1
00:00:13,970 --> 00:00:11,990
wild flying birds changed the shape of

2
00:00:19,580 --> 00:00:13,980
their wings according to various flight

3
00:00:21,410 --> 00:00:19,590
conditions with today's plenty of

4
00:00:24,140 --> 00:00:21,420
sophisticated computers and building

5
00:00:26,029 --> 00:00:24,150
materials planning now exists that

6
00:00:29,570 --> 00:00:26,039
changes the shape of its wings during

7
00:00:32,330 --> 00:00:29,580
flight much the way birds do the plane

8
00:00:34,940 --> 00:00:32,340
is NASA's f-111 a high performance jet

9
00:00:38,060 --> 00:00:34,950
that has specially adapted wing sections

10
00:00:40,880 --> 00:00:38,070
that can change shape or Kim their

11
00:00:42,709 --> 00:00:40,890
leading and trailing edges variable

12
00:00:45,950 --> 00:00:42,719
camber can be best understood through

13
00:00:48,080 --> 00:00:45,960

this view of the wings profile in flight

14
00:00:50,420 --> 00:00:48,090
the wing surface can be changed from

15
00:00:53,150 --> 00:00:50,430
flat to third according to the flight

16
00:00:56,510 --> 00:00:53,160
mode necessary whether it be cruise high

17
00:00:58,639 --> 00:00:56,520
speed or maneuver time to mission

18
00:01:01,099 --> 00:00:58,649
adaptive wing this technology represents

19
00:01:03,500 --> 00:01:01,109
a joint venture between NASA's Ames

20
00:01:06,980 --> 00:01:03,510
Dryden Flight Research Facility and the

21
00:01:09,140 --> 00:01:06,990
US Air Force the idea of building a

22
00:01:11,359 --> 00:01:09,150
variable camber winning is not a new one

23
00:01:13,490 --> 00:01:11,369
it dates from our beginnings in flight

24
00:01:16,100 --> 00:01:13,500
according to the program manager of

25
00:01:17,990 --> 00:01:16,110
NASA's mission adaptive wing John Smith

26
00:01:22,100 --> 00:01:18,000
the Wright brothers and their Wright

27
00:01:24,800 --> 00:01:22,110
Flyer also used wing warping that is

28
00:01:28,789 --> 00:01:24,810
changing the camber of the outboard tip

29
00:01:31,010 --> 00:01:28,799
of the wing to generate rope and form so

30
00:01:33,230 --> 00:01:31,020
the idea is not new it's just that the

31
00:01:36,469 --> 00:01:33,240
technology has now developed to the

32
00:01:39,050 --> 00:01:36,479
point where it is practical for us to

33
00:01:42,020 --> 00:01:39,060
design an aircraft wing to give us that

34
00:01:45,100 --> 00:01:42,030
kind of performance I really expect that

35
00:01:48,410 --> 00:01:45,110
it will see variable camber wings

36
00:01:51,350 --> 00:01:48,420
designed into most airplanes in another

37
00:01:53,600 --> 00:01:51,360
10 years one of the first practical

38
00:01:56,209 --> 00:01:53,610

applications for a variable cambered

39
00:01:59,170 --> 00:01:56,219
wing was found in a plane called the RB

40
00:02:03,040 --> 00:01:59,180
racer vote by the Dayton right airplane

41
00:02:05,020 --> 00:02:03,050
in 1920 the pilot used a hand crank to

42
00:02:07,990 --> 00:02:05,030
manually change the shape of the wings

43
00:02:09,820 --> 00:02:08,000
leading and trailing edge sections by

44
00:02:12,280 --> 00:02:09,830
flattening the surface the plane gained

45
00:02:15,070 --> 00:02:12,290
more efficiency and speed once it taken

46
00:02:18,070 --> 00:02:15,080
off building on technology from the

47
00:02:20,470 --> 00:02:18,080
early Belle x5 the mission adaptive wing

48
00:02:21,100 --> 00:02:20,480
incorporates variable Wayne sweep during

49
00:02:23,530 --> 00:02:21,110
flight

50
00:02:26,040 --> 00:02:23,540
studying the combination of wing sweep

51
00:02:29,380 --> 00:02:26,050
and shape may provide new insight into

52
00:02:31,390 --> 00:02:29,390
aerodynamic efficiency initially the

53
00:02:34,210 --> 00:02:31,400
plane will be flown manually with the

54
00:02:36,190 --> 00:02:34,220
pilot making changes in wing shape later

55
00:02:38,500 --> 00:02:36,200
researches plan to make use of flight

56
00:02:40,660 --> 00:02:38,510
control computers at AI into aircraft

57
00:02:43,300 --> 00:02:40,670
sensors on the plane's wings and

58
00:02:45,880 --> 00:02:43,310
fuselage and automatically adapt camber

59
00:02:47,890 --> 00:02:45,890
to flight conditions the ultimate goal

60
00:02:49,720 --> 00:02:47,900
of the program is to prove the plane's

61
00:02:52,300 --> 00:02:49,730
efficiency in different flight modes

62
00:02:55,240 --> 00:02:52,310
from high-speed cruise to complete

63
00:02:57,310 --> 00:02:55,250

maneuverability at lower speeds from

64
00:03:00,010 --> 00:02:57,320
this study basic knowledge and wing

65
00:03:02,890 --> 00:03:00,020
sweep and Kemp will allow engineers to