WEBVTT

1
00:00:06.895 --> 00:00:07.245
Hello.

2
00:00:07.245 --> 00:00:08.565
Good afternoon. Thank you.

3
00:00:08.755 --> 00:00:10.925
It's a privilege and honor to be able to present today,

4
00:00:11.065 --> 00:00:13.285
and I know I'm the first, uh,

5
00:00:13.285 --> 00:00:15.205
person in the chalks out after lunch.

6
00:00:15.305 --> 00:00:18.605
So, uh, I, I trust that, uh, it will be a, uh,

7
00:00:19.205 --> 00:00:20.285
a good, uh, presentation.

8
00:00:20.685 --> 00:00:23.565
I have to admit though, I'm, I'm violating SETP, uh,

9
00:00:23.845 --> 00:00:26.645
protocol by not having a really cool stay awake video.

10
00:00:27.385 --> 00:00:28.525
Uh, I have videos,

11
00:00:28.785 --> 00:00:31.445
but unfortunately, uh, public affairs wouldn't allow me

12
00:00:31.445 --> 00:00:33.285
to present them in this forum.

13
00:00:34.425 --> 00:00:35.805
So, with that, let's get started.

14
00:00:37.645 --> 00:00:41.045
A few years ago, the Navy was testing its newest AIS Air

15
00:00:41.045 --> 00:00:44.125
Defense system installed with a Navy's flagship destroyer

16
00:00:44.685 --> 00:00:45.965
underway in the Point Magus sea range.

17
00:00:46.865 --> 00:00:50.405
The test event required four BQM 74 a target drones flying

18
00:00:50.425 --> 00:00:52.845
low altitude, high subsonic anti-ship cruise missile

19
00:00:52.845 --> 00:00:54.325
profiles in lead trail formation.

20
00:00:55.755 --> 00:00:57.285
Four drones were ready for launch,

21
00:00:57.585 --> 00:01:00.125
and the navy destroyer was poised for the engagement.

22
00:01:00.635 --> 00:01:01.885
Then nothing went as planned.

23
00:01:03.235 --> 00:01:05.365
Only two of the four drones launched for the mission,

24
00:01:05.385 --> 00:01:07.245
and at times they did not respond properly

25
00:01:07.265 --> 00:01:09.285
to commands from the remote control operators.

26
00:01:09.595 --> 00:01:12.565
Finally, with two targets at low altitude on presentation

27
00:01:12.565 --> 00:01:14.445

course and speed flying directly at the ship,

28
00:01:14.775 --> 00:01:17.765
everything seemed normal until the lead target failed

29
00:01:17.765 --> 00:01:19.405
to respond to the climb out commands

30
00:01:20.025 --> 00:01:21.525
and struck the Navy destroyer.

31
00:01:22.385 --> 00:01:25.245
The time from launch to impact was less than time allotted.

32
00:01:25.245 --> 00:01:26.885
To share this story in our lessons today,

33
00:01:27.915 --> 00:01:29.605
this paper discusses the human element

34
00:01:29.705 --> 00:01:32.085
of the aerial target team's drive for missions, uh,

35
00:01:32.085 --> 00:01:35.805
accomplishment when faced with extreme control data latency

36
00:01:36.065 --> 00:01:38.605
and an unrecognized system for target navy control

37
00:01:38.955 --> 00:01:41.925
that resulted in the BQM 74 impacting

38
00:01:41.925 --> 00:01:43.085
the destroyer under test.

39
00:01:44.225 --> 00:01:46.885
The s and TC failure experienced by the target team was

40
00:01:46.885 --> 00:01:49.445
so improbable that the engineers considered it

41
00:01:49.445 --> 00:01:50.565
to be impossible.

42
00:01:51.385 --> 00:01:53.965
So I have to ask when the impossible happens,

43
00:01:54.395 --> 00:01:55.725
will your testing be ready?

44
00:01:58.375 --> 00:01:59.755
We will discuss the following topics

45
00:01:59.755 --> 00:02:00.995
during the next 25 minutes.

46
00:02:01.595 --> 00:02:03.875
I will need to build the system for Navy target control

47
00:02:03.895 --> 00:02:04.995
to find what happened

48
00:02:05.175 --> 00:02:07.755
before I can discuss the time critical emergency procedure

49
00:02:08.075 --> 00:02:10.595
followed by the aftermath, changing the safety culture,

50
00:02:10.935 --> 00:02:13.915
and finally share our lessons learned from this event.

51
00:02:15.615 --> 00:02:19.555
The BQM 74 is a subscale subsonic aerial target used

52
00:02:19.555 --> 00:02:21.515
to test airborne and service launch weapon

53
00:02:21.515 --> 00:02:22.755
systems for all services.

54
00:02:23.535 --> 00:02:26.795

The anti-ship cruise missile profile in low altitude is one

55
00:02:26.795 --> 00:02:28.155
of several profiles available

56
00:02:28.305 --> 00:02:31.195
with an operating envelope from surface to 40,000 feet.

57
00:02:32.095 --> 00:02:33.995
The target is capable of carrying internal

58
00:02:34.015 --> 00:02:35.995
and external electronic warfare and DF

59
00:02:35.995 --> 00:02:37.635
and payloads for threat representation

60
00:02:38.965 --> 00:02:40.675
fully recoverable by parachute.

61
00:02:40.935 --> 00:02:42.995
The target is reusable for future emissions

62
00:02:43.285 --> 00:02:44.875
until being fully expended

63
00:02:44.895 --> 00:02:47.515
during live fire weapons test and evaluation.

64
00:02:49.055 --> 00:02:51.115
The target includes a UHF transponder

65
00:02:51.115 --> 00:02:52.355
to receive command messages

66
00:02:52.695 --> 00:02:54.835
and transmits time, space position,

67
00:02:54.835 --> 00:02:56.115
and aircraft state information

68
00:02:56.115 --> 00:02:57.475
to the remote control operator.

69
00:02:59.305 --> 00:03:01.325
The system for Navy target control, or S

70
00:03:01.325 --> 00:03:03.165
and TC provides command

71
00:03:03.165 --> 00:03:05.445
and control of the aerial target through a Microsoft Windows

72
00:03:06.145 --> 00:03:07.885
NT based interface.

73
00:03:08.985 --> 00:03:12.245
The s and TC uses a 10 base two coaxial cable

74
00:03:12.515 --> 00:03:14.125
with serially connected components.

75
00:03:14.865 --> 00:03:16.245
The master control console

76
00:03:16.345 --> 00:03:19.865
or MCC, the target control console

77
00:03:19.925 --> 00:03:24.785
or TCC, the ground radio frequency unit we call EW antenna,

78
00:03:24.785 --> 00:03:27.585
is to transmit UHF data link directly to the aerial targets

79
00:03:27.585 --> 00:03:29.745
or through an airborne data link.

80
00:03:31.285 --> 00:03:33.425
The master control console is the brains of the S

81
00:03:33.425 --> 00:03:36.825

and TC with duplicate backup control console monitoring

82
00:03:36.825 --> 00:03:38.385
system performance for redundancy.

83
00:03:39.525 --> 00:03:43.065
The MCC console is a bi-fold suitcase design consisting

84
00:03:43.065 --> 00:03:44.665
of a liquid crystal display in the lid

85
00:03:44.925 --> 00:03:46.425
and the command panel with a keyboard

86
00:03:46.525 --> 00:03:47.905
and cursor for data entry.

87
00:03:49.005 --> 00:03:50.825
The MCC operator sets up the s

88
00:03:50.825 --> 00:03:53.465
and TC within the control room and runs diagnostic

89
00:03:53.465 --> 00:03:55.265
and systems checks to ensure proper

90
00:03:55.265 --> 00:03:56.545
performance before missions.

91
00:03:57.325 --> 00:03:59.545
The MCC operator then assigns targets

92
00:03:59.545 --> 00:04:02.225
to the appropriate target control console and pairs.

93
00:04:02.225 --> 00:04:03.505
The UHF data links

94
00:04:03.525 --> 00:04:06.105
to the targets being controlled by the TCCs.

95
00:04:07.005 --> 00:04:10.065
The backup control console is a standby mode monitoring

96
00:04:10.065 --> 00:04:13.905
command traffic, and when the MCC stops radiating

97
00:04:14.365 --> 00:04:17.145
or the BCC stops receiving commands,

98
00:04:17.565 --> 00:04:19.105
the BCC will become active

99
00:04:19.565 --> 00:04:21.065
and a search control over the system.

100
00:04:22.725 --> 00:04:24.425
The target control console consists

101
00:04:24.425 --> 00:04:27.105
of the same bi-fold suitcase design consisting

102
00:04:27.105 --> 00:04:29.825
of the display and the lid, the command panel control stick

103
00:04:30.405 --> 00:04:34.345
and, uh, and uh, controls for the aerial target.

104
00:04:35.885 --> 00:04:37.745
The display panel provides the RCO

105
00:04:37.745 --> 00:04:40.705
with telemetry information, aircraft, state information

106
00:04:40.705 --> 00:04:42.145
and payload command status.

107
00:04:42.885 --> 00:04:44.225
The command panel consists

108
00:04:44.225 --> 00:04:46.665

of discrete electromagnetic switches for target

109
00:04:46.685 --> 00:04:50.105
and payload control, throttle, increase

110
00:04:50.185 --> 00:04:52.385
or decrease escape left

111
00:04:52.445 --> 00:04:55.905
or escape right, low altitude cruises, delayed recovery,

112
00:04:55.975 --> 00:04:57.545
instant recovery, climb

113
00:04:57.605 --> 00:05:00.465
and climb, disengage are a few of those commands.

114
00:05:00.925 --> 00:05:02.625
And then the control stick provides pitch

115
00:05:02.625 --> 00:05:05.105
and roll commands, just like any aircraft,

116
00:05:06.885 --> 00:05:10.225
the ground radio frequency unit is an associated antenna.

117
00:05:10.225 --> 00:05:12.545
Provides a UHF data link for command and control.

118
00:05:13.605 --> 00:05:17.225
The RF views may be coated co-located with the S and TC

119
00:05:17.225 --> 00:05:19.425
or remotely located as required

120
00:05:19.425 --> 00:05:21.545
by the range layout for this mission.

121
00:05:21.725 --> 00:05:23.905
The FUS were established at the top of Laguna Peak,

122
00:05:23.995 --> 00:05:25.545
three miles from the control room,

123
00:05:26.085 --> 00:05:29.185
and at 1,500 foot above, uh, C level

124
00:05:29.585 --> 00:05:32.025
provided excellent line of sight coverage.

125
00:05:33.605 --> 00:05:36.185
The peripherals are not associated with the SNTC,

126
00:05:36.185 --> 00:05:38.305
but are required for range interface.

127
00:05:38.965 --> 00:05:41.305
The range interface processor allows for connection

128
00:05:41.305 --> 00:05:42.905
between the SNTC and the local range,

129
00:05:43.485 --> 00:05:45.385
and the media converter is required

130
00:05:45.385 --> 00:05:47.065
to connect the 10 base two network

131
00:05:47.125 --> 00:05:49.905
to the ethernet bridge using the T one fiber optic network.

132
00:05:51.885 --> 00:05:56.745
So putting this all together above the Blue Horizon line is,

133
00:05:56.765 --> 00:05:59.805
uh, all the equipment at, uh, Laguna Peak, as long as a re

134
00:06:00.025 --> 00:06:03.605
as well as a relay aircraft and the, um, targets

135
00:06:03.605 --> 00:06:05.885

and below the line is everything that's set up in, uh,

136
00:06:05.885 --> 00:06:07.085
control room mic.

137
00:06:07.465 --> 00:06:09.045
So you start off with the MC

138
00:06:09.185 --> 00:06:13.485
and the BCC, you add the, uh, six TCCs,

139
00:06:13.585 --> 00:06:17.765
the four primary controlling targets, Charlie delta, alpha,

140
00:06:17.765 --> 00:06:19.925
and Bravo one through four, as well

141
00:06:19.925 --> 00:06:21.605
as backups for five and six.

142
00:06:22.825 --> 00:06:26.085
The curfews, the Robert Laguna Peak, this is all connected

143
00:06:26.105 --> 00:06:31.005
by a 10 base two, uh, uh, network, uh,

144
00:06:31.525 --> 00:06:33.045
properly terminated with 50 ohms.

145
00:06:33.465 --> 00:06:35.365
In the lower right, the range interface

146
00:06:35.765 --> 00:06:37.325
connects to the uh, C range.

147
00:06:37.825 --> 00:06:40.685
The media converter also properly terminated, connects

148
00:06:40.685 --> 00:06:43.605
with ethernet bridge up to Laguna Peak,

149
00:06:44.185 --> 00:06:46.445
and that's connected to the UHF antennas.

150
00:06:47.025 --> 00:06:48.925
Uh, UHF data linked to the aircraft,

151
00:06:49.145 --> 00:06:50.845
and then down to the, uh, target

152
00:06:51.665 --> 00:06:55.085
in the low altitude environment, control room.

153
00:06:55.365 --> 00:06:58.445
Physical layout, uh, played in this, uh, in this, uh,

154
00:06:58.725 --> 00:07:01.885
physical layout is, is, uh, about si uh, twice the size

155
00:07:01.945 --> 00:07:05.485
of the stage I'm standing upon, uh, the MCC

156
00:07:05.485 --> 00:07:08.045
and the BCC operator would be facing the audience

157
00:07:08.385 --> 00:07:11.405
and the RCOs would be facing the back wall

158
00:07:11.945 --> 00:07:14.445
or as, as you're looking at that wall, you can see

159
00:07:14.445 --> 00:07:17.765
that there's about 18 foot of separation between the, uh,

160
00:07:17.765 --> 00:07:19.845
master control con, uh, operator

161
00:07:19.985 --> 00:07:21.525
and the remote control operator.

162
00:07:24.825 --> 00:07:25.965

Um, The, uh,

163
00:07:26.235 --> 00:07:27.965
RCOs are controlling their respective targets.

164
00:07:28.225 --> 00:07:31.405
Uh, uh, in this target control room is open

165
00:07:31.405 --> 00:07:32.565
to the range control room,

166
00:07:32.585 --> 00:07:34.885
and when withstanding, everybody is within view,

167
00:07:35.385 --> 00:07:37.925
the operations and conductor controls all activity within

168
00:07:37.925 --> 00:07:38.965
the target control room

169
00:07:39.265 --> 00:07:42.285
and is on headset with a test conductor who is in control

170
00:07:42.285 --> 00:07:46.045
of the entire test event For control room communications,

171
00:07:46.385 --> 00:07:48.445
the test conductor is the designated representative

172
00:07:48.485 --> 00:07:51.245
of the Point Magoo Sea Range, with responsibility

173
00:07:51.305 --> 00:07:53.525
and authority to conduct live fire operations.

174
00:07:53.985 --> 00:07:56.525
The test conductor is in direct radio communications

175
00:07:56.915 --> 00:07:58.205
with the systems under test

176
00:07:58.545 --> 00:08:00.925
and the target team providing threat presentations

177
00:08:01.545 --> 00:08:02.685
for the purpose of this test

178
00:08:02.905 --> 00:08:07.285
to control nets were established the ship control net

179
00:08:07.285 --> 00:08:08.605
and the target control net.

180
00:08:14.445 --> 00:08:16.225
All communications during the test passes

181
00:08:16.225 --> 00:08:17.505
through the test conductor.

182
00:08:17.805 --> 00:08:20.505
The operations conductor cannot hear transmissions from the

183
00:08:20.585 --> 00:08:21.705
ship, and the ship cannot hear

184
00:08:21.705 --> 00:08:22.985
transmissions from the target team.

185
00:08:23.575 --> 00:08:25.665
Furthermore, all communications in the

186
00:08:25.665 --> 00:08:26.745
target team are verbal.

187
00:08:30.355 --> 00:08:33.345
There are, uh, three primary recovery methods,

188
00:08:33.565 --> 00:08:34.825
two primary recovery methods,

189
00:08:34.845 --> 00:08:37.385

and an emergency recovery method for the, uh, target.

190
00:08:38.085 --> 00:08:39.425
Uh, the first two are the delayed

191
00:08:39.705 --> 00:08:40.745
recovery and the instant recovery.

192
00:08:41.445 --> 00:08:43.825
The third recovery method is only initiated

193
00:08:43.825 --> 00:08:45.945
by the MCC operator by unselect.

194
00:08:45.965 --> 00:08:48.145
The radiate to target command

195
00:08:48.775 --> 00:08:51.465
kill the carrier is the verbal command from the RCO

196
00:08:51.465 --> 00:08:53.945
to the MCC operator to activate this recovery method.

197
00:08:56.265 --> 00:08:58.165
The illustration represents the HF

198
00:08:58.405 --> 00:08:59.445
recovery failure sequence.

199
00:09:00.145 --> 00:09:01.645
The system uses two timers,

200
00:09:01.865 --> 00:09:05.365
one external pre-flight selectable with 1, 2, 4, 8,

201
00:09:05.365 --> 00:09:06.405
or 16 seconds,

202
00:09:07.025 --> 00:09:09.405
and the second internal timer fixed at four seconds.

203
00:09:09.745 --> 00:09:12.405
During this mission, the external timer was set

204
00:09:12.405 --> 00:09:16.325
for four seconds, and the internal timer, uh, was, uh, set

205
00:09:16.345 --> 00:09:20.045
for a four, providing eight seconds, uh, total time

206
00:09:20.225 --> 00:09:23.605
before the target would be commanded into a 20 degree climb,

207
00:09:24.265 --> 00:09:28.165
uh, followed by, uh, engine cutoff electrical cutoff,

208
00:09:28.165 --> 00:09:29.525
eventual parachute deployment.

209
00:09:29.975 --> 00:09:31.845
Below 120 knots,

210
00:09:32.815 --> 00:09:34.525
there is no big red button in flight

211
00:09:34.525 --> 00:09:35.965
termination with the S and TC.

212
00:09:37.695 --> 00:09:41.355
So the scenario for this, uh, event was relatively simple

213
00:09:41.775 --> 00:09:44.035
and starts with the destroyer on the established course

214
00:09:44.095 --> 00:09:48.195
and speed 2.5 nautical mile safety keep out was established

215
00:09:48.195 --> 00:09:50.075
around the destroyer, along

216
00:09:50.075 --> 00:09:51.555

with the left and right boundaries.

217
00:09:52.335 --> 00:09:56.115
The targets presented the dual lead trail profile from two

218
00:09:56.115 --> 00:09:59.075
different approach headings, however, target's Alpha

219
00:09:59.075 --> 00:10:01.715
and Bravo never got Airborne, leaving only Charlie

220
00:10:01.775 --> 00:10:03.035
and Delta for the profile.

221
00:10:03.785 --> 00:10:06.475
This was a defined contingency in the test plan and

222
00:10:06.475 --> 00:10:07.875
therefore allowed to proceed.

223
00:10:11.095 --> 00:10:13.875
It was a cool and clear Saturday morning at point Magoo,

224
00:10:14.015 --> 00:10:16.635
the ship was on station and the four targets were ready

225
00:10:16.635 --> 00:10:18.115
for launch targets.

226
00:10:18.115 --> 00:10:21.435
Charlie and Delta were set up in control frequency UHF data,

227
00:10:21.435 --> 00:10:22.915
link one and targets.

228
00:10:22.915 --> 00:10:25.315
Alpha and Bravo were set up on UHF data link two.

229
00:10:26.615 --> 00:10:27.995
At four minutes before launch,

230
00:10:28.215 --> 00:10:29.955
the backup control console became active

231
00:10:30.215 --> 00:10:32.115
and assertive control of the S and TC.

232
00:10:32.615 --> 00:10:35.915
The BCC operator was not aware of this anomalous state.

233
00:10:36.695 --> 00:10:39.355
During engine runup checks, all four engines were commanded

234
00:10:39.355 --> 00:10:42.675
to 100% and all targets were very slow to reach full RPM

235
00:10:43.575 --> 00:10:45.195
at 10 seconds before target,

236
00:10:45.195 --> 00:10:49.435
Charlie launched the BCC reported the GRFU for UHF data.

237
00:10:49.435 --> 00:10:50.555
Link two was offline.

238
00:10:51.535 --> 00:10:52.875
At four seconds before target,

239
00:10:52.875 --> 00:10:55.315
Charlie launched the RF failure recovery sequence was

240
00:10:55.315 --> 00:10:57.875
triggered, and eight seconds later target's Alpha

241
00:10:57.895 --> 00:11:01.795
and Bravo would shut down target tar.

242
00:11:02.145 --> 00:11:04.235
When Target Charlie launched, the time

243
00:11:04.235 --> 00:11:07.475

to impact was 18 minutes and one second target.

244
00:11:07.475 --> 00:11:08.835
Delta launched in 10 seconds.

245
00:11:08.895 --> 00:11:11.795
In trail target's, alpha

246
00:11:11.795 --> 00:11:13.435
and Bravo shut down in the launchpad,

247
00:11:13.575 --> 00:11:15.035
and when ground crew approached,

248
00:11:15.145 --> 00:11:17.315
they observed the parachute canisters were open

249
00:11:19.565 --> 00:11:22.755
after takeoff and climb out target's.

250
00:11:22.845 --> 00:11:25.195
Alpha and Bravo appeared to respond appropriately

251
00:11:25.215 --> 00:11:28.115
to commands and the target team felt the network latency was

252
00:11:28.115 --> 00:11:29.635
improving with only two targets.

253
00:11:29.635 --> 00:11:32.355
Now in the network, when the RCOs command

254
00:11:32.355 --> 00:11:34.155
and climb disengage at 20,000 feet,

255
00:11:34.535 --> 00:11:35.795
the targets did not respond

256
00:11:35.795 --> 00:11:38.955
and continued in their last assigned climb command to climb.

257
00:11:39.065 --> 00:11:42.555
Disengage was eventually received

258
00:11:42.635 --> 00:11:46.395
and the targets then leveled off just above 25,000 feet.

259
00:11:46.825 --> 00:11:49.315
Time to impact from this point was about 13 minutes.

260
00:11:51.895 --> 00:11:54.565
The RCOs regained control of the targets descended

261
00:11:54.565 --> 00:11:55.725
to low altitude and maneuver

262
00:11:55.725 --> 00:11:56.925
the target to the initial point.

263
00:11:56.985 --> 00:11:59.285
To begin the presentation run on course and speed.

264
00:11:59.825 --> 00:12:01.845
The targets were manually flown, accelerated

265
00:12:01.845 --> 00:12:04.005
to 488 knots indicated air speed.

266
00:12:04.235 --> 00:12:07.325
However, the RCOs were not aware of a 22 knot tailwind.

267
00:12:08.075 --> 00:12:10.645
This resulted in a 510 knot ground speed,

268
00:12:10.645 --> 00:12:13.645
which was greater than desired from the initial point.

269
00:12:13.705 --> 00:12:16.405
The time to impact was now four minutes and 14 seconds.

270
00:12:18.075 --> 00:12:19.205

With the targets on course

271
00:12:19.205 --> 00:12:21.685
and speed, the RCOs are monitoring target performance.

272
00:12:21.985 --> 00:12:24.805
Target Charlie Controller applied a small roll command

273
00:12:24.805 --> 00:12:26.765
to fine tune his course towards the destroyer.

274
00:12:27.195 --> 00:12:28.925
This was the last roll command sent

275
00:12:28.925 --> 00:12:31.325
to target Charlie from TCC one.

276
00:12:32.235 --> 00:12:34.085
Time to impact was now only a minute,

277
00:12:34.085 --> 00:12:37.445
43 seconds at 30 seconds.

278
00:12:37.465 --> 00:12:40.845
To impact the backup control console directed TCC one

279
00:12:40.845 --> 00:12:43.565
to fail over to the now unoccupied TC

280
00:12:43.615 --> 00:12:45.645
three for control of target.

281
00:12:45.645 --> 00:12:48.805
Charlie, however, TC one continued

282
00:12:48.805 --> 00:12:50.445
to display the target control screen

283
00:12:50.445 --> 00:12:52.245
with target state situational awareness

284
00:12:52.665 --> 00:12:54.565
and with Universal Time incrementing.

285
00:12:55.195 --> 00:12:57.525
This gave that control operator the impression

286
00:12:57.525 --> 00:12:59.765
that he was still in control of his target.

287
00:13:01.955 --> 00:13:04.965
When Target Charlie was about

288
00:13:04.965 --> 00:13:07.445
to penetrate the 2.5 nautical mal safety bubble,

289
00:13:07.505 --> 00:13:09.445
the RCEO commanded escape left

290
00:13:09.745 --> 00:13:11.325
and pulled the control stick aft

291
00:13:11.325 --> 00:13:13.405
and left to ensure the command was transmitted.

292
00:13:14.305 --> 00:13:16.445
At that same instant, TCC one failed

293
00:13:16.445 --> 00:13:19.325
to the desktop screen if you're ever working on your laptop,

294
00:13:19.345 --> 00:13:21.125
and it, uh, blue screen comes up.

295
00:13:21.305 --> 00:13:24.165
That's what this operator was looking at as he was, uh,

296
00:13:24.195 --> 00:13:28.205
observing his, uh, target control RCO for target,

297
00:13:28.205 --> 00:13:30.645

Delta commanded escape left on TCC two

298
00:13:31.025 --> 00:13:33.245
and Target Delta responded appropriately

299
00:13:33.555 --> 00:13:36.045
with a climbing left hand turn away from the destroyer.

300
00:13:36.515 --> 00:13:38.685
Time to impact was now only 22 seconds.

301
00:13:40.265 --> 00:13:41.925
So what did this look like? Target,

302
00:13:41.925 --> 00:13:45.525
Charlie was reassigned from TC one to TCC three,

303
00:13:45.955 --> 00:13:49.125
however, the RCOs manning those two stations

304
00:13:49.595 --> 00:13:50.605
left their positions.

305
00:13:50.605 --> 00:13:53.085
When target's Alpha and Bravo shut down on the launchpad,

306
00:13:53.915 --> 00:13:56.485
they moved to observe the operation near the operations

307
00:13:56.485 --> 00:13:59.565
conductor, creating a barrier between the RCOs and the MCC

308
00:13:59.565 --> 00:14:00.765
and BCC operators.

309
00:14:01.785 --> 00:14:05.485
The BCC operator was not aware of the failover to TCC three,

310
00:14:06.385 --> 00:14:07.645
had an operator been present

311
00:14:08.065 --> 00:14:11.405
and selected escape left discreet command on TCC three,

312
00:14:12.025 --> 00:14:14.125
the target would have escaped left

313
00:14:15.105 --> 00:14:16.125
and avoided the collision.

314
00:14:18.835 --> 00:14:21.045
This is the BCC screenshot.

315
00:14:21.335 --> 00:14:24.205
We'll zoom in on the, uh, red box and upper left.

316
00:14:25.865 --> 00:14:30.325
You can see that the, uh, uh, active mode is displayed.

317
00:14:30.905 --> 00:14:33.765
Uh, TCC one is now assigned as floating,

318
00:14:34.425 --> 00:14:39.085
and TCC three is in command of target 5 6 0 0 9.

319
00:14:39.395 --> 00:14:41.205
This is the target that hit the ship.

320
00:14:43.865 --> 00:14:45.125
The command kill the carrier

321
00:14:46.465 --> 00:14:49.125
was expressed three times towards the MCC operator,

322
00:14:49.185 --> 00:14:50.725
who was the only person with the ability

323
00:14:50.745 --> 00:14:52.925
to stop transmitting the UHF data link

324
00:14:53.105 --> 00:14:55.805

and put the target into the RF failure recovery sequence.

325
00:14:56.685 --> 00:14:58.005
Remember, the sequence takes eight seconds,

326
00:14:58.665 --> 00:15:01.485
and at this point, we only had 15 seconds until impact.

327
00:15:03.185 --> 00:15:05.245
The order to kill the carrier was confirmed

328
00:15:05.245 --> 00:15:07.885
with the MCs operator unselect the radiate

329
00:15:07.885 --> 00:15:09.405
to target command on the display.

330
00:15:09.595 --> 00:15:11.525
This occurred at six seconds to impact

331
00:15:14.185 --> 00:15:15.685
at 1301 local time.

332
00:15:16.225 --> 00:15:19.125
The BQM 74 struck the destroyer on the port side

333
00:15:19.125 --> 00:15:20.285
just above the oh one level.

334
00:15:21.265 --> 00:15:23.605
Let me repeat that. We hit the ship.

335
00:15:25.495 --> 00:15:28.445
While I don't have body access equations, coefficients,

336
00:15:28.515 --> 00:15:31.485
bode plots associated with typical SETP presentations,

337
00:15:32.005 --> 00:15:33.325
I do have empirical evidence

338
00:15:33.355 --> 00:15:35.565
that force equals mass times acceleration.

339
00:15:39.145 --> 00:15:41.765
The target created a three foot diameter hole in the outer

340
00:15:41.765 --> 00:15:43.405
hall and penetrated interior compartment.

341
00:15:43.945 --> 00:15:46.525
For size comparison, you can see a man in the lift

342
00:15:46.545 --> 00:15:48.165
and a four foot by eight foot piece

343
00:15:48.165 --> 00:15:49.365
of plywood to cover the hole.

344
00:15:50.905 --> 00:15:54.445
So what happened? Two root causes were identified that led

345
00:15:54.445 --> 00:15:56.485
to the impact of the drone into the destroyer.

346
00:15:58.265 --> 00:16:00.485
The first root cause resulted in the failure of the s

347
00:16:00.485 --> 00:16:02.325
and TC system, and the second resulted in the

348
00:16:02.325 --> 00:16:03.565
target impacting the ship.

349
00:16:04.505 --> 00:16:07.325
The first root cause consisted of two errors.

350
00:16:07.625 --> 00:16:09.725
The SNTC was improperly terminated

351
00:16:09.725 --> 00:16:11.125

with an additional 50 ohms,

352
00:16:11.465 --> 00:16:14.445
and the MCC transmission selection was improperly set

353
00:16:14.445 --> 00:16:16.125
to broadcast instead of unicast.

354
00:16:16.945 --> 00:16:19.885
The SNTC operator's manual did not clearly identify the

355
00:16:19.885 --> 00:16:21.165
proper 50 ohm termination,

356
00:16:21.305 --> 00:16:24.085
but did properly illustrate the transmission selection

357
00:16:24.395 --> 00:16:26.325
requiring unicast, which was not followed.

358
00:16:27.785 --> 00:16:28.805
The second root cause

359
00:16:28.805 --> 00:16:30.925
of the drone impact was the target team's failure

360
00:16:30.985 --> 00:16:34.765
to execute a time critical immediate action emergency.

361
00:16:36.195 --> 00:16:38.975
Proper termination of the media converter is the application

362
00:16:38.975 --> 00:16:41.575
of 50 ohms in the form of either mechanical connector

363
00:16:41.595 --> 00:16:44.255
or electrical micro micro switch.

364
00:16:45.675 --> 00:16:48.255
The media converter for this event was improperly terminated

365
00:16:48.255 --> 00:16:49.815
with two 50 ohm terminations.

366
00:16:50.635 --> 00:16:52.775
The hardware termination was installed as well

367
00:16:52.775 --> 00:16:54.855
as the electrical micro switch was selected

368
00:16:54.855 --> 00:16:57.295
to the 50 ohm position.

369
00:16:58.205 --> 00:17:01.615
This resulted in a i instead of an, uh,

370
00:17:01.775 --> 00:17:05.495
a sponge absorbing all that, uh, command traffic acted

371
00:17:05.635 --> 00:17:07.855
as a mirror reflecting all those

372
00:17:07.855 --> 00:17:09.415
messages back into the system.

373
00:17:10.125 --> 00:17:11.655
This created a data storm

374
00:17:11.655 --> 00:17:13.935
with significant increase in network message traffic

375
00:17:14.035 --> 00:17:15.135
and system instability.

376
00:17:16.235 --> 00:17:19.575
So what did this look like? There we have the, uh,

377
00:17:19.695 --> 00:17:21.135
edge view of the media converter.

378
00:17:21.135 --> 00:17:23.775

You can see the 50 ohm termination as well as

379
00:17:23.775 --> 00:17:27.095
that micro switch, uh, is set to 50 ohms, uh,

380
00:17:27.095 --> 00:17:28.815
with young eyes and bright lighting.

381
00:17:28.995 --> 00:17:30.055
You may be able to see that.

382
00:17:30.515 --> 00:17:32.815
Uh, the, the operators who set this up did not,

383
00:17:34.655 --> 00:17:37.095
Wouldn't be an SETP presentation without data.

384
00:17:37.475 --> 00:17:38.775
And so this is my data.

385
00:17:39.605 --> 00:17:41.055
This chart displays a number

386
00:17:41.055 --> 00:17:43.535
of retransmissions on the vertical axis against time

387
00:17:43.555 --> 00:17:44.655
and seconds to a system

388
00:17:44.805 --> 00:17:46.735
with four targets properly terminated.

389
00:17:47.235 --> 00:17:49.325
The average retransmission rate is three

390
00:17:49.645 --> 00:17:50.685
retransmissions per second.

391
00:17:51.265 --> 00:17:53.565
Notice those vertical scales from zero to 30.

392
00:17:55.265 --> 00:17:58.205
Now, if we improperly terminate the 10 base two system

393
00:17:58.205 --> 00:18:00.565
with four targets, we observe the retransmission rate

394
00:18:00.565 --> 00:18:04.165
increased to 45 retransmissions per second.

395
00:18:04.835 --> 00:18:09.085
This retransmission rate is 15 times greater than normal.

396
00:18:11.625 --> 00:18:13.605
The second improper setup of the s

397
00:18:13.605 --> 00:18:16.325
and TC was a selection of broadcast instead of unicast

398
00:18:16.325 --> 00:18:17.605
through the master control console,

399
00:18:18.115 --> 00:18:21.285
this error compounded the, uh, improper termination

400
00:18:21.285 --> 00:18:23.405
by quadrupling the data bandwidth.

401
00:18:24.185 --> 00:18:27.845
So what does that look like? Here we have a network

402
00:18:28.225 --> 00:18:29.285
and data bandwidth.

403
00:18:29.825 --> 00:18:32.525
The normal network bandwidth is about 1.3

404
00:18:33.245 --> 00:18:34.245
megabits per second,

405
00:18:34.665 --> 00:18:37.845

and the normal data bandwidth in the green box is about

406
00:18:37.915 --> 00:18:39.965
0.2 megabits per second.

407
00:18:40.755 --> 00:18:43.045
When the transmission switch was improperly set

408
00:18:43.045 --> 00:18:46.725
to broadcast, that quadrupled that data bandwidth

409
00:18:47.145 --> 00:18:49.485
to 0.8 megabits per second.

410
00:18:51.195 --> 00:18:54.325
When we incorrectly terminated the um system,

411
00:18:54.825 --> 00:18:57.405
the decreased network bandwidth about 50%,

412
00:18:58.205 --> 00:19:00.805
resulted in 0.7 megabits per second,

413
00:19:01.925 --> 00:19:04.085
creating a data bandwidth that exceeded

414
00:19:04.625 --> 00:19:05.685
the network bandwidth.

415
00:19:07.825 --> 00:19:10.445
In layman's terms, the pipe is clogged,

416
00:19:12.345 --> 00:19:13.645
the drive for mission success.

417
00:19:14.225 --> 00:19:16.205
So why did the target team allow this to happen?

418
00:19:16.945 --> 00:19:19.285
The only answer was the overwhelming drive

419
00:19:19.425 --> 00:19:20.445
for mission success.

420
00:19:22.025 --> 00:19:25.525
The target team provided prided themselves in nearly 100%

421
00:19:25.525 --> 00:19:27.885
mission completion rates by providing the desired

422
00:19:27.885 --> 00:19:31.365
presentation for the system under test every single time.

423
00:19:32.165 --> 00:19:33.525
SNTC is not a perfect system.

424
00:19:33.635 --> 00:19:35.685
It's prone to latency and occasional failures.

425
00:19:36.025 --> 00:19:39.165
The BQM 74 has a historical mission success rate

426
00:19:39.165 --> 00:19:41.445
of 97% over time.

427
00:19:42.385 --> 00:19:47.245
The target team, uh, worked through control latencies

428
00:19:47.665 --> 00:19:50.205
and sometimes resulted in brief loss of control

429
00:19:50.205 --> 00:19:52.285
of the target and payload activation delays.

430
00:19:52.915 --> 00:19:55.045
They worked through those challenges during every mission

431
00:19:55.345 --> 00:19:56.645
and over a course of many years,

432
00:19:56.715 --> 00:19:58.645

they normalized the abnormal.

433
00:20:00.145 --> 00:20:02.885
So what were those abnormal latency indications?

434
00:20:03.665 --> 00:20:04.925
You can probably remember those.

435
00:20:04.985 --> 00:20:08.045
The BCC uh, asserts control becomes active.

436
00:20:08.645 --> 00:20:10.245
RPM was very slow to respond.

437
00:20:10.315 --> 00:20:11.965
Targets alpha and bravo were shut down,

438
00:20:12.325 --> 00:20:14.245
employed parachutes and targets.

439
00:20:14.245 --> 00:20:16.845
Charlie and Delta failed to level at 20,000 feet.

440
00:20:17.585 --> 00:20:20.685
And then finally, uh, target Charlie failed to respond

441
00:20:20.685 --> 00:20:23.245
to the TC one at 23 seconds to impact,

442
00:20:23.745 --> 00:20:25.245
and that's where this became

443
00:20:25.765 --> 00:20:28.165
a time critical immediate action emergency.

444
00:20:29.995 --> 00:20:31.255
The emergency steps start

445
00:20:31.255 --> 00:20:32.775
with a recognition of loss of control.

446
00:20:33.005 --> 00:20:36.055
Command the MCC operator to kill the carrier.

447
00:20:36.635 --> 00:20:39.295
The MCC operator unselect radi to target,

448
00:20:39.395 --> 00:20:42.335
and then in eight seconds, the target will execute the RF

449
00:20:42.335 --> 00:20:43.655
failure recovery sequence.

450
00:20:44.195 --> 00:20:46.855
So how do you kill the carrier? What are those steps?

451
00:20:48.035 --> 00:20:51.205
Well, the MCC operator has to use his cursor control.

452
00:20:51.865 --> 00:20:54.645
How many people, uh, in their laptop computer use

453
00:20:54.645 --> 00:20:56.805
that little cursor control in the middle of the keyboard

454
00:20:56.985 --> 00:20:59.205
to try and maneuver their mouse around?

455
00:20:59.555 --> 00:21:00.965
It's fairly challenging at times,

456
00:21:01.425 --> 00:21:03.445
and I would say most people don't want to do that.

457
00:21:03.985 --> 00:21:05.845
And, and that's what is used in the system.

458
00:21:07.625 --> 00:21:08.765
If I were to, uh,

459
00:21:08.765 --> 00:21:10.885

give this a Cooper Harper handling qualities

460
00:21:10.885 --> 00:21:12.445
rating, I would rate this.

461
00:21:12.445 --> 00:21:13.565
An HQR six.

462
00:21:14.685 --> 00:21:16.565
Adequate performance requires extensive

463
00:21:17.325 --> 00:21:21.525
operator compensation for the MCC screenshot.

464
00:21:21.585 --> 00:21:24.485
We will zoom in on target 5 6 0 0 9.

465
00:21:25.265 --> 00:21:29.285
The NCC operator takes his cursor, uh, moves it up

466
00:21:29.285 --> 00:21:30.445
to the radiate to target

467
00:21:30.905 --> 00:21:33.165
and uncheck that radiate to target box.

468
00:21:33.995 --> 00:21:34.725
It's that simple.

469
00:21:40.725 --> 00:21:43.585
So let's look at, uh, time available for the target team

470
00:21:44.525 --> 00:21:47.065
to stop the UHF data link transmission to the target.

471
00:21:52.165 --> 00:21:53.305
The first visual indication

472
00:21:53.305 --> 00:21:56.265
that TCC one failure occurred at 23 seconds to impact.

473
00:21:58.385 --> 00:21:59.985
Actually, let me go with a human reaction time.

474
00:22:00.525 --> 00:22:02.785
Uh, so what is the human reaction time when dealing

475
00:22:02.785 --> 00:22:04.785
with a time critical immediate action emergency?

476
00:22:05.035 --> 00:22:08.225
First, we have to determine the reaction time as the ability

477
00:22:08.245 --> 00:22:10.745
to perceive a stimulus, either visual, oral, or both,

478
00:22:11.125 --> 00:22:14.385
and respond appropriately in clinical settings.

479
00:22:14.685 --> 00:22:17.425
Visual stimuli averages about 190 milliseconds

480
00:22:17.565 --> 00:22:21.025
and oral stimuli a little faster at 160 milliseconds.

481
00:22:21.605 --> 00:22:24.345
In discussions with the system, uh, uh,

482
00:22:24.345 --> 00:22:25.745
safety department at NAV Air,

483
00:22:26.095 --> 00:22:28.465
that reaction time is approximately three seconds,

484
00:22:28.555 --> 00:22:33.505
which involves, uh, recognition action and initial response.

485
00:22:33.885 --> 00:22:36.345
So, why did we fail to complete the action

486
00:22:36.345 --> 00:22:37.505

item then kill the carrier?

487
00:22:39.045 --> 00:22:40.105
Timing to react.

488
00:22:40.125 --> 00:22:43.105
Visual failure occurred of TC one at 23 seconds.

489
00:22:43.885 --> 00:22:45.465
Uh, less, uh, eight seconds

490
00:22:45.565 --> 00:22:48.625
for the target recovery sequence leaves 15 seconds to com

491
00:22:48.805 --> 00:22:51.225
to communicate, kill the carrier to the MC operator.

492
00:22:53.485 --> 00:22:56.185
So where did the 11 seconds remaining go?

493
00:22:56.565 --> 00:23:01.145
The factors affecting reaction time, uh, are listed here.

494
00:23:01.205 --> 00:23:03.465
The two greatest contributors were state of attention

495
00:23:03.565 --> 00:23:04.785
and situational awareness.

496
00:23:05.945 --> 00:23:08.425
Remember the control room? The MCC operator had his back

497
00:23:08.425 --> 00:23:11.305
to the RCOs, did not have situational awareness displays,

498
00:23:11.645 --> 00:23:14.425
and kept up with mission progress on headsets that were not,

499
00:23:14.615 --> 00:23:16.065
that were not used.

500
00:23:16.655 --> 00:23:19.105
Ambient noise as a result from verbal communication in the

501
00:23:19.105 --> 00:23:22.225
control room was a distraction of the MCC operator, along

502
00:23:22.225 --> 00:23:23.225
with focused attention.

503
00:23:24.725 --> 00:23:28.905
And if he heard the, uh, command, he did not realize

504
00:23:28.905 --> 00:23:30.385
that it was directed towards him.

505
00:23:31.925 --> 00:23:33.105
So it was lifelike

506
00:23:33.105 --> 00:23:34.985
after the impossible for this test team,

507
00:23:35.735 --> 00:23:37.945
obviously target operations were suspended.

508
00:23:38.515 --> 00:23:40.465
Three separate investigations were convened,

509
00:23:40.465 --> 00:23:42.265
and I was a member of the safety investigation

510
00:23:42.265 --> 00:23:43.265
to determine the root cause.

511
00:23:43.885 --> 00:23:45.405
We corrected documentation

512
00:23:45.545 --> 00:23:48.085
and actually had to develop new documentation

513
00:23:48.585 --> 00:23:49.685

for some of the manuals.

514
00:23:49.745 --> 00:23:51.685
And then we started the return to flight training,

515
00:23:52.155 --> 00:23:53.845
operational risk management, crew,

516
00:23:54.085 --> 00:23:55.365
resource management and test team.

517
00:23:55.545 --> 00:24:00.445
Off Nominal training was conducted by everyone, uh,

518
00:24:00.625 --> 00:24:02.085
during the return to flight.

519
00:24:02.215 --> 00:24:04.405
After we completed all recommendations

520
00:24:04.425 --> 00:24:06.925
by the investigation boards, we set off to brief

521
00:24:07.545 --> 00:24:10.525
all applicable leaders in these flags, uh,

522
00:24:10.525 --> 00:24:12.925
within the Nair chain of command, the nav sea chain

523
00:24:12.925 --> 00:24:14.885
of command and the Commander Pacific Fleet

524
00:24:15.545 --> 00:24:16.605
and all over briefed a total

525
00:24:16.605 --> 00:24:18.685
of 17 stars over a four week period.

526
00:24:20.085 --> 00:24:22.485
I joined the, uh, threat target system department a year

527
00:24:22.485 --> 00:24:24.525
after this incident and was given the commander's intent

528
00:24:24.525 --> 00:24:26.645
to standardize us and make us better.

529
00:24:29.125 --> 00:24:32.365
I was a primary author for the new NVE instruction being

530
00:24:32.745 --> 00:24:35.245
to bring the best attributes of man aviation training,

531
00:24:35.525 --> 00:24:36.565
standardization, certification,

532
00:24:36.565 --> 00:24:38.645
and currency into the naval aerial target

533
00:24:38.645 --> 00:24:40.045
community called T tops.

534
00:24:40.385 --> 00:24:43.925
For those in the navy crowd, uh, NATOPS rhymes with T tops.

535
00:24:44.705 --> 00:24:48.645
We developed a new BQM 74 control system, uh, uh,

536
00:24:48.645 --> 00:24:52.485
control operators course, uh, training, uh, new RCOs.

537
00:24:52.485 --> 00:24:53.925
For the first time in 16 years,

538
00:24:54.985 --> 00:24:57.405
we developed a new range safety approval

539
00:24:57.435 --> 00:25:00.245
that prevents the potential for a target impact with a ship

540
00:25:00.245 --> 00:25:01.645

by creating an offset aim point.

541
00:25:02.065 --> 00:25:04.565
And finally, we, we reconfigured the control room.

542
00:25:05.425 --> 00:25:09.365
So before we had a 2.5 nautical mile

543
00:25:09.365 --> 00:25:10.485
with a left turnout.

544
00:25:11.105 --> 00:25:15.365
Uh, now after we have a, uh, five nautical mile, uh,

545
00:25:15.375 --> 00:25:19.645
right turn to either a thousand yard, uh, to the right

546
00:25:19.665 --> 00:25:21.165
or a thousand yard to the left.

547
00:25:21.785 --> 00:25:24.805
Uh, and then our, our turnout begins at 1.5.

548
00:25:25.625 --> 00:25:28.845
And then the new control room layout, uh, brings, uh,

549
00:25:28.905 --> 00:25:33.045
the MCCs and the BCC operators closer together faces the,

550
00:25:33.105 --> 00:25:37.085
uh, uh, RCOs puts everybody on headsets

551
00:25:37.545 --> 00:25:39.725
and, uh, provide that situational awareness.

552
00:25:39.795 --> 00:25:43.845
Display lessons learned from, uh, the,

553
00:25:44.105 --> 00:25:46.925
the change the safety culture was critical for this event.

554
00:25:46.945 --> 00:25:49.725
We realized the need to change our safety culture, uh,

555
00:25:49.725 --> 00:25:51.605
to get away from mission success at all costs.

556
00:25:51.715 --> 00:25:54.045
Gone are the days of, uh, working through

557
00:25:54.645 --> 00:25:56.045
multiple latency emergencies.

558
00:25:56.065 --> 00:26:00.445
We practice good crew resource management, as well as, uh,

559
00:26:00.885 --> 00:26:02.085
briefing the safety, no vote.

560
00:26:02.625 --> 00:26:06.005
Uh, the MCC operators now know how to, uh, kill the carrier.

561
00:26:06.665 --> 00:26:10.165
By and through this, uh, practice, uh,

562
00:26:10.225 --> 00:26:13.445
we have caged our abnormal gyro, uh,

563
00:26:13.625 --> 00:26:16.925
and our, our working, uh, emergencies as they come up.

564
00:26:17.505 --> 00:26:19.365
Uh, we've provided a mission success

565
00:26:19.405 --> 00:26:20.845
tempered through safety.

566
00:26:22.465 --> 00:26:23.725
So what were our lessons learned?

567
00:26:24.265 --> 00:26:26.285

Um, they were obvious and fair

568
00:26:26.385 --> 00:26:29.845
and fairly, uh, uh, consistent with with our findings.

569
00:26:30.265 --> 00:26:31.285
You have to know your network.

570
00:26:31.385 --> 00:26:32.925
You have to know your interfaces.

571
00:26:33.265 --> 00:26:35.765
Uh, you have to close your, uh, documentation gaps.

572
00:26:36.305 --> 00:26:38.805
You know, you want to optimize your control room setups

573
00:26:38.805 --> 00:26:40.925
with, uh, situational awareness displays

574
00:26:41.425 --> 00:26:42.685
as well as headsets.

575
00:26:43.585 --> 00:26:46.085
Uh, test team practice is critical.

576
00:26:46.085 --> 00:26:48.045
Practicing your crew resource management,

577
00:26:48.045 --> 00:26:49.365
your operational risk management.

578
00:26:49.825 --> 00:26:52.445
And then finally, uh, if you, um,

579
00:26:52.585 --> 00:26:55.565
accept deviations on a routine basis, you're,

580
00:26:55.625 --> 00:26:56.925
you are normalizing the abnormal.

581
00:26:57.255 --> 00:27:00.965
Don't do that. And then, uh, uh, obviously the last one,

582
00:27:01.185 --> 00:27:04.885
if you are assigned a, uh, position, uh, and,

583
00:27:05.345 --> 00:27:07.485
and, uh, uh, you're given a task,

584
00:27:07.815 --> 00:27:09.205
don't ever leave your post.

585
00:27:09.825 --> 00:27:12.525
You could be that one person that can escape left

586
00:27:12.625 --> 00:27:14.405
and avoid a collision altogether,

587
00:27:15.905 --> 00:27:17.805
we learned a tremendous amount from the

588
00:27:17.805 --> 00:27:18.925
supply test, uh, failure.

589
00:27:19.425 --> 00:27:22.085
And it's my desire that other teams learn from this event,

590
00:27:22.535 --> 00:27:24.725
apply our lessons to ensure your team is ready

591
00:27:24.745 --> 00:27:26.005
for when the impossible happens.

592
00:27:26.965 --> 00:27:29.005
I thank you for your time and attention today.

593
00:27:37.985 --> 00:27:39.445
Do we have time for any questions?

594
00:27:40.545 --> 00:27:43.405

Uh, does anyone have one question?

595
00:27:43.405 --> 00:27:44.885
There's a lot of questions. We could wait

596
00:27:44.885 --> 00:27:47.285
until the panel at the end if you wanna write those

597
00:27:47.605 --> 00:27:49.205
questions down and we can address 'em there

598
00:27:49.675 --> 00:27:50.935
unless you have something burning

599
00:27:51.035 --> 00:27:52.615
to ask smells right. Next.

600
00:27:52.925 --> 00:27:54.775
Just a quick one, did they ever redesign how to

601
00:27:55.395 --> 00:27:56.735
do the checkbox or whatever

602
00:27:58.865 --> 00:28:00.135
There is a new system?

603
00:28:00.515 --> 00:28:04.335
The question was, was there a, a redesign to, uh, uh, uh,

604
00:28:04.335 --> 00:28:05.655
unselect radio to target?

605
00:28:05.985 --> 00:28:08.815
There is a new system that's fielded by the program office

606
00:28:08.845 --> 00:28:12.855
that is now, um, ethernet, uh, based with, uh,

607
00:28:12.965 --> 00:28:14.695
Panasonic tough books instead of

608
00:28:14.695 --> 00:28:16.975
that dual clam shell that we saw.

609
00:28:17.475 --> 00:28:18.535
But that procedure

610
00:28:18.715 --> 00:28:23.715
to uncheck the box remains

611
00:28:25.045 --> 00:28:27.205
I was curious, what are the, the safety procedures

612
00:28:27.205 --> 00:28:29.165
that the, the guys on the boat went

613
00:28:29.165 --> 00:28:30.725
through preparing for this test?

614
00:28:31.825 --> 00:28:33.045
Um, that's a very good question.

615
00:28:33.385 --> 00:28:37.485
Uh, obviously I, I was able to tell the nav air story.

616
00:28:38.005 --> 00:28:40.205
I was not able to tell the nav sea story

617
00:28:40.465 --> 00:28:43.005
or the surface, uh, ship story.

618
00:28:43.545 --> 00:28:45.205
Um, they would not give me permission

619
00:28:45.205 --> 00:28:46.925
to speak about those two aspects.

620
00:28:49.055 --> 00:28:49.965
Thank you all very much.