



LIGHT LOADS LABORATORY
Established 1961

37
36
35
34

1
00:00:00,500 --> 00:00:05,220

[Music]

2
00:00:05,800 --> 00:00:12,800

[Background Noise]

3
00:00:48,720 --> 00:00:50,560

>>Test 1.

4
00:00:54,200 --> 00:00:56,840

>>I think that's good Natalie, let it go.

5
00:00:56,850 --> 00:01:01,269

>>This is the last test of the X-56A that we're doing in the Loads Lab and we are doing a

6
00:01:01,269 --> 00:01:04,890

Swing Test, which is to determine the Moment of Inertia of the vehicle.

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00:01:04,890 --> 00:01:09,110

Moment of Inertia, you can think of that as angular momentum, how hard or easy is it for

8
00:01:09,110 --> 00:01:10,860

the vehicle to pitch up and down.

9
00:01:10,860 --> 00:01:15,040

So when it's flying in the air, you want to determine 'Ok, if we deflect the control surface

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00:01:15,040 --> 00:01:19,770

a few degrees, is it going to rotate sharply down, or rotate sharply up?

11
00:01:19,770 --> 00:01:24,290

Or how much force do we need to apply while it's flying to make sure that we really understand

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00:01:24,290 --> 00:01:26,290

the flight dynamics of the vehicle?'

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00:01:26,290 --> 00:01:31,590

It's currently configured right now in what we call the IYY, or pitch, inertia, so you

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00:01:31,590 --> 00:01:35,560

can see it's swinging about the fore and aft of the vehicle, and this is the configuration

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00:01:35,560 --> 00:01:38,510

we're most concerned about to determine this information experimentally.

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00:01:39,360 --> 00:01:44,760

>>Test number 4, Natalie, go ahead, swing.

17

00:01:45,200 --> 00:01:50,200

[Music]

18

00:01:50,720 --> 00:01:54,800

Ok, let it go Natalie.

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00:01:59,980 --> 00:02:02,180

>>IMU is go and recording.

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00:02:02,820 --> 00:02:04,420

>>Tracker is recording.

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00:02:06,140 --> 00:02:10,820

>>To determine this moment of inertia, we need to know what the weight of the vehicle is,

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00:02:10,830 --> 00:02:16,530

the approximate CG location, and the period at which it is doing each oscillation.

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00:02:16,530 --> 00:02:20,360

We measured a period using multiple different tools.

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00:02:20,360 --> 00:02:24,290

One of them was a simple stopwatch, so we're just counting the oscillation as it's going

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00:02:24,290 --> 00:02:25,920

across the same position.

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00:02:25,920 --> 00:02:29,770

We also have this laser tracker that is connected to a laser ball on the vehicle.

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00:02:29,770 --> 00:02:32,900

We have an attached inertial measurement unit on the very back.

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00:02:32,900 --> 00:02:36,190

We also have the onboard system measuring angular rates as well.

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00:02:36,190 --> 00:02:40,840

So all these independent sets of data, we're essentially just trying to get period, but

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00:02:40,840 --> 00:02:45,410

it's viable to have different sets of data so we can compare to make sure that we have

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00:02:45,410 --> 00:02:47,220

the best information possible.

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00:02:47,220 --> 00:02:51,030

So we'll compare the accuracy of the laser tracker, the IMU, the onboard systems, even

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00:02:51,030 --> 00:02:57,940

the stopwatch, just as a checking measure,

to make sure our data is correct.

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00:02:57,940 --> 00:03:02,030

We test in two different lengths, the lengths, you can see those hangar plates which is connecting

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00:03:02,030 --> 00:03:06,820

between the pivot and the vehicle, what this helps us do is allow us to obtain two independent

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00:03:06,820 --> 00:03:07,820

sets of data.

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00:03:07,820 --> 00:03:12,130

It's essentially two independent tests we can do for not a lot more work, to get some

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00:03:12,130 --> 00:03:15,050

good data to work with.

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00:03:15,050 --> 00:03:19,830

After we wrap up and bring the test article back down, we're gonna analyze the data to

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00:03:19,830 --> 00:03:25,360

make sure that we have all of our period information accurately, make sure we calculate our CG

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00:03:25,360 --> 00:03:28,380

location accurately, and we accounted for all the weights.

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00:03:28,380 --> 00:03:33,260

And once we do this analysis, we'll hand over the information to update our finite element