1
00:00:06,110 --> 00:00:04,460
the Personnel Launch System or pls is a

2
00:00:08,600 --> 00:00:06,120
vehicle which could provide future

3
00:00:10,970 --> 00:00:08,610
transport of people and small cargo to

4
00:00:12,770 --> 00:00:10,980
and from low-earth orbit although not

5
00:00:15,350 --> 00:00:12,780
presently approved for development the

6
00:00:17,510 --> 00:00:15,360
pls is being designed to complement the

7
00:00:19,189 --> 00:00:17,520
space shuttle and is being considered as

8
00:00:22,730 --> 00:00:19,199
a future addition to the manned launch

9
00:00:24,500 --> 00:00:22,740
capability of the United States in the

10
00:00:26,000 --> 00:00:24,510
era of space station freedom and

11
00:00:28,160 --> 00:00:26,010
subsequent missions of the space

12
00:00:30,410 --> 00:00:28,170
exploration initiative it may be

13
00:00:32,330 --> 00:00:30,420

important that the United States have an

14
00:00:36,040 --> 00:00:32,340
alternate means of getting people and

15
00:00:39,020 --> 00:00:36,050
small cargo to low-earth orbit and back

16
00:00:40,700 --> 00:00:39,030
to designs being considered for pls

17
00:00:43,700 --> 00:00:40,710
differ in their aerodynamic properties

18
00:00:45,860 --> 00:00:43,710
and mission capabilities while the

19
00:00:47,660 --> 00:00:45,870
Johnson Space Center's approach uses a

20
00:00:49,639 --> 00:00:47,670
bi conic shaped capsule with the

21
00:00:53,029 --> 00:00:49,649
parachute landing the Langley Research

22
00:00:54,860 --> 00:00:53,039
Center's design designated the hl-20 is

23
00:00:57,049 --> 00:00:54,870
a winged lifting body which could make

24
00:00:57,950 --> 00:00:57,059
conventional runway landings on return

25
00:01:00,529 --> 00:00:57,960
from orbit

26
00:01:03,049 --> 00:01:00,539
unlike the space shuttle the PLS would

27
00:01:05,479 --> 00:01:03,059
have as a design objective a launch

28
00:01:09,080 --> 00:01:05,489
abort capability to safely recover the

29
00:01:10,880 --> 00:01:09,090
crew during ascent predating and

30
00:01:13,160 --> 00:01:10,890
influencing the design of the space

31
00:01:15,620 --> 00:01:13,170
shuttle several lifting body aircraft

32
00:01:18,200 --> 00:01:15,630
including the HL 10 were flown by test

33
00:01:21,920 --> 00:01:18,210
pilots during the period from 1966 to

34
00:01:24,140 --> 00:01:21,930
1975 over the past few years the hl-20

35
00:01:26,420 --> 00:01:24,150
has undergone considerable analysis at

36
00:01:28,399 --> 00:01:26,430
langley and has evolved into a mature

37
00:01:31,160 --> 00:01:28,409
design with capabilities which

38
00:01:33,950 --> 00:01:31,170

adequately satisfied the PLS design and

39
00:01:36,140 --> 00:01:33,960
mission requirements a lifting body

40
00:01:38,690 --> 00:01:36,150
spacecraft such as the hl-20

41
00:01:41,749 --> 00:01:38,700
and the HL 10 shown here would have

42
00:01:43,760 --> 00:01:41,759
several advantages over other shapes the

43
00:01:45,499 --> 00:01:43,770
spacecraft would fly over large land

44
00:01:47,499 --> 00:01:45,509
areas and the number of available

45
00:01:49,910 --> 00:01:47,509
landing opportunities would be increased

46
00:01:51,710 --> 00:01:49,920
wheeled runway landings would be

47
00:01:54,200 --> 00:01:51,720
possible permitting simple

48
00:01:56,179 --> 00:01:54,210
cost-effective precision recovery at

49
00:01:59,280 --> 00:01:56,189
many sites around the world including

50
00:02:02,280 --> 00:01:59,290
the Kennedy Space Center launch site

51
00:02:03,900 --> 00:02:02,290
a primary mission of the PLS would be to

52
00:02:06,600 --> 00:02:03,910
deliver passengers to the space station

53
00:02:08,340 --> 00:02:06,610
freedom typically a space station crew

54
00:02:11,670 --> 00:02:08,350
of eight will be delivered by a two

55
00:02:13,410 --> 00:02:11,680
person pls flight crew with an overall

56
00:02:16,440 --> 00:02:13,420
length of twenty nine point five feet

57
00:02:19,260 --> 00:02:16,450
and span across the wingtips of 23.5

58
00:02:20,580 --> 00:02:19,270
feet the hl-20 concept would be a much

59
00:02:23,340 --> 00:02:20,590
smaller craft than the Space Shuttle

60
00:02:25,460 --> 00:02:23,350
Orbiter and will fit within the payload

61
00:02:28,170 --> 00:02:25,470
Bay of the shuttle with wings folded

62
00:02:30,420 --> 00:02:28,180
using the extensive one tunnel resources

63
00:02:32,360 --> 00:02:30,430

at Langley researchers compiled a

64
00:02:34,830 --> 00:02:32,370
comprehensive aerodynamic and

65
00:02:37,710 --> 00:02:34,840
aerothermodynamic database on the hl-20

66
00:02:40,710 --> 00:02:37,720
concept spanning the entire speed range

67
00:02:42,390 --> 00:02:40,720
which the PLS will flock several models

68
00:02:45,060 --> 00:02:42,400
were built for testing the various

69
00:02:47,040 --> 00:02:45,070
tunnels ranging from a 6-foot model used

70
00:02:49,500 --> 00:02:47,050
for forces and moments tests at low

71
00:02:52,350 --> 00:02:49,510
speeds to six-inch models used in

72
00:02:54,420 --> 00:02:52,360
hypersonic test results have shown the

73
00:02:58,140 --> 00:02:54,430
shape possesses good flying qualities

74
00:03:00,720 --> 00:02:58,150
and all speed regimes computational

75
00:03:02,699 --> 00:03:00,730
fluid dynamics or CFD codes have been

76
00:03:04,500 --> 00:03:02,709
used at Langley to study flow field

77
00:03:06,780 --> 00:03:04,510
characteristics of the hl-20

78
00:03:09,210 --> 00:03:06,790
these advanced computational grid

79
00:03:11,400 --> 00:03:09,220
techniques were used in conjunction with

80
00:03:13,729 --> 00:03:11,410
when tunnel tests to study patterns of

81
00:03:16,680 --> 00:03:13,739
flow field phenomena shock waves

82
00:03:18,660 --> 00:03:16,690
stability and control and heating on the

83
00:03:20,789 --> 00:03:18,670
windward and leeward surfaces of the

84
00:03:22,680 --> 00:03:20,799
vehicle it was found that heating

85
00:03:24,300 --> 00:03:22,690
predicted by this concept will be within

86
00:03:26,250 --> 00:03:24,310
the limits of space shuttle based

87
00:03:28,830 --> 00:03:26,260
high-temperature a reusable surface

88
00:03:30,420 --> 00:03:28,840

insulation except at the nose where

89
00:03:31,610 --> 00:03:30,430
shuttle bays carbon carbon will be

90
00:03:33,530 --> 00:03:31,620
requirement

91
00:03:35,750 --> 00:03:33,540
in addition to computer modeling of

92
00:03:37,729 --> 00:03:35,760
vehicle controllability during entry a

93
00:03:39,710 --> 00:03:37,739
flight simulator has been set up at

94
00:03:42,440 --> 00:03:39,720
Langley to permit pilots to study the

95
00:03:45,410 --> 00:03:42,450
final landing phase of flight starting

96
00:03:47,180 --> 00:03:45,420
at 15,000 feet the simulation presents a

97
00:03:49,520 --> 00:03:47,190
realistic view of the approach to a

98
00:03:50,900 --> 00:03:49,530
runway landing using a sidestick

99
00:03:53,479 --> 00:03:50,910
controller at a minimum of

100
00:03:55,430 --> 00:03:53,489
instrumentation pilots including one who

101
00:03:57,500 --> 00:03:55,440
flew the x-15 rocket plane and the

102
00:03:59,660 --> 00:03:57,510
lifting bodies have demonstrated this

103
00:04:01,990 --> 00:03:59,670
configuration to be controllable and

104
00:04:04,339 --> 00:04:02,000
capable of pinpoint landings a

105
00:04:06,559 --> 00:04:04,349
cooperative agreement between NASA and

106
00:04:09,380 --> 00:04:06,569
North Carolina State and North Carolina

107
00:04:12,080 --> 00:04:09,390
A&T universities led to the construction

108
00:04:13,970 --> 00:04:12,090
of the full scale model of the hl-20 pls

109
00:04:16,699 --> 00:04:13,980
for use in further research of this

110
00:04:19,039 --> 00:04:16,709
concept with requirements furnished by

111
00:04:20,930 --> 00:04:19,049
Langley University instructors and

112
00:04:23,629 --> 00:04:20,940
students designed the research model

113
00:04:25,330 --> 00:04:23,639

during their 1990 spring semester with

114
00:04:27,980 --> 00:04:25,340
construction following during the summer

115
00:04:30,230 --> 00:04:27,990
the research objectives of the hl-20

116
00:04:33,529 --> 00:04:30,240
model are to assess crew ingress and

117
00:04:36,110 --> 00:04:33,539
egress operations assess crew volume and

118
00:04:38,060 --> 00:04:36,120
habitability examine fit checks of

119
00:04:40,430 --> 00:04:38,070
various subsystems arrangements and

120
00:04:42,290 --> 00:04:40,440
determine visibility requirements for

121
00:04:45,350 --> 00:04:42,300
the crew during critical docking and

122
00:04:47,180 --> 00:04:45,360
landing operations the model will be

123
00:04:48,920 --> 00:04:47,190
moved to the Langley Research Center

124
00:04:51,140 --> 00:04:48,930
where human factors or search will be

125
00:04:52,640 --> 00:04:51,150
conducted later the model will be

126
00:04:54,980 --> 00:04:52,650
located at the Johnson Space Center

127
00:04:56,930 --> 00:04:54,990
where the research effort will involve

128
00:04:59,240 --> 00:04:56,940
members of the astronaut corps who will

129
00:05:02,240 --> 00:04:59,250
evaluate the hl-20 for operations

130
00:05:05,210 --> 00:05:02,250
efficiency the Langley Research Center

131
00:05:08,180 --> 00:05:05,220
has defined a lifting body pls for a

132
00:05:10,879 --> 00:05:08,190
sure advanced s2 space for future u.s.

133
00:05:13,640 --> 00:05:10,889
space missions this reusable vehicle

134
00:05:15,909 --> 00:05:13,650
designated the hl-20 has been designed

135
00:05:19,190 --> 00:05:15,919
for safe and reliable operations

136
00:05:22,310 --> 00:05:19,200
improved operability maintainability and

137
00:05:25,010 --> 00:05:22,320
affordability and has a potential for