

# Next Generation Data Acquisition System for a Sounding Rocket

**CURTISS-  
WRIGHT**
**DEFENSE SOLUTIONS**


## Challenge

- Future proof design
- High bandwidth data required from compact, light and rugged unit
- Price pressure to keep low cost model

## Solution

- Partner that has design capability to meet future measurement needs
- Next generation data acquisition system
- Flight-proven COTS system

## Results

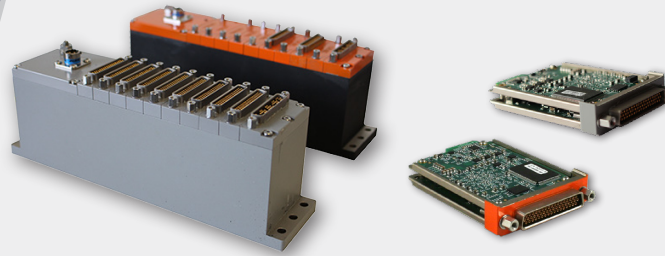
- Development of unique modules
- Getting the data they need from each new payload
- Met budget constraints

## Challenge

Sounding rockets can carry experiments to high altitudes (30 to 90 miles) that are often unsuitable for balloons and satellites. Because they do not require expensive boosters or extended telemetry and tracking coverage, sounding rockets are cost-effective platforms for suborbital experiments. In addition to being low cost, their mission payloads can be developed in a very short time frame, sometimes as quickly as 3 months, enabling scientists to react quickly to new phenomena and to incorporate the most up-to-date technology in their experiments. Often used to carry scientific instruments into space along a parabolic trajectory, sounding rockets are perfect for a variety of applications including meteorological, materials, and microgravity studies, and as test beds for orbital equipment.

Often, the data gathered by onboard data acquisition systems (DAS) is vital for mission success. A prolific operator of sounding rockets was looking to upgrade their existing DAS technology to meet more data intensive future measurement requirements. The system had to be compact and light while capable of gathering high bandwidth data. Additionally, the DAS would need to survive the harsh environmental conditions encountered in a rocket launch.

Both commercial space companies and national space agencies, such as the NASA and ESA, are seeking to cut costs and speed development by using commercial-off-the-shelf (COTS) equipment to meet the needs of future space missions. This philosophy includes sounding rocket operators who are looking to offer a low price point in order to keep their sounding rocket services costs competitive.



AXN/ADAU chassis and modules

## Solution

The operator required a modular DAS to increase the flexibility of what data could be acquired during a mission. Bespoke designed solutions are difficult and expensive to modify and because each mission would typically bring a new set of instruments, it was important to ensure that the new DAS could be reconfigured quickly to prevent it from delaying the scientific or experimental equipment's data from being captured. Thus a solution was needed that included a library of off-the-shelf modules coupled with a partner that had the design capacity and heritage to create modules that could gather data from new, or more unusual, instruments and busses.

A Curtiss-Wright space COTS solution provided the customer with the best balance between system requirements and cost. Given the limited space for the DAS onboard the rocket, the operator was concerned that existing DASs on the market would have problems with future high data volume demands. Curtiss-Wright's new Axon DAS neatly solved this issue, offering superior data acquisition bandwidth compared to anything else on the market, in a similar footprint.

Curtiss-Wright's space COTS solutions are field proven in harsh conditions and have been used in a number of space programs, including multiple launchers, space vehicles, and systems onboard the ISS. This record of successful deployments and proven reliability was very important to the operator because sounding rockets are not generally recoverable. If the DAS fails during a flight, then the whole mission is a very expensive failure. Instrumenting vehicles with proven off-the-shelf hardware that passes rigorous environmental tests for payload safety also allowed them to meet their aggressive flight schedules.

## Results

The DAS was successfully installed and deployed with custom developed modules. The Axon product family is the newest and most advanced rugged airborne DAS available today. It builds on Curtiss-Wright's heritage as the leading supplier of rugged reliable data acquisition for aerospace applications, and any gaps in the existing module set is covered by other more established DAUs from Curtiss-Wright, which can operate seamlessly together.

The DAS performed successfully during the flight and the operator was able to gather the data they needed, with all indications being the system was suitable for future flights. Axon's future-proof design, using a high-speed serial backplane (1 Gbps dedicated link per module), ensures increasing high data rates will be supported, providing excellent coverage for new acquisition requirements in many years to come. Axon's unique design also allows any of the Axon family user modules to be placed in ultra-miniature "Axonite" housings and located remotely, separated from the chassis by up to 10 meters. This yields excellent flexibility for future missions, where payload space may be minimal.

The challenge of balancing the system cost without compromising the overall mission assurance requirements was met thanks to the Axon's COTS design and wider market appeal (i.e. it is not custom designed for a limited space market) and highly rugged and reliable design objective. It is easy to make an inexpensive system, and easy to make an ultra-rugged one – balancing the two is the challenge. Curtiss-Wright's extensive experience providing low cost COTS systems into several space missions, including multiple launchers and space vehicles, helped build the customer's confidence, which was again justified during the system's flawless performance during flight.