1
00:00:18,780 --> 00:00:16,029
before men traveled in space energy from

2
00:00:21,220 --> 00:00:18,790
the Sun was thought to be constant then

3
00:00:23,769 --> 00:00:21,230
scientific instruments rising above the

4
00:00:25,929 --> 00:00:23,779
atmosphere recorded great shafts of

5
00:00:29,560 --> 00:00:25,939
energy flashing out from the Sun like

6
00:00:31,659 --> 00:00:29,570
beams from a lighthouse energy affecting

7
00:00:36,910 --> 00:00:31,669
communications and perhaps the weather

8
00:00:39,130 --> 00:00:36,920
on earth small levels of pollution were

9
00:00:41,470 --> 00:00:39,140
considered unimportant until

10
00:00:43,869 --> 00:00:41,480
high-altitude research showed that a few

11
00:00:48,450 --> 00:00:43,879
parts per billion of freon could reduce

12
00:00:56,439 --> 00:00:51,520
in space we learned things which were

13
00:00:58,959 --> 00:00:56,449

obscured to us on earth but space

14
00:01:01,619 --> 00:00:58,969
research using one-shot Rockets has been

15
00:01:04,750 --> 00:01:01,629
expensive and somewhat inflexible as

16
00:01:06,910 --> 00:01:04,760
scientists set on earth while astronauts

17
00:01:08,789 --> 00:01:06,920
worked their apparatus

18
00:01:11,830 --> 00:01:08,799
[Music]

19
00:01:14,050 --> 00:01:11,840
now there is a reusable space shuttle

20
00:01:17,020 --> 00:01:14,060
capable of making repeated trips into

21
00:01:19,569 --> 00:01:17,030
space and there is a space laboratory

22
00:01:22,539 --> 00:01:19,579
which takes advantage of this economical

23
00:01:25,660 --> 00:01:22,549
transportation to and from orbit it is

24
00:01:27,940 --> 00:01:25,670
called space lab it fits in the shuttle

25
00:01:30,310 --> 00:01:27,950
payload Bay and converts the shuttle

26
00:01:34,830 --> 00:01:30,320
into a versatile Research Center

27
00:01:37,310 --> 00:01:34,840
[Music]

28
00:01:39,959 --> 00:01:37,320
trips into orbit can be frequent

29
00:01:43,380 --> 00:01:39,969
scientific objectives can change for

30
00:01:45,809 --> 00:01:43,390
each mission scientists not just career

31
00:01:48,929 --> 00:01:45,819
astronauts can ride the shuttle and work

32
00:01:56,630 --> 00:01:48,939
in the lab Space Lab is truly a new

33
00:01:56,640 --> 00:02:22,800
[Music]

34
00:02:32,410 --> 00:02:26,979
in the early 70s NASA began developing a

35
00:02:39,410 --> 00:02:36,710
in Europe Issa the European Space Agency

36
00:02:41,680 --> 00:02:39,420
was interested in collaborating what

37
00:02:44,410 --> 00:02:41,690
major contribution could Europe make

38
00:02:50,000 --> 00:02:44,420

many possibilities were considered

39
00:02:52,520 --> 00:02:50,010
ultimately Space Lab was selected this

40
00:02:55,430 --> 00:02:52,530
laboratory would be versatile it would

41
00:02:57,370 --> 00:02:55,440
be reusable it would meet the demands of

42
00:02:59,600 --> 00:02:57,380
the international scientific community

43
00:03:02,360 --> 00:02:59,610
exclusively to do research in the

44
00:03:04,370 --> 00:03:02,370
broadest range of disciplines it would

45
00:03:06,470 --> 00:03:04,380
have a pressurized room where the

46
00:03:09,860 --> 00:03:06,480
scientists themselves could work without

47
00:03:12,020 --> 00:03:09,870
cumbersome spacesuits it would have

48
00:03:13,910 --> 00:03:12,030
platforms where instruments would be

49
00:03:16,430 --> 00:03:13,920
exposed directly to the airless

50
00:03:22,220 --> 00:03:16,440
cloudless low gravity environment of

51
00:03:24,860 --> 00:03:22,230
space now a reality space lab is a

52
00:03:27,800 --> 00:03:24,870
European development involving European

53
00:03:30,050 --> 00:03:27,810
industry in space technology it was

54
00:03:32,470 --> 00:03:30,060
assembled in Bremen Germany from parts

55
00:03:39,020 --> 00:03:32,480
made in all participating Isa countries

56
00:03:41,780 --> 00:03:39,030
Brno is the prime contractor because the

57
00:03:44,210 --> 00:03:41,790
Space Lab fits in the shuttle NASA was

58
00:03:46,550 --> 00:03:44,220
also involved Marshall Space Flight

59
00:03:48,890 --> 00:03:46,560
Center led the development for NASA and

60
00:03:51,380 --> 00:03:48,900
managed development of an access tunnel

61
00:03:53,670 --> 00:03:51,390
and support hardware and software for

62
00:03:57,819 --> 00:03:53,680
the lab

63
00:04:00,729 --> 00:03:57,829

and because Space Lab is new Marshall

64
00:04:02,530 --> 00:04:00,739
designed a series of test instruments to

65
00:04:04,520 --> 00:04:02,540
monitor the space labs performance

66
00:04:07,110 --> 00:04:04,530
during the first two missions

67
00:04:10,140 --> 00:04:07,120
[Music]

68
00:04:12,660 --> 00:04:10,150
Space Lab is versatile it can be

69
00:04:15,270 --> 00:04:12,670
composed of any of several modular units

70
00:04:18,180 --> 00:04:15,280
which fit into the bay to meet the needs

71
00:04:20,610 --> 00:04:18,190
of a particular scientific mission there

72
00:04:23,330 --> 00:04:20,620
is the pressurized laboratory called a

73
00:04:26,820 --> 00:04:23,340
module containing instrument racks

74
00:04:30,290 --> 00:04:26,830
utilities computers work benches and

75
00:04:33,629 --> 00:04:30,300
controls for the conduct of research

76
00:04:35,879 --> 00:04:33,639
there also are outside platforms called

77
00:04:41,310 --> 00:04:35,889
palettes for experiments which need

78
00:04:43,860 --> 00:04:41,320
direct exposure to space this mix or

79
00:04:46,230 --> 00:04:43,870
match design makes the space lab able to

80
00:04:51,629 --> 00:04:46,240
accommodate a wide variety of scientific

81
00:04:53,850 --> 00:04:51,639
investigations at missions end the

82
00:04:56,190 --> 00:04:53,860
pressurized modules and the palettes are

83
00:04:58,409 --> 00:04:56,200
fully or partly stripped of one set of

84
00:05:03,080 --> 00:04:58,419
experiments and new ones are installed

85
00:05:09,350 --> 00:05:05,480
the laboratory module can hold more than

86
00:05:11,240 --> 00:05:09,360
five tonnes of experiment hardware more

87
00:05:16,400 --> 00:05:11,250
than nine tons can be carried in the

88
00:05:18,980 --> 00:05:16,410

palette only configurations as many as

89
00:05:21,260 --> 00:05:18,990
five scientists and science astronauts

90
00:05:23,960 --> 00:05:21,270
live in the Shuttle Orbiter along with a

91
00:05:26,120 --> 00:05:23,970
commander and pilot they passed through

92
00:05:28,670 --> 00:05:26,130
a tunnel to go to work in the laboratory

93
00:05:33,980 --> 00:05:28,680
module palette only missions are

94
00:05:37,010 --> 00:05:33,990
operated from inside the orbiter in

95
00:05:39,080 --> 00:05:37,020
every way possible Space Lab minimizes

96
00:05:41,030 --> 00:05:39,090
the amount of modifications needed to

97
00:05:46,250 --> 00:05:41,040
take ground laboratory experiment

98
00:05:49,040 --> 00:05:46,260
equipment into space the scientist or

99
00:05:52,700 --> 00:05:49,050
principal investigator can monitor his

100
00:05:55,010 --> 00:05:52,710
or her experiment from Earth voice data

101
00:05:57,230 --> 00:05:55,020
and video circuits will allow the

102
00:06:01,190 --> 00:05:57,240
investigator direct involvement during

103
00:06:03,680 --> 00:06:01,200
an experiment procedural changes based

104
00:06:07,040 --> 00:06:03,690
on observation can be passed up to the

105
00:06:09,409 --> 00:06:07,050
onboard science crew for execution in

106
00:06:12,170 --> 00:06:09,419
some cases changes can be made by the

107
00:06:14,990 --> 00:06:12,180
scientist from the grounds it's the next

108
00:06:24,640 --> 00:06:15,000
best thing to taking some 70 scientists

109
00:06:28,610 --> 00:06:24,650
into orbit mission one the maiden voyage

110
00:06:31,250 --> 00:06:28,620
its purpose tests the laboratory prove

111
00:06:34,370 --> 00:06:31,260
the thousands of electronic parts pumps

112
00:06:36,400 --> 00:06:34,380
fans and valves as well as the computers

113
00:06:38,390 --> 00:06:36,410

which service the experiments

114
00:06:40,870 --> 00:06:38,400
demonstrate new research techniques

115
00:06:43,909 --> 00:06:40,880
developed specially for Space Lab

116
00:06:47,450 --> 00:06:43,919
conduct more than 70 investigations in

117
00:06:50,600 --> 00:06:47,460
nine days it's a joint mission of NASA

118
00:06:52,610 --> 00:06:50,610
and the European Space Agency each

119
00:06:56,180 --> 00:06:52,620
agency has sponsored about half the

120
00:06:59,390 --> 00:06:56,190
payload 11 European countries Canada

121
00:07:02,300 --> 00:06:59,400
Japan and the US have experiments on

122
00:07:02,300 --> 00:07:02,310
Space Lab one

123
00:07:08,230 --> 00:07:05,820
[Music]

124
00:07:11,470 --> 00:07:08,240
scientific diversity is important on

125
00:07:13,650 --> 00:07:11,480
mission one it tests the labs ability to

126
00:07:16,390 --> 00:07:13,660
serve the full range of disciplines

127
00:07:19,330 --> 00:07:16,400
equally important is the expansion of

128
00:07:21,100 --> 00:07:19,340
man's scientific knowledge mission one's

129
00:07:23,500 --> 00:07:21,110
experiments were selected for their

130
00:07:28,290 --> 00:07:23,510
scientific merit by international peer

131
00:07:35,320 --> 00:07:33,430
welcome everybody to all from once the

132
00:07:37,480 --> 00:07:35,330
experiments were selected the

133
00:07:40,000 --> 00:07:37,490
investigators formed a cooperative body

134
00:07:44,320 --> 00:07:40,010
called the investigators working group

135
00:07:46,420 --> 00:07:44,330
or iwg one of the group's tasks was to

136
00:07:48,730 --> 00:07:46,430
recommend which of the many scientists

137
00:07:50,770 --> 00:07:48,740
only one from Europe and one from the

138
00:07:56,640 --> 00:07:50,780

United States would fly the first

139
00:08:02,140 --> 00:07:59,890
called payload specialists these career

140
00:08:05,590 --> 00:08:02,150
scientists would learn details of each

141
00:08:07,570 --> 00:08:05,600
experiment over the next four years dr.

142
00:08:11,170 --> 00:08:07,580
wolf mayor bold of the max planck

143
00:08:13,570 --> 00:08:11,180
institute in stuttgart germany and dr.

144
00:08:16,030 --> 00:08:13,580
byron Lichtenberg of the massachusetts

145
00:08:19,600 --> 00:08:16,040
institute of technology were chosen as

146
00:08:22,150 --> 00:08:19,610
flight payload specialists dr. Wu Bo

147
00:08:24,640 --> 00:08:22,160
locals of the University of Krone engine

148
00:08:27,010 --> 00:08:24,650
in the Netherlands and dr. Michael

149
00:08:28,810 --> 00:08:27,020
Lambton of the University of California

150
00:08:31,050 --> 00:08:28,820
at Berkeley our alternates

151
00:08:33,910 --> 00:08:31,060
[Music]

152
00:08:36,790 --> 00:08:33,920
these payload specialists have learned

153
00:08:39,520 --> 00:08:36,800
the background objectives and procedures

154
00:08:41,110 --> 00:08:39,530
for each experiment they have become

155
00:08:44,140 --> 00:08:41,120
personally acquainted with each

156
00:08:49,710 --> 00:08:44,150
principal investigator they have become

157
00:08:54,550 --> 00:08:52,840
mission one also has two scientists

158
00:08:58,030 --> 00:08:54,560
astronauts for NASA

159
00:09:00,940 --> 00:08:58,040
dr. Owen Garriott and dr. Robert Parker

160
00:09:03,100 --> 00:09:00,950
they are called mission specialists and

161
00:09:06,070 --> 00:09:03,110
are responsible for operating the

162
00:09:08,200 --> 00:09:06,080
systems of the laboratory itself and for

163
00:09:11,470 --> 00:09:08,210

coordination with shuttle pilots John

164
00:09:13,060 --> 00:09:11,480
Young and Brewster Shaw they trained as

165
00:09:15,220 --> 00:09:13,070
much as possible with the payload

166
00:09:17,470 --> 00:09:15,230
specialists and would spend much of

167
00:09:28,510 --> 00:09:17,480
their time conducting experiments with

168
00:09:30,160 --> 00:09:28,520
them what would it be like this

169
00:09:33,310 --> 00:09:30,170
simulation at the Marshall Space Flight

170
00:09:36,850 --> 00:09:33,320
Center covers a 24 hour slice of the

171
00:09:40,300 --> 00:09:36,860
nine-day mission Marshall is responsible

172
00:09:42,360 --> 00:09:40,310
for managing the early Spacelab mission

173
00:09:45,370 --> 00:09:42,370
[Applause]

174
00:09:47,220 --> 00:09:45,380
there is a new word that's important to

175
00:09:50,620 --> 00:09:47,230
Space Lab the park

176
00:09:53,920 --> 00:09:50,630
it stands for payload operations control

177
00:09:56,130 --> 00:09:53,930
center it does for the payload what

178
00:09:59,440 --> 00:09:56,140
Mission Control does for the shuttle

179
00:10:00,850 --> 00:09:59,450
mission control and the POC are in the

180
00:10:03,550 --> 00:10:00,860
same building at the Johnson Space

181
00:10:06,400 --> 00:10:03,560
Center in Houston Mission Control

182
00:10:09,190 --> 00:10:06,410
handles the flying payload control

183
00:10:16,320 --> 00:10:09,200
manages all scientific activities inside

184
00:10:20,020 --> 00:10:16,330
the Space Lab you hear a lot about

185
00:10:22,450 --> 00:10:20,030
timelines around the park these detailed

186
00:10:24,190 --> 00:10:22,460
charts show graphically everything

187
00:10:26,560 --> 00:10:24,200
scheduled for each segment of the

188
00:10:29,770 --> 00:10:26,570

mission which experiments are running

189
00:10:32,110 --> 00:10:29,780
but each crew member is doing where the

190
00:10:35,680 --> 00:10:32,120
orbiters pointing and a host of other

191
00:10:38,170 --> 00:10:35,690
details down to the second the flight of

192
00:10:43,160 --> 00:10:38,180
space lab one may be the most intense

193
00:10:52,699 --> 00:10:50,389
problem number 9 - behind the control

194
00:10:55,370 --> 00:10:52,709
consoles in the payload Control Center

195
00:10:57,440 --> 00:10:55,380
are several rooms where investigators

196
00:11:00,500 --> 00:10:57,450
set up the equipment necessary to

197
00:11:03,350 --> 00:11:00,510
monitor their experiments much of the

198
00:11:07,189 --> 00:11:03,360
time Space Lab is in satellite contact

199
00:11:10,430 --> 00:11:07,199
with earth through the direct voice TV

200
00:11:13,550 --> 00:11:10,440
and data links investigators can analyze

201
00:11:16,550 --> 00:11:13,560
their results and if necessary extend

202
00:11:25,759 --> 00:11:16,560
their hands and minds 135 nautical miles

203
00:11:27,889 --> 00:11:25,769
right up to the laboratory bench all

204
00:11:30,590 --> 00:11:27,899
this activity was Endora strated

205
00:11:32,810 --> 00:11:30,600
overnight the mission manager has been

206
00:11:35,449 --> 00:11:32,820
responsible for planning and directing

207
00:11:38,509 --> 00:11:35,459
the space lab one mission the mission

208
00:11:40,939 --> 00:11:38,519
manager and his team's prime goal is to

209
00:11:42,710 --> 00:11:40,949
ensure the space lab payload satisfies

210
00:11:45,710 --> 00:11:42,720
the research needs of the user

211
00:11:48,050 --> 00:11:45,720
scientists that it uses the shuttle and

212
00:11:53,390 --> 00:11:48,060
Space Lab effectively and that it

213
00:12:00,610 --> 00:11:56,990

as the simulations draw to a close the

214
00:12:08,749 --> 00:12:06,199
[Music]

215
00:12:11,720 --> 00:12:08,759
clarity of observation lets us see the

216
00:12:14,030 --> 00:12:11,730
world in order to explain it from orbit

217
00:12:16,699 --> 00:12:14,040
we can see the universe without a veil

218
00:12:19,429 --> 00:12:16,709
of clouds we can analyze phenomena

219
00:12:21,710 --> 00:12:19,439
without the bias of gravity we can

220
00:12:25,040 --> 00:12:21,720
sample the complex forces and particles

221
00:12:28,340 --> 00:12:25,050
others thought to be empty space as we

222
00:12:31,639 --> 00:12:28,350
move into orbit our vision clears now we

223
00:12:34,400 --> 00:12:31,649
can go back again and again learning

224
00:12:36,530 --> 00:12:34,410
from each flight experience accumulating

225
00:12:39,919 --> 00:12:36,540
new knowledge we have a new generation

226
00:12:40,220 --> 00:12:39,929
of orbiting laboratories we have Space