Defense Support Program (DSP)

Endless Excellence

DSP

DEFENSE SUPPORT PROGRAM

Preserving Peace Since 1970

A Pictorial Chronology 1970-1998

DSP

THE DEFENSE SUPPORT PROGRAM (DSP)
"28 Years of Service"
A Pictorial Chronology 1970-1998

by
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On November 6, 1970, the USAF launched a classified satellite on a Titan III-C rocket from Launch Complex-40 (LC-40) at Cape Canaveral Air Station, Florida. In the Fall of 1995, we celebrated the 25th anniversary of that launch of what became the first "**D**efense **S**upport **P**rogram" or DSP satellite. Over the past 28 years, there have been 18 satellite launches for this military space system covering five major design changes. These block changes were known in turn as Phase I (1970-1973, 4 flights), Phase II (1975-1977, 3 flights), Multi-Orbit Satellite/Performance Improvement Modification (MOS/PIM) (1979-1984, 4 flights), Phase II Upgrade (1984-1987, 2 flights), and the present block DSP-1 (1989-present, 5 flights to date). This pictorial chronology and satellite overview shows all DSP launches from 1970 to 1997.

Figure 1: Painting of DSP-1 Satellite in Orbit (Courtesy of TRW) (1)

Table 1 gives the DSP engineering characteristics history for the major differences in each design change in the 28 years since the first launch. Table 2 lists the names of all DSP managers, including military, civilian, and contractors. The military managers in Table 2 show their ranks while they were in the DSP position, followed by pictures of all USAF program directors and managers (Figures 2-16). A number of them later attained higher rank. Table 3 shows the operational history of the DSP program.

TABLE 1: DSP Engineering History (2) (3)

	PHASE I	PHASE II	MOS/PIM	PHASE II UG	DSP-1
FLIGHT #	1,2,3,4	5,6,7	8,9,10,11	12,13	14-23
LAUNCH YEARS	1970-1973	1975-1977	1979-1984	1984-1987	1989-
WEIGHT (lbs)	2000	2300	2580	3690	5250
POWER (Watts)	400	480	500	680	1275
DESIGN LIFE (Years)	1.25	2.0	3.0	3.0	3.0
DETECTORS					
2000 (PbS) (SWIR)	X	X	X		
6000 (PbS) (SWIR)				X	X
2nd Color (HgCdTe) (MWIR)				Demo	X
CAPABILITY					
Below the Horizon (BTH)	X	X	X	X	X
Above the Horizon (ATH)		Demo		X	X
RADEC	X	X	X		
Advanced RADEC				X	X

From 1970 to 1993, the DSP Program had its own program office headed by its own program director. In 1993, DSP was absorbed into a larger or umbrella Program Office, which eventually became the Space-Based Infrared Systems (SBIRS) System Program Office (SPO). This was because during the 1980s, President Ronald Reagan initiated the Strategic Defense Initiative (SDI), to give the United States and its Allies a space-based missile detection and defensive weapon system for protection against nuclear missile attack. These SDI systems required different types of space-based missile launch detection systems than DSP had to offer at the time. Such systems included the Boost Surveillance and Tracking System (BSTS), and Space Surveillance and Tracking System (SSTS). After a number of starts, beginning with the Follow-On Early Warning System (FEWS), and the Alert, Locate and Report Missiles (ALARM) system, the SBIRS SPO was created as the successor to the DSP SPO. The new SPO's mission was to develop a space-based system that not only detected global missile launches but theater based missiles as well in a timely manner. When DSP became part of SBIRS, the DSP program director became a program manager under a SBIRS System Program Director (SPD). SPDs for SBIRS have been Colonel Joseph A. Bailey (1993-1994), Colonel Craig P. Weston (1994-1997), and the present SPD Colonel Daniel L. Burkett II (1997 to present). Table 2 includes only those USAF officers who directly managed DSP.

TABLE 2: DSP Program Directors/Managers (Including Military, Civilian, and Associate Contractors)

YEAR	USAF (4)	AEROSPACE CORP (Systems Engineering) (5)	TRW (Spacecraft) (6)	AEROJET (IR Sensor) (7)	IBM/LORAL (Ground) (8)	SANDIA (ARI/ARII) (9)	LOS ALAMOS (ARII) (9)
1966	Col Victor M. White	J. Statsinger	R.L. Walquist	Arvid Wedin	Del Babb	H.H Patterson	Jim Coon
1967		D.L. Cohn				M.L. Kramm	
1968	Col Roger H. Lengnick						
1969	Col Frederick S. Porter, Jr.	E.E. Lapin					
1970			E.E. Noneman		Jim May		
1971							
1972	Brig Gen John G. Albert				Frank Mutz		
1973						W.C. Myre	
1974	Brig Gen Howard M. Estes, Jr.				Gene Sharer		Jerry Conner
1975	Col James E. McCormick		L.F. Ornella		Leo Pedlow		
1976					Joe Shanis	H.H. Dumas	
1977			N.S. Pixley				
1978			E.G. Wheeler				
1979	Col Edward P. Barry, Jr	L.C. Lidstrom					Doyle Evans
1980					Jim Howard		
1981							
1982				Art Bishop			Jack Asbridge
1983	Col Clyde R. Magill, Jr						
1984					Art Johnson		
1985	Col Wayne Craft		D.C. Stager				
1986		Bob Gaylord			Don Upton		
1987							
1988					Nick Rossi		
1989	Col John R. Kidd	Ev Bersinger	J.A. Gliksman	Bill Mullooly			
1990			J.W. Burnett				
1991							John Laros
1992					Terry Drabant		
1993	Col Edward Dietz		Joanne Maguire		Barry Macalady	Lee Maschoff	Mike Meier
1994	Col Terry Crossey	John Winterkorn	Elliot Bailis				
1995	Col Lacaillade/Lt Col Crews/ Col Killam	Barbara Ching		Carol Neves/ Bill Robbins	LeRoy Tadlock		
1996	Col Dudley B. Killam		Craig Staresinich	Ron Simpson			
1997		David Gorney					
1998			Martin Melnick				

USAF DSP PROGRAM DIRECTORS AND MANAGERS

Figure 2: Col Victor M. White
1966-1968

Figure 3: Col Roger H. Lengnick
1968-1969

Figure 4: Col Frederick S. Porter, Jr.
1969-1972

Figure 5: Brig Gen John G. Albert
1972-1974

Figure 6: Brig Gen Howard M. Estes, Jr.
1974-1975

Figure 7: Col James E. McCormick
1975-1979

Figure 8: Col Edward P. Barry, Jr.
1979-1983

Figure 9: Col Clyde R. Magill, Jr.
1983-1985

Figure 10: Col Wayne Craft
1985-1989

Figure 11: Col John R. Kidd
1989-1993

Figure 12: Col Edward Dietz
1993-1994

Figure 13: Col Terry Crossey
1994-1995

Figure 14: Col Mark Lacaillade
1995-1996 (Space)

Figure 15: Lt Col Timothy Crews
1995-1996 (Ground)

Figure 16: Col Dudley B. Killam
1996-Present

TABLE 3: DSP Operational History (10)

Flight #	Block (11)(12)	Spacecraft # (11)(12)(6)	Sensor # (11)(12)(13)	RI # (D1/D2) (14)	RII # (14)	ARI # (14)	ARII # (14)	Launch Date	Launch Site	Launch Vehicle
DSP-1	Phase I	1	R	–/1	–	–	–	11/6/70	ETR/LC-40	Titan IIIC/Transtage
DSP-2	Phase I	3	T	2/3	–	–	–	5/5/71	ETR/LC-40	Titan IIIC/Transtage
DSP-3	Phase I	4	U	1/4	–	–	–	3/1/72	ETR/LC-40	Titan IIIC/Transtage
DSP-4	Phase I	2	S	3/2	–	–	–	6/12/73	ETR/LC-40	Titan IIIC/Transtage
DSP-5	Phase II	8	9	6/9	8	–	–	12/14/75	ETR/LC-40	Titan IIIC/Transtage
DSP-6	Phase II	7	8	8/8	7	–	–	6/26/76	ETR/LC-40	Titan IIIC/Transtage
DSP-7	Phase II	9	5	9/5	9	–	–	2/6/77	ETR/LC-40	Titan IIIC/Transtage
DSP-8	MOS/PIM	11	13	13/13	11	–	–	6/10/79	ETR/LC-40	Titan IIIC/Transtage
DSP-9	MOS/PIM	10	10	12/11	10	–	–	3/16/81	ETR/LC-40	Titan IIIC/Transtage
DSP-10	MOS/PIM	13	12	–	13	2	–	3/6/82	ESMC/LC-40	Titan IIIC/Transtage
DSP-11	MOS/PIM	12	11	–	12	4	–	4/14/84	ESMC/LC-40	Titan 34D/Transtage
DSP-12	Phase II UG	6R	7R	–	6	3	–	12/22/84	ESMC/LC-40	Titan 34D/Transtage
DSP-13	Phase II UG	5R	6R	–	5	1	–	11/29/87	ESMC/LC-40	Titan 34D/Transtage
DSP-14	DSP-1(Blk 14)	14	17	–	–	6	1	6/14/89	ESMC/LC-41	Titan IVA/IUS
DSP-15	DSP-1(Blk 14)	15	15	–	–	8	2	11/13/90	ESMC/LC-41	Titan IVA/IUS
DSP-16	DSP-1(Blk 14)	16	16	–	–	5	3	11/24/91	KSC/LC-39A	STS/IUS
DSP-17	DSP-1(Blk 14)	17	14	–	–	7	4	12/22/94	ER/LC-40	Titan IVA/IUS
DSP-18	DSP-1(Blk 18)	20	21	–	–	9	7	2/23/97	ER/LC-40	Titan IVB/IUS

Flight # - The official designation of a particular launch.
Block - The engineering block or model of the satellite.
Spacecraft - The serial number of the delivered TRW spacecraft; spacecraft were not necessarily launched in sequential order.
Sensor - The serial number of the delivered Aerojet sensor; sensors, like spacecraft, were not necessarily launched in sequential order, usually for technical reasons
RI -- RADEC I or RAdiation DEtection Capability I device; serial number of a nuclear detonation detection instrument; D1=Device1, D2=Device 2
ARI -- Advanced RADEC I.
RII -- RADEC II or RAdiation DEtection Capability II device; serial number of a nuclear detonation detection instrument.
ARII -- Advanced RADEC II.
Launch Date - Launch date of the satellite from Cape Canaveral, Florida (Universal Coordinated Time).
Launch Site - Various names for Cape Canaveral, Florida and the NASA launch facilities
ETR - Eastern Test Range
ESMC - Eastern Space and Missile Center
ER - Eastern Range
KSC - Kennedy Space Center
Launch Vehicle - Launch vehicles used by the DSP satellites, along with their upper stage.

Phase I (4 Flights, 1970-1973) (11)

The primary mission of the DSP satellite is to detect and report any Intercontinental Ballistic Missile (ICBM) or Sea Launched Ballistic Missile (SLBM) raids against the U.S. and its allies. Its secondary missions include space launch detection and nuclear detonation detection in support of international test ban treaties. Development of the Soviet Union's first ICBM in the 1950's created a threat for which the U.S. had no in-place defense. The combination of man-made orbiting satellites and the capability of infrared (IR) sensors to detect the intense heat radiation of rocket engines drove the initiative for a space-based early warning system (SBEWS). Beginnings of a DSP-like system had its initial operational test and evaluation in the early 1960s.

The first four launches of the DSP satellites, Flights 1 through 4 and collectively known as "Phase I", began in 1970 and established the initial operational constellation. A Titan III-C rocket along with a Transtage, our country's largest military launch workhorse at that time, placed the flight into parking and then geosynchronous orbit (GEO), its operational orbit. These launches covered the period from 1970 through 1973. Each satellite weighed approximately 2000 pounds, and had a power output of 400 watts through a combination of solar cells around the body of the satellite and on four deployable paddles. Initial design life for each satellite was a short 1.25 years. The DSP Phase I satellite was designed to provide early warning against both Soviet and Chinese ICBMs and Soviet short range SLBMs around the Continental United States (CONUS). This warning was provided by an IR sensor array of 2000 Lead Sulphide (PbS) detectors which gave below-the-horizon (BTH) coverage. Initial DSP System Program Directors (SPD) included Col. Fred S. Porter, Jr., (1969-1972), and Brig. Gen. (later Lt. Gen.) John G. Albert (1972-1974). Figures 17 through 24 show the Phase I satellites and launches.

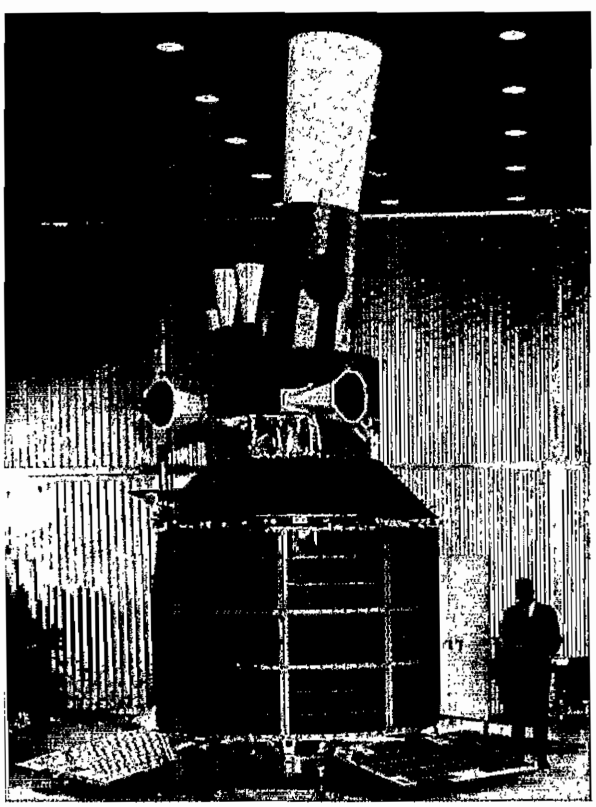

Figure 17: DSP Flight #1 (Phase I)

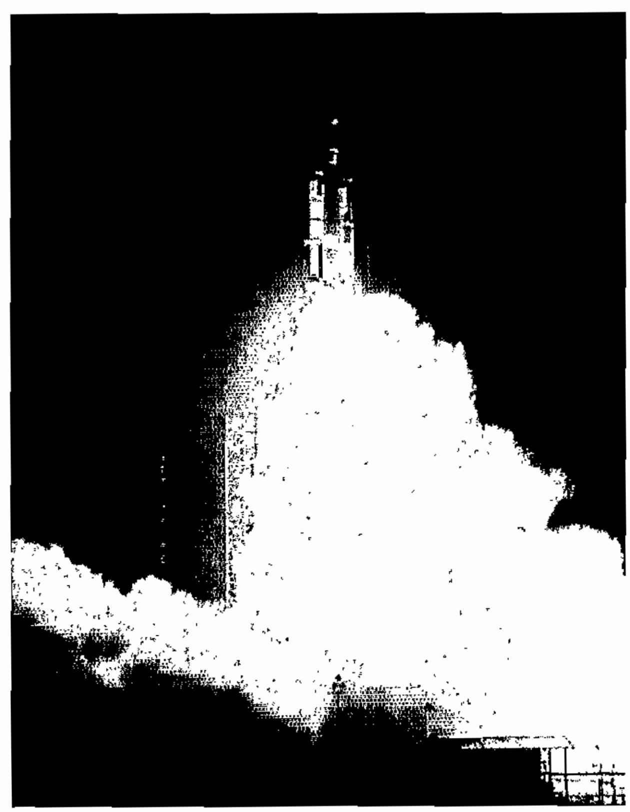

Figure 18: Launch of DSP Flight #1
November 6,1970 (15)

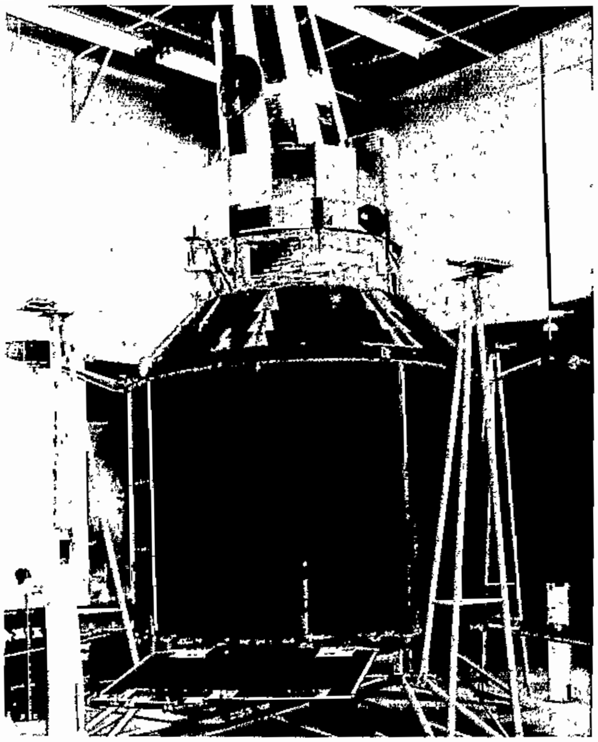

Figure 19: DSP Flight #2 (Phase I)

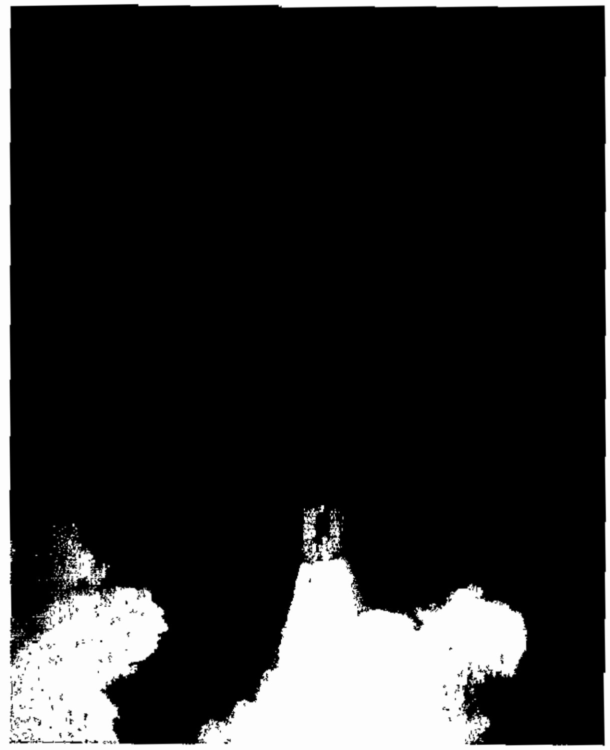

Figure 20: Launch of DSP Flight #2
May 5, 1971

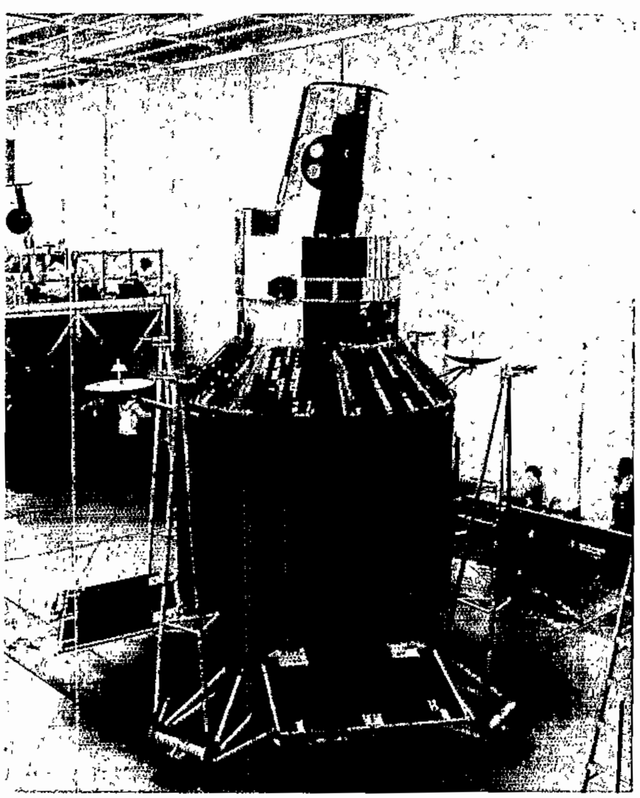

Figure 21: DSP Flight #3 (Phase I)

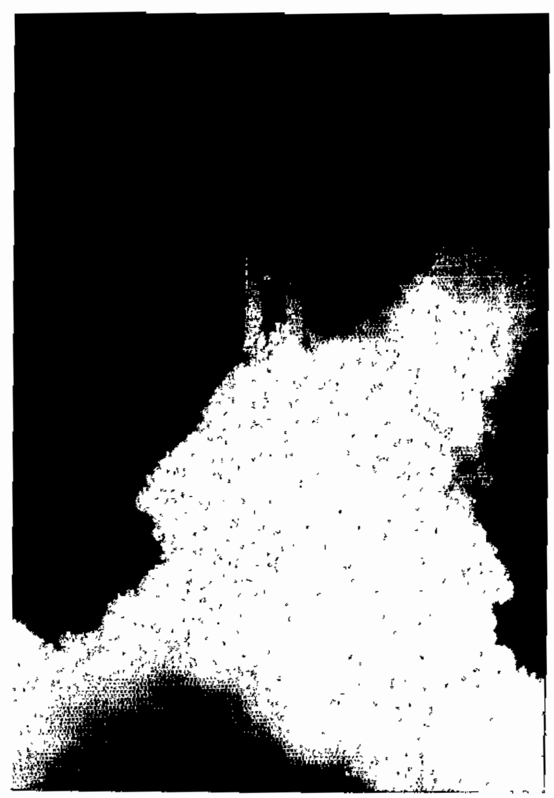

Figure 22: Launch of DSP Flight #3
March 1, 1972

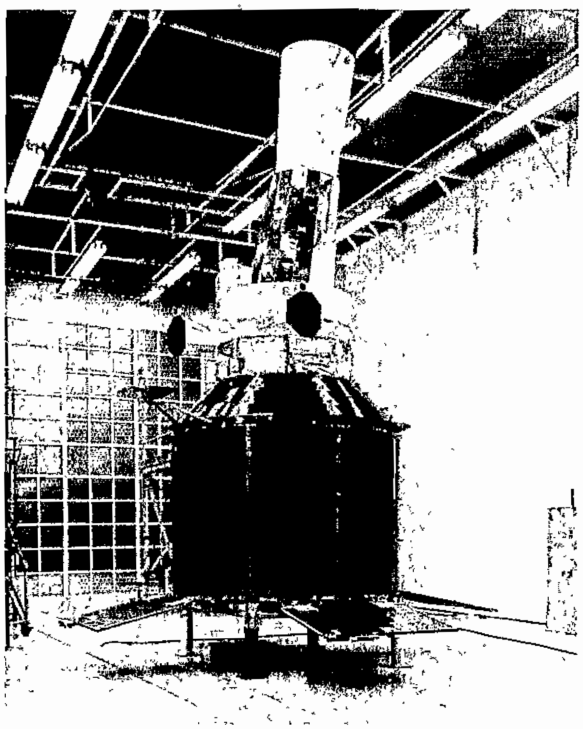

Figure 23: DSP Flight #4 (Phase I)

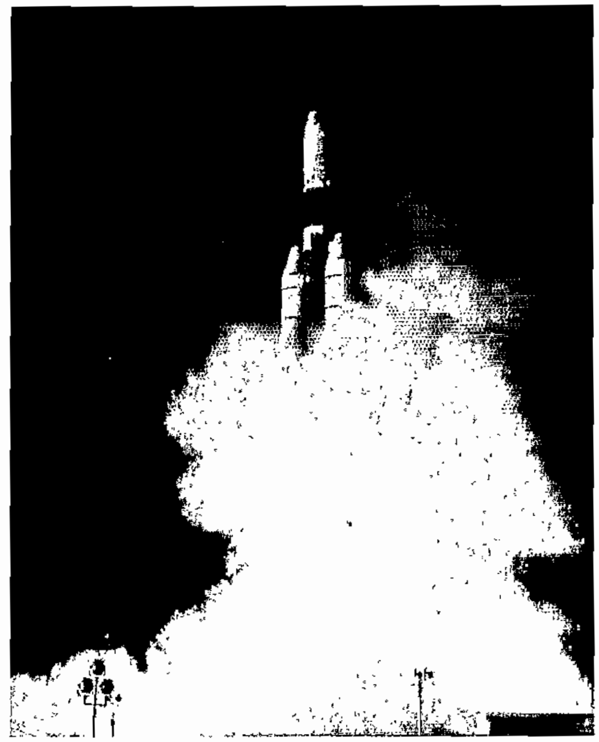

Figure 24: Launch of DSP Flight #4
June 12, 1973

Phase II (3 Flights, 1975-1977) (11)

For the DSP program, the USAF is the full system integrator with four associate contractors responsible for building parts of the total system. Associate contractors responsible for manufacturing the DSP satellite include GenCorp Aerojet Electro-Systems (AES) of Azusa, California (responsible for the primary sensors), Sandia National Laboratories of Albuquerque, New Mexico (responsible for the nuclear detonation detection sensors), and TRW Space and Defense Division of Redondo Beach, California (who produces the spacecraft and also integrates the sensors onto the spacecraft). The associate contractor responsible for the ground segment is Lockheed, Federal Systems Division, Boulder, Colorado. The Aerospace Corporation, a Federally Funded Research and Development Center (FFRDC), provides general systems engineering and integration support to the USAF System Program Office.

The next block of DSP satellites was known as "Phase II." There were three satellites in this series, Flights 5 through 7, launched between 1975 and 1977. This main upgrade from the "Phase I" block of satellites provided increased on-orbit design lifetime from 1.25 to 2.0 years, increasing the weight of the Phase II from 2000 to 2300 pounds, and the solar panel output from 400 to 480 watts. This block used the same basic spacecraft, but other packages were added. The same basic sensor was still used (2000 PbS detectors) providing BTH coverage. An experimental Above-the-Horizon (ATH) array sensor was flown on Flight 6. Phase II satellites can be distinguished from Phase I satellites by the two electronic packages (located 180 degrees apart) on the rim of the satellite conical section. The prime launch vehicle was still the reliable Titan IIIC along with a Transtage. DSP SPDs during this time period included Brig. Gen. (later Maj. Gen.) Howard M. Estes (1974-1975), and Col. James E. McCormick (1975-1979). Figures 25 through 29 show Phase II satellites and launches.

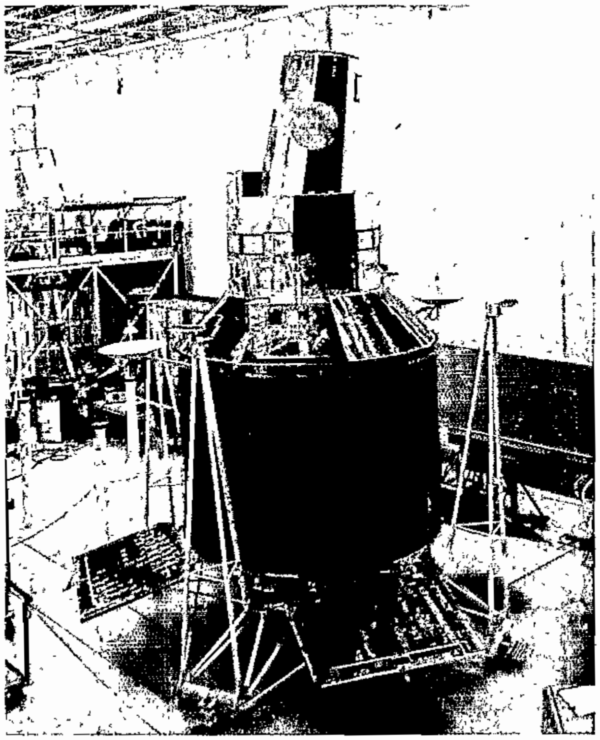

Figure 25: DSP Flight #5 (Phase II)

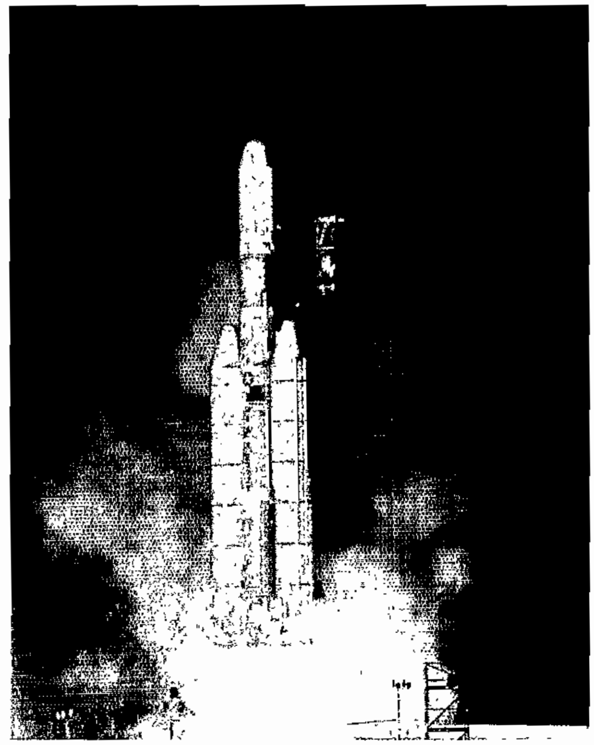

Figure 26: Launch of DSP Flight #5
December 14, 1975

NO PICTURE AVAILABLE
OF DSP FLIGHT #6

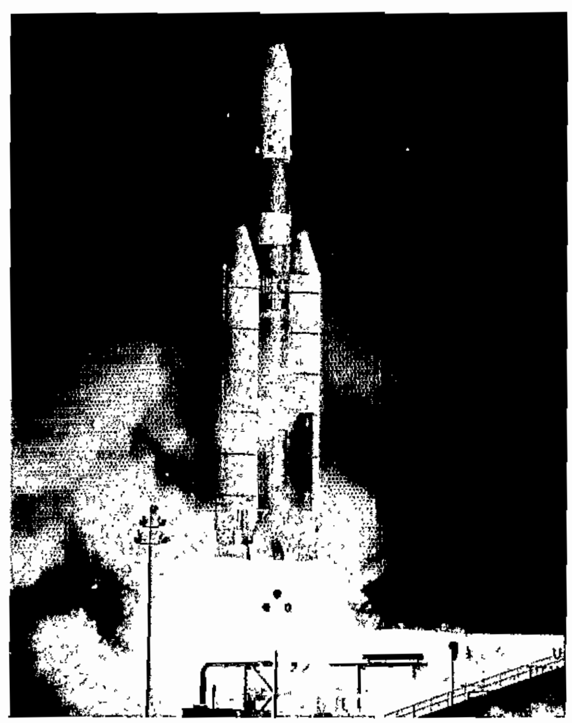

Figure 27: Launch of DSP Flight #6
June 26, 1976

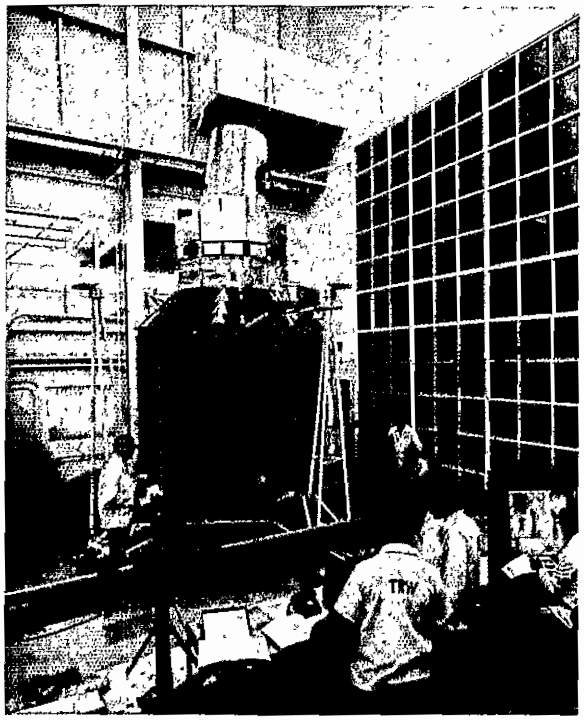

Figure 28: DSP Flight #7 (Phase II)

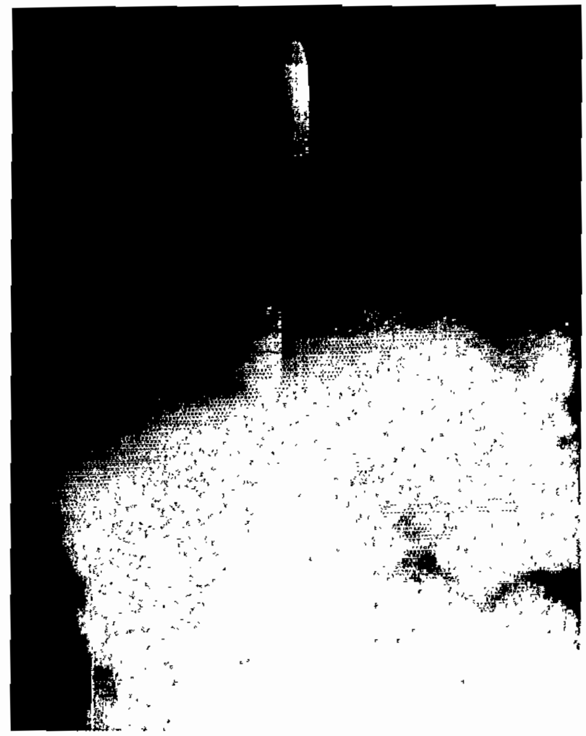

Figure 29: Launch of DSP Flight #7
February 6, 1977

Multi-Orbit Satellite/Performance Improvement Modification (MOS/PIM) (4 Flights, 1979-1984) (11)

The Soviet threat grew in its diversity and unpredictability between 1975 and 1985. These growing and improving threats included longer range SLBMs with increased submarine deployment time and numbers, multiple reentry vehicle (MRV) and multiple independent reentry vehicle (MIRV) missiles, mobile ICBMs, and anti-satellite systems (ASATs) such as orbital interceptors, developing ground-based lasers, and particle beam weapons. The DSP system responded by introducing the Multi-Orbit Satellite/Performance Improvement Modification (MOS/PIM) satellites, designed with multi-orbit capability. They could be orbited into normal geosynchronous orbits (22,300 miles above the earth surface), and also highly elliptical orbits (HEO). The weight of these satellites was increased to 2580 pounds with the addition of extra external electronic packages for hardening and survivability, and attitude control system fuel which allowed extending the orbital design life of the satellite to three years. Electrical capacity was increased to 500 watts. The MOS/PIM satellites can be distinguished from the Phase II satellites by three (instead of two) electronic packages (located 90 degrees apart) on the rim of the satellite's conical section.

Satellites in this series were Flights 8 through 11, launched between 1979 and 1984. Launch vehicles for this series included the Titan IIIC and the first DSP use of the Titan 34D, both with Transtages for insertion into GEO orbit. System Program Directors during this time period included Col. James E. McCormick (1975-1979), Col. (later Lt. Gen.) Edward P. Barry, Jr. (1979-1983), and Col. Clyde R. Magill, Jr (1983-1985). Figures 30 through 36 show the MOS/PIM satellites and their launches.

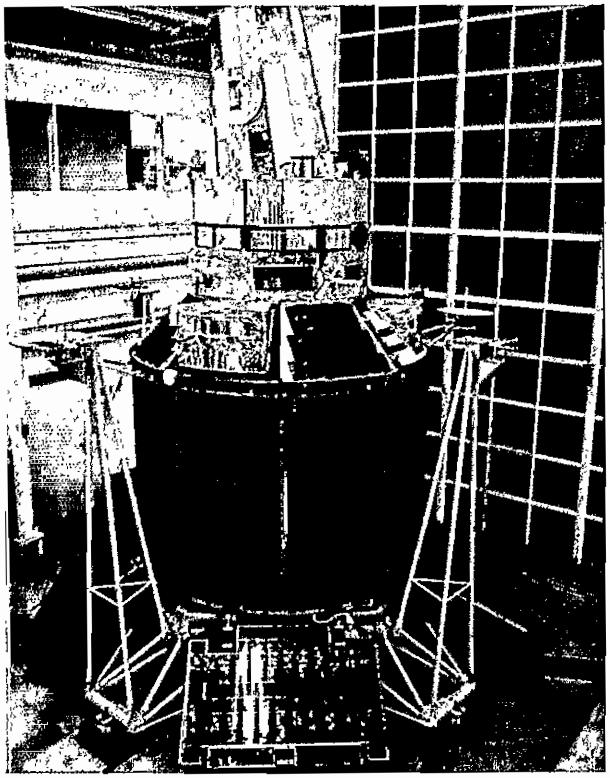

Figure 30: DSP Flight #8 (MOS/PIM)

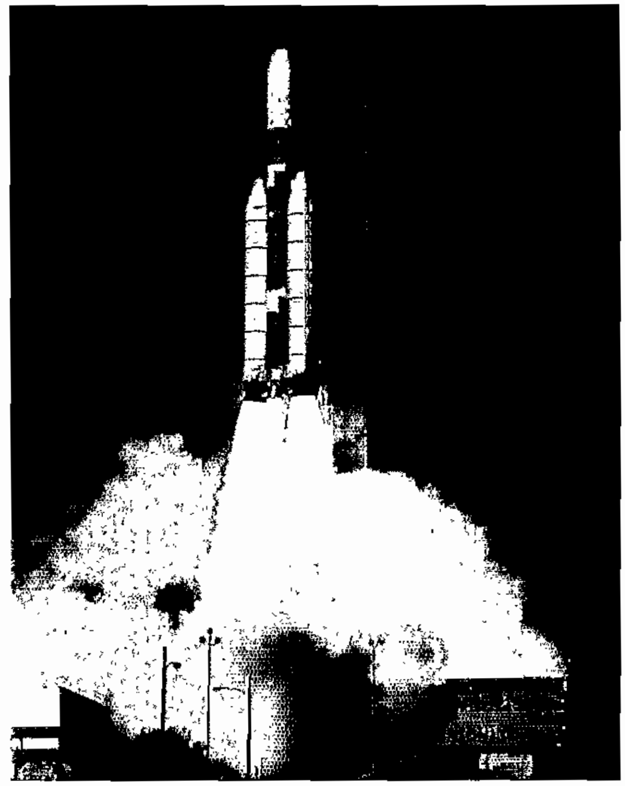

Figure 31: Launch of DSP Flight #8
June 10, 1979

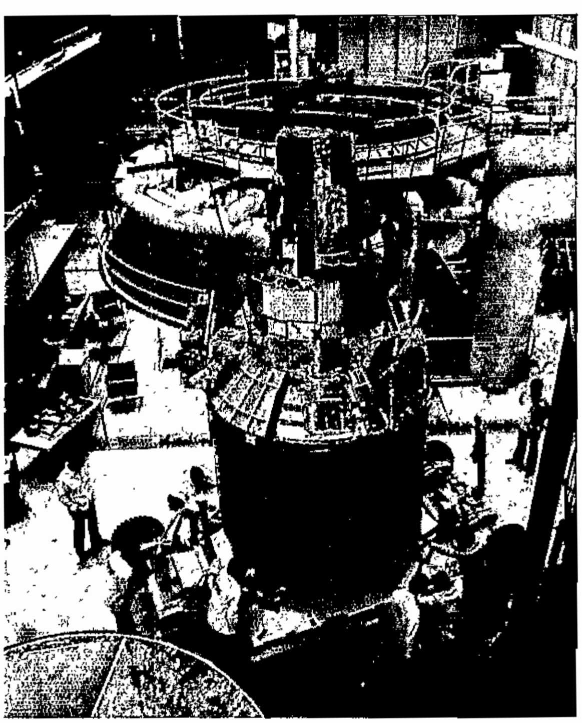

Figure 32: DSP Flight #9 (MOS/PIM)

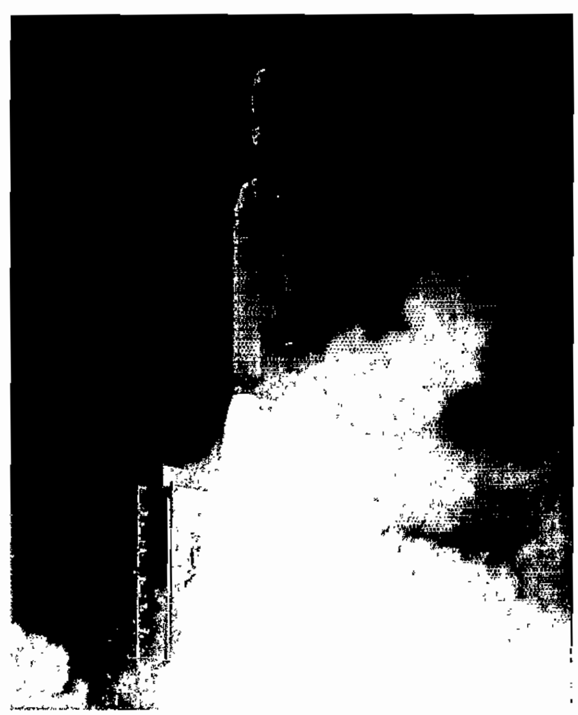

Figure 33: Launch of DSP Flight #9
March 16, 1981

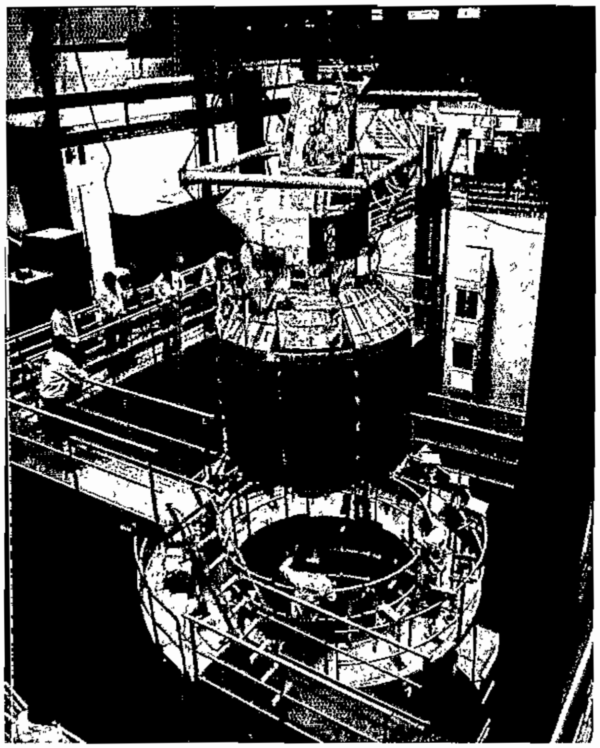

Figure 34: DSP Flight #10 (MOS/PIM)

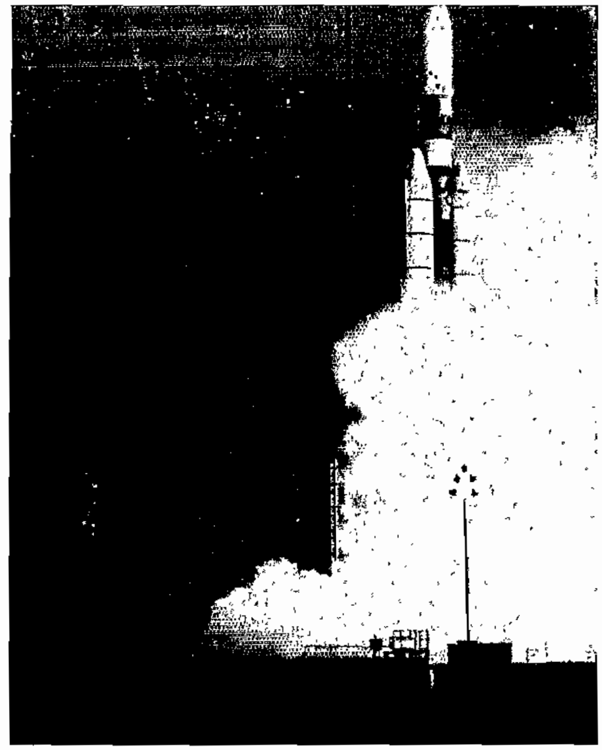

Figure 35: Launch of DSP Flight #10
March 6, 1982

NO PICTURE AVAILABLE
OF DSP FLIGHT #11

Figure 36: Launch of DSP Flight #11
April 14, 1984

Phase II Upgrade (PII UG) (2 Flights, 1984-1987) (11)

During TRW's production of Phase II spacecraft (5-9), Spacecraft 5 and 6 were put into storage after completion since other Phase II satellites were lasting longer on orbit than expected, and the MOS/PIM block was coming on line. The two Phase II spacecraft were later retrofitted and redesignated as 5R and 6R. These retrofit satellites were redesigned for continued improved performance that started with the MOS/PIM block change, an improved RADEC sensor, and a new primary IR sensor. The increased performance for Satellites 5R and 6R included improved resolution and a push for better polar/global coverage. The new primary IR sensor was known as Sensor Evolutionary Development or SED. This IR sensor now had a total of 6000 detectors on the sensor focal plane, an increase of 4000 detectors, and provided an Above the Horizon (ATH) capability for increased resolution and polar coverage. A second type of detector, Mercury Cadmium Telluride or HgCdTe, was tested for the first time on this block to demonstrate a second waveband capability, which was also known as second color or Medium Wave Infrared (MWIR). With a greater number of detectors and associated electronics for signal processing, the weight of the satellite increased to 3690 pounds, with solar panels now providing 680 watts. Design life was still kept at three years like the MOS/PIM block. The Phase II Upgrade satellites could be distinguished from MOS/PIM satellites by the different size and shape of the sensor, and the unique set of triangular solar panel paddles.

Satellites in this series were Flight 12 (Satellite 6R) and Flight 13 (Satellite 5R), launched between 1984 and 1987. The launch vehicle was the dependable Titan 34D with a Transtage. SPDs during this period were Col. Clyde R. Magill, Jr. (1983-1985), and Col. Wayne Craft (1985-1989). Figures 37 through 39 show the Phase II Upgrade satellites and their launches.

NO PICTURE AVAILABLE
OF DSP FLIGHT #12

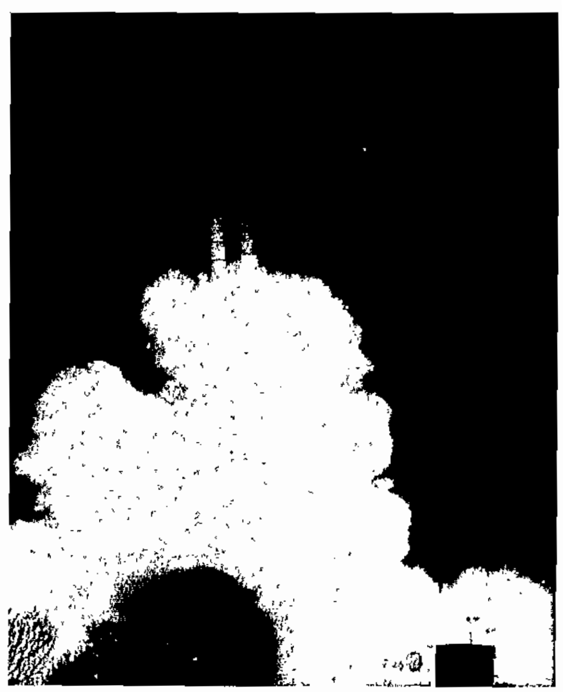

Figure 37: Launch of DSP Flight #12
December 22, 1984

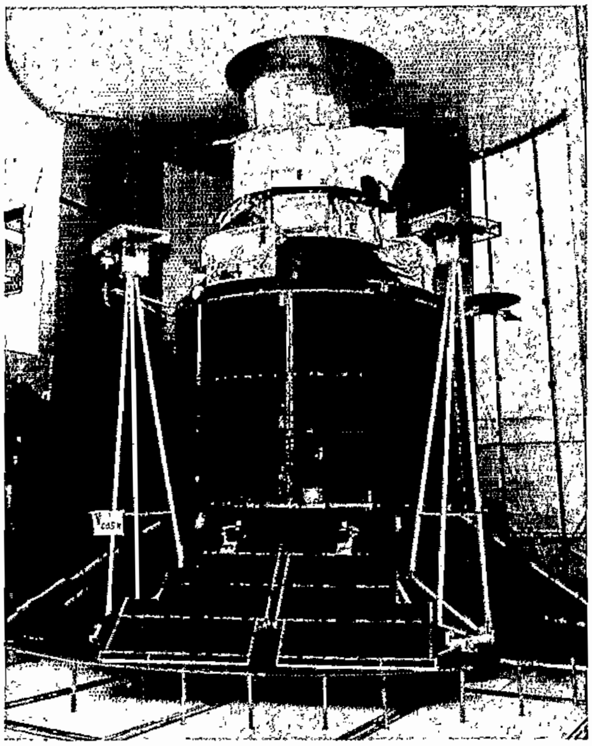

Figure 38: DSP Flight #13
(Phase II Upgrade)

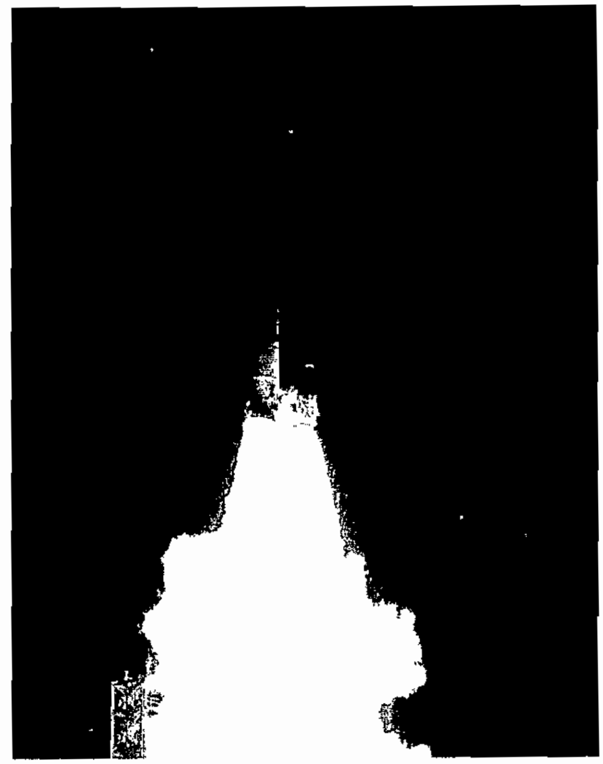

Figure 39: Launch of DSP Flight #13
November 29, 1987

DSP-1 (5 Flights to Date, 1989-1998) (11)

The present DSP configuration is known as DSP-1. Design began in the mid-1980s, and this block will eventually include a total of ten satellites, Flights 14 through 23. These satellites were originally designed to be launched from the Space Transportation System (STS) with an Inertial Upper Stage (IUS). After the design process, the new DSP configuration was also analyzed for the Titan IV launch environment, and these loads were found to be acceptable. After the STS Challenger accident, many military satellites originally scheduled for the Shuttle were re-manifested on the new Titan IV launch vehicle. At present, the DSP-1 design is one of the few satellites that has dual launch capability. It can be launched by both the Titan IV and STS launch systems, and has demonstrated this capability. The DSP-1 configuration was designed for the upgraded SED sensor and a new star sensor. DSP-1's retain the 6000-detector SED sensor, including both BTH and ATH capabilities (SWIR), and fly the second color detectors (MWIR) as an operational unit. Design life goal was increased to five years, with satellite weight now at 5250 pounds, and power output at 1275 watts.

Flights 14 through 18 of this series were launched between 1989 and 1997; three on Titan IV-As, one on the STS (STS-44), and one on a Titan IV-B, all with the IUS. Program directors and mangers included Col. Wayne Craft (1985-89), Col. John R. Kidd (1989-93), Col. Edward Dietz (1993), Col. Terry Crossey (1994), Col. Mark Lacaillade and Lt. Col. Timothy Crews (1995), and Col. Dudley B. Killam (the present program manager). Figures 40 through 54 show the satellites and their respective launches. Figure 55 shows all the DSP satellite blocks, and Figure 56 shows all the DSP launch vehicles.

Figure 40: DSP Flight #14 (DSP-1)

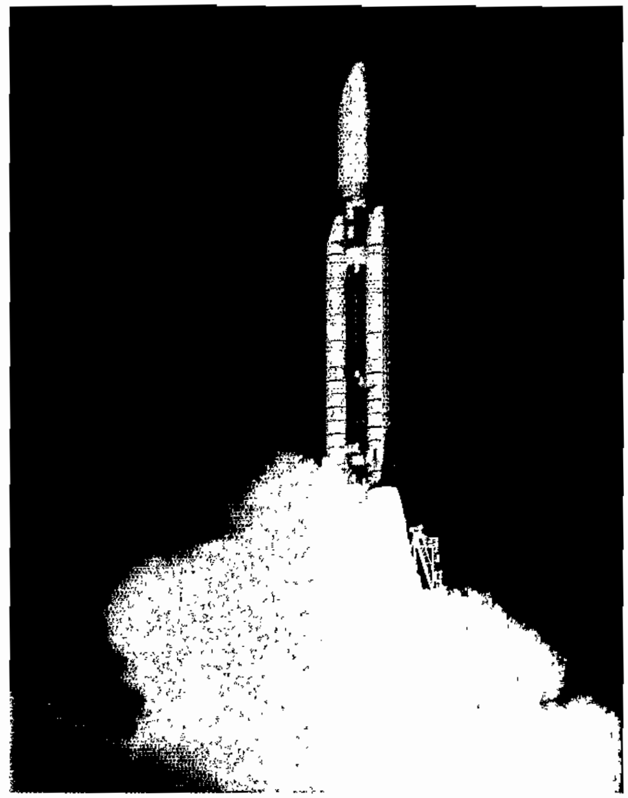

Figure 41: Launch of DSP Flight #14
June 14, 1989

Figure 42: DSP Flight #14 Satellite Patch

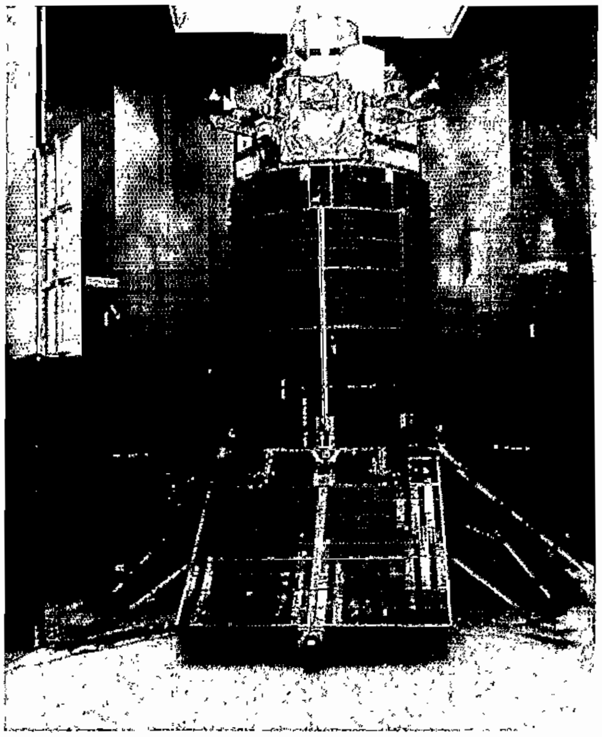

Figure 43: DSP Flight #15 (DSP-1)

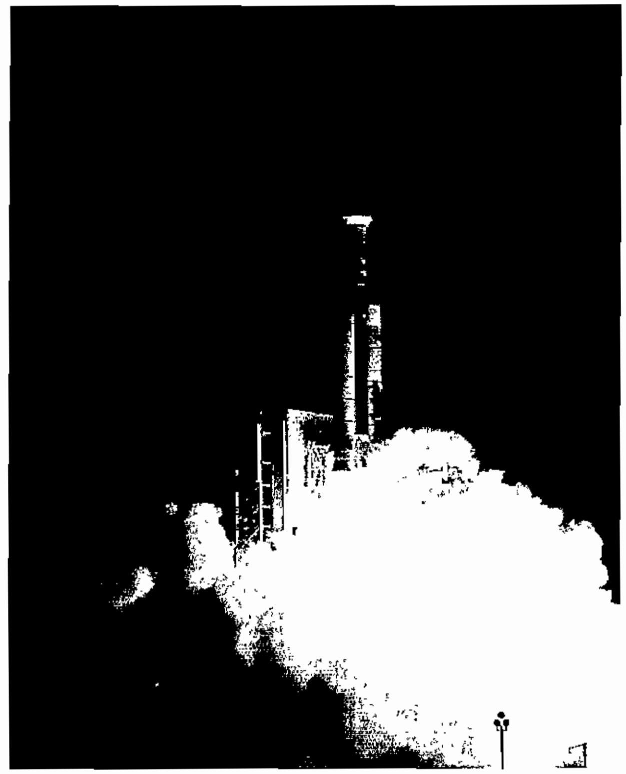

Figure 44: Launch of DSP Flight #15
November 13, 1990

Figure 45: DSP Flight #15 Satellite Patch

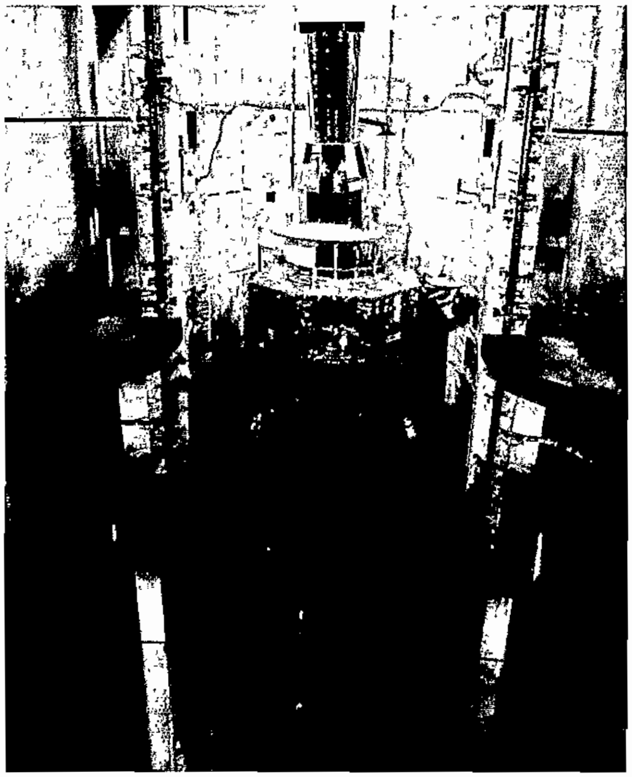

Figure 46: DSP Flight #16 (DSP-1)

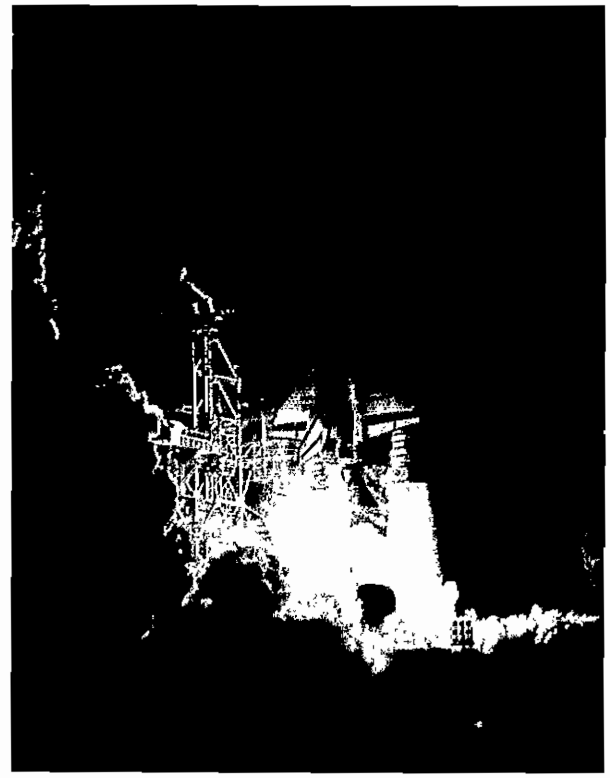

Figure 47: Launch of DSP Flight #16
November 24, 1991

Figure 48: DSP Flight #16 Satellite Patch

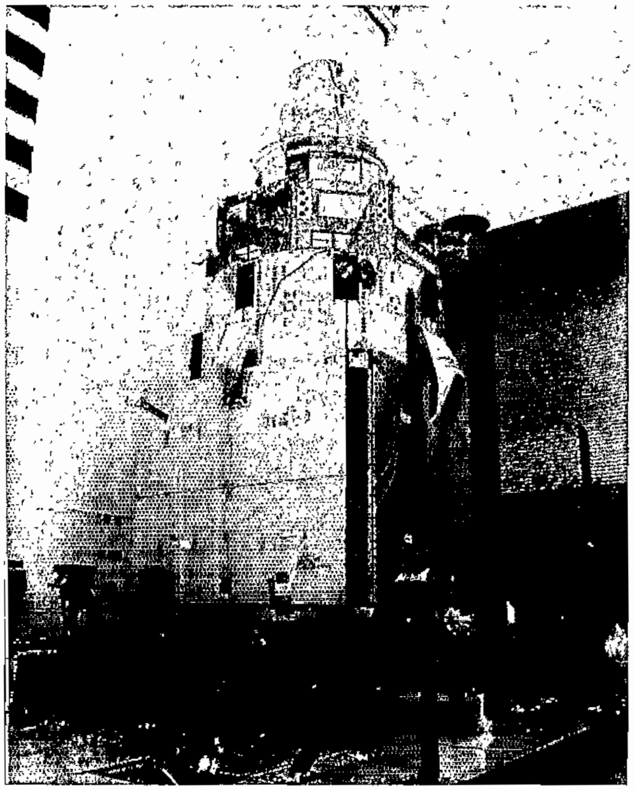

Figure 49: DSP Flight #17 (DSP-1)

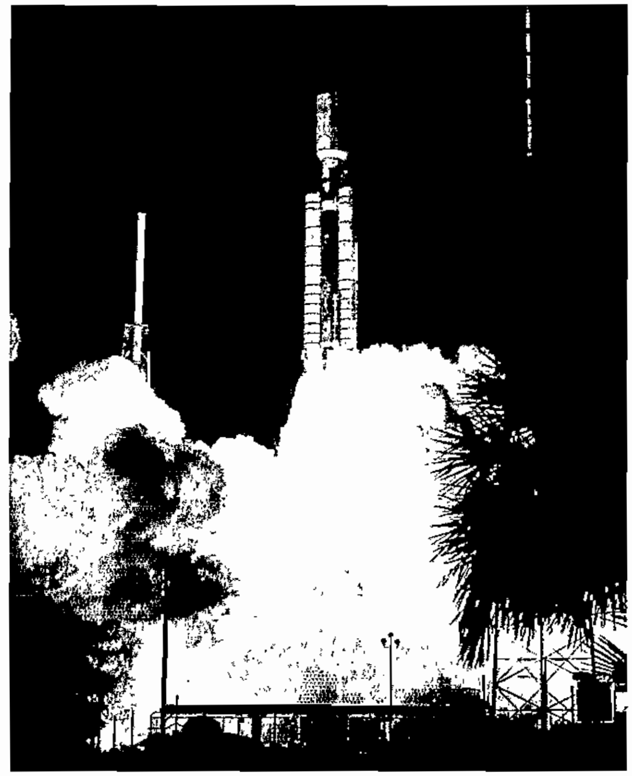

Figure 50: Launch of DSP Flight #17
December 22, 1994

Figure 51: DSP Flight #17 Satellite Patch

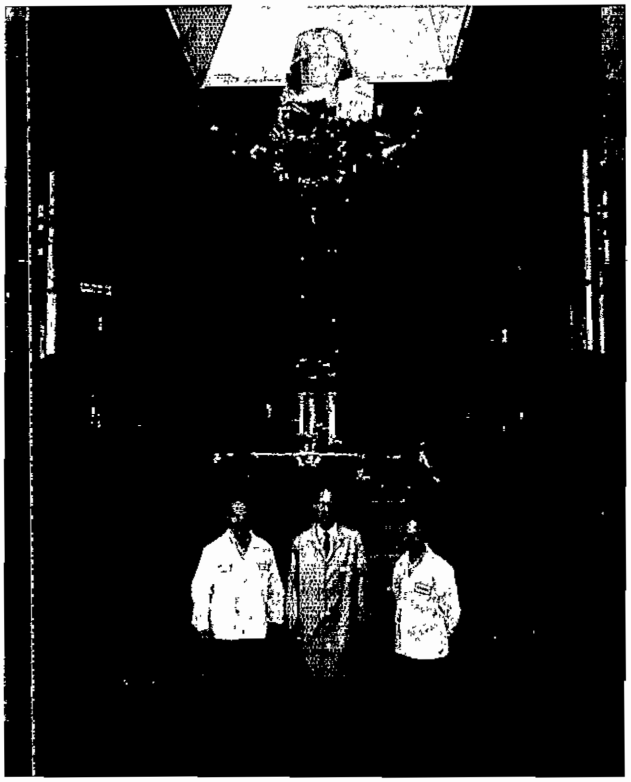

Figure 52: DSP Flight #18 (DSP-1)

Figure 53: Launch of DSP Flight #18
February 23, 1997

Figure 54: DSP Flight #18 Satellite Patch

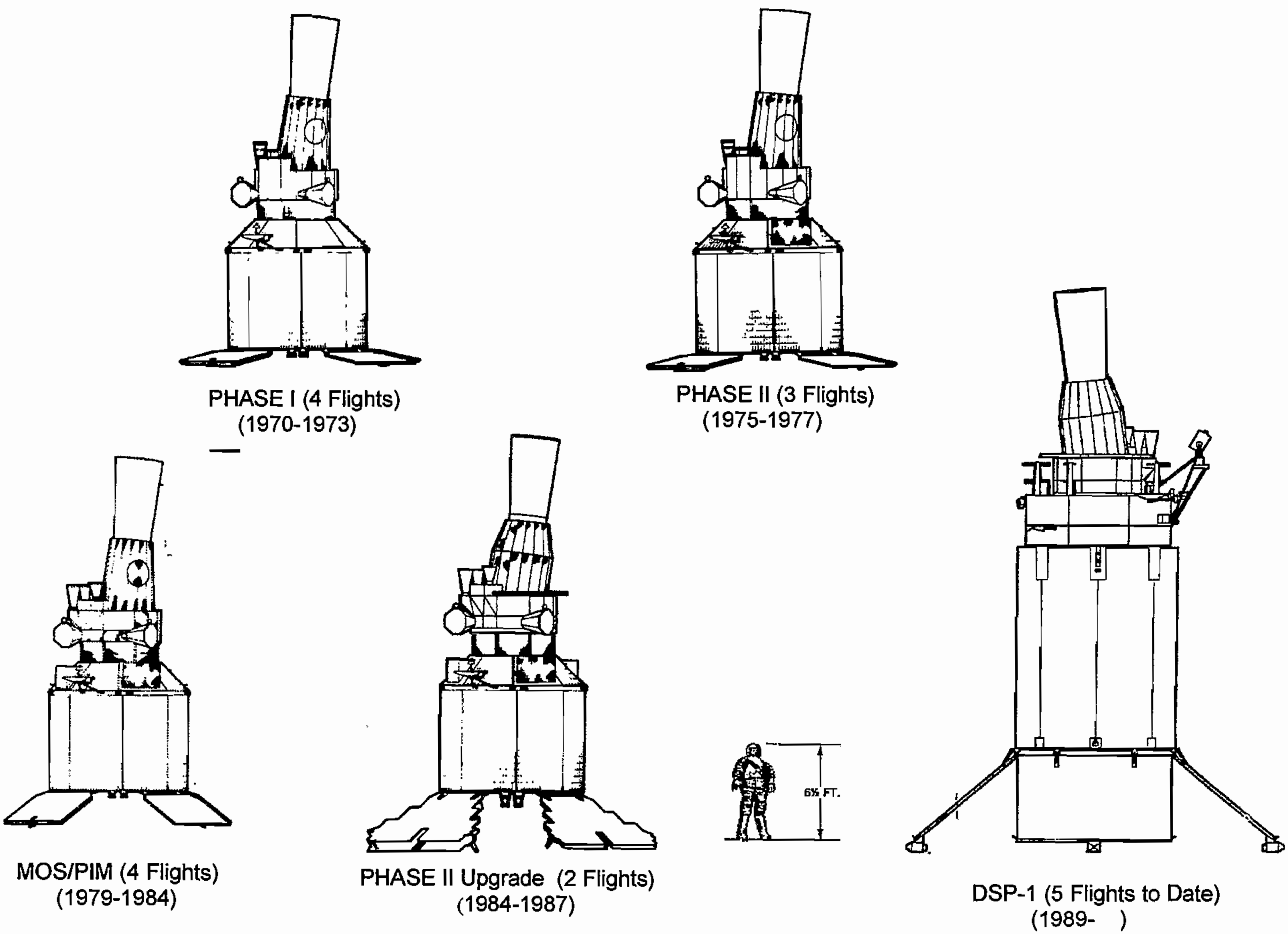

FIGURE 55: DSP Block Change Configurations (1)

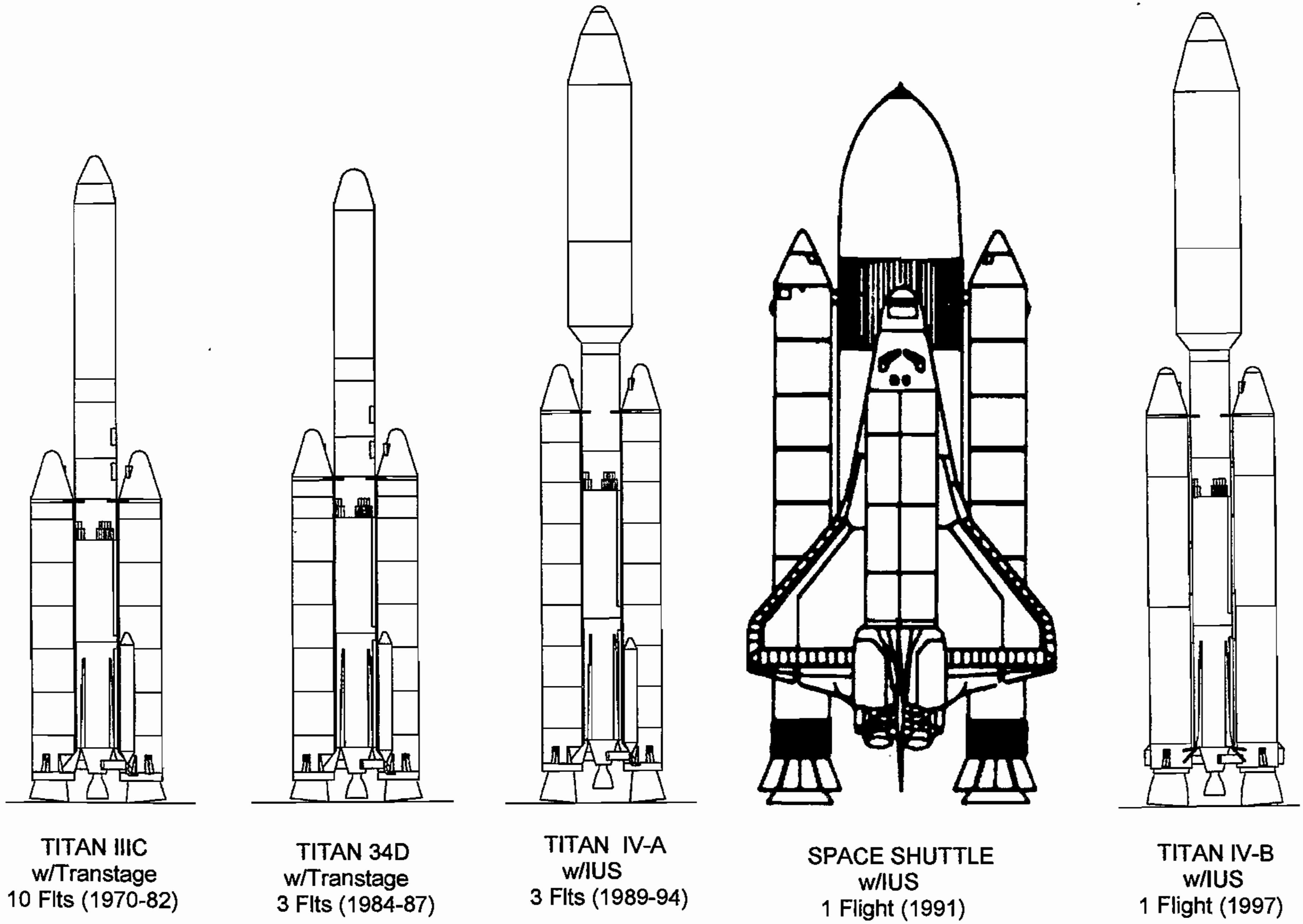

FIGURE 56: DSP Launch Vehicles (16)

Operation "Desert Storm" (17)

DSP continued in operational use even as the Berlin Wall came tumbling down. With the demise of the Soviet Union in 1991, the threat of ICBM and SLBM attacks against the US and allies has greatly diminished. Unfortunately, the growth of nations with theater ballistic missile (TBM) capability has increased. It was with this new threat in mind that the DSP system opened its operational envelope and spectacularly helped our troops in the Persian Gulf War during Operation Desert Storm. DSP's grand moment of glory came when the constellation of satellites detected the launch of Iraqi SCUD missiles, providing timely warning to civilian populations and coalition forces, including Patriot missile battery commanders in Saudi Arabia and Israel. The US Space Command in Colorado Springs, Colorado routed data from the DSP satellites to coalition forces in the Persian Gulf region. DSP's superb operational performance demonstrated that the system could provide significant early warning capability for tactical missile attacks, providing direct support to our war fighters. The Gulf War experience confirmed DSP's flexibility in dealing with both theater as well as global missile threats. This success in battle led directly to the establishment of the "Talon Shield" developmental capability and the "Attack and Launch Early Reporting to Theater (ALERT)" operational capability to process DSP tactical data.

DSP Ground Stations (11)(12)(18)

A satellite ground segment or ground station is the means by which ground controllers communicate with an orbiting vehicle. The site will control the satellite, and/or gather telemetry data in the form of health and status data, or mission data. In the case of DSP, there are three permanent ground sites, one mobile site, and one support facility. Two of the permanent sites are known as Large Processing Stations (LPS). These two sites are located at the Overseas Ground Station (OGS), and the CONUS Ground Station (CGS). The first ground station to become operational was the OGS in 1971 (Figure 57). OGS's prime mission is to process health and status data, mission data, and then provide reports to the National Command Authority (NCA) from any Eastern hemisphere satellites. The second ground station to become operational was the CGS in 1972 (Figure 58). It provides reports to the NCA from any Western hemisphere satellites. The one support facility, called the Multi-Purpose Facility (MPF), was activated in 1974. Its purpose was to provide telemetry and mission data analysis support, software trouble-shooting with upgrade development, and personnel operational training. In 1975, an additional antenna was constructed at the OGS. In 1982, both the OGS and CGS facilities were given both hardware and software upgrades to support the future capabilities of the newest and planned DSP satellites coming on line, which included the MOS/PIM and the future DSP-1 configurations. The Mobile Ground System (MGS) became operational in 1985. MGS includes the Mobile Ground Terminals (MGT, Figure 59), Mobile Communication Terminals (MCT), and a MGS Operating Base (MOB). Reason for MGS development was survivability in a hostile environment, such as a nuclear strike or a terrorist attack. The last permanent fixed site, the European Ground Station (EGS), was activated in the early 1980s, and upgraded with its current equipment in 1990. Due to the tactical success of the DSP system during Operation Desert Storm, the operational command of DSP, United States Space Command, ordered the permanent establishment of a DSP site to process tactical data. This site has become know as ALERT and the ALERT Control Center is shown in Figure 60.

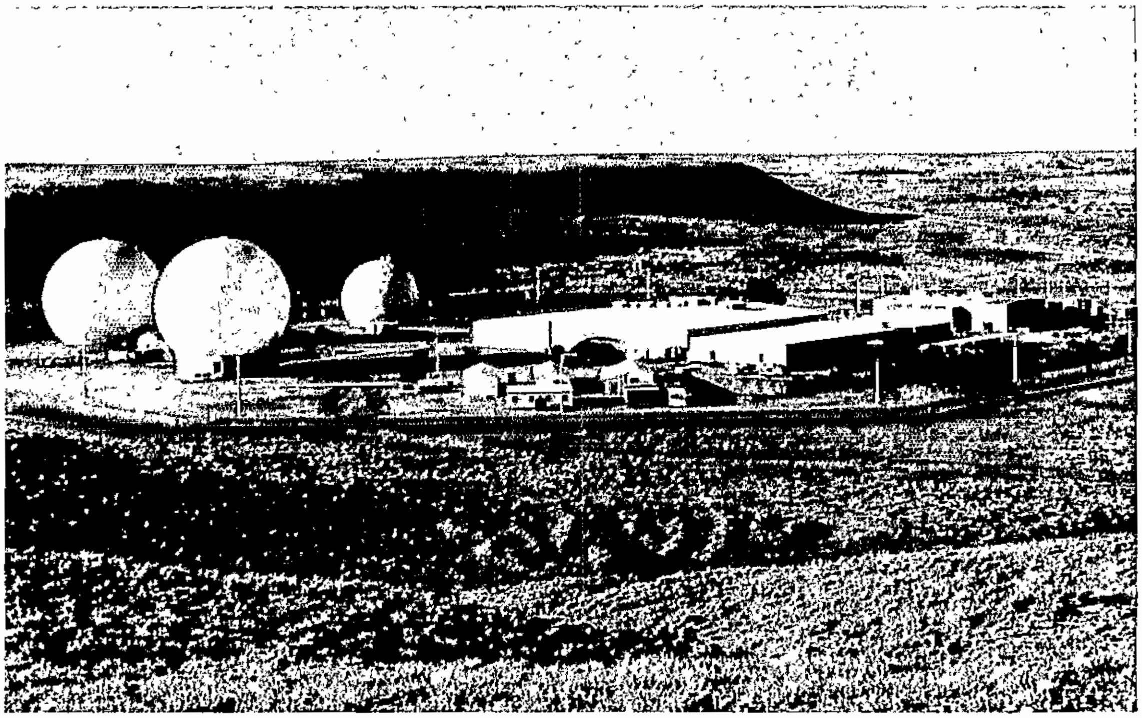

Figure 57: Overseas Ground Station (OGS)
First Operational DSP Fixed Ground Site (19)

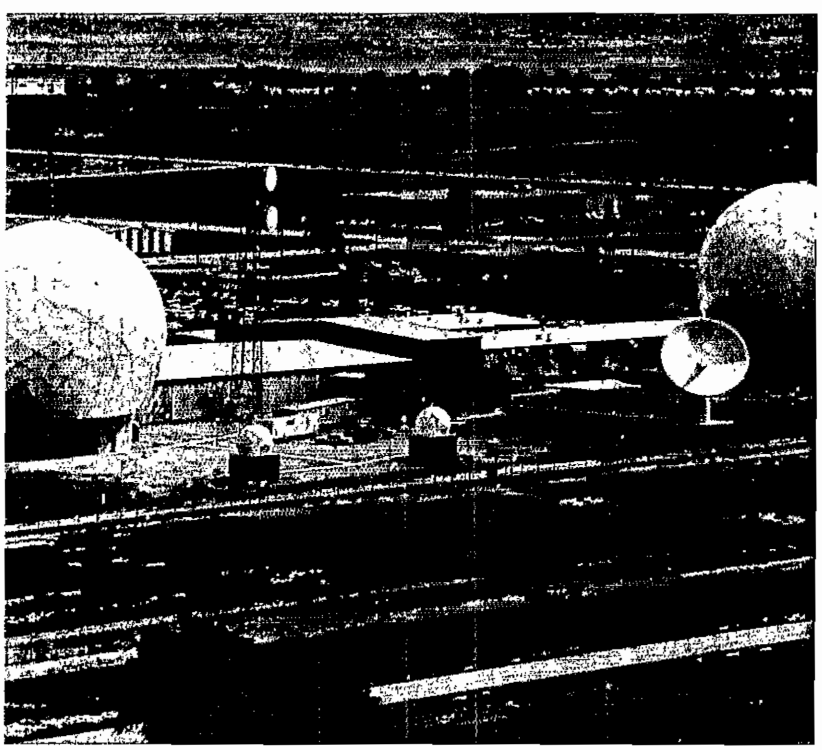

Figure 58: Continental Ground Station (CGS)

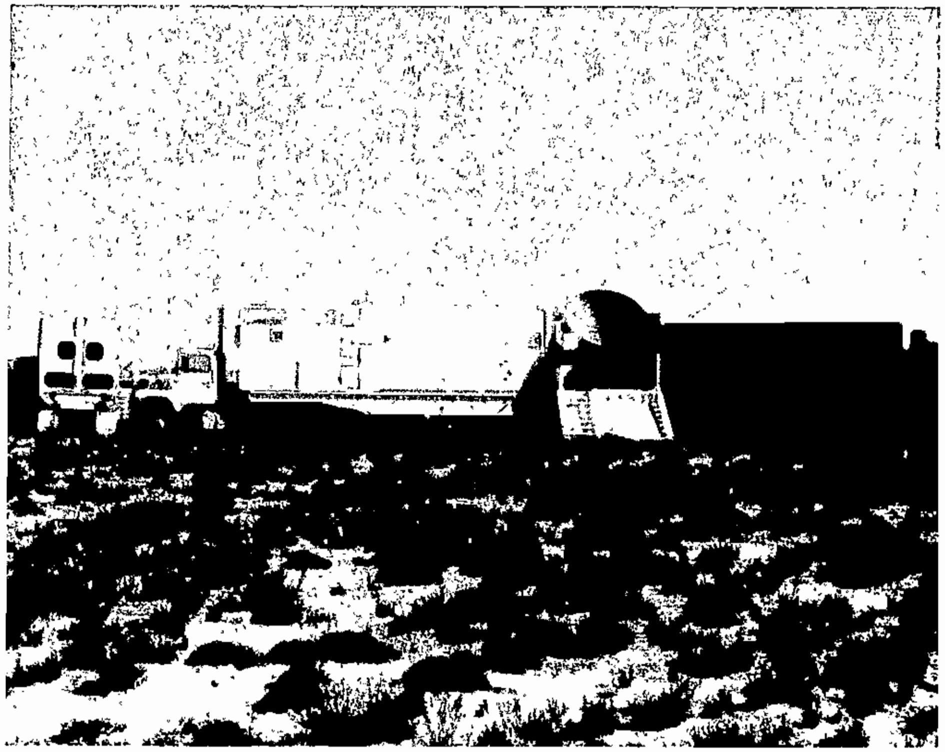

Figure 59: Mobile Ground Terminals (MGT)

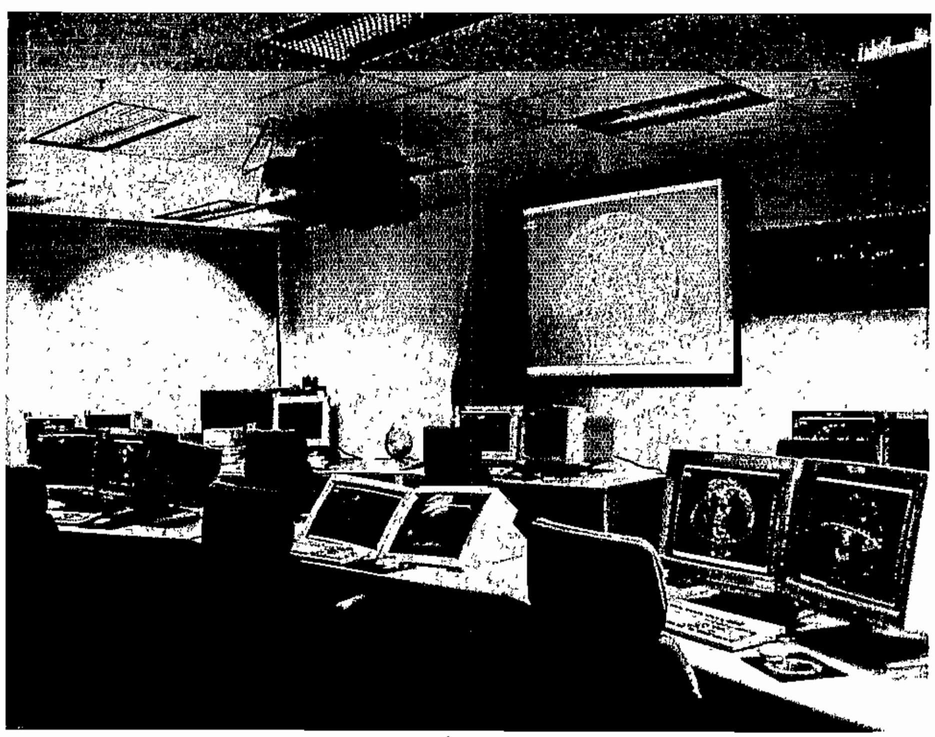

Figure 60: ALERT Control Center

The importance of DSP to the nation was highlighted on June 22, 1993 when Vice President Albert Gore reviewed Satellite 19 at TRW (see Figure 46), and spoke to the DSP team of their system's contribution to the winning of the Cold War and its continuous service to the nation in these turbulent times. DSP will continue to be the strong, silent sentinel into the next century, protecting our nation from strategic missile attacks, and our deployed forces and allies from theater missile attacks.

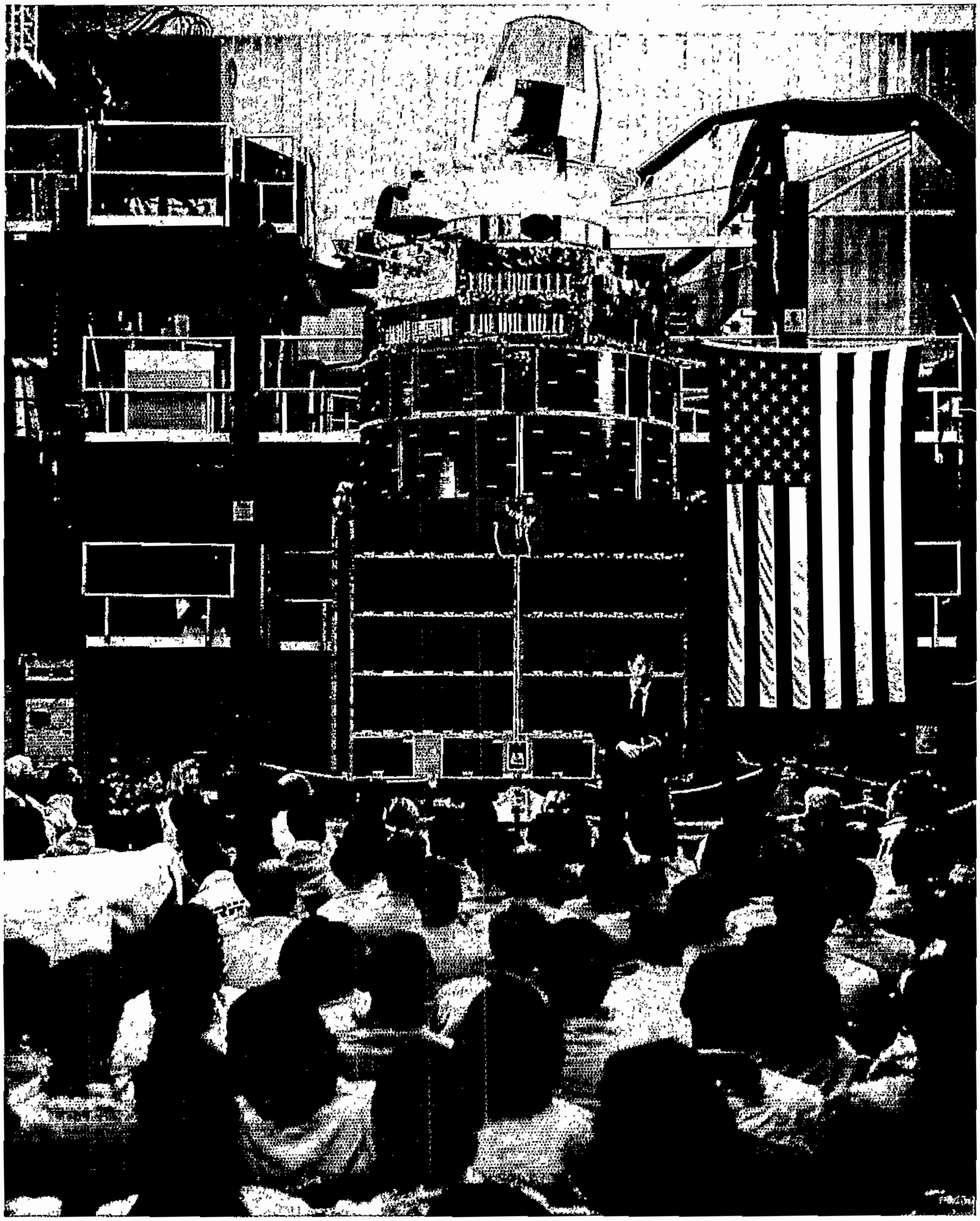

Figure 61: Vice President Gore visits TRW facility in the Summer of 1993
to View Satellite 19

LIST OF ACRONYMS

ALARM	--	Alert, Locate, and Report Missiles
ALERT	--	Attack and Launch Early Reporting to Theater
ARI	--	Advanced RADEC I Device
ARII	--	Advanced RADEC II Device
ASAT	--	Anti-Satellite
ATH	--	Above The Horizon
BTH	--	Below The Horizon
BSTS	--	Boost Surveillance and Tracking System
CGS	--	CONUS Ground Station
CONUS	--	Continental United States
DSP	--	Defense Support Program
EGS	--	European Ground Station
ESMC	--	Eastern Space and Missile Center
ETR	--	Eastern Test Range
FEWS	--	Follow-on Early Warning System
GEO	--	Geosynchronous Orbit
HEO	--	Highly Elliptical Orbit
HgCdTe	--	Mercury Cadmium Telluride
ICBM	--	Intercontinental Ballistic Missile
IR	--	Infrared
IUS	--	Inertial Upper Stage
KSC	--	Kennedy Space Center
LC	--	Launch Complex
LPS	--	Large Processing Station
MCT	--	Mobile Communication Terminal
MGS	--	Mobile Ground System
MGT	--	Mobile Ground Terminal
MIRV	--	Multiple Independent Reentry Vehicle
MOB	--	MGS Operating Base
MOS/PIM	--	Multi-Orbit Satellite / Performance Improvement Modification
MPF	--	Multi-Purpose Facility
MRV	--	Multiple Reentry Vehicle
MWIR	--	Medium Wave Infrared
NCA	--	National Command Authority
OGS	--	Overseas Ground Station
PIIUG	--	Phase II Upgrade
PbS	--	Lead Sulphide
RADEC	--	Radiation Detection Capability
RI	--	RADEC I Device
RII	--	RADEC II Device
SBEWS	--	Space Based Early Warning System
SBIRS	--	Space Based Infrared Systems
SDI	--	Strategic Defense Initiative
SED	--	Sensor Evolutionary Development
SLBM	--	Sea Launched Ballistic Missile

SPD	--	System Program Director
SPO	--	System Program Office
SSTS	--	Space Surveillance and Tracking System
STS	--	Space Transportation System
SWIR	--	Short Wave Infrared
TBM	--	Theater Ballistic Missile
USAF	--	United States Air Force

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5. Information provided by Ms. Lorian M. Shito, Administrative Assistant, The Aerospace Corporation, El Segundo, California, 1995

6. Information provided by Mr. Bud Murch, Product Line Manager, Defense Support Program, TRW, Redondo Beach, California, 1995

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8. Information provided by Mr. Don K. Tomajan, Los Angeles Business Development Manager, Loral Federal Systems, Los Angeles, California,1996

9. Information provided by Mr. Paul Elder, RADEC Project Manager, Sandia National Laboratories, Albuquerque, New Mexico, 1996

10. Information compiled, provided, and reviewed by Lt. Col. Randel L. Cohen (USAF), Information Release Officer, Information Declassification and Release Center, National Reconnaissance Office, Chantilly, Virginia, 1995

11. Information provided and reviewed by Mr. Louis Bodnar, Project Engineer, DSP Space Segment, The Aerospace Corporation, El Segundo, California, 1997

12. Information provided and reviewed by the following The Aerospace Corporation Engineers, 1997:
    Dr. P.K. Chang, Project Engineer, DSP Space Segment
    Mr. Benjamin Savagian, Project Engineer, DSP Space Segment
    Mr. Nathaniel Rosenblatt, Project Engineer, DSP Ground Segment
    Mr. Rodney O. Barfield, Systems Director of DSP Ground Segment

13. Information provided and reviewed by following GenCorp Aerojet Engineers, 1996:
    Ms. Carol Neves, DSP Block 23 Sensor Manager
    Mr. William Robbins, DSP Block 18 Sensor Manager
    Mr. William Mullooly, DSP Program Manager

14. Information compiled, provided, and reviewed by Mr. Hubert J. Filusch, RADEC Project Engineer, Sandia National Laboratories, Albuquerque, New Mexico, 1996

15. All launch pictures provided by BIONETICS CORPORATION, Cape Canaveral Air Station, Florida, 1995

16. Titan launch vehicle pictures provided by the Titan System Program Office, Los Angeles Air Force Base, California, 1996

17. *USAF Fact Sheet: Defense Support Program (DSP)*, updated November 1996.

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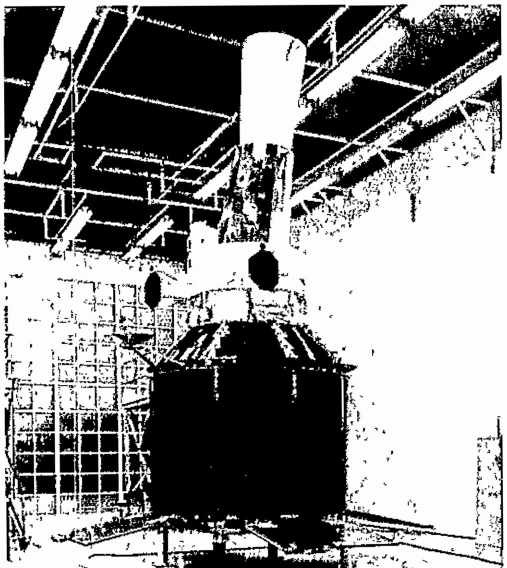
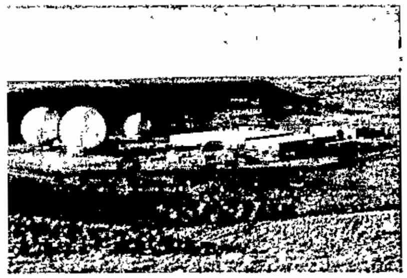
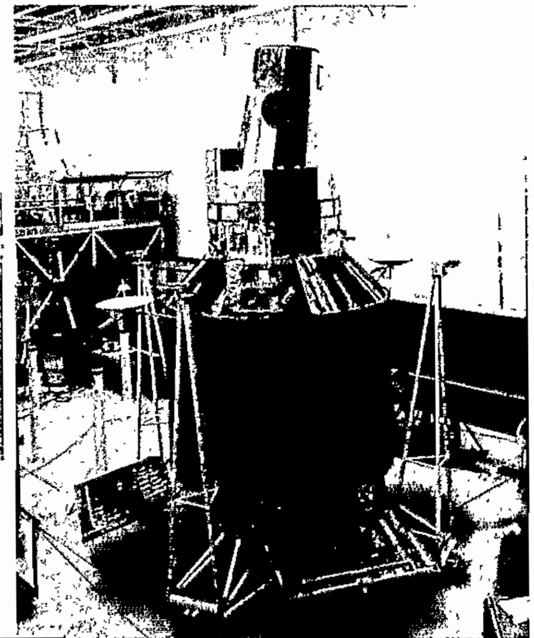
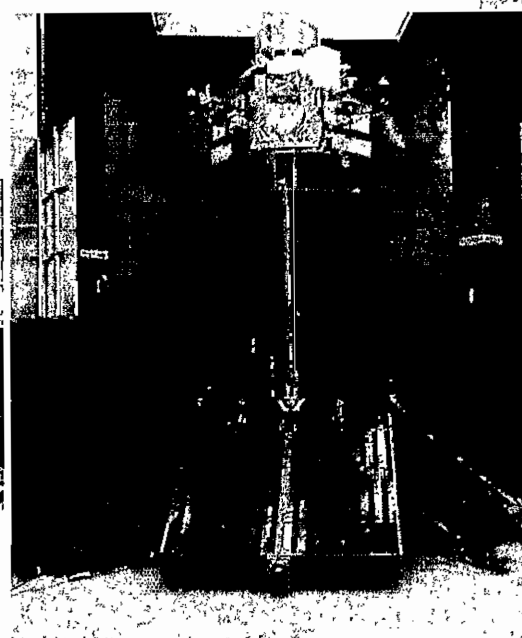
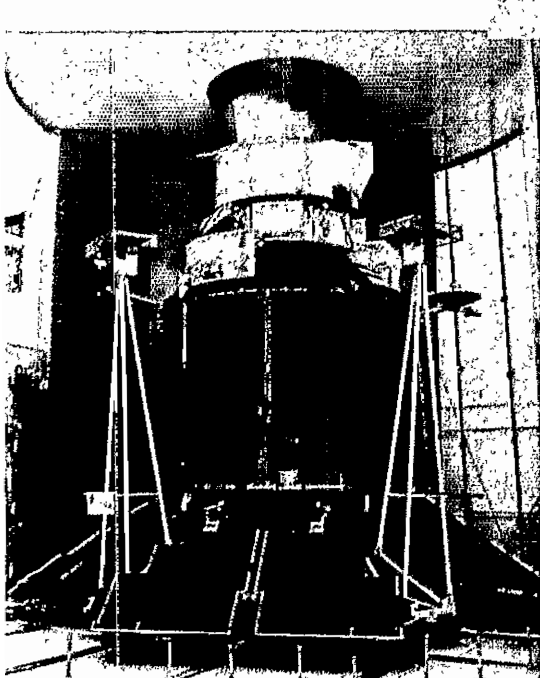
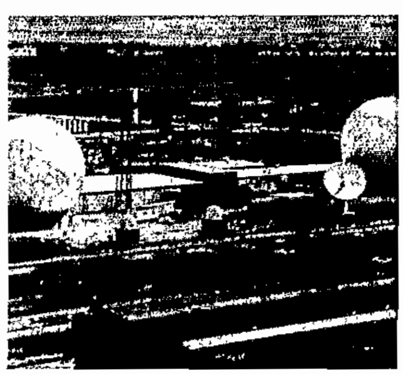
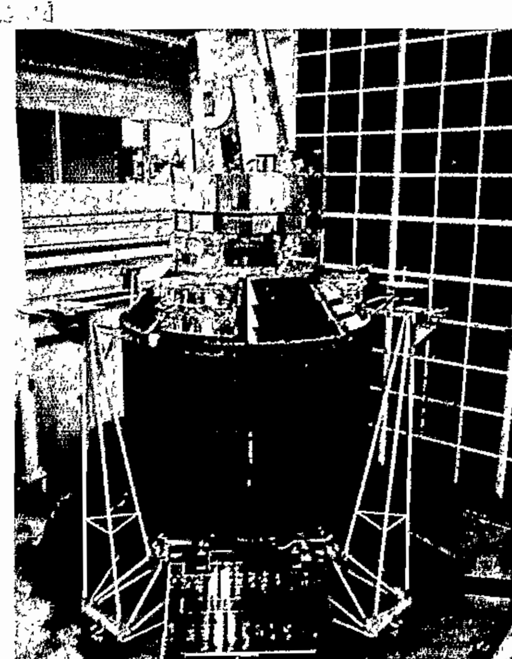
19. All ground system pictures provided courtesy of Ms. Carol Neves, DSP Block 23 Sensor Manager, GenCorp Aerojet, Azusa, California,1996



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