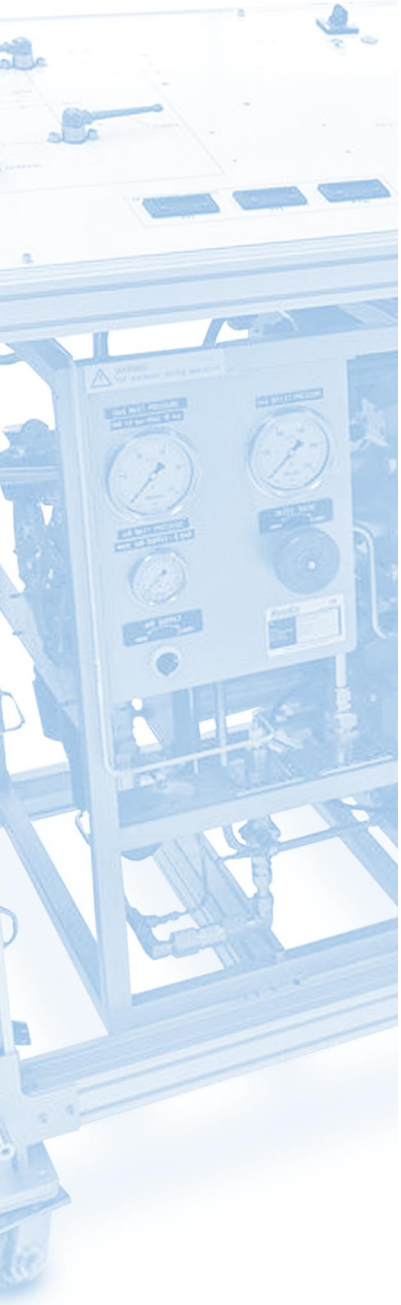
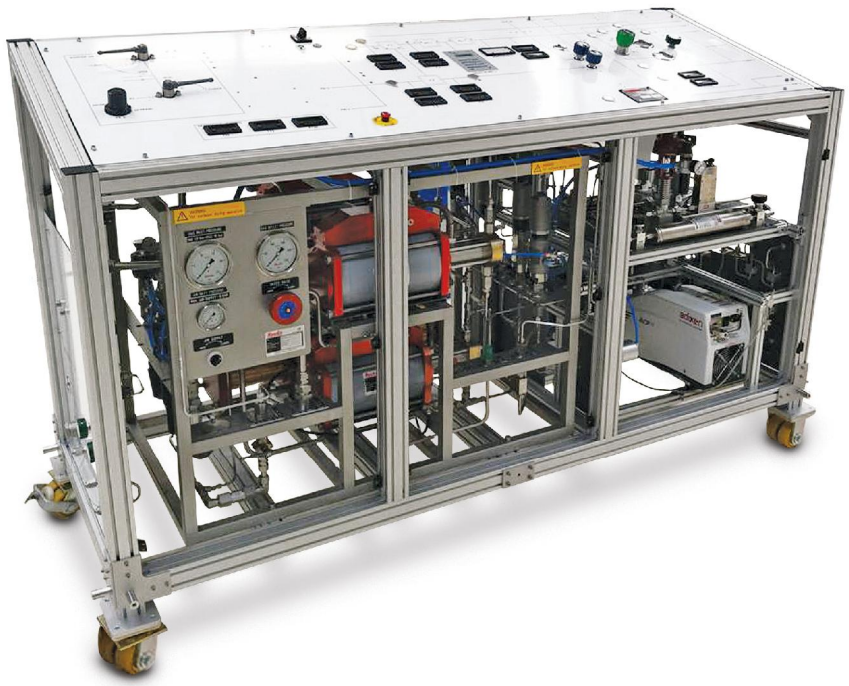
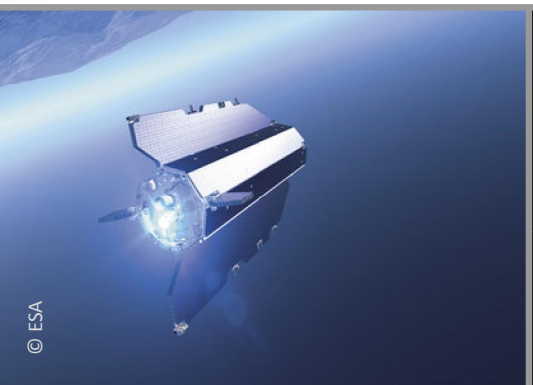
XENON LOADING CART

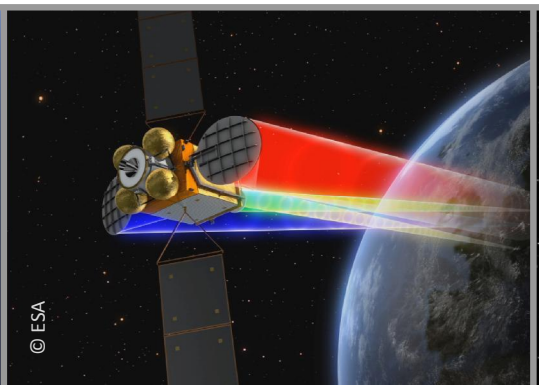




The Electrical Propulsion System of the current generation communication satellite platforms requires unprecedented levels of performance from the GSE loading cart to be used for filling of its Xenon Storage Tanks. Of importance are especially the loading accuracy and the low-ppb level of impurities allowed in the loaded Xenon. The Xenon Loading Cart developed by Bradford consists of a Mass Balance Unit, a Pressurization and Loading Unit. In the past Bradford built a Xenon Loading Cart for the GOCE spacecraft; this Xenon Loading Cart is now fully re-designed for unprecedented levels of performance.

Having experience from the development of the GOCE Proportional Xenon Feed Assembly and XLC in the use of Xenon, Bradford fully understands the unorthodox behaviour of Xenon occurring during the loading into the spacecraft propellant tanks. For this purpose, a high-accuracy Xenon Massflow Controller has been installed into the Loading Unit, which allows a fully controlled and fully automated loading of the spacecraft propellant tank. The flow control is adjustable to a fixed value, allowing the operator in advance to analyze, predict and avoid any thermal issues with regard to compressing Xenon into a storage tank. As such, any loading aborts can be avoided in an already tight spacecraft launch schedule.





Xenon Loading Cart

Characteristic	Performance / Interfaces Budget
Fluid Compatibility	Xe, N2, He, Ar
Inlet filtration rating	2 micron nominal
Outlet filtration rating	2 micron nominal
Maximum inlet pressure	Xe: 60 barA N2, He, Ar: 200 bar
Maximum outlet pressure	Low-pressure: 17.2 bar High-pressure: 200 bar Proof-pressure: 300 barA
Proof pressure	MEOP x 1.5
Burst pressure	MEOP x 4
Vacuum compatibility	Full
Design propellant flow capability	3 g/s Xe
Operational temperature range	10°C – 30 °C
Mass flow feedback accuracy	≤ 1% FS
Pressure feedback accuracy	High pressure section: ≤ 1 bar Low pressure section: ≤ 0.1 bar
Impurity Performance	
O2	< 0.1 ppm
H2	< 1 ppm
H2O	< 0.1 ppm
CO + CO2	< 0.1 ppm
CnHm	< 0.1 ppm
Total Fluor Carbons	< 0.1 ppm

XLC Architecture

The Xenon Loading Cart consists of a Mass Balance Unit, a Pressurization and Loading Unit. The Mass Balance Unit allows an accurate determination of the depletion of propellant from the supply vessels, the Pressurization and Loading Unit allows pressurization of the supply gas up to proof-pressure levels, and high-accuracy flow control & loading, low-ppb level purification and verification of H2O and O2 low-ppb impurity levels.

During loading, the XLC H/W provides accurate real-time information on the loaded purity (H2O) and amount on Xenon into the spacecraft Xenon Storage Tank. Therefore, even in the case of a potential loading abort (e.g. caused by S/C system-level issues), the loading procedure can be simply paused and continued at any time of desire.

External equipment, for example an oxygen analyser, can be connected to the XLC. Sample bottles can be extracted for external verification and, for testing purposes, a vacuum loop connection can be made with the space craft.

bradford

ABOUT

Bradford is a high-tech European developer and manufacturer of satellite control sub-systems and components.

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