BLACK BRANT SOUNDING ROCKETS

Bristol

A Magellan Aerospace Company

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Cover: Trajectory of Black Brant three-stage rocket launched from Alaska to an altitude of 958 km to carry out auroral research. This half-hour exposure also shows the glow from two barium charges released following third-stage burn to reveal the orientation of the earth's magnetic field.

Setting World Standards in Sounding Rocketry

Black Brant is a solid propellant rocket system in single and multi-stage configurations that can carry payloads of 70 - 850 kg to altitudes from 150 km to more than 1500 km.

It provides up to 20 minutes of useful time for micro-gravity experiments, auroral studies, deep space observations, and other extra-terrestrial research.

Black Brants are launched from conventional boom rails or 3 or 4 fin towers.

Bristol's Space Systems Group can provide a comprehensive range of vehicle/payload design and fabrication through full launch support worldwide.

Since 1962, more than 400 Black Brants have been lauched, with a vehicle success rate of 98%.

Vehicles are in continuous production at Bristol for ready availability to experimenters. High rates of production help keep the Black Brant more cost-effective than any other sounding rocket of comparable performance.

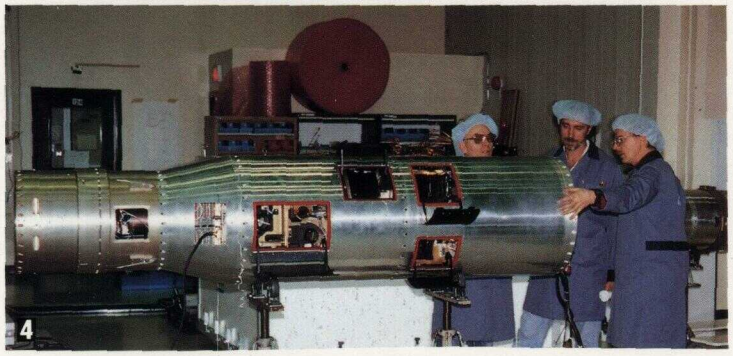
Whether studying the upper atmosphere or conducting micro-gravity research, the Black Brant is the most reliable, cost-effective, and available sounding rocket to carry experiments to the fringes of space.

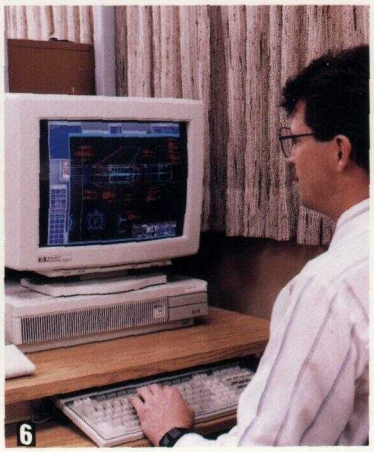
Launch of the first Black Brant 12 from Wallops Island, Virginia, in 1988.

BB 10 launched from Andoya Rocket Range, Norway

** The BB 9 and BB 10 use the Terrier MK12 motor.*
The BB 9 Mod 1 and BB 10 Mod 1 use the TX-664-5 motor.

Support Services/Facilities





Bristol's Space Systems Group, staffed by many of Canada's foremost experts in high altitude research rocketry, offers turn-key services and support to experimenters:

- mission feasibility and definition
- payload/hardware design and fabrication
- experiment integration
- environmental testing
- mission analysis
- launch services and range crew support
- project management

1 *Launch of a BB 9 from 4-fin tower at White Sands, New Mexico. The payload carried micro-gravity experiments in support of the Canadian Space Agency's materials research program.*

2 *Bristol's range crew at Natal, Brazil. The rocket carried mass spectrometers for ozone layer research. Identical experiments were launched simultaneously from Churchill in northern Canada for comparative data from a remote location.*

3 *Static firing of Black Brant motor at Rockwood, Bristol's solid propellant plant. Since 1963, when the plant opened, it has produced over 600,000 rocket motors for a variety of applications.*

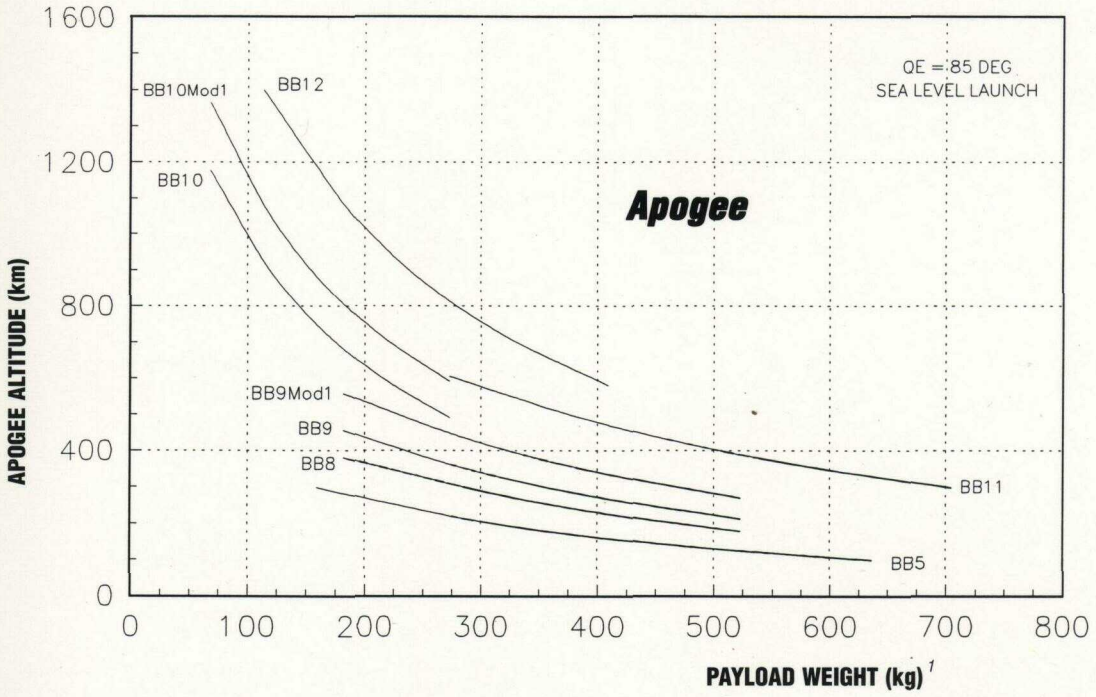
4 *Environmental testing ensures that "what goes up does not break down".*

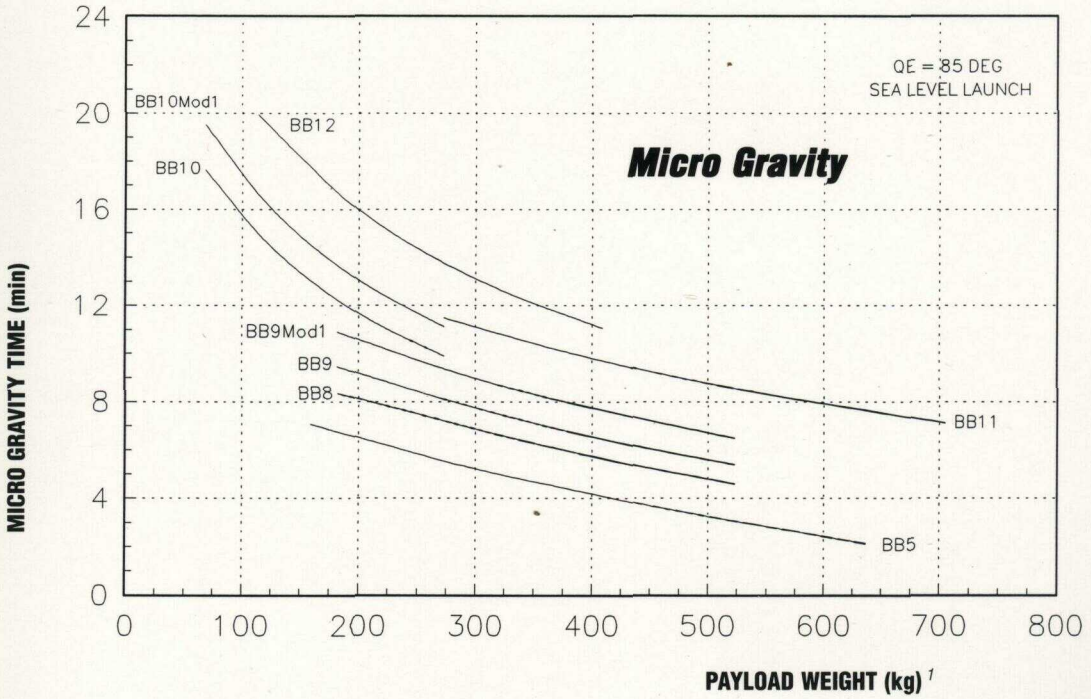
5 *Fabrication of ogive parachute recovery systems.*

6 *Vehicle hardware is designed using CAD.*

7 *Bristol Aerospace, Winnipeg. The company's total facilities, which include over 700,000 square feet of floor space, are located adjacent to Winnipeg International Airport.*

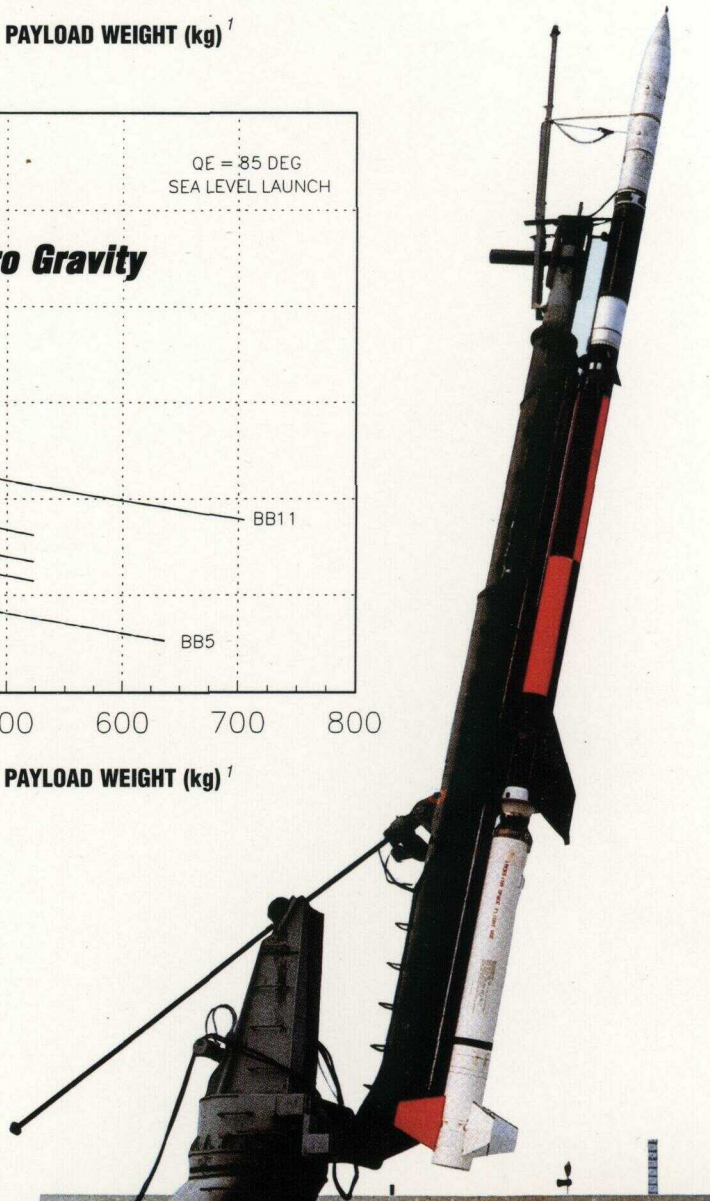
Performance



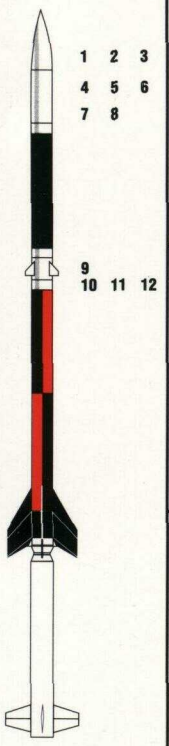


[1] *Payload weight includes the igniter housing (21 kg).*

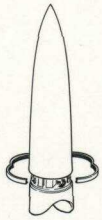
First launch of a BB 10 from NASA's Wallops Island, demonstrating capability of a low-cost three-stage guided sounding rocket to overfly the earth's polar cusp. NASA, the world's leading space agency, is one of Bristol's principal customers for sounding rockets.



Support Systems

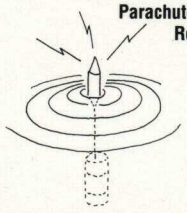


1
Forward Ejecting Nose Fairing



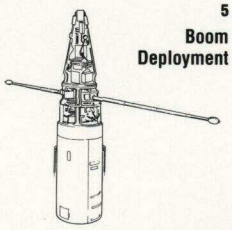
2
Parachute Recovery
Forward or aft mounted. Payload recovery wt up to 725 kg

3
Parachute Water Recovery

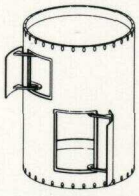


4
Payload Instrumentation
Standardized or custom designed on-board instrumentation. Telementry - IRIG standard FM/FM and PCM

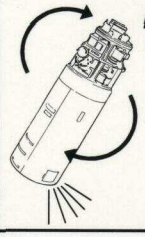
5
Boom Deployment



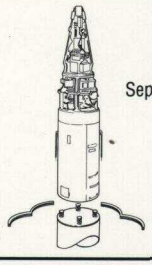
6
Opening and Closing Payload Doors



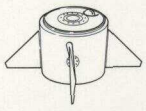
7
Attitude Control Systems (ACS)
for various scientific requirements



8
Payload Separation
Separation rates 0.6 - 3 m/s

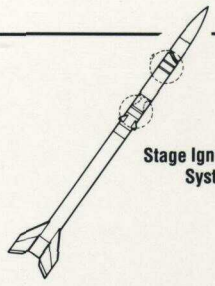


9
S-19 Boost Guidance



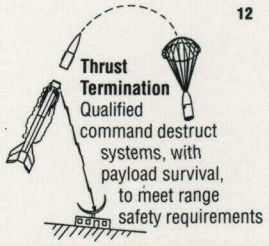
Saab/SSC S-19 rocket guidance system available to reduce trajectory impact dispersion

10
Stage Ignition Systems



11
Yo-yo Despin

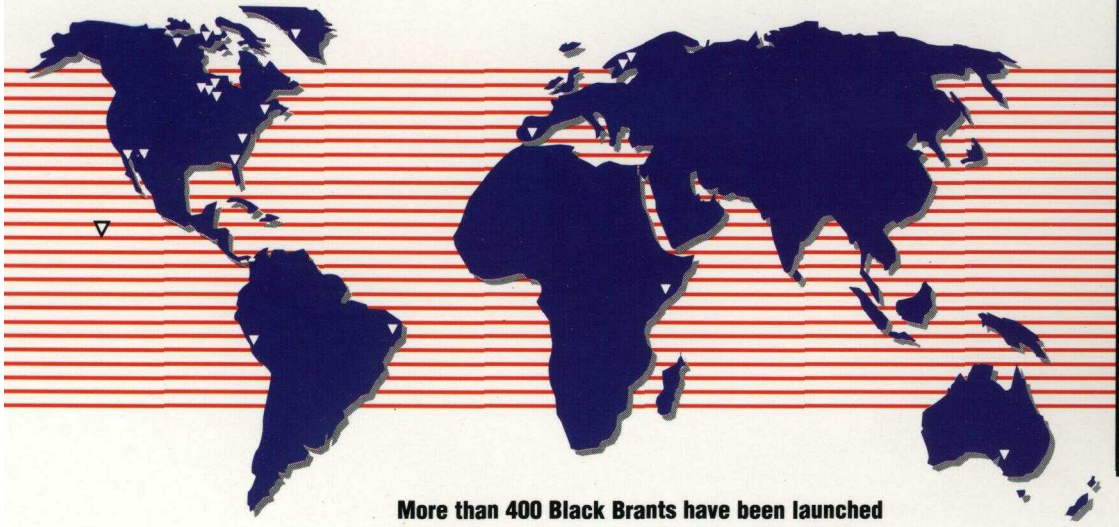
12
Thrust Termination
Qualified command destruct systems, with payload survival, to meet range safety requirements



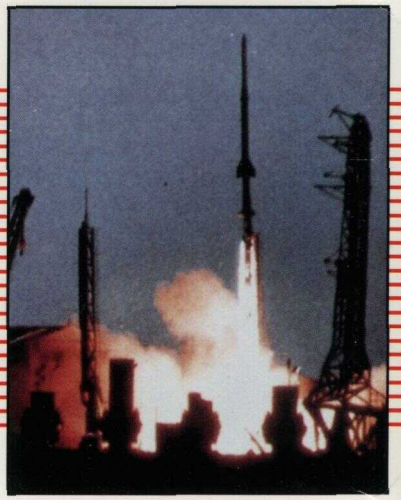
Payload and vehicle support systems are an integral part of the Black Brant program. Designed to meet the needs of experimenters from all over the world, they range from forward ejecting nose fairings to payload recovery by parachute. On-board instrumentation can include in-flight sequencing, uplink command communications, power subsystems, pyrotechnic initiation, diagnostics and data collection, and IRIG standard FM/FM and PCM/FM telemetry systems. In addition to nominal 44 cm diameter payloads, Black Brants have carried payloads with diameters up to 58 cm.

World-Wide Launch Support

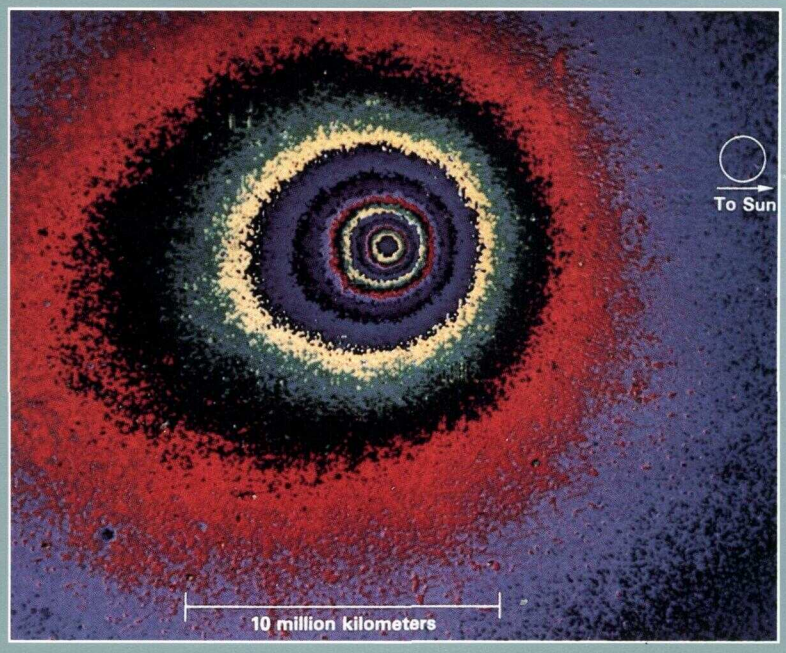
Bristol Aerospace has provided comprehensive range support services for launches from five continents. Bristol has supplied portable payload checkout equipment, and back-up telemetry monitoring systems for scientific missions from remote locations.



More than 400 Black Brants have been launched from sites as far apart as Alaska and Australia.



Total eclipse shot, San Marco Platform, off the coast of Kenya, 1980.



Far-ultraviolet image of Comet Halley taken from a BB 9, one of two Black Brants used by NASA to loft observation cameras and telescopes and aim them at Comet Halley. To observe the comet without the contamination of sunlight, the launch occured just before dawn so that the comet would be above the horizon, and the sun below, when the rocket reached apogee.

Bristol Aerospace has been a pioneer in the aviation and aerospace industry for more than 60 years. Our pioneering spirit keeps us at the forefront of aerospace technology. A commitment to innovation in design and manufacture has earned us a reputation for excellence in a highly competitive global marketplace. Bristol Aerospace enjoys the loyalty of military and commercial customers worldwide.

Bristol

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