AIR STRIKE

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Test for success.

Background

Circuit boards are key components in controlling various aircraft systems. Northrop Grumman currently tests the durability of these circuit boards using a shock test method that occupies an entire room, requires three people to operate, is unsafe, and can yield inaccurate results.

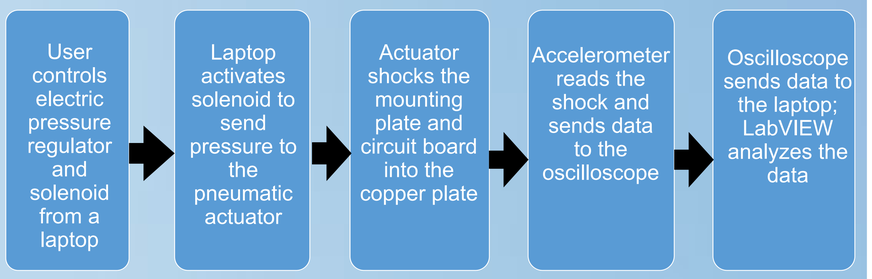
Air Strike addresses these issues and more with an innovative, efficient design that outperforms the competition.

Overview

Air Strike is a desktop testing apparatus that can deliver a mechanical shock to a mounted circuit board; testing its durability. Air Strike comprises of a pneumatic actuator and self-calibration system to shock up to 4500 g's independently in the x, y, and z directions using a movable mounting plate. This automated system increases user safety and reduces the time required to obtain data from about two weeks to less than an hour. Air Strike also costs a fraction of current market offerings

Process Flowchart

Figure 1. Air Strike works by using a user-specified pressure and pneumatic actuator to shock the mounted circuit board. The Shock data is analyzed and a Shock Response Spectrum Graph is output.



The Design

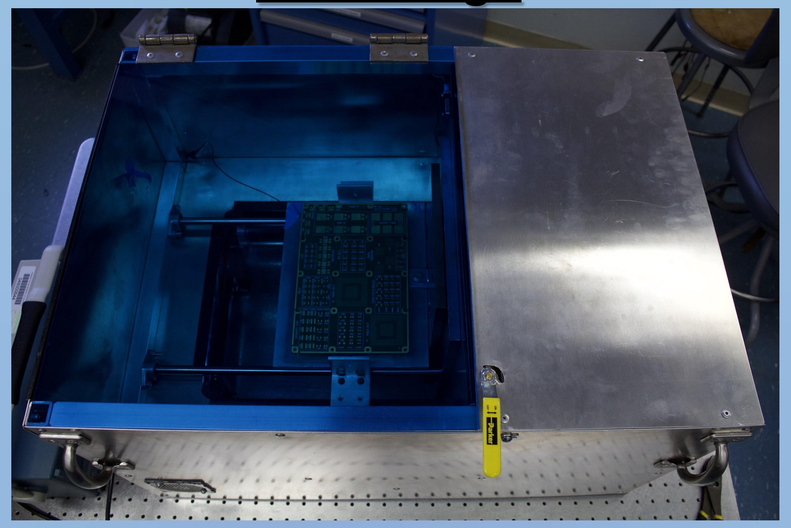


Figure 2. Air Strike is an innovative, automated, self-calibrating, safe apparatus that delivers mechanical shocks of up to 4500 g's.

Crucial Components

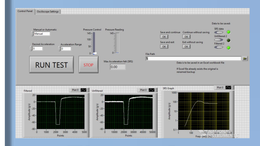


Figure 3

The LabVIEW environment

The user can control the air pressure and desired acceleration using the LabVIEW program. This program also enables the self-calibration feature of Air Strike after delivering an initial shock.

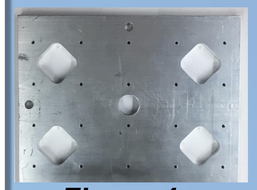


Figure 4

Mounting Plate

The versatile mounting plate can be configured to shock each of the three axes, saving time to detach and reattach the circuit board from this plate.

Figure 5

Pneumatic Actuator

The pneumatic actuator attaches to the mounting plate either directly or with a clevis. The high pressures in the pneumatic allow Air Strike to reach the required accelerations.

Safety Mechanisms

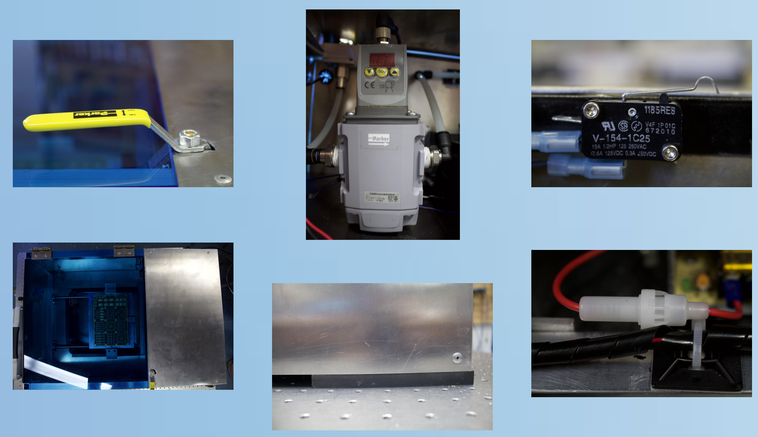


Figure 6. There are numerous precautions in place that make Air Strike a safe, dependable apparatus (counter-clockwise from top left):

- Mechanical release valve
- Acrylic shatter-proof lid
- Vibration/shock isolators
- Fuses
- Lid Switch
- Pressure regulator

Shock Level Results

Specification	Benchmark	Goal	Air Strike
Time to use	~2 weeks	< 30 min	~1 hour
People required to run machine	3	1	1
Footprint (ft^2)	~100	<6	4.3
Deceleration (g's)	4500	4500	5000
Weight (lbs.)	??	150	150.5

Figure 7. Air Strike meets all of the design specifications. It decreases testing time, decreases labor requirements, requires less space, and is a fraction of the weight of the benchmark, allowing users to move Air Strike.

NORTHROP GRUMMAN

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