



1
00:00:00,000 --> 00:00:03,000
Sound: Unintelligible radio chatter.

2
00:00:03,000 --> 00:00:07,000
Kyle Nyberg: As the Masten engineering team performs the final system checks on Xombie,

3
00:00:07,000 --> 00:00:11,000
JPL's new Fuel-Optimal Large Divert Guidance Algorithm, known as G-FOLD,

4
00:00:11,000 --> 00:00:15,000
is about to get its largest demonstration to date.

5
00:00:15,000 --> 00:00:18,000
With support from NASA's Flight Opportunities Program,

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00:00:18,000 --> 00:00:23,000
this ground-breaking project enables JPL to validate robust landing technology.

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00:00:23,000 --> 00:00:29,000
This Google Earth visualization is created from the actual trajectory data recorded by Xombie in flight.

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00:00:29,000 --> 00:00:31,000
The trajectory may look simple,

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00:00:31,000 --> 00:00:36,000
but this flight represented an unprecedented achievement in autonomous rocket technology.

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00:00:36,000 --> 00:00:41,000
The half-mile translation across the desert was, in fact, a spontaneous landing diversion

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00:00:41,000 --> 00:00:46,000
in which the rocket was commanded to abort its initial nearby landing spot during final approach,

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00:00:46,000 --> 00:00:50,000
aggressively change direction and begin following a new trajectory that was

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00:00:50,000 --> 00:00:53,000

first calculated only one second earlier.

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00:00:53,000 --> 00:00:57,000

The G-FOLD computer calculated this new trajectory in mid-air in real time,

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00:00:57,000 --> 00:00:59,000

choosing a new landing site in the distance

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00:00:59,000 --> 00:01:04,000

and optimizing the path through the sky to burn the least amount of fuel possible.

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00:01:04,000 --> 00:01:07,000

Although the engineering teams knew the intended landing diversion before launch,

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00:01:07,000 --> 00:01:13,000

the vehicle's systems received the updated instructions mid-flight, with no advance warning.

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00:01:13,000 --> 00:01:17,000

Once commanded to change direction, the system instantly throttled up the engine

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00:01:17,000 --> 00:01:20,000

and aimed the vehicle hard over to meet the new objective.

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00:01:20,000 --> 00:01:24,000

This flight was yet another expansion of Xombie's vehicle flight dynamics,

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00:01:24,000 --> 00:01:29,000

reaching a maximum altitude of 1200 feet while flying out-of-plane with the landing pads,

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00:01:29,000 --> 00:01:35,000

then traversing downrange nearly a half mile over the desert floor at more than 50 miles an hour

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00:01:35,000 --> 00:01:38,000

before gently touching down within 9 inches of its target.

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00:01:38,000 --> 00:01:42,000

Sound: Rocket ignites.

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00:01:42,000 --> 00:01:45,000

Sound: Rocket flying.