1
00:00:07,040 --> 00:00:03,409
the frontiers of flight have been

2
00:00:10,450 --> 00:00:09,290
highly experimental designs for the

3
00:00:13,280 --> 00:00:10,460
plains of the world

4
00:00:17,179 --> 00:00:13,290
this plane is the latest of the x-series

5
00:00:19,640 --> 00:00:17,189
an aircraft called the x-29 at first

6
00:00:23,180 --> 00:00:19,650
glance the prime seems ordinary until

7
00:00:29,690 --> 00:00:25,120
bring back

8
00:00:34,500 --> 00:00:32,490
through the use of the x-29 is a test

9
00:00:36,750 --> 00:00:34,510
vehicle engineers will be able to

10
00:00:39,870 --> 00:00:36,760
explore the forward swept wings unique

11
00:00:42,660 --> 00:00:39,880
mixture of speed agility and slow flying

12
00:00:44,400 --> 00:00:42,670
qualities they will also explore the

13
00:00:46,979 --> 00:00:44,410

interaction of the wings with the

14
00:00:50,370 --> 00:00:46,989
forward canards and rear straight flaps

15
00:00:52,190 --> 00:00:50,380
in this design all control surfaces are

16
00:00:55,140 --> 00:00:52,200
linked together by computer

17
00:00:59,610 --> 00:00:55,150
Walter sepak NASA's program manager for

18
00:01:04,700 --> 00:00:59,620
the x-29 all three of these surfaces are

19
00:01:07,860 --> 00:01:04,710
tied into a digital computer and their

20
00:01:10,530 --> 00:01:07,870
deflection or movement during flight is

21
00:01:13,140 --> 00:01:10,540
optimized by the flight control

22
00:01:15,600 --> 00:01:13,150
computers when the pilot makes a stick

23
00:01:18,300 --> 00:01:15,610
input to the airplane these three

24
00:01:20,460 --> 00:01:18,310
surfaces all right react simultaneously

25
00:01:23,490 --> 00:01:20,470
to give the optimal response of the

26
00:01:26,100 --> 00:01:23,500
airplane to minimize drag and maximize

27
00:01:28,230 --> 00:01:26,110
performance the forward swept wing

28
00:01:30,510 --> 00:01:28,240
concept was first explored during World

29
00:01:33,090 --> 00:01:30,520
War two when the Germans built a test

30
00:01:36,120 --> 00:01:33,100
bomber with 15 degree forward swept

31
00:01:38,280 --> 00:01:36,130
wings the bomber had a limitation which

32
00:01:41,340 --> 00:01:38,290
is inherent to all forward swept wings

33
00:01:44,130 --> 00:01:41,350
it is called structural divergence and

34
00:01:46,290 --> 00:01:44,140
is illustrated here as soon as higher

35
00:01:47,580 --> 00:01:46,300
speeds are realized the wingtips

36
00:01:50,190 --> 00:01:47,590
experience tremendous

37
00:01:53,610 --> 00:01:50,200
twisting loads which flex the wings and

38
00:01:56,490 --> 00:01:53,620

can literally tear them off the x-29

39
00:01:58,950 --> 00:01:56,500
swing is criss-crossed with 750

40
00:02:02,790 --> 00:01:58,960
composite tapes of such material as

41
00:02:04,920 --> 00:02:02,800
carbon Kevlar and glass the materials

42
00:02:07,260 --> 00:02:04,930
are woven in a way to counteract the

43
00:02:13,870 --> 00:02:07,270
twisting forces encountered by the wing

44
00:02:19,350 --> 00:02:15,520
is to prove the benefits of the

45
00:02:22,410 --> 00:02:19,360
forward-swept wing to confirm the x-29

46
00:02:24,510 --> 00:02:22,420
and when these goals are accomplished to

47
00:02:27,840 --> 00:02:24,520
make sure the results are transferred to

48
00:02:29,970 --> 00:02:27,850
government and industry what we learned

49
00:02:32,250 --> 00:02:29,980
this program will help build the next

50
00:02:33,320 --> 00:02:32,260
generation of fighter and commercial