



1
00:00:15,350 --> 00:00:12,709
thanks for joining us today here in the

2
00:00:17,189 --> 00:00:15,360
building nine mock-up facility with us

3
00:00:19,189 --> 00:00:17,199
veteran astronaut mike fink who has

4
00:00:21,189 --> 00:00:19,199
spent more days in space than any other

5
00:00:22,950 --> 00:00:21,199
u.s astronaut and who has had the

6
00:00:25,670 --> 00:00:22,960
privilege of launching twice and landing

7
00:00:27,509 --> 00:00:25,680
twice in this vehicle the russian soyuz

8
00:00:28,950 --> 00:00:27,519
spacecraft mike's going to take us

9
00:00:31,189 --> 00:00:28,960
through a little walk on each of the

10
00:00:33,190 --> 00:00:31,199
sections of the soyuz today before we go

11
00:00:35,510 --> 00:00:33,200
inside for a look-see mike

12
00:00:37,590 --> 00:00:35,520
rob it's great to be here and it's great

13
00:00:40,549 --> 00:00:37,600

to get a chance to talk about one of my

14

00:00:43,510 --> 00:00:40,559

favorite spacecraft the soyuz comes in

15

00:00:45,750 --> 00:00:43,520

three parts it's a classic spacecraft

16

00:00:47,270 --> 00:00:45,760

a capsule-based design so in the middle

17

00:00:49,670 --> 00:00:47,280

part let's talk about that first that's

18

00:00:52,549 --> 00:00:49,680

where we sit in for launch and landing

19

00:00:54,069 --> 00:00:52,559

so we call that the crew module and

20

00:00:56,389 --> 00:00:54,079

right above it we have the habitation

21

00:00:57,910 --> 00:00:56,399

module so that when we actually get into

22

00:00:59,750 --> 00:00:57,920

space we need a little bit more room so

23

00:01:01,590 --> 00:00:59,760

we're not cramped in that little can

24

00:01:03,270 --> 00:01:01,600

so we have the habitation module and the

25

00:01:05,750 --> 00:01:03,280

third module below is the

26
00:01:08,310 --> 00:01:05,760
instrumentation module which has extra

27
00:01:10,630 --> 00:01:08,320
things like oxygen and our engines and

28
00:01:12,390 --> 00:01:10,640
things like that now just before landing

29
00:01:13,830 --> 00:01:12,400
all three of these modules separate and

30
00:01:15,990 --> 00:01:13,840
only the part in the middle where we're

31
00:01:17,749 --> 00:01:16,000
sitting is the one that comes back home

32
00:01:23,190 --> 00:01:17,759
well let's take a look inside mike yeah

33
00:01:27,910 --> 00:01:26,149
rob this is a mock-up of a soyuz model

34
00:01:30,710 --> 00:01:27,920
tma and

35
00:01:33,670 --> 00:01:30,720
the a part came uh in the mid to late

36
00:01:36,310 --> 00:01:33,680
90s early 2000s when we put in this new

37
00:01:38,550 --> 00:01:36,320
glass cockpit the neptune panel

38
00:01:41,030 --> 00:01:38,560

and so we uh we're sitting down i'm

39

00:01:43,190 --> 00:01:41,040

sitting down in the flight engineer spot

40

00:01:45,190 --> 00:01:43,200

which is at the left seat and then there

41

00:01:47,670 --> 00:01:45,200

is the center seater who is the

42

00:01:50,789 --> 00:01:47,680

commander and then you're sitting in the

43

00:01:52,789 --> 00:01:50,799

right seater position which is either

44

00:01:54,469 --> 00:01:52,799

another flight engineer flight engineer

45

00:01:57,510 --> 00:01:54,479

number two or

46

00:01:59,429 --> 00:01:57,520

a space flight participant so you can

47

00:02:01,350 --> 00:01:59,439

see on that side there are fewer buttons

48

00:02:03,910 --> 00:02:01,360

to push and a few things to control so

49

00:02:06,149 --> 00:02:03,920

usually the spacecraft is flown with the

50

00:02:08,550 --> 00:02:06,159

commander and the flight engineer which

51
00:02:10,790 --> 00:02:08,560
more like a co-pilot working together

52
00:02:12,949 --> 00:02:10,800
and since the sen the center seat is is

53
00:02:14,550 --> 00:02:12,959
depressed a little bit lower it's harder

54
00:02:16,390 --> 00:02:14,560
for the commander to actually push the

55
00:02:19,030 --> 00:02:16,400
button so either he uses a stick like

56
00:02:21,430 --> 00:02:19,040
this or oftentimes the way that i've

57
00:02:23,830 --> 00:02:21,440
flown it is as a flight engineer i push

58
00:02:26,869 --> 00:02:23,840
all the buttons i set everything up

59
00:02:29,350 --> 00:02:26,879
commander agrees or disagree and then we

60
00:02:31,190 --> 00:02:29,360
we execute you can see there's a a

61
00:02:32,869 --> 00:02:31,200
screen right here that's a periscope

62
00:02:36,390 --> 00:02:32,879
that looks uh out either in front of the

63
00:02:38,070 --> 00:02:36,400

vehicle or below us as well as

64

00:02:40,390 --> 00:02:38,080

some control sticks here so we can

65

00:02:41,830 --> 00:02:40,400

actually manually fly from the center

66

00:02:43,589 --> 00:02:41,840

seat

67

00:02:46,550 --> 00:02:43,599

so let's say we're at the baikonur

68

00:02:48,309 --> 00:02:46,560

cosmodrome in kazakhstan it's launch day

69

00:02:51,110 --> 00:02:48,319

the crew has had breakfast at their

70

00:02:53,190 --> 00:02:51,120

resident crew quarters you've gone out

71

00:02:54,790 --> 00:02:53,200

into the cosmodrome to suit up and now

72

00:02:57,110 --> 00:02:54,800

you're at the launch pad

73

00:02:59,589 --> 00:02:57,120

how do you get inside this this

74

00:03:01,670 --> 00:02:59,599

efficient vehicle and uh get settled in

75

00:03:03,509 --> 00:03:01,680

for the rest of the countdown the the

76

00:03:05,509 --> 00:03:03,519

launch pad that i launched off of twice

77

00:03:07,509 --> 00:03:05,519

was yuri gagarin's launch pad how cool

78

00:03:09,030 --> 00:03:07,519

is that to have have people from all

79

00:03:11,030 --> 00:03:09,040

over the world including americans

80

00:03:13,509 --> 00:03:11,040

launching from yuri's launch pad so

81

00:03:16,790 --> 00:03:13,519

about uh two and a half hours before

82

00:03:18,390 --> 00:03:16,800

launch we uh we arrived by bus already

83

00:03:19,910 --> 00:03:18,400

dressed in our spacesuits

84

00:03:21,750 --> 00:03:19,920

we climb up the

85

00:03:24,789 --> 00:03:21,760

ladder to the gantry take a small

86

00:03:27,030 --> 00:03:24,799

elevator up to the tippy top and the

87

00:03:28,869 --> 00:03:27,040

rocket doesn't look so big from below

88

00:03:30,550 --> 00:03:28,879

but when you're up there at the at the

89

00:03:33,270 --> 00:03:30,560

up at the tippy top of the rocket

90

00:03:35,830 --> 00:03:33,280

looking down it's a big rocket

91

00:03:37,990 --> 00:03:35,840

we come in through the

92

00:03:40,470 --> 00:03:38,000

living and habitation module and there's

93

00:03:42,470 --> 00:03:40,480

a hatch right up up here that we

94

00:03:44,149 --> 00:03:42,480

actually come through so the hatch you

95

00:03:46,949 --> 00:03:44,159

see behind us doesn't really exist it's

96

00:03:49,190 --> 00:03:46,959

great for the mock-up so we send down

97

00:03:50,869 --> 00:03:49,200

usually the flight engineer first then

98

00:03:52,710 --> 00:03:50,879

over to the flight engineer number two

99

00:03:54,550 --> 00:03:52,720

or space flight participant and then

100

00:03:58,070 --> 00:03:54,560

this commander comes in last we close

101
00:04:00,070 --> 00:03:58,080
the hatch we turn on the panels we turn

102
00:04:01,270 --> 00:04:00,080
on the spacecraft make sure all the

103
00:04:03,990 --> 00:04:01,280
systems are working do our

104
00:04:05,750 --> 00:04:04,000
communications checks and then we sit

105
00:04:06,630 --> 00:04:05,760
back and let the ground team do their

106
00:04:08,949 --> 00:04:06,640
job

107
00:04:10,789 --> 00:04:08,959
the soyuz booster rocket that the

108
00:04:14,309 --> 00:04:10,799
spacecraft is perched

109
00:04:15,670 --> 00:04:14,319
on top of is fully fueled ready to go

110
00:04:17,830 --> 00:04:15,680
what are some of the things that take

111
00:04:21,270 --> 00:04:17,840
place let's say in the final 30 minutes

112
00:04:22,790 --> 00:04:21,280
or so before liftoff usually uh up to

113
00:04:25,270 --> 00:04:22,800

that point uh

114

00:04:27,110 --> 00:04:25,280

we have been relaxing if all the comm

115

00:04:29,350 --> 00:04:27,120

checks went well the pressurization of

116

00:04:31,030 --> 00:04:29,360

the capsule our suit checks if that all

117

00:04:33,830 --> 00:04:31,040

goes well then we're just sitting down

118

00:04:35,430 --> 00:04:33,840

relaxing and sometimes they even put in

119

00:04:36,870 --> 00:04:35,440

some some music

120

00:04:38,469 --> 00:04:36,880

and it's very

121

00:04:40,550 --> 00:04:38,479

amazing to sit there on the step of

122

00:04:42,629 --> 00:04:40,560

kazakhstan listening to

123

00:04:44,550 --> 00:04:42,639

maybe some american jazz right before a

124

00:04:47,110 --> 00:04:44,560

launch so about half an hour though we

125

00:04:50,230 --> 00:04:47,120

get we get our head back in the game and

126
00:04:52,390 --> 00:04:50,240
we make sure all of our systems are are

127
00:04:53,749 --> 00:04:52,400
are functioning properly do some more

128
00:04:55,590 --> 00:04:53,759
comm checks with the ground make sure

129
00:04:57,749 --> 00:04:55,600
that they hear us they'll tell they'll

130
00:04:59,749 --> 00:04:57,759
give us an update and then

131
00:05:01,350 --> 00:04:59,759
by that time it's time to go and it's

132
00:05:02,950 --> 00:05:01,360
just starting to

133
00:05:04,390 --> 00:05:02,960
you know you start you can't believe

134
00:05:06,070 --> 00:05:04,400
because up to that point you're you're

135
00:05:07,749 --> 00:05:06,080
saying wow i've been training for years

136
00:05:09,510 --> 00:05:07,759
ready to go and you can see the little

137
00:05:11,749 --> 00:05:09,520
counter start to go down a little bit so

138
00:05:14,310 --> 00:05:11,759

my goodness we're it's gonna happen and

139

00:05:17,189 --> 00:05:14,320

then you hear some a few thumps or bumps

140

00:05:18,390 --> 00:05:17,199

outside as the gantry moves and uh

141

00:05:20,150 --> 00:05:18,400

you're standing there all by yourself

142

00:05:22,070 --> 00:05:20,160

and then you can feel the vibration of

143

00:05:23,670 --> 00:05:22,080

the engine start to launch and then

144

00:05:25,670 --> 00:05:23,680

beauty of it all eight and a half

145

00:05:26,710 --> 00:05:25,680

minutes later you're in orbit it's that

146

00:05:29,110 --> 00:05:26,720

fast

147

00:05:30,870 --> 00:05:29,120

and then mike conversely after about six

148

00:05:33,909 --> 00:05:30,880

months on orbit it's time to come home

149

00:05:35,830 --> 00:05:33,919

at some point back to kazakhstan

150

00:05:36,950 --> 00:05:35,840

walk us through the preparations that

151
00:05:40,469 --> 00:05:36,960

you all

152
00:05:42,870 --> 00:05:40,479

do when it's time to undock and

153
00:05:45,029 --> 00:05:42,880

give us a little uh glimpse of what that

154
00:05:47,029 --> 00:05:45,039

entry is all about we close the hatch

155
00:05:48,550 --> 00:05:47,039

between the uh

156
00:05:50,230 --> 00:05:48,560

we get back in our spacesuits then we

157
00:05:52,150 --> 00:05:50,240

close the hatch to the

158
00:05:53,990 --> 00:05:52,160

uh the living habitation module we get

159
00:05:55,990 --> 00:05:54,000

back here in the in the crew module the

160
00:05:58,309 --> 00:05:56,000

descent module and we're all in our

161
00:05:59,990 --> 00:05:58,319

spacesuits again we make sure that uh

162
00:06:02,710 --> 00:06:00,000

that this hatch especially the one

163
00:06:05,909 --> 00:06:02,720

between the living habitation module and

164

00:06:08,309 --> 00:06:05,919

the uh and the crew module here is very

165

00:06:09,670 --> 00:06:08,319

fully sealed because all of a sudden

166

00:06:12,230 --> 00:06:09,680

that hatch is going to be the one to the

167

00:06:14,390 --> 00:06:12,240

outside because our three compartments

168

00:06:15,909 --> 00:06:14,400

break apart so we get ready for

169

00:06:17,990 --> 00:06:15,919

undocking to the space station we're in

170

00:06:20,390 --> 00:06:18,000

our spacesuits everything's good and we

171

00:06:22,950 --> 00:06:20,400

uh we watch the undocking it's all

172

00:06:24,950 --> 00:06:22,960

automatic uh we make sure that uh we're

173

00:06:26,790 --> 00:06:24,960

pointing away from the sp yeah we pull

174

00:06:29,430 --> 00:06:26,800

away from space station make sure we get

175

00:06:31,110 --> 00:06:29,440

out of the space station's way and uh we

176

00:06:33,270 --> 00:06:31,120

check out all of our systems to make

177

00:06:35,029 --> 00:06:33,280

sure that we can come back home safely

178

00:06:36,629 --> 00:06:35,039

again it's always about checking out our

179

00:06:39,189 --> 00:06:36,639

systems it's really tricky because we're

180

00:06:40,469 --> 00:06:39,199

going 17 500 miles an hour and we're

181

00:06:42,469 --> 00:06:40,479

going to go back to zero and we're going

182

00:06:44,070 --> 00:06:42,479

to do that by breaking through the air

183

00:06:46,070 --> 00:06:44,080

that means you're using the air to slow

184

00:06:49,189 --> 00:06:46,080

us down generates a lot of heat our heat

185

00:06:51,350 --> 00:06:49,199

shield not just glows it actually melts

186

00:06:54,150 --> 00:06:51,360

off it's an ablative heat shield our

187

00:06:56,230 --> 00:06:54,160

whole capsule is is coated in it and

188

00:06:57,510 --> 00:06:56,240

it's just amazing because once we do our

189

00:06:59,189 --> 00:06:57,520

deorbit burn

190

00:07:01,270 --> 00:06:59,199

that's really important it takes about

191

00:07:02,790 --> 00:07:01,280

three minutes to slow down but once we

192

00:07:05,510 --> 00:07:02,800

hit the atmosphere and start to slow

193

00:07:07,350 --> 00:07:05,520

down it's just a amazing ride you can

194

00:07:09,510 --> 00:07:07,360

look right out the windows and you can

195

00:07:11,110 --> 00:07:09,520

see the ablative heat shields melting

196

00:07:12,870 --> 00:07:11,120

you can see the plasma ball that you're

197

00:07:15,189 --> 00:07:12,880

traveling through and you're slowing

198

00:07:16,870 --> 00:07:15,199

down and we start

199

00:07:19,029 --> 00:07:16,880

hitting the atmosphere like in central

200

00:07:21,270 --> 00:07:19,039

africa by the time we reach central asia

201
00:07:23,589 --> 00:07:21,280
as we travel north and east you know

202
00:07:25,189 --> 00:07:23,599
we're uh you know it's uh

203
00:07:27,670 --> 00:07:25,199
yeah we're slowed down enough that

204
00:07:30,629 --> 00:07:27,680
parachutes can pop out and we gent we

205
00:07:32,390 --> 00:07:30,639
drift gently to the earth below but that

206
00:07:34,309 --> 00:07:32,400
parachute deployment is almost like the

207
00:07:36,390 --> 00:07:34,319
e-ticket of the ride isn't it

208
00:07:38,469 --> 00:07:36,400
well that's uh that's definitely uh i

209
00:07:40,629 --> 00:07:38,479
know some rides it's amusement parks

210
00:07:42,550 --> 00:07:40,639
where people pay money for that because

211
00:07:44,070 --> 00:07:42,560
our parachute because we have this hatch

212
00:07:46,790 --> 00:07:44,080
here our parachutes actually off to the

213
00:07:48,950 --> 00:07:46,800

side so when it first pops out

214

00:07:50,469 --> 00:07:48,960

we kind of swing around in a big arc and

215

00:07:51,909 --> 00:07:50,479

we haven't had gravity for a long time

216

00:07:54,309 --> 00:07:51,919

and all of a sudden we're swinging

217

00:07:57,029 --> 00:07:54,319

around in a big circle so uh and that

218

00:07:58,550 --> 00:07:57,039

comes right after you know after the

219

00:08:00,390 --> 00:07:58,560

the screaming in through the atmosphere

220

00:08:01,510 --> 00:08:00,400

and breaking up to pulling up the six

221

00:08:03,029 --> 00:08:01,520

g's and all of a sudden we're spinning

222

00:08:05,749 --> 00:08:03,039

around with the parachute but then the

223

00:08:07,909 --> 00:08:05,759

parachute repositions itself and it then

224

00:08:11,430 --> 00:08:07,919

becomes a kind of a normal parachute and

225

00:08:13,749 --> 00:08:11,440

we slow down and then it's just a gentle

226

00:08:17,029 --> 00:08:13,759

drifting but until then it's pretty

227

00:08:19,589 --> 00:08:17,039

exciting until

228

00:08:21,670 --> 00:08:19,599

the last meter or so the last three feet

229

00:08:24,070 --> 00:08:21,680

as when we meet the ground we're going

230

00:08:27,830 --> 00:08:24,080

about 20 miles an hour at the time and

231

00:08:29,990 --> 00:08:27,840

we hit the hit the earth firmly and uh

232

00:08:32,230 --> 00:08:30,000

and we know that we're back home

233

00:08:35,269 --> 00:08:32,240

there are engines that fire right a

234

00:08:37,829 --> 00:08:35,279

split second before touchdown uh almost

235

00:08:40,630 --> 00:08:37,839

strangely named soft landing engines but

236

00:08:43,190 --> 00:08:40,640

we're lying on what would be custom

237

00:08:45,990 --> 00:08:43,200

seat liners that have some cushion

238

00:08:47,750 --> 00:08:46,000

capability for you right it's a

239

00:08:50,550 --> 00:08:47,760

the russian designers have tried to make

240

00:08:53,509 --> 00:08:50,560

it as safe as possible so that we can

241

00:08:55,990 --> 00:08:53,519

come back come back safely and gently so

242

00:08:58,389 --> 00:08:56,000

nobody gets hurt so they do slow us down

243

00:09:00,630 --> 00:08:58,399

with our uh with the retro rockets right

244

00:09:02,150 --> 00:09:00,640

in the last meter or so these seats

245

00:09:03,350 --> 00:09:02,160

actually right before landing in fact

246

00:09:05,269 --> 00:09:03,360

that's what how you know that you're

247

00:09:08,389 --> 00:09:05,279

getting close to the ground they kind of

248

00:09:11,190 --> 00:09:08,399

uh position up so they would uh so that

249

00:09:14,630 --> 00:09:11,200

as soon as we land the shock absorber

250

00:09:16,470 --> 00:09:14,640

takes the the bulk of the the impact now

251
00:09:17,990 --> 00:09:16,480
once you're down on the ground those of

252
00:09:19,590 --> 00:09:18,000
us who have been

253
00:09:21,910 --> 00:09:19,600
flying in helicopters russian

254
00:09:24,550 --> 00:09:21,920
helicopters in a racetrack pattern

255
00:09:26,710 --> 00:09:24,560
around the landing site waiting for you

256
00:09:28,870 --> 00:09:26,720
we will land in sequential fashion and

257
00:09:30,870 --> 00:09:28,880
then the process begins to extract the

258
00:09:32,550 --> 00:09:30,880
crew take us through there well it's

259
00:09:33,990 --> 00:09:32,560
always comforting because on the way

260
00:09:36,230 --> 00:09:34,000
down especially under the parachutes

261
00:09:38,550 --> 00:09:36,240
we're able to talk to the the pilots of

262
00:09:40,070 --> 00:09:38,560
the of the air airplanes and the and the

263
00:09:42,070 --> 00:09:40,080

helicopters so they know where to find

264

00:09:43,750 --> 00:09:42,080

us and that's very comforting to know

265

00:09:45,829 --> 00:09:43,760

once we hit the ground that there's

266

00:09:47,990 --> 00:09:45,839

going to be someone there to meet us so

267

00:09:48,870 --> 00:09:48,000

after we hit the ground we actually have

268

00:10:10,150 --> 00:09:48,880

a

269

00:10:12,310 --> 00:10:10,160

kind of crowded in here so sometimes

270

00:10:14,230 --> 00:10:12,320

they have to move some uh some payload

271

00:10:16,230 --> 00:10:14,240

or some of our survival equipment out of

272

00:10:18,069 --> 00:10:16,240

the way first and then they pull out the

273

00:10:20,630 --> 00:10:18,079

commander and then the flight engineer

274

00:10:21,829 --> 00:10:20,640

number two and then of course last but

275

00:10:23,910 --> 00:10:21,839

not least

276

00:10:26,630 --> 00:10:23,920

me the flight engineer

277

00:10:28,230 --> 00:10:26,640

it must be almost a sensory overload

278

00:10:31,110 --> 00:10:28,240

after six months

279

00:10:33,190 --> 00:10:31,120

in a vacuum environment basically

280

00:10:35,190 --> 00:10:33,200

up on the space station

281

00:10:37,190 --> 00:10:35,200

the smell of fresh air the look of the

282

00:10:38,389 --> 00:10:37,200

grass the smell of the dirt down in

283

00:10:41,430 --> 00:10:38,399

kazakhstan

284

00:10:43,430 --> 00:10:41,440

what are those sensations like for you

285

00:10:45,829 --> 00:10:43,440

all of those sensations rob are

286

00:10:48,230 --> 00:10:45,839

heightened by our emotional feeling of

287

00:10:49,990 --> 00:10:48,240

coming back home and uh as they say in

288

00:10:52,150 --> 00:10:50,000

the movies there's no place like home

289

00:10:53,910 --> 00:10:52,160

and you you're coming back to earth and

290

00:10:55,430 --> 00:10:53,920

coming back to gravity all these all

291

00:10:57,190 --> 00:10:55,440

these things they're not new to us but

292

00:10:58,630 --> 00:10:57,200

we haven't had them in a while so

293

00:11:00,230 --> 00:10:58,640

they're it's kind of like re

294

00:11:02,470 --> 00:11:00,240

rediscovering things all over again

295

00:11:04,230 --> 00:11:02,480

rediscovering the sense of smell and how

296

00:11:06,790 --> 00:11:04,240

beautiful it smells and the outdoors on

297

00:11:08,389 --> 00:11:06,800

the step how it is to uh how it is to

298

00:11:11,509 --> 00:11:08,399

they hand us an apple right after we

299

00:11:14,790 --> 00:11:11,519

land just to just to give us a a a taste

300

00:11:17,190 --> 00:11:14,800

a scent of of mother earth

301

00:11:19,030 --> 00:11:17,200

back on earth mike uh and we appreciate

302

00:11:21,269 --> 00:11:19,040

your time as always and thanks for

303

00:11:22,470 --> 00:11:21,279

walking us through a trip in the soyuz

304

00:11:24,150 --> 00:11:22,480

i'm really glad