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FACT SHEET FOR EXCALIBUR PROGRAM

- The initial X-Ray laser (XRL) design concept was referred to as "Excalibur"

- The XRL program is a Department of Energy effort. The Strategic Defense Initiative Organization contributed to the DoE effort during fiscal years 1985 to 1992 inclusive. SDI provided only a small fraction of the total budget.

- The principal objectives of SDIO's participation in the program were:

  - To understand whether an adversary could use such as system against our defensive systems. If this were possible, then our assets would have to be designed to survive and/or counter an XRL attack.

  - To understand if such a system would offer a substantial advantage to U.S. defenses.

- Significant theoretical and experimental work has been carried out in the course of this program.

- SDI completed its investment in the effort in fiscal year 1992, supporting DoE attempts to complete a test to further elucidate the physical processes and technology issues associated with the XRL. That test was cancelled as a result of a policy decision that underground tests would be carried out only to enhance nuclear weapon safety and reliability.

#462

Brilliant Pebbles

Description:

Brilliant Pebbles (BP) is an element of the Strategic Defense Initiative Organization's multi-tier Global Protection Against Limited Strikes (GPALS) system. BP is a space-based, highly autonomous, proliferated, surveillance and kinetic hit-to-kill interceptor system. The BP concept consists of single interceptors and their associated "life jacket" carrier vehicles. The interceptor incorporates sensors, guidance control, battle management, and an axial propulsion stage. Additionally, the interceptor will possess high-rate attitude control, on-board data processing, navigation and divert propulsion capabilities. Each life jacket provides on-orbit power, low-rate attitude control, surveillance, communication, thermal control and survivability. Ground control systems will provide man-in-the-loop, positive control of the BP constellation.

BP is currently in the Pre-Engineering Manufacturing Development (EMD) phase where the system design concept will be finalized, demonstrated and validated.

Demonstrations will be performed through a combination of ABM treaty compliant orbital and suborbital flight tests, ground and underground tests, hover tests, "hardware-in-the-loop" tests, simulations, and technical analyses.

Although the Missile Defense Act (MDA) of 1991 mandated that space-based interceptors, such as BP, not be included in the initial deployment of a limited defense system, it did establish a separate space-based interceptor program element which includes BP. This program element has as its primary objective, "the conduct of research on space-based interceptors to provide an overlay for ground-based interceptors." The MDA also stated a requirement for "robust funding for research and development of such promising follow-on anti-ballistic missile technologies."

To date, several program accomplishments have been achieved, including validation of the basic BP concept and demonstration of key technologies. Many of these technologies are applicable to SDI ground-based systems and serve as the catalyst for spinoffs in many scientific and technical fields. Demonstrations in communications and processing

subsystems, advanced light-weight shields for optical systems against x-rays, and highly miniaturized computer technology, will enhance technology in areas such as computers, electronics, optics and communications.

The Lawrence Livermore National Laboratory developed the BP concept, accomplished initial component development, and is performing flight experiments under SDIO supervision. SDIO has conducted Concept Definition studies and is currently executing demonstration/validation contracts with two prime contractors, Martin Marietta and TRW.

Executing Agent: Colonel Rowland H. Worrell, USAF

Contractors (Prime/Sub)	City	State
Martin Marietta	Denver	CO
IBM	Manassas	VA
Mission Research Corp	Colorado Springs	CO
Aerojet Propulsion Div.	Sacramento	CA
Litton	Woodland Hills	CA
Stanford Telecomm	Reston	VA
OCA	Garden Grove	CA
LIRIS	Lexington	MA
MDESC	St. Louis	MO
Eagle Picher	Joplin	MO
Babcock	Orange	CA
Courtaids	Bennington	VT
AOI	Rolling Hills Estate	CA
OEA	Aurora	CA
Hi-Shear	Torrance	CA
Wittaker	Hollister	CA
TRW	Redondo Beach	CA
Hughes Aircraft	El Segundo	CA
Defense System, Inc	Vienna	VA
Photon Research Assoc.	San Diego	CA
Mission Research Corp	Santa Barbara	CA
SPARTA	Laguna Hills	CA
Prairie View A&M	Prairie View	TX
Alliance Infonet	Costa Mesa	CA
Applied Technology Assoc.	Mountain View	CA
Sun Computers	Carson	CA
Frontier Electronics	Stillwater	OK
Romallo Tool & Die	Torrance	CA
Sloane Company	Sun Valley	CA
Spaceonics Industrial, Inc	Harbor City	CA
Webber Cable & Electronic	Cerritos	CA
Bob Lewis Machine	Gardena	CA
Omega Engineering, Inc.	Stanford	CT

C.W. Swift & Assoc.	Van Nuys	CA
LSI Logic	Milpitas	CA
Ward/Davis	Redondo Beach	CA
Lambda Novatronics, Inc.	Del Rey Beach	FL
Qualcom	San Diego	CA
London Engineering	Gardena	CA
Precision Bearing Center	West Lebanon	NH

Funding ($0.0M)	Prior	FY91	FY92	FY93
	183.5	388.5	389.8	449.2

Milestones:	Event	QTR/FY
	Concept Definition Initiated	3/90
	LLNL Flight Experiments	4/90-1/93
	Pre-EMD Initiated	3/91
	Contractor Pre-EMD Flight Tests	1/93-1/96
	MSII	4/96

CHARACTERISTICS

The following characteristics describe the BP baseline concept:

- Interceptor Size: 1 meter light weight
- Sensors: UV/visible surveillance camera, SW/MWIR tracking camera, and Star Tracker provide robust surveillance and target tracking
- Propulsion: Divert plus axial drop tanks
- Communications: RF and laser systems
- Computer System: Microprocessor system, packaged using hybrid wafer scale integration techniques
- Divert/Attitude Control System: Hot gas valves, fuel pumps, and monopropellent gas generator components
- Survivability: Proliferation, hardening, maneuvering capability, and decoys
- Launch Vehicle: Atlas II ASH, Delta, and Titan vehicles are being studied; proposed launch site in the Western Test Range (WTR)
- Ground Element: Fixed and transportable sites

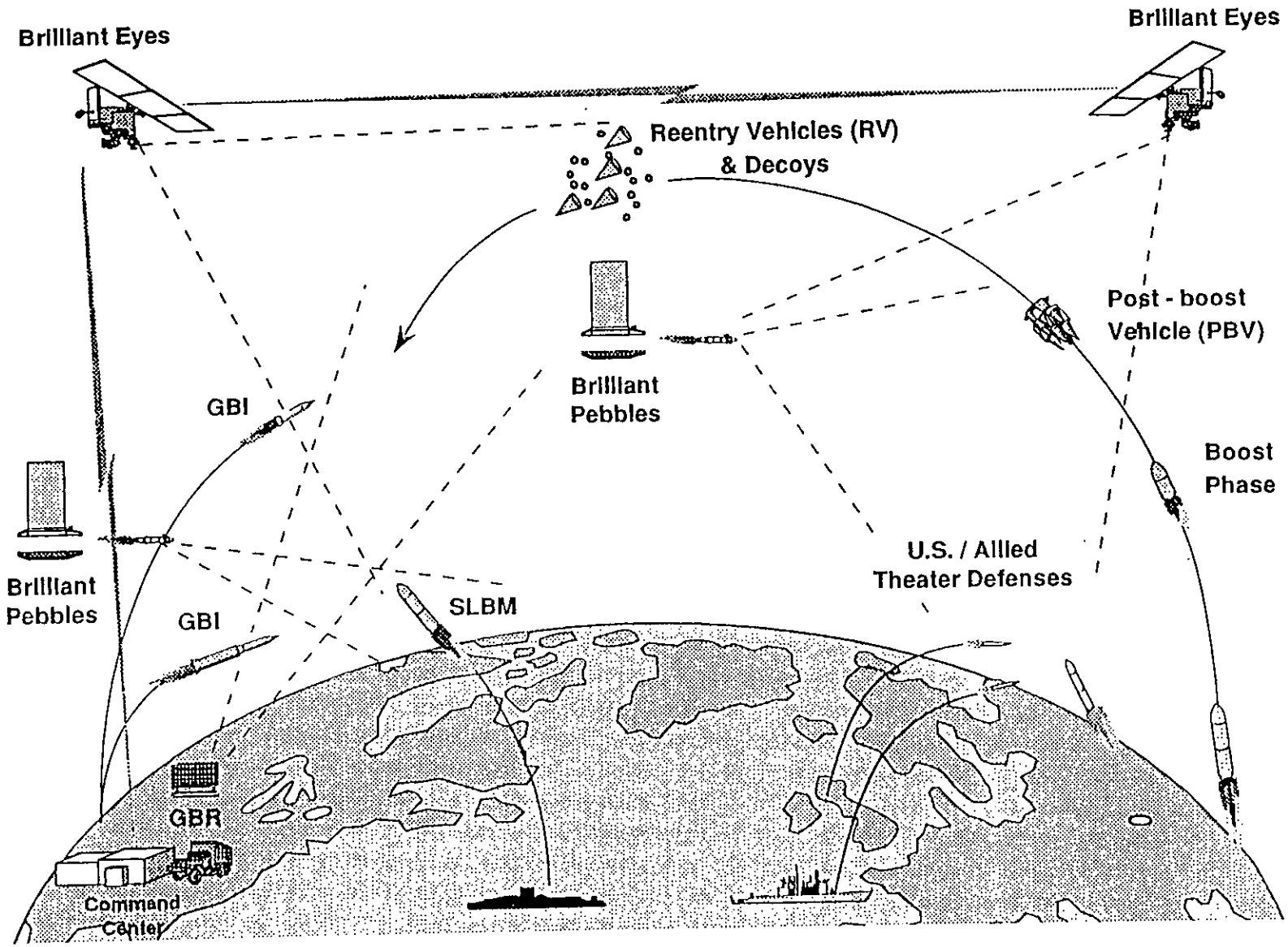
SIGNIFICANT TECHNICAL ACCOMPLISHMENTS

- Completed life jacket design
- Completed and tested integrated brassboard processor system
- Demonstrated communications and processing system and OMNI directional receiver system
- Developed and integrated test vehicle and conducted ground tests
- Integrated and tested sensor system
- Completed six concept definition contracts with industry to refine the BP system concept and develop detailed program plans
- Developed a flight test vehicle and conducted two suborbital tests
- Validated component hardening requirements in DISKO ELM and MINERAL QUARRY underground nuclear tests

PROGRAM MANAGEMENT

BP is managed directly by the BP Task Force within the Strategic Defense Initiative Organization (SDIO). Supporting the BP Task Force in this activity are executing agents at LLNL, the Army Strategic Defense Command, and the Air Force Space Systems Division.

GPALS ELEMENTS STRATEGIC AND THEATER



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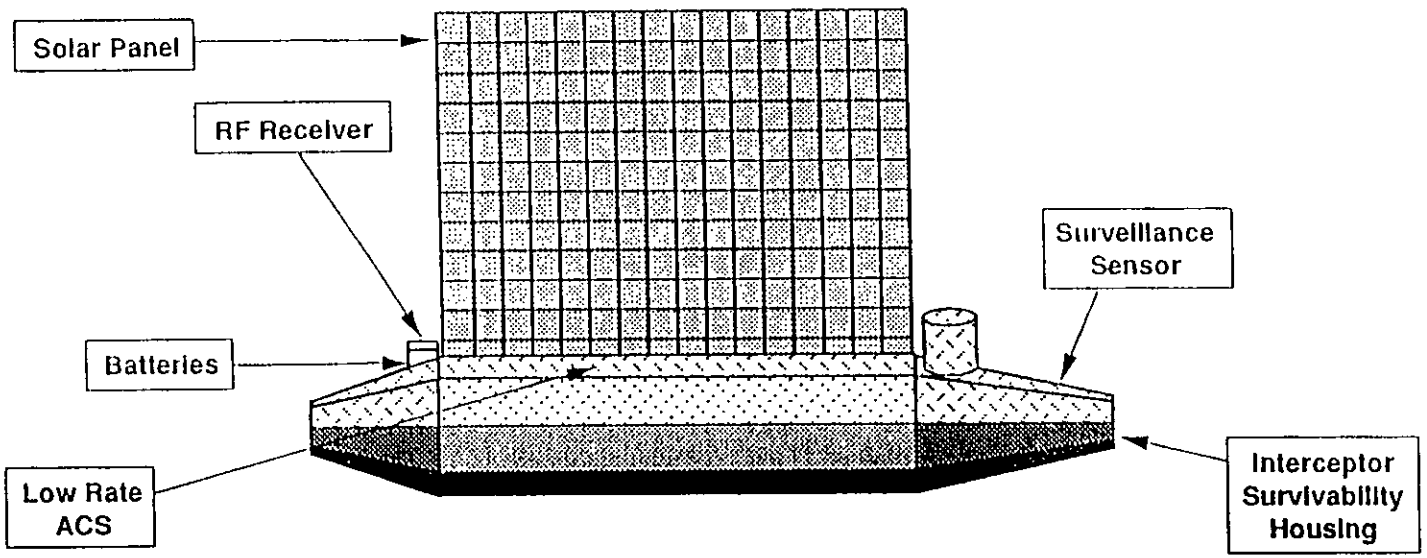
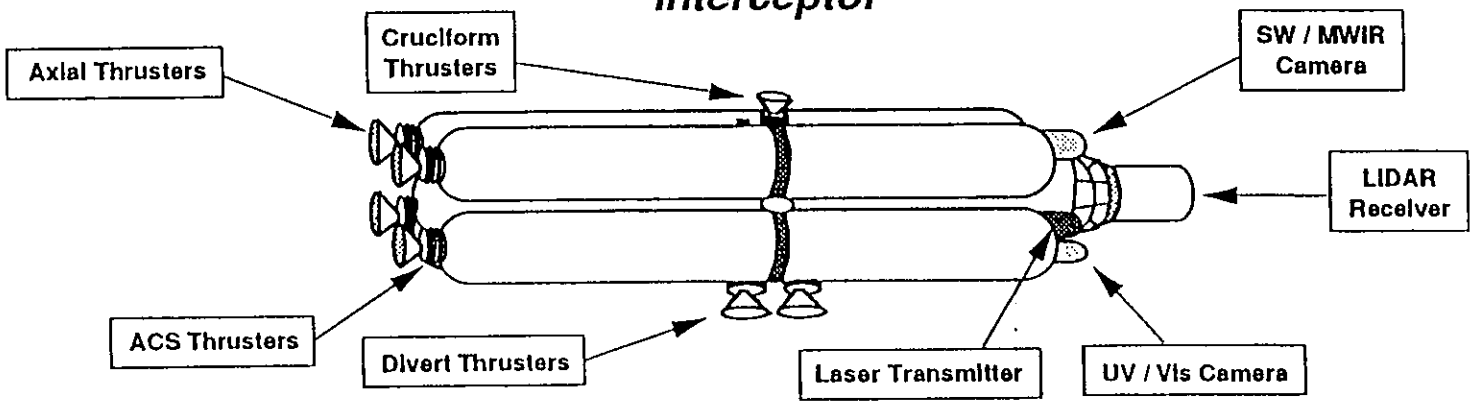
NOTIONAL BP SPACE BASED INTERCEPTOR

Life Jacket



Interceptor



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