SpaceTech GmbH

DEPLOYMENT MECHANISMS

Product Information

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SpaceTech's light-weight deployment mechanisms feature smart, reliable, and highly cost-efficient designs.

SpaceTech develops selected satellite equipment, both, for use in our solar arrays and in other subsystems, making extensive use of our in-house manufacturing and test capabilties. We have a thorough understanding of details of satellite equipment and „hands-on" experience in development, manufacturing, assembly, integration and test, being an ideal foundation for the development of higher levels of integration as in subsystems.

Unique Features of STI Deployment Mechanisms

- Low deployment shocks
- High torque margins
- Extremely light-weight all-CFRP designs with integrated hinges
- High deployment accuracy
- Contactless end-switches

Each mission typically requires individual mechanism design adaptions or completely new developments to fit the specific application. Depending on the application the mechanisms are optimized with respect to mass, torque, low shock, accuracy, etc. Extremely light, accurate, and almost friction-free designs become possible with the innovative CFRP integral slotted hinges.

Solar array deployment mechanism for all multi hinge solar arrays

The STI hinge axis assembly (HAA) fits in a standard design envelope for approximately all common LEO and GEO satellite missions up to solar array wings with six axis.
This mechanism is an autonomous spring driven hinge. After the release mechanisms of the solar array panel stack are activated, the hinges unfold the wing automatically into its final stiff deployed configuration in less than 1 minute. The HAA consists of three functional elements:

1. The core element of the hinge is the "C" shaped tape spring called "C-Blade". It provides driving torque for the deployment and latch into the final deployed position.

2. The Torque Limiter (TL). Due to a stack of disc springs, the total induced deployment energy and therefore high torques at the C-Blades can be absorbed in one axis only. This prevents a spontaneous forced delatch of an already latched hinge axis and avoids a chaotic deployment of the solar array wing.

3. The exoskeleton (CAM) is the third and last functional element. It provides axis guidance during the deployment process as well as protection for the C-Blade from bounce back events due to energy peaks induced by a latching hinge. The advanced shape of the exoskeleton brings further advantages in the stowed as well as in the deployed HAA position.

Project Examples

Solar array deployment mechanism for Airbus OneWeb Satellites:

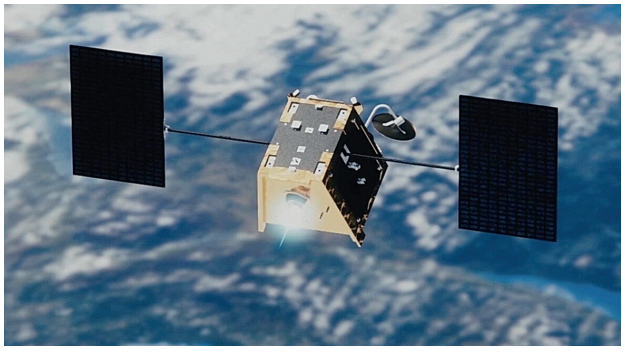
The AOS Airbus OneWeb Satellites mega constellation for global broadband internet consists of 900 small satellites. AOS selected SpaceTech to develop and deliver 1800 solar arrays deployment mechanisms SADM – two on every satellite.
SpaceTech's AOS SADMs consist of a CRFP booms and SAP launch support parts.
The booms are equipped with two tape spring hinges and the harness for the solar array and the seasonal drive. The challenging requirement of available space between spacecraft body and solar panel was achieved by squeezing the CFRP boom. The CFRP boom with integrated high strength alloy tape springs is manufactured by CarboSpaceTech and provides a high stiffness in deployed configuration. The power harness is directly attached to the boom and provides high performance due to its low resistance.

Safe launch suspension is achieved by one release mechanism that pretensions the solar array panel and the boom. The deployment process can be divided into three steps:

1. Release of the HDRM. The solar panel is still caught by the hook-roller–combination.

2. Driving the seasonal drive, that results in a partly latching of the boom hinges.

3. Further driving the seasonal drive, which releases from the hook and fully deploys the solar array panel.



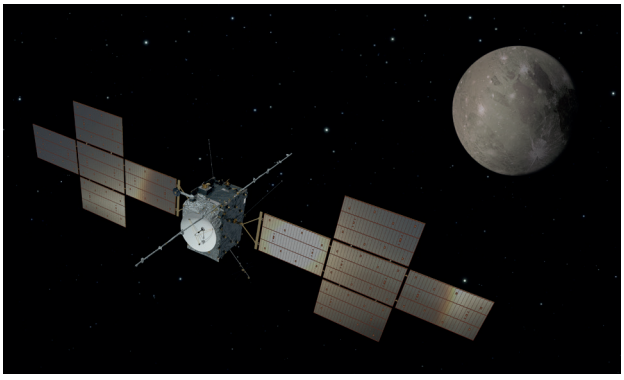
OneWeb satellite (source: OneWeb Satellites Inc)

SpaceTech antenna for JUICE RIME:

The RIME Antenna (Radar for Icy Moons Exploration), SpaceTech's contribution to the ESA JUICE (JUpiter ICy moons Explorer) mission, is an instrument which will investigate the geophysical structure of Jupiter's three largest icy moons – Europa, Ganymede and Callisto.

Key Characteristics of the SpaceTech JUICE RIME Antenna

- Total mass of less than 7 kg for the whole antenna and less than 2 kg for the antenna booms made of ultra-light CFRP for a total deployed length of 16 meters, allowing savings in propellant on the long flight to Jupiter
- Release mechanism lightweight non explosive actuators
- Integrated elastic hinge technology with multiple foldings (6 hinges) is used. When deployed these hinges ensure extreme high stiffness and alignment performance over the wide temperature range necessary to fly-by Venus and then operate in cryogenic cold environment in the backyard of the moons of Jupiter. The elastic hinge is achieved by cutting slots into the CFRP tube, resulting in an extremely light weight all CRFP hinge without any metallic bracket or blades.



JUICE spacecraft with STI antenna (source: spacecraft: ESA/ATG medialab; Jupiter: NASA/ESA/J. Nichols (University of Leicester); Ganymede: NASA/JPL; Io: NASA/JPL/University of Arizona; Callisto and Europa: NASA/JPL/DLR

Are you interested in our existing components or in need of a new development? Please contact us!

SpaceTech (STI) is a privately owned company and independent from large aerospace companies. Located in Immenstaad, Germany, on the shore of Lake Constance, we are ideally situated in the centre of a high tech area together with several other aerospace companies and have access to a strong network of experienced suppliers. Founded in 2004, STI has developed into an established and well recognized medium size enterprise in the space industry.
STI offers a wide spectrum of products and services for space missions, from challenging prototypes for institutional science and earth observation missions to low cost series production for mega constellations. Our main capability is the design, development and manufacturing of innovative, high quality space equipment. Our products in particular include:

- Small satellite system design, production, integration
- Solar arrays, satellite structures, deployment mechanisms, electronics, and cold gas propulsion systems
- Laser-optical instruments and components, ICARUS systems

Key to STI's success is our profound knowledge of satellite system and subsystem design which allows us to find smart solutions for each customer and mission from a holistic point of view. SpaceTech systems and equipment operate flawlessly on more than 300 satellites in orbit. We are known in the space industry for our straight forward and pragmatic approach, tailored processes and safe in-orbit function. The momentum as a young and dynamic space enterprise with innovative ideas is a perfect match for many of the new space challenges. This is why SpaceTech attracts highly qualified personnel, many with long standing and exceptional experience in the space business but also young and highly motivated engineers and scientists. And this is why we can deliver you the best solution for your needs.

When can we launch your space vision?

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