MAGELLAN AEROSPACE IN SPACE – A CANADIAN SUCCESS STORY

Magellan Aerospace is a Canadian company headquartered in Mississauga, Ontario, Canada, and has operating divisions located in Canada, the United States, the United Kingdom, India, and Poland. Magellan employs approximately 3,200 people throughout all of its divisions.

The company manufactures complex aeroengine components and advanced aerostructures fabrications, as well as proprietary products; including small satellite buses, propulsion products, and the Wire Strike Protection System™ (WSPS™) for civil and military helicopters.

Magellan's space business operates primarily from its largest division in Winnipeg, MB, which also includes satellite offices in Rockwood, Manitoba and in the Canadian Space Agency David Florida Laboratory in Ottawa, Ontario. The Winnipeg division employs approximately 700 people at the three facilities.

ORIGINS

Magellan's space heritage dates back to the early 1960's and the development of the Black Brant family of sub-orbital rocket vehicles. For the past 40 years, Magellan has worked closely with the Canadian scientific community to deliver more than 130 space missions. These missions encompassed sounding rocket flights, space shuttle and International Space Station (ISS) experiments and small satellites. Magellan's space activities are concentrated in three areas: sub-orbital rockets, space payloads and small satellites.

BLACK BRANT SOUNDING ROCKET FAMILY

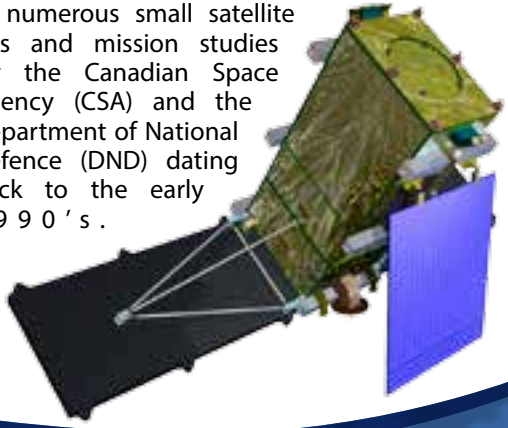
Magellan has built over 1000 Black Brant rockets and the product remains in production today. The Black Brant has been launched from over 20 ranges worldwide with an overall reliability of 98%. Magellan is responsible for the design of the overall system including manufacture of the BB5 and Nihka solid propellant rocket motors, interstage hardware manufacture, payload accommodation, guidance and control package integration, recovery system hardware and, in some cases, mission analysis and launch operations.

PAYLOADS

Magellan has also been involved with the development of the many of the science payloads that have been used on Black Brant missions. One rocket payload that was built by Magellan was for the GEODESIC mission that was launched successfully in 2000. This CSA-NASA collaboration contained instruments contributed by Canadian and US scientists to study plasma in the ionosphere. This experience led directly to Magellan developing numerous science payloads for a number of space shuttle and ISS missions.

SATELLITES

The core space business at Magellan today is the development of small satellite buses. Magellan, a long time advocate of a Canadian small satellite program, has led or participated in numerous small satellite bus and mission studies for the Canadian Space Agency (CSA) and the Department of National Defence (DND) dating back to the early 1990's.



Magellan is now established as Canada's sole supplier of small satellite buses.

SCISAT-1

SCISAT-1 was the first Canadian small satellite mission since the 1970s. Magellan was the spacecraft prime contractor for the SCISAT-1mission. Magellan developed the spacecraft bus and was responsible for instrument integration and spacecraft level assembly, integration and test (AIT). Magellan procured the Ground Control and Data Handling Systems now used in the Mission Operations Centre at CSA and also developed the real time spacecraft operations and training simulator. Magellan worked closely with Orbital Science Corporation to integrate the spacecraft onto the Pegasus XL launcher and with CSA satellite operations to perform the launch and early operations, and on-orbit commissioning for the spacecraft. The 150 kg SCISAT-1 spacecraft was successfully launched to the desired 650 km orbit on a Pegasus-XL vehicle on August 12, 2003. The bus was designed to meet a two year mission life requirement. As of January 2013, the SCISAT-1 spacecraft continues to perform well within specification and is delivering high quality science data relating to ozone measurement.

CASSIOPE

The CASSIOPE mission was the first to use the MAC-200 bus. Magellan developed the bus and performed the payload integration under contract to MacDonald, Dettwiler and Associates (MDA). In parallel, Magellan was contracted by the CSA to develop the spacecraft simulator and ground infrastructure that will be used to support multiple missions. CASSIOPE is scheduled to be launched in 2013. http://www.asc-csa.gc.ca/eng/satellites/cassiope.asp

RADARSAT

Magellan's most recent satellite project is the RADARSAT Constellation Mission (RCM) satellite bus. RCM is a constellation of three identical satellites that will provide high-resolution radar images of the earth. The RCM design re-uses many of the existing MAC-200 bus subsystems. Magellan has completed the design phase of RCM. The three RCM spacecraft are scheduled for launch in the 2018 timeframe.

Magellan Aerospace's Winnipeg division was a pioneer in Canada's space industry. The Black Brant was one of Canada's first space contributions to the world, and a proud part of Magellan's past that has developed into our burgeoning space business today. Starting with the first Black Brant 50 years ago, Magellan has years of experience providing customers with solutions for space missions that include sounding rockets and payloads, space shuttle payloads, International Space Station payloads, and spacecraft buses and integration services.

WHAT IS A SATELLITE BUS?

The bus is the "chassis" and support infrastructure of a spacecraft. It usually provides locations for the payload (typically space experiments or instruments) and guidance, control and mission-specific systems.

http://en.wikipedia.org/wiki/Satellite_bus

In 2004, Magellan was awarded a CSA contract to design the MAC-200 multi-mission smallsat bus. The MAC-200 was designed to provide a standardized platform capable of supporting requirements from a wide range of anticipated Canadian satellite missions. Magellan has since participated in numerous studies for a wide range of science and operational missions.

THE BLACK BRANT ROCKET - 50 YEARS OF OPERATIONAL EXCELLENCE

Black Brant is the name of a goose indigenous to Western Canada. This was the name that was given 50 years ago to a new, Canadian-built sounding rocket that would become a legacy product for Magellan's Winnipeg division, formerly Bristol Aerospace.

On June 15, 1962, a Black Brant 3 (BB3) rocket launched from Wallops Island, Virginia soared into the upper atmosphere. This was the first flight of a Bristol Aerospace-built rocket and is considered the first milestone of what was to become a very successful rockets and space business at the company.

WHAT IS A SOUNDING ROCKET?

Sounding rockets, sometimes called research rockets, take their name from the nautical term "to sound", which means to take measurements. Unlike orbital rockets, sounding rockets use their energy to achieve mission requirements and then return to earth. Up to six minutes of weightlessness can be achieved from sounding rocket trajectories.

The origins of the Magellan space business date back to the 1950s when the Canadian Armament Research and Development Establishment (CARDE) in Valcartier, Quebec (now called the Defence Research and Development Canada or DRDC) was developing a solid propellant called CARDEPLEX. Bristol Aero Industries (the company name then) manufactured the motor cases to test the CARDEPLEX. The flight of the CARDE rocket, later designated as BB1, took place from Churchill, Manitoba in 1959 and proved the flight performance of the motor and the propellant. CARDE subsequently transformed the BB1 into BB2 using the same motor; but with better fins giving improved performance. The first flight of BB2 rocket took place in 1960. Motor cases for both the BB1 and BB2 were built by Bristol.

In 1960, the Government of Canada awarded a contract to Bristol to develop three sounding rockets – BB3, BB4 and BB5 - with CARDE initially having the overall engineering control. In 1961, total responsibility for the supply of solid propellant powered rockets for the Canadian Space Program and the supporting technology was transferred to Bristol. CARDE and the National Research Council (NRC) provided invaluable assistance for these development activities. CARDE filled all the rocket motors with propellant until Bristol's Rockwood propellant plant came into operation in 1963.

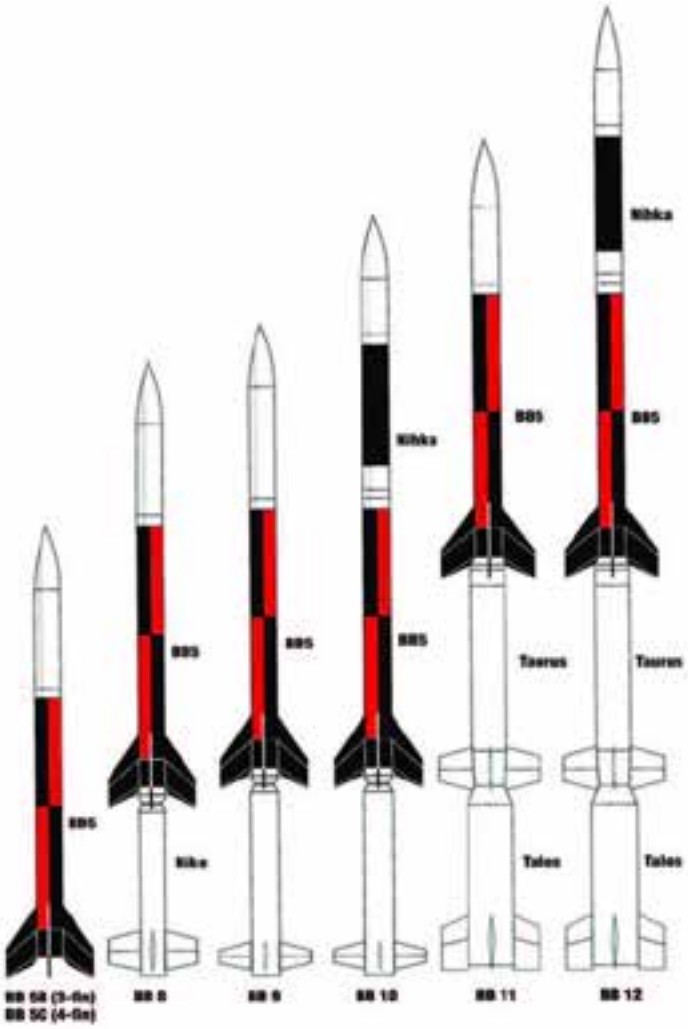
The Rockwood propellant plant was built by a company named Bristol Aerojet; a joint venture between Bristol Aero Industries and Aerojet General Corporation of California. This venture produced the BB5 motor which utilized an Aerojet propellant named AEROPLEX. Aerojet withdrew from the joint venture in 1965 which led to renaming the company Bristol Aerospace.

The upper atmospheric research scientists at NRC and at the Canadian Universities were the major customers in the early days of the Black Brant program. Later, NASA and the US Department of Defense (DoD) became customers, and production of Black Brant rocket motors and hardware for NASA continues to this day.

A family of Black Brant rockets with various modifications have been

designed and developed during the past 50 years. The BB12, which included the NIHKA motor as the fourth stage took place in 1988 and was the last complete Black Brant rocket developed to meet specific requirements for NASA. Product improvements to the Black Brant rocket are an ongoing activity.

Black Brant rockets have carried payloads of 70 to 850 kgs to an altitude of 150 to 1,500 kms (high above the 370 km orbit of the International Space Station). In addition to diagnostic and scientific payloads, Magellan has developed many rocket accessories for specific mission requirements. These include: The Despin System, Deployable Nose Fairings, Interstage Separation Systems, Payload Recovery Systems, Water Recovery Systems, and Thrust



Termination System and Payload Tether systems. Knowledge and experience gained from the Black Brant program have been extended to many other Magellan products including the CRV7 Rocket System, CL89 and CL289 surveillance drones, the Excalibur target system rocket motors, satellites and space shuttle payloads.

Approximately 1,160 Black Brant rockets have been flown to-date; primarily from launch sites in Churchill, Manitoba; Wallops Island, Virginia; White Sands, New Mexico and Poker Flats, Alaska. However, Black Brant rockets have also been flown from various other established ranges and temporary sites in remote locations such as Vandenberg, California; Kauai, Hawaii; Cape Parry and Resolute Bay, NWT; Australia, Brazil, France, Greenland, Kenya, Norway, Peru, Sweden and Spain. In fact, the Black Brant rocket has been fired from every continent except Antarctica, with a success rate of more than 98 per cent. Many of these launches were conducted or supported by Bristol personnel and equipment.

Magellan was the first non-US recipient of the NASA Goddard's Contractor of Excellence Award and the continued use of the Black Brant rockets by NASA is a testimony to the reliability and cost effectiveness of this 50 year legacy product.

To celebrate the 50th anniversary of the first launch of a Bristol-built Black Brant rocket, a celebration was held at the Magellan Aerospace plant in Winnipeg on July 5, 2012.

At the event, Magellan Aerospace's Vice President and General Manager, Don Boitson, made a special presentation to commemorate the anniversary by donating a full scale Black Brant V rocket to the Manitoba Museum. The rocket will be an exhibit in their new Science Gallery.

"We are delighted to entrust this Black Brant V rocket to the Manitoba Museum. We know that the Museum is the perfect place to display the Black Brant rocket for the enjoyment of Manitobans today and for future generations. The Black Brant is an important piece of Manitoba's heritage and showcases one of Manitoba's significant contributions to the field of rocketry and to space science," he said.

The Black Brant rocket is science at its best in Manitoba, and a significant part of our province's science and engineering history.