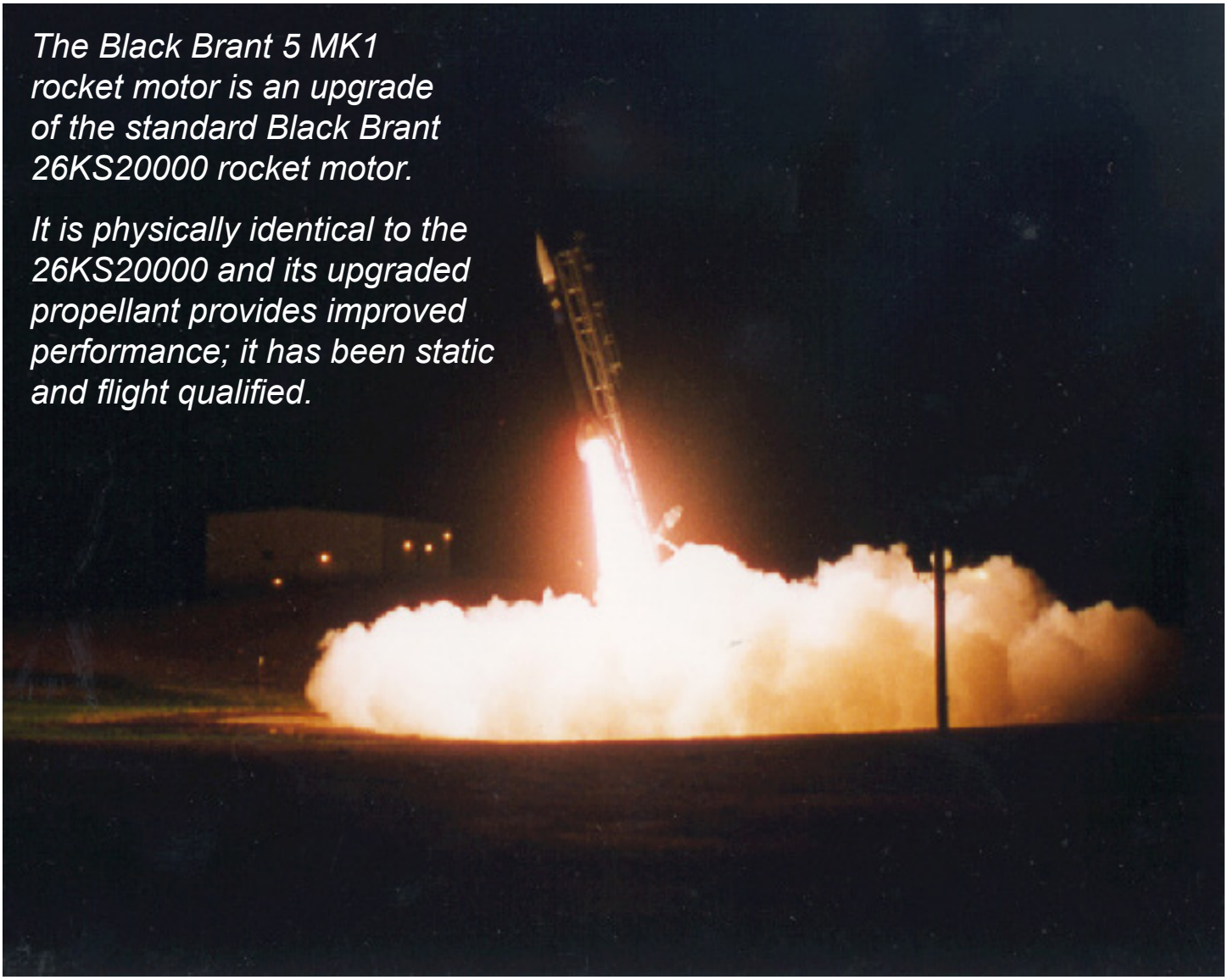
BLACK BRANT 5 MK1 ROCKET MOTOR

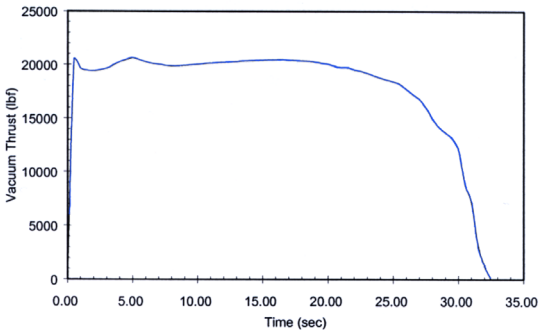
The Black Brant 5 MK1 rocket motor is an upgrade of the standard Black Brant 26KS20000 rocket motor.

It is physically identical to the 26KS20000 and its upgraded propellant provides improved performance; it has been static and flight qualified.

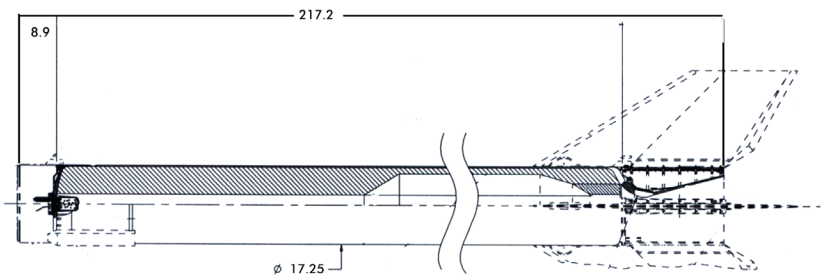


WORLD'S BEST SOUNDING ROCKET • AFFORDABLE • REUSEABLE

BLACK BRANT MK1 VACUUM THRUST VS TIME
(standard exit cone, 70 ºF)



BLACK BRANT MK1 DIMENSIONS



OVERVIEW

The rocket motor, designed and developed at Magellan Aerospace, can be used as a single or multi-stage vehicle for placing scientific payloads into space.

In the past 50 years, more than 1,000 Black Brant vehicles have been flown with an overall reliability exceeding 98%.

PROPELLANT

The solid propellant is an aluminized hydroxyl-terminated polybutadiene (HTPB) propellant. The formulation consists of 15% HTPB binder/fuel, 65% ammonium perchlorate (AP) oxidizer, and 20% aluminum powder fuel. The propellant grain configuration is a two-slotted finocyl which provides an approximately neutral pressure/thrust-time trace.

CASE INSULATION/LINER SYSTEM

The motor case insulation/liner system consists primarily of Kevlar fibre-filled EPDM rubber. Forward and aft end release flaps provide propellant grain stress relief. A carbon black/HTPB washcoat liner is applied to the inside of the EPDM material to enhancing bonding to the propellant. As well, silica/phenolic insulation is placed at the motor aft end in line with the propellant slots for added erosion protection.

MOTOR CASE

The motor case is made from 4335 V Mod alloy steel heat treated to 170 ksi minimum yield strength. Each motor case is hydrostatically proof pressure tested to 1440 psig.

NOZZLE AND EXIT CONE

The nozzle consists of a tape-wrapped graphite/phenolic entrance insulator, an ATJ graphite throat insert, and a tape-wrapped silica/phenolic throat back-up insulator, bonded into a heat treated steel housing. The exit cone consists of tape-wrapped carbon and silica/phenolic liners co-cured into a mild steel housing. The nozzle and exit cone employ a threaded attachment interface.

IGNITER

The igniter contains 255 grams of boron potassium nitrate (BPN) pyrotechnic main charge within a consumable plastic basket, and a 7.5 gram BPN booster charge. The basket and booster charge are threaded onto a steel igniter plug. Motor chamber pressure is monitored with a Lucas Control Systems P963-0164-2K2PS absolute pressure strain gauge unit (28V DC input, 0-5V DC output), which is threaded directly into the igniter plug.

MOTOR TO VEHICLE INTERFACES

The Black Brant 5 igniter housing assembly is attached to the motor case head end through the forward tension joint, and the Black Brant 5 aft body assembly is attached to the motor case aft end through the aft tension joint. The four fins are then bolted to the aft body assembly.

BLACK BRANT MK1 MOTOR MASS AND PERFORMANCE PROPERTIES

Property	Pre-Fire	Post-Fire
Propellant Mass	2211 lbm	-
All-up Motor Mass[1]	2633 lbm	400 lbm
X_{cg} (ref. to head and tension joint)[1]	94 in	122 in
Roll Moment of Inertia (about X_{cg} location)[1]	23.9 slug-ft²	5.4 slug ft²
Pitch Moment of Inertia (about X_{cg} location)[1]	1755 slug-ft²	337 slug-ft²
Throat Area	12.3 in²	-
Exit Area (Standard/Extended)	135.9/320.4 in²	-
Vacuum Total Impulse at 70ºF:		
Standard Exit Cone	586,400$_f$lb -sec	
Extended Exit Cone	626,850$_f$lb -sec	
Operating/Storage Temperature Range	-10ºF to +125ºF	

[1] Includes motor, igniter, nozzle, and standard exit cone.

ABOUT MAGELLAN AEROSPACE

Magellan Aerospace is a global enterprise providing integrated products and services to the aerospace industry worldwide. Magellan designs, engineers, and manufactures aeroengine and aerostructure assemblies and components for aerospace markets, advanced products for military and space markets, and complementary specialty products. Magellan Aerospace is a public company whose shares trade on the Toronto Stock Exchange (TSX: MAL), with operating units throughout Canada, the United States, the United Kingdom, Poland, and India.

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