54,060 --> 00:08:55,720
>> I think that was your -- your next photo.

183
00:08:55,720 --> 00:09:00,110
>> And so picture number 2 shows a spool
that was designed to be put in place

184
00:09:00,110 --> 00:09:02,840
so that everything was structurally sound.

185
00:09:02,840 --> 00:09:04,090
So the vehicle was still Ferry-worthy,

186
00:09:04,090 --> 00:09:06,920
because this vehicle's never flown
without the pre-valve installed.

187
00:09:06,920 --> 00:09:07,040
>> Right.

188
00:09:07,040 --> 00:09:10,470
>> So you can see some of the -- this
is a little bit of the same sort of mode

189
00:09:10,470 --> 00:09:13,270
that we were in, sustaining
engineering, that type of thing was still

190
00:09:13,270 --> 00:09:15,670
in place even under transition of retirement.

191
00:09:15,670 --> 00:09:19,190
Things like this had to go on in order
to keep the vehicles Ferry-worthy.

192
00:09:19,190 --> 00:09:24,620
>> Now one of the -- one of the other
major components that the programs decided

193
00:09:24,620 --> 00:09:27,410
to retain, and mainly I guess for SLS --

194
00:09:27,410 --> 00:09:27,710
>> Mm-hmm.

195

00:09:27,710 --> 00:09:32,910
>> -- the space launch system, is
the 14 or 15 shuttle main engines.

196
00:09:32,910 --> 00:09:34,700
>> 14 flight engines at the
end of the program --

197
00:09:34,700 --> 00:09:35,090
>> Right.

198
00:09:35,090 --> 00:09:36,490
>> -- that were retained
for space launch system.

199
00:09:36,490 --> 00:09:39,760
>> So in order to replace those,
we had to come up with a --

200
00:09:39,760 --> 00:09:46,150
an ingenious kind of design I guess, and
that's the replica space shuttle main engine.

201
00:09:46,150 --> 00:09:46,500
>> Right.

202
00:09:46,500 --> 00:09:47,730
>> And that's what you see there.

203
00:09:47,730 --> 00:09:51,130
>> The -- the next picture, the
third picture is actually the --

204
00:09:51,130 --> 00:09:52,290
what we call the RS and Main [phonetic].

205
00:09:52,290 --> 00:09:56,010
We have to have our acronyms around
here in order to survive at NASA.

206
00:09:56,010 --> 00:09:56,240
>> Right.

207
00:09:56,240 --> 00:10:00,250
>> And that was really kind of
an ingenious way to look at --

208
00:10:00,250 --> 00:10:03,630
you know, you take an orbiter
and everybody recognizes the --

209
00:10:03,630 --> 00:10:06,420
the nozzles on the back end
for the shuttle main engines.

210
00:10:06,420 --> 00:10:09,500
If we're retaining the engines, we -- we
didn't think it looked right without it,

211
00:10:09,500 --> 00:10:13,440
and we were able to find old nozzles
that had been used for engineering tests,

212
00:10:13,440 --> 00:10:16,810
different things, and do a little
bit of work to them, fix them up.

213
00:10:16,810 --> 00:10:22,300
And actually had to come up with a -- an adapter
to install where the power head would have been

214
00:10:22,300 --> 00:10:25,780
on this engine so that we could install
it on the aft end of the vehicle,

215
00:10:25,780 --> 00:10:27,310
so it looks like main engines are there.

216
00:10:27,310 --> 00:10:30,170

So you get an RSME [phonetic],
and it's Ferry-worthy.

217
00:10:30,170 --> 00:10:31,760
We went through all the certifications
and everything.

218
00:10:31,760 --> 00:10:35,640
So you see a picture there, and that -- that
actually shows the RSME at the end of the line.

219
00:10:35,640 --> 00:10:38,380
And you see three shuttle
main engines behind it.

220
00:10:38,380 --> 00:10:40,020
You can see the difference on the top --

221
00:10:40,020 --> 00:10:42,500
the public will never see that because
that's in the aft end of the vehicle.

222
00:10:42,500 --> 00:10:46,780
So the nozzle will be exposed, and it'll
look like it has three main engines onboard.

223
00:10:46,780 --> 00:10:53,460
>> Right. So then you go onto your next image,
and that is the attached point inside --

224
00:10:53,460 --> 00:10:53,560
>> Right.

225
00:10:53,560 --> 00:10:55,840
>> -- what you just mentioned
that the public won't see.

226
00:10:55,840 --> 00:10:56,620
But there's some --

227
00:10:56,620 --> 00:10:57,650
>> That's exactly right.

228
00:10:57,650 --> 00:11:00,560
>> -- items in there I think that
were part of the transition --

229
00:11:00,560 --> 00:11:00,720
>> Right.

230
00:11:00,720 --> 00:11:01,760
>> -- process, correct?

231
00:11:01,760 --> 00:11:04,970
>> We've always -- when we Ferry the vehicles,
we have Ferry struts we always had to put

232
00:11:04,970 --> 00:11:07,140
in there to -- to lock things in place.

233
00:11:07,140 --> 00:11:09,080
We don't want pieces moving
around and vibrating.

234
00:11:09,080 --> 00:11:12,670
And so -- but if you look in that
picture, you can actually see that adapter.

235
00:11:12,670 --> 00:11:14,060
Normally the power head would
have been in there,

236
00:11:14,060 --> 00:11:16,450
would have looked a lot more
complex with all the plumbing.

237
00:11:16,450 --> 00:11:19,950
And here you just see the adapter in the
middle of those Ferry struts in there.

238
00:11:19,950 --> 00:11:21,270
>> Right. Right.

239
00:11:21,270 --> 00:11:24,680
Yeah, there's the -- the next one with the --

240
00:11:24,680 --> 00:11:26,920
>> Right. Another picture
similar to that one there.

241
00:11:26,920 --> 00:11:27,230
>> Right. Right.

242
00:11:27,230 --> 00:11:30,120
>> A little bit better picture
what you're looking at.

243
00:11:30,120 --> 00:11:31,990
>> Yeah. We're talking with Kevin Templin.

244
00:11:31,990 --> 00:11:34,870
He's the Integration Manager for the
Space Shuttle program's Transition

245
00:11:34,870 --> 00:11:37,000
and Retirement Office.