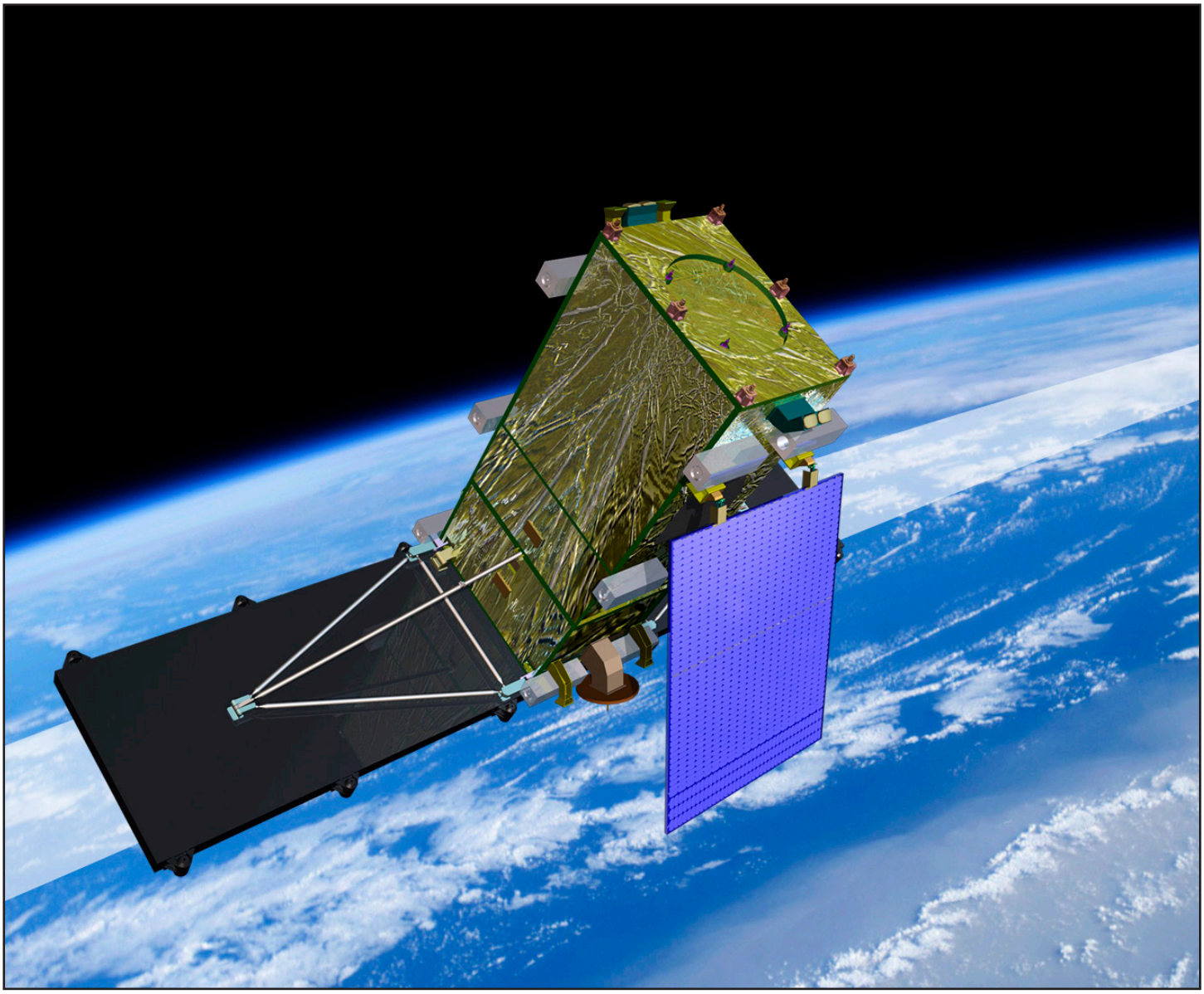
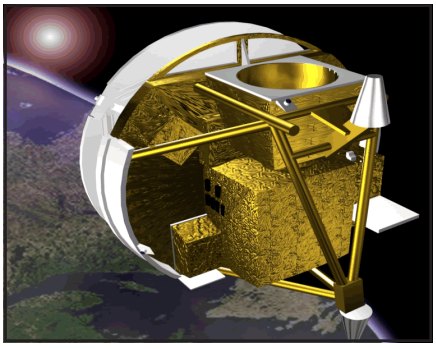
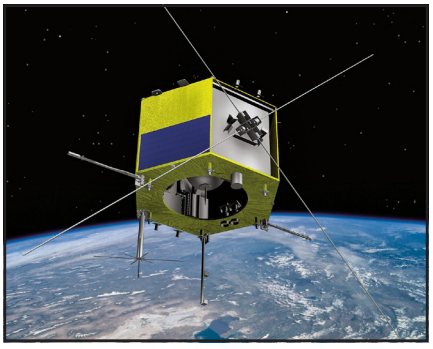
MAGELLAN AEROSPACE

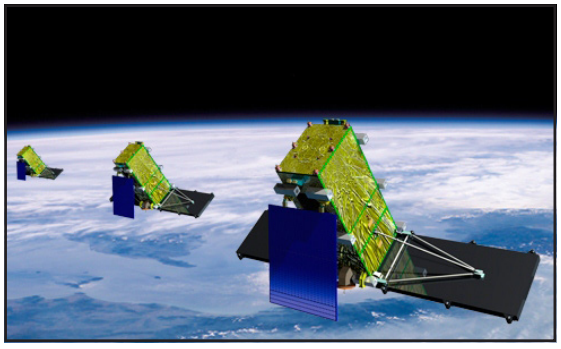
MAGELLAN SATELLITE BUSES



SCALABLE ARCHITECTURE • HIGH RELIABILITY • FLIGHT-PROVEN DESIGNS







OVERVIEW

Magellan Aerospace offers a family of spacecraft bus solutions consisting of the microsatellite-class MAC-100 and the smallsat-class MAC-200. The MAC-100 was developed for the SCISAT-1 mission launched in 2003. This bus is targeted at low Earth orbit (LEO) missions with design lifetimes on the order of two years. Key features include low power consumption, radiation tolerant command and data handling, high rate and high volume payload data support, and high rate CCSDS-compliant downlink. The MAC-200 has a flexible, fully redundant cross-strapped architecture with standard interfaces that can be tailored to meet mission-specific requirements and targeted life-cycle costs, while providing high reliability for mission lifetimes of seven years or more. Originally designed to operate in LEO, variants are under development for higher energy orbits such as Molniya and Tundra. The MAC-200 is the bus for the CASSIOPE mission launched in 2013 and the three spacecraft of the RADARSAT Constellation Mission (RCM) scheduled for launch in 2018.

	MAC-100 Microsatellite Bus	**MAC-200 Small Satellite Bus**
Spacecraft Specifications		
Bus Dry Mass (without payload)	100 kg	Up to 730 kg (mission dependent)
Bus Power (without payload)	32 W (orbit average)	Up to 200 W (orbit average)
Solar Array Power	110 W (BOL orbit average)	Up to 600 W (BOL orbit average)
Solar Array Configuration	Body-fixed	Body-fixed or deployed
Redundancy	Single-string	Dual-string
Bus Reliability	0.84 at 2 years	0.85 at 7 years
Design Lifetime	2 years	7+ years
Flight Heritage	SCISAT-1 (on-orbit since 2003)	CASSIOPE (on-orbit since 2013) RADARSAT Constellation Mission (launch in 2018)
Payload Accommodations		
Mass	50 kg	Up to 530 kg (mission dependent)
Volume	0.12 m^3	Mission dependent
Power	65 W average, 100 W peak	500 W average, 2 kW peak (scalable)
Voltage	28±6 V_{DC} (unregulated)	28±6 V_{DC} (unregulated)
Data Interface	RS-422 @ 4 Mbps	RS-422 or CAN @ 4 Mbps
Data Storage	1.5 GB	2.0 GB (expandable)
Guidance, Navigation and Control (GNC)		
ADCS Architecture	3-axis, bias momentum	3-axis, zero momentum
Attitude Knowledge	±1° (3σ, in each axis)	<0.007° (3σ, in each axis)
Attitude Control	±2° (3σ)	<0.011° (3σ, in each axis)
Pointing Performance	<240 arcsec	<20 arcsec
Propulsion	None	Hydrazine monopropellant
Command and Data Handling (C&DH)		
TT&C Protocol	CCSDS and STDN compatible	CCSDS and STDN compatible
Command Uplink	S-band, 4 kbps (CCSDS compliant)	S-band, 4 kbps (CCSDS compliant)
Telemetry Downlink	S-band, 4 Mbps (CCSDS compliant) Reed-Solomon encoding (optional)	S-band, 4 Mbps (CCSDS compliant) Reed-Solomon and Convolutional encoding (optional)

ABOUT MAGELLAN AEROSPACE

Magellan Aerospace (TSX: MAL) provides products and solutions to the aviation, defense and space markets, with facilities in Canada, the United States, Europe and India. The company's Space and Rocket Division has over fifty years of flight heritage on NASA and CSA missions including Black Brant sounding rockets, sub-orbital payloads, Shuttle and ISS experiments, and satellite missions. Magellan's space solutions include the microsatellite-class MAC-100 bus and the smallsat-class MAC-200 bus, as well as payloads and subsystems including C&DH, power, ADCS, structures and flight software.

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