

## AEROSPACE AND DEFENSE

# Thales Alenia Space

Leading European satellite manufacturer uses Siemens Digital Industries Software solutions for electronics component testing

### Product

Simcenter

### Business challenges

Minimize risk of satellite equipment failure due to pyroshock events

Maximize test safety and performance

Minimize training and maintenance requirements

### Keys to success

Work with a single partner for both vibration and pyroshock tests

Select a high-performance and reliable solution

### Results

Increased test efficiency

Documented confidence in results

Improved shock resistance of electronics equipment

### Thales Alenia Space utilizes Simcenter Testlab and Simcenter SCADAS for pyroshock testing

Dynamic environmental testing is an engineering discipline that seeks to reproduce any severe conditions an item or piece of equipment will be exposed to during its lifetime. The goal of any dynamic environmental test is to minimize the risk of failure during operation by assessing whether the item's mechanical properties are compatible with its operational environment.

Dynamic environmental testing is a critical phase in spacecraft development programs. A space rocket launch generates extremely harsh environmental conditions that include potentially damaging vibration levels, severe shocks and very high acoustic excitation levels. Such extreme circumstances present risks for the structural and functional integrity of both the launcher and its payload. Dynamic environmental testing features a variety of required qualification tests that include vibration and acoustic qualification testing, and pyroshock testing.



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Paolo Montanari  
Head Mechanical Tests  
Thales Alenia Space



Located in L'Aquila, Italy, Thales Alenia Space is a world-leading European satellitemanufacturer that also produces antennas that equip geostationary or scientific satellites. Thales Alenia Space is a joint venture between Thales (67 percent) and Leonardo (33 percent). Combining 40 years of experience with a unique blend of expertise, talents and cultures, Thales Alenia Space architects design and deliver high-tech solutions for telecommunications, navigation, earth observation, environmental management, exploration, science and orbital infrastructures.

#### **Working with trustful partners**

Paolo Montanari, head mechanical tests, leads the company's mechanical testing department. His team performs acceptance and qualification tests on electronic units and their components. Their field of expertise includes pyroshock testing, and their department features a vibration

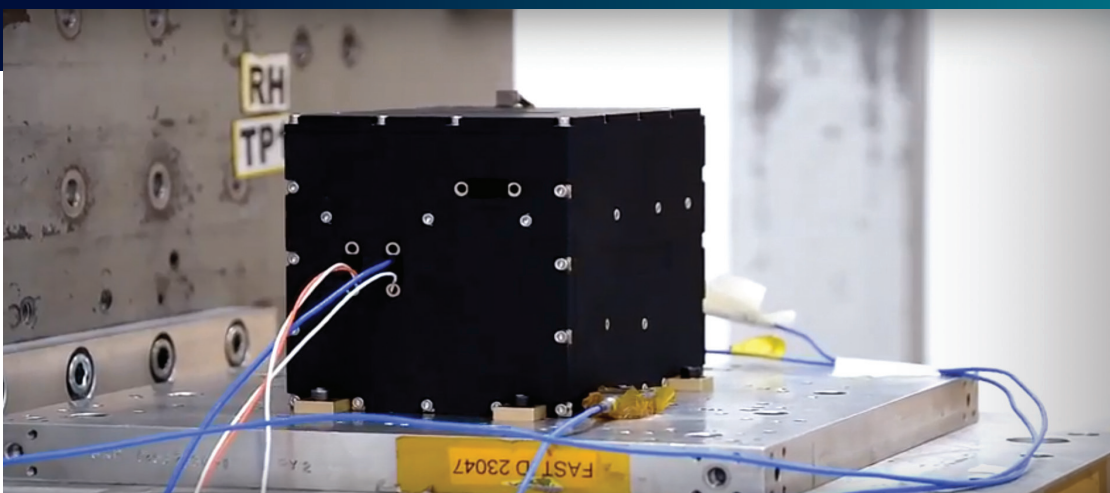
laboratory as well as a dedicated facility for pyroshock tests. Montanari explains, “We use Simcenter SCADAS hardware and Simcenter Testlab software in both facilities. Working with Siemens Digital Industries Software is very valuable, not only because the software is versatile and responds adequately to all of our needs, but also because we benefit from having a single point of contact for all questions related to maintenance and support.”

For pyroshock tests, Thales Alenia Space relies on a pyroshock simulator supplied by the SERMS laboratory. SERMS operates on a national and international scale, offering its customers a wide range of services including, environmental testing and mechanical design of aerospace, automotive, naval and industrial components.

“Pyroshock tests are very important tests that provide valuable information,” says

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In the test phase, the bullet-shot by the air gun excites the ringing plate, and a special pyroshock accelerometer transmits the response signals to the Siemens Simcenter SCADAS mobile data acquisition hardware. The obtained response signals are then analyzed using Siemens' Simcenter Testlab software.

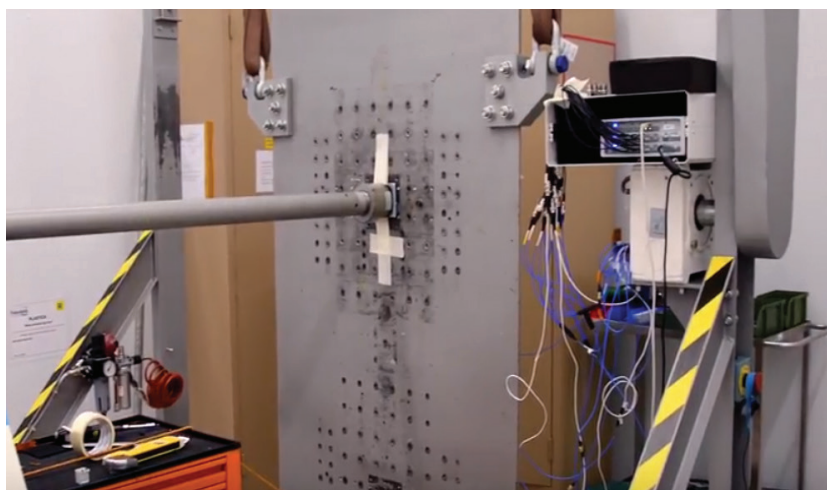
Montanari, "In the past, our equipment would sometimes fail during a mission for no apparent reason. We found that the failures were often the result of severe shocks to the equipment. By performing pyroshock tests, we can better understand the potential causes of failure and validate our equipment for improved shock resistance."

#### State-of-the-art pyroshock testing

A pyroshock is a very violent event characterized by its short duration (a few milliseconds) and a high magnitude with extreme acceleration levels. In the space industry, pyrotechnic devices like explosive bolts are routinely used, for example in the release mechanisms employed for stage separation or payload release. The resulting pyroshock event may cause damage to the payload's electronics.

Replicating pyroshock events without explosive charges, or using only mechanical means, is a challenging task. The goal of the testing team is to reach the extreme acceleration level imposed by the shock response spectrum (SRS) in a repeatable manner (achieving the same result shock after shock) with minimal health hazard, as mechanical machines may produce dangerous metal shards at impact. Antonio Alvino, technical director, SERMS, and his team have designed and produced a pyroshock simulator named SP2. The system can modulate the mechanical response of a ringing plate excited by an air gun controlled through a programmable logic controller (PLC). Many control variables, like impact duration, point of impact, bullet shape, speed, etc., can be set in the control panel to support the equalization process. In the test phase, the bullet shot

A pyroshock event can cause different space component failures. On electronic devices, it may cause the failure or the degradation of the relay, the quartz, the transformer, or another component. Pyroshock events can also damage structural parts, resulting in cracks and fractures in brittle materials. They can also distort mechanical parts such as bearings, gears and worm wheels. In addition, they can affect valves and cause leakage. Like other dynamic environmental testing disciplines, pyroshock testing seeks to replicate those potentially damaging events to understand their impact and minimize the risk of component failure.



### Solutions/Services

Simcenter Testlab  
[siemens.com/simcentertestlab](https://www.siemens.com/simcentertestlab)  
Simcenter SCADAS  
[siemens.com/simcenterscadas](https://www.siemens.com/simcenterscadas)

### Customer's primary business

Governments, institutions and companies rely on Thales Alenia Space to design, operate and deliver satellite-based systems that help them position and connect anyone or anything and help optimize our resources.  
[www.thalesgroup.com](https://www.thalesgroup.com)

### Customer location

L'Aquila  
Italy

by the air gun excites the ringing plate, and a special pyroshock accelerometer transmits the response signals to the Simcenter SCADAS™ mobile data acquisition hardware from Siemens. The obtained response signals are then analyzed using Simcenter Testlab™ software.

This testing approach offers multiple advantages as it is precise and flexible with all control variables easily adjusted to achieve the target shock response spectrum (SRS), and it is highly repeatable with discrepancies ranging below one decibel. This testing approach is also extremely powerful as the machine can reach acceleration exceeding 50,000 G-force (g) depending on the characteristics of the test item.

Equally important, the test can be run remotely if necessary and controlled from a different room, minimizing the risk of injury from metal shards or noise exposure. The machine is also easy to use; a

short training phase suffices for operators to use the system autonomously.

Finally, this testing method is fast. The SERMS Pyroshock Management (SPM) software has been developed by SERMS to help accelerate the equalization of the SRS within the relative tolerances. It uses a database that is gradually populated based on previous measurements. This database relies on an algorithm to immediately suggest the optimal calibration settings for the simulator, drastically accelerating the test preparation phase. The usage of the SPM can reduce the time needed for an equalization by 70 percent. The SPM can also be used to allocate an adequate time slot for a qualification test and helps better plan and allocate the budget for a test campaign.

By using the pyroshock simulator from SERMS in combination with Simcenter testing solutions, Thales Alenia Space can rely on state-of-the-art solutions for pyroshock testing and confidently validate the pyroshock performance of its equipment.

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### Siemens Digital Industries Software

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