SPACE AND MISSILE SYSTEMS CENTER

LINEAGE
Established as Space Systems Division, and activated, on 20 Mar 1961
Organized on 1 Apr 1961
Discontinued, and inactivated, on 1 Jul 1967
Consolidated (7 Aug 1989) with the Space and Missile Systems Organization, which was established, and activated 25 May 1967
Organized on 1 Jul 1967
Redesignated Space Division on 1 Oct 1979
Redesignated Space Systems Division on 15 Mar 1989
Redesignated Space and Missile Systems Center on 1 Jul 1992

STATIONS
Los Angeles, CA, 1 Apr 1961
Los Angeles AFS (later, AFB), CA, 25 Apr 1964

ASSIGNMENTS
Air Force Systems Command, 20 Mar 1961
Air Force Materiel Command, 1 Jul 1992
Air Force Space Command, 1 Oct 2001

COMMANDERS
LTG Samuel C. Phillips, #1971
Lt Gen. Edward P. Barry Jr. July 1992-Nov. 1994
Lt. Gen. Lester L. Lyles Nov. 1994-Aug. 1996
Lt. Gen. Roger G. Dekok Aug. 1996-Aug. 1998
Maj. Gen. (later Lt. Gen.) Eugene L. Tattini Aug. 1998-May2001

Lt. Gen. Brian A. Arnold May 2001-Oct. 2001
LTG Brian A. Arnold, #2004

LTG Michael A. Hamel, #2007
LTG John T. Sheridan, #2009
Lt. Gen. Ellen Pawlikowski, 2011-2014
Lt. Gen. Samuel Greaves, 2014

HONORS
Service Streamers
None

Campaign Streamers
None

Armed Forces Expeditionary Streamers
None

Decorations
Air Force Organizational Excellence Awards
1 Jan 1986-31 Dec 1987
1 Jul 1993-30 Jun 1995
1 Oct 2003-30 Sep 2005
1 Oct 2005-30 Sep 2007
1 Oct 2007-30 Sep 2009

EMBLEM
Approved 2 Aug 2002

EMBLEM SIGNIFICANCE

MOTTO

NICKNAME

OPERATIONS

Space and Missile Systems Center (SMC/CC):
1.10.1. Develops/acquires and tests new space systems capabilities before turnover to AFSPC operational units.
1.10.2. Provides sustainment and depot level maintenance of space systems operations hardware and software In Accordance With (IAW) Integrated Weapon System Management (IWSM).
1.10.3. Provides technical advisors, as required, to support satellite and launch operations.
1.10.4. Conducts Research, Development, Test & Evaluation (RDT&E) satellite operations.
1.10.5. Provides transportable assets to support space systems operations, including factory compatibility
testing.
1.10.6. Provides test and calibration support for on-orbit assets (e.g., Camp Parks Communications

Annex (CPCA)).
1.10.7. Supports transition of RDT&E space assets to operational units as required and end of life
test support.
1.10.8. Provides expertise and resources for development and testing of new satellite control ground systems (e.g., Center for Research Support).
1.10.9. Coordinates with HQ AFSPC and SW to ensure SW units required to support new space system tests and development have the necessary resources to support test and development efforts.
1.10.10. Develops and submits financial plans to AFSPC/FM and identify new program requirements
to AFSPC/A5

Space Division. Western Development Division designated and organized I July 1954; redesignated Air Force Ballistic Missile Division, 1 June 1957; discontinued 1 April 1961. Ballistic Systems Division and Space Systems Division established I April 1961 (both assigned to Deputy Commander for Aerospace Systems). Space and Missile Systems Organization established 1 July 1967; redesignated Space Division, I October 1979.

SPACE SYSTEMS DIVISION—SSD
AF Unit Post Office, Los Angeles, California
Development, acquisition and launch of space vehicles and research satellites are responsibilities of this Division. These responsibilities include launch support, on-orbit control and retrieval.

MG O. J. Ritland, CA, #1961

The Space and Missile Systems Center, a subordinate organization of the Air Force Space Command is responsible for the research, development, acquisition and fielding of military space systems. The center is also responsible for on-or-bit check-out, testing, sustainment and maintenance of military space systems and other Department of Defense space systems. The center is located at Los Angeles Air Force Base, Calif., and supported by the 61st Air Base Wing. The center has an annual total budget in excess of $10 billion and employs 1,358 military members, 1,068 civilians and an estimated 4,000 contractors worldwide. It manages between $60 and $70 billion in contracts at any one time.

The 61st ABW provides medical, civil engineering, communications, contracting, chaplain, security, logistics, personnel, readiness and quality-of-life services impacting 84 units and more than 204,000 active-duty, civilian and retired personnel in the Los Angeles area. It manages a $60 million budget and $608 million in plant assets, with 564 facilities.

DELETE A LARGE PORTION; REMEMBER THAT THIS IS AN AFOB NOT A HISTORY OF AIR FORCE SATELLITES

The Space and Missile Systems Center traces its ancestry back to the Western Development Division (WDD) of the Air Research and Development Command (ARDC). WDD was activated on 1 July 1954 and was redesignated the Air Force Ballistic Missile Division (AFBMD) on 1 June 1957. The organization's original mission was to develop strategic missiles for the Air Force, but ARDC added the responsibility for developing the first military satellite system on 10 October 1955. The responsibility for strategic missiles remained with AFBMD and its successors through the decades that followed, but the Department of Defense (DOD) continued to modify and add to its assignment of the responsibility for the space mission. In February 1958, the Eisenhower administration activated the Advanced Research Projects Agency (ARPA) and placed it in charge of all military space programs during their research and development phases. In September 1959, ARPA lost its dominant role, and Secretary of Defense Neil McElroy divided responsibilities for developing military satellites among the three services. The Army was to develop communication satellites; the Navy, navigation satellites; and the Air Force (in effect, AFBMD), reconnaissance and surveillance satellites. Only the Air Force, , was to develop and launch military space boosters. This arrangement continued until March 1961, when Secretary of Defense Robert McNamara gave the Air Force a near monopoly on development of all military space systems, ending the role of the Army and the Navy except under exceptional circumstances. Some important exceptions to this developmental monopoly occurred during the next 40 years. For example, the development of reconnaissance satellites and related systems soon came under the authority of the National Reconnaissance Office (NRO), and the Navy developed the first successful space-based navigation system.

By 1961, AFBMD had two parallel missions to perform, but it was not necessarily clear that the two missions belonged together. Over the next several decades the missile and space functions were separated and rejoined repeatedly, causing numerous reorganizations and redesignations. Because of the increasing importance of space systems, the space and missile functions were separated on 1 April 1961, when AFBMD was inactivated and replaced by the Ballistic Systems Division (BSD) and the Space Systems Division (SSD). On 1 July 1967, the space and missile functions were reconsolidated in the interest of economy, and BSD and SSD were merged to form the Space and Missile Systems Organization (SAMSO). Space and missile functions were separated a second time on 1 October 1979, when SAMSO was divided into the Space Division and the Ballistic Missile Office. These two organizations were redesignated Space Systems Division (SSD) and Ballistic Systems Division (BSD) on 15 March 1989. By the early 1990s, missile programs were being cut back because the cold war had ended, and a final series of redesignations and realignments brought the space and missile functions together for a third time. On 5 May 1990, BSD was redesignated the Ballistic Missile Organization (BMO) and realigned under SSD. On 1 July 1992, SSD was redesignated the Space and Missile Systems Center (SMC), the name it bears today. Finally, in September 1993, BMO was inactivated and absorbed by SMC, recreating the situation that had existed in the 1950s and again in the 1970s, when a single organization was responsible for both space and missile programs.

SMC and its predecessors have been supported over the years by private sector organizations that have provided systems engineering for its programs and technical direction to its contractors. The first such organization was the Ramo-Wooldridge Corporation, chosen in 1954 to provide systems engineering and technical direction for WDD's missile programs. In 1958, Ramo-

Wooldridge merged with Thompson Products to form Thompson-Ramo-Wooldridge (TRW).

Congress expressed reservations about the propriety of a profit-making entity serving an agency of the government so closely and exclusively. In 1959, Congress recommended that a nonprofit agency be established as the systems engineering arm of the Air Force for space and missile programs. In June 1960, a nonprofit organization—The Aerospace Corporation—was created at the initiative of the Secretary of the Air Force to perform that function. At that time, plans called for TRW to continue providing systems engineering for existing missile programs and for Aerospace to provide systems engineering for all space programs and for future missile programs. As it turned out, Aerospace did perform some work in the missile field, but it focused primarily on space, and TRW remained the primary source of systems engineering for missile programs.

That predominance was recognized by DOD's Commission to Assess U.S. National Security Space Management and Organization in its report published on 11 January 2001. It was translated into policy when Secretary of Defense Donald Rumsfeld, acting on the Commission's recommendations, assigned to the Air Force the "responsibility for planning, programming, and acquisition of space systems" in his assessment of the Commission's report provided to Congress on 8 May 2001.

Changes in the organizational structure of SMC and its predecessors have been paralleled by changes in field units. Through those field units, its predecessors were involved not only in the development and acquisition of space systems but in space operations as well. Beginning in the 1950s, SMC's predecessors provided or acquired units that controlled military satellites in orbit, conducted satellite launches as well as R&D missile launches, and operated the ranges that supported those launches.2 The satellite control function was originally performed by the 6594th Test Group, created by AFBMD in 1959, and later by the Air Force Satellite Control Facility, which replaced the Test Group in 1965. During the 1960s, launches were performed by the 6595th Aerospace Test Wing at Vandenberg Air Force Base (AFB) and by the 6555th Aerospace Test Wing at Cape Canaveral Air Force Station (AFS). In 1970, the 6555th became a Group and was realigned under the 6595th, and the 6595th was realigned under a new field unit, the Space and Missile Test Center (SAMTEC). SAMTEC was responsible for overseeing launches at both Vandenberg and the Cape and for operating the Western Test The ranges themselves—that is, the facilities as opposed to the organizations that conducted launches—were controlled during the 1950s and 1960s by organizations that did not report to AFBMD. The ranges reported directly to Air Force Systems Command and were designated the Air Force Missile Test Center at Cape Canaveral and the Air Force Space Test Center at Vandenberg AFB. From 1964 to 1970, both ranges—known then as the Eastern Test Range and the Western Test Range—were overseen by the Range that supported launches out of Vandenberg. In 1977, it also acquired responsibility for running the Eastern Test Range that supported launches at the Cape. In 1979, SAMTEC was redesignated the Space and Missile Test Organization (SAMTO) and was restructured with two major field units of its own, the Eastern Space and Missile Center (ESMC) and the Western Space and Missile Center (WSMC). ESMC and WSMC conducted launches and operated the ranges on the east and west coasts respectively.

SMC's responsibility for space operations began to change on 1 September 1982, when Air

Force Space Command was activated to serve specifically as an operational command for military space systems. In the years that followed, Space Command gradually took over the operational functions previously performed by SMC's field units, and, in the process, it absorbed most of the units themselves. The Air Force Satellite Control Facility was inactivated on 1 October 1987, and most of its personnel and functions were taken over by wing-level units assigned to Space Command. HQ SAMTO was inactivated on 1 October 1989. A year later, the Eastern and Western Space and Missile Centers were reassigned to Space Command, and the transfer of launch operations to Space Command began.

While SMC's predecessors lost field units involved in operations, they temporarily gained units involved in research. In October 1982, the Air Force Space Technology Center (AFSTC) was activated at Kirtland AFB and assigned to Space Division. At the same time, three pre-existing laboratories were assigned to the AFSTC—the Air Force Weapons Laboratory, the Air Force Geophysics Laboratory, and the Air Force Rocket Propulsion Laboratory (later redesignated the Air Force Astronautics Laboratory). Creation of the AFSTC centralized Air Force space technology efforts and reoriented them to better serve the needs of the program offices at Space Division. In December 1990, the AFSTC was redesignated the Phillips Laboratory, and the three laboratories formerly assigned to it were folded into it to form a single super laboratory. In January 1993, Kirtland AFB, where the Phillips Laboratory was located, was transferred to SMC, and the 377th Air Base Wing, the host wing at Kirtland, was assigned to SMC as well. Nevertheless, SMC's subordinate units and their missions were stripped away again during the late 1990s. Phillips Laboratory became part of the newly created, centralized Air Force Research Laboratory on 8 April 1997. The 377th ABW was reassigned to the Air Armament Center at Eglin AFB, Florida, on 1 October 1998 to centralize air armament issues within the Air Force. Some space and missile programs managed at Kirtland AFB were closely tied SMC's central mission and were not reassigned. In general, they provided test and evaluation, launch of experimental payloads, and on-orbit operations from the Space Shuttle. These programs were placed under a single SMC detachment—Detachment 12—on 29 June 2001.

National Range Division, which reported directly to Air Force Systems Command. In 1970, the Space and Missile Test Center (SAMTEC) was set up under SAMSO to oversee both the launching organizations and the ranges as explained above.

Launch operations were transferred incrementally. The Delta II and Atlas E launch operations were transferred first, followed by the Atlas II, Titan II, and Titan IV launch operations.

During the years 2000-2001, changes in SMC's relationship to its higher headquarters underwent profound changes. Supporters of more highly centralized military space functions had been gaining strength within Congress, and they inserted language in the National Defense Authorization Act for FY 2000 calling for a commission to assess the management and organization of space activities that supported national security. When constituted, the Commission to Assess United States National Security Space Management and Organization included prestigious space experts drawn from DOD and Congress, and its report, published on 11 January 2001, carried great weight.4 The Commission emphasized the importance of the Air Force's management of space programs by recommending that the Secretary of Defense formally designate the Air Force as the executive agent for space within the Department of Defense. Among other managerial changes, the Commission proposed consolidating the Air Force's management of space efforts by realigning SMC from Air Force Materiel Command (AFMC) to Air Force Space Command (AFSPC), thus bringing the developers and operators of military space systems together under one major command. During a ceremony at Fort MacArthur on 1 October 2001, SMC's flag passed from the hands of AFMC's commander to the hands of AFSPC's commander, thus beginning in fact as well as in symbol a significant change in the management of military space programs.

Developers and operators had worked together under SMC's organizational predecessors a generation earlier. Now, the managers at the top of the organizational pyramid for space would be members of the operational rather than the developmental community. With developers and operators in the same organization, the management and organization of Air Force space efforts had come full circle.

Another significant change in the management of Air Force space programs also resulted from the recommendations of the Space Commission. Until 1986, space and other acquisition efforts managed by the Air Force had reported on the status of their programs through the organizational chain of command. In 1986 the President's Blue Ribbon Commission on Defense Management, known as the Packard Commission, recommended that managers of individual programs report to Program Executive Officers (PEOs), who would report to Service Acquisition Executives in the service secretariats. The Air Force began to implement this recommendation in 1987, designating acquisition programs with large budgets as Executive Programs and leaving the other programs to the oversight of product division commanders. The new system created few changes in practice because product division commanders were usually designated as PEOs for the Executive Programs managed by their organizations. , in 1989 the President asked for another review of the defense procurement process. The review was known as the Defense Management Review, and it endorsed the recommendations of the Packard Commission but proposed that product division commanders not be allowed to serve as PEOs. The Air Force implemented this proposal in January 1990, appointing new PEOs for major areas of acquisition, including space. Eventually, all of the PEOs were reassigned to the area of Washington, D.C., to improve communications with acquisition executives in the Pentagon. The PEO for Space was reassigned to Washington effective 1 September 1990.

When the Space Commission issued its report on 11 January 2001, it recommended that the PEO for Space be transferred from the Pentagon back to SMC in order to consolidate SMC's space research, development, and acquisition responsibilities under Air Force Space Command. The Air Force PEO for Space was physically reassigned to SMC in June 2001 during the transition to the Commission's recommendations. On 19 February 2002, Secretary of the Air Force James G. Roche officially assigned the responsibilities of the PEO for Space to SMC's commander, directing that all acquisition programs at SMC were to be considered PEO programs. In matters of execution and support for space acquisition programs, the commander of SMC would report directly to the Under Secretary of the Air Force or, in his absence, to the Secretary of the Air Force.

Space Acquisition Center Reorganizes: Air Force space officials have realigned the offices within the Space and Missile Systems Center at Los Angeles AFB, Calif., to conform to the new organizational construct that USAF's acquisition community is adopting. This construct is built upon directorates, divisions, and branches; it replaces the structure based on wings, groups, and squadrons that had been in place since 2004. This realignment is meant to improve acquisition processes and better structure programs for success, say SMC officials. "The key here is our work hasn't changed," said Lt. Gen. John Sheridan, SMC commander, at the ceremony earlier this month where these changes officially took effect. He added, "Our mission to deliver unrivaled space and missile systems to the joint warfighter and our nation continues." As an example of the redesignations, SMC's Global Positioning Systems Wing is now known as the GPS Directorate.

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Because of changes in their field units, SMC and its predecessors have played a diminishing role in space operations and an increasing role in space-related research. acquisition of space and missile systems has been the core mission and a constant over the years. Following sections in this Historical Overview will look at those acquisition efforts as well as the workplace--Los Angeles AFB--in more detail.

When WDD was established in July 1954, it set up temporary headquarters in a former parochial school on Manchester Avenue in Inglewood, California. The old schoolhouse was only a stopgap solution, , and early in 1955, WDD moved into buildings on Arbor Vitae Street in southwest Los

Angeles, near the airport. These offices housed not only Air Force and civil service personnel, but also personnel working for the Ramo-Wooldridge Corporation, which supported WDD's missile programs.

In 1955, Ramo-Wooldridge purchased 40 acres on the southeast corner of Aviation and El Segundo Boulevards in El Segundo. The site was three miles from the Arbor Vitae complex but was the closest site available. Beginning in the middle of 1956, a complex of seven buildings was constructed on the site to provide a home for the Ramo-Wooldridge operation. That complex, known as the Research and Development (R&D) Center, was completed in the fall of 1958, and employees of Ramo-Wooldridge, now part of TRW, moved into it.

The Arbor Vitae Complex and the R&D Center provided much more room than the old schoolhouse, but they did not provide enough. By the late 1950s, the missile program had expanded, and WDD (now AFBMD) had become involved in the space program as well. The manpower associated with these growing programs left the Arbor Vitae complex and the R&D Center extremely congested, and additional facilities had to be found to accommodate it. Trailers were rented and parked at the Arbor Vitae complex and the R&D Center, and additional buildings were rented in southwest Los Angeles, Inglewood, Hawthorne, Lawndale, and Torrance.

The Arbor Vitae complex-- the second headquarters of the Western Development Division. The runways of Los Angeles International Airport can be seen in the background, and beyond them, marked by a rectangle, STL's R&D Center in El Segundo.

In April 1961, AFBMD was divided into BSD and SSD, and between July and September 1962, BSD moved to Norton AFB in San Bernardino, California. TRW employees who performed systems engineering for the missile program went there as well. Meanwhile, in December 1961, the Air Force had purchased the R&D Center from TRW to serve as a home for The Aerospace Corporation, which had been created in 1960 and was now supporting Air Force space programs. As a result of these changes, SSD now occupied the Arbor Vitae complex and Aerospace occupied the R&D Center. The departure of BSD and TRW relieved pressure on the facilities, and there was now enough office space for SSD and Aerospace.

While the office space problem had been solved, another problem remained--the fact that the Arbor Vitae complex and the R&D Center were three miles apart. It was obviously more efficient to consolidate SSD and Aerospace in one place, and during 1961/62, a plan was devised to bring that about. The plan involved acquisition of two pieces of real estate adjoining the R&D Center. One, a 50 acre parcel at the northwest corner of Aviation and El Segundo Boulevards, was part of an aircraft plant owned by the Navy. That site was transferred to the Air Force in October 1962. The other site, a 31 acre parcel at the southwest corner of the same intersection, was owned by the Utah Construction and Mining Company. The Aerospace Corp. acquired that site in November 1962, and a new headquarters for Aerospace was built there between February 1963 and April 1964. As Aerospace personnel moved into their new headquarters, Air Force people moved into the R&D Center and the former Navy facility. By 30 April 1964, this process was complete, and the Air Force property at the intersection of Aviation and El Segundo

Boulevards was designated as Los Angeles Air Force Station (AFS). The R&D Center became Area A of Los Angeles AFS, and the former Navy facility became Area B.

Headquarters of the Ballistic Missile Organization at Norton AFB as it appeared in the early 1990s. From 1962 to 1981, missile elements at Norton AFB occupied a converted warehouse on the main base. In 1981, they moved to this facility just outside the main base.

Building 105 of Area A, as it appeared during the 1960s and 1970s. Command section offices were, and still are, on the top floor of this building. The Thor Agena launch vehicle in front of the building, a landmark for many years, was blown down by a strong wind in March 1975.

SSD's successors have remained at Los Angeles AFS, which was redesignated as Los Angeles Air Force Base (AFB) in September 1987. For several decades, Air Force elements responsible for development and production of ICBMs remained in San Bernardino. This geographical separation continued even in the SAMSO era, when the missile and space functions belonged to the same organization. , the situation finally changed due to the drawdown of missile programs following the end of the cold war. The old BSD/BMO headquarters in San Bernardino closed in September 1995, and the few remaining personnel moved to Los Angeles AFB.

In the years since it was established, Los Angeles AFB has expanded by acquisition of two geographically separated annexes. One, referred to as the Lawndale Facility or Annex 3, is 13 acres in size and is located on Aviation Boulevard in the city of Hawthorne, about a mile south of the main base. The Lawndale Facility has one building, a former Army missile plant. The facility was acquired by the Air Force in 1982, and renovation of the building was completed in December 1986. It was then used as office space by personnel working in Strategic Defense Initiative (SDI) programs managed by Space Division.

In 1978, the Army announced that it would transfer its support units from Fort MacArthur to the Los Alamitos Armed Forces Reserve Center and would declare the remaining land excess. At that point, SAMSO was looking for a site to build housing for its military personnel, many of whom could not afford to buy or even rent housing in the very expensive Los Angeles market. SAMSO saw Fort MacArthur as the solution to its problem, and it asked the Air Staff to place a hold on the land. In September 1979, the Department of Defense approved the transfer of Fort MacArthur from Army to Air Force jurisdiction. After some initial delays, Congress appropriated funds for construction of military housing at the Fort, and 370 townhouses were built there between November 1981 and December 1985. In addition, 33 existing homes at the Fort were renovated. Fort MacArthur was officially transferred from Army to Air Force control on 1 October 1982, and Air Force families began moving into the first of the newly built townhouses at that point.

While the construction of townhouses at Fort MacArthur alleviated the housing problem for Air Force personnel in Los Angeles, it did not completely solve it, and even before construction was finished, Space Division began looking for a place where it could build another 170 units. It targeted 50 acres at White Point, which the Army had declared excess in 1975 and turned over to the City of Los Angeles. The city was unwilling to transfer this land to the Air Force, but a compromise was eventually reached, whereby the Air Force received title to 11.34 acres at White

Point and 22.09 acres of nearby Bogdanovich Park. An agreement to this effect was signed in April 1987, and between August 1987 and August 1989, 170 units of military family housing were built at the White Point site, which was renamed Pacific Heights, and at Bogdanovich Park, which was renamed Pacific Crest. Completion of this construction gave Los Angeles AFB a total of 573 units of military family housing at Fort MacArthur, Pacific Heights, and Pacific Crest. This housing made the base a more viable installation and helped it to survive three rounds of base closures conducted under the Base Closure and Realignment Act of 1990.

The Air Force ballistic missile program had its origins in studies and projects initiated by the Army Air Corps immediately after World War II. These efforts aimed at mating the German V-2 ballistic missile and the atomic bomb--a union that, if realized, would completely revolutionize weaponry and strategic warfare as it then existed. Technical problems held the program back at first, but the situation was changed drastically by the so-called "thermonuclear breakthrough" of the early 1950's. This breakthrough made it possible to manufacture high-yield nuclear weapons that were small enough and light enough to be carried as warheads aboard ballistic missiles. While these developments were taking place in the US, the Soviet Union was making significant progress in the development of thermonuclear weapons and ballistic missiles of its own. If the Soviet missile threat were real and the missiles deployed, the USSR could gain a sudden and possibly decisive strategic advantage over the US. In view of this danger, the US government decided to accelerate its missile development efforts, and the Western Development Division was established to carry out that task.

Initially, the Western Development Division was responsible for developing just one missile--the Atlas. The Atlas, which was being designed and built by the Consolidated Vultee Aircraft Corporation (Convair), was an intercontinental ballistic missile with liquid fuel engines and a stage-and-a-half configuration. Within a year, the Division had also become responsible for developing an alternate, or backup missile called the Titan. A more advanced, two-stage missile to be built by the Martin Company, the Titan was a hedge against failure or delay in the Atlas program. By the end of 1955, the Division was given the additional task of developing an intermediate range ballistic missile, the Thor, and was also charged with achieving initial operational capability with the three missile systems it was now building. In barely 18 months, the mission of the Division had undergone an enormous expansion.

To attain its assigned objective of developing operational missile systems as soon as possible, the Division largely replaced the conventional pattern of sequential development with concurrent development. Within the framework of a single overall plan, development, production, testing, and initial operational capability actions were undertaken simultaneously. Although the concept of concurrency was not entirely new, the Division applied it on a scale never before used in military development programs.

The development of ballistic missile systems was slowed in 1956-1957, when the Eisenhower administration made large cuts in defense spending in an effort to balance the budget. on October 4, 1957, the Soviet Union used an ICBM to launch Sputnik, the first man-made satellite. Sputnik's impact was immediate and dramatic. The US missile program was given renewed impetus, restrictions were lifted, previous program priorities were reinstated, and funding was vastly increased.

On September 20, 1957, even before Sputnik, the Air Force Ballistic Missile Division had successfully launched a Thor missile from Cape Canaveral, Florida. On December 17, the first successful Atlas launch was made, also from Cape Canaveral. Following these successes, the Air Force missile program progressed rapidly. Deployment of the Thor was completed in 1960, while deployment of the Atlas was completed in 1962. The Titan made its first successful flight in 1959 and was deployed in 1962. By the end of 1962, e, all three first generation missiles were in place and ready for operation.

In the late 1950's, the Ballistic Missile Division had begun developing two second generation missiles--the Titan II and the Minuteman.

The earliest launch vehicles used by the Air Force were Thor and Atlas missiles modified by the Air Force Ballistic Missile Division and Space Systems Division to serve as space boosters. The Air Force achieved its first success in space with Project Score, an Atlas booster containing a communications repeater that transmitted President Eisenhower's Christmas message to the world in December 1958. Thor and Atlas missiles with only minor modifications continued to be used as space boosters for a long time, especially for military and civilian weather satellites. The last Thor launch occurred in July 1980, and the last launch of a modified Atlas missile occurred in March 1995, with both boosters carrying military weather satellites. As time went by, Thor and Atlas vehicles were improved and standardized, and families of Standard Launch Vehicles were created. The Thor gave rise to the series known as Standard Launch Vehicle 2, and the Atlas gave birth to the several varieties of Standard Launch Vehicle 3. Upper stages such as the Agena, the Burner II, and the Stage Vehicle System were developed for use with these vehicles. Together with their associated upper stages, Thor and Atlas launch vehicles once constituted the backbone of the US space program.

The launch vehicles developed by the Ballistic Missile Division and its successors were used not only by the Air Force but also by the National Aeronautics and Space Administration, created in 1958. Civilian programs began using boosters based on the Thor missile immediately, and in 1959, NASA began developing the Delta upper stage for it--the first step in developing the highly successful Delta launch vehicle. NASA started using the Atlas vehicle in 1959, and its first manned space program, Project Mercury, relied on the Atlas for its orbital flights. Project Gemini, the agency's next manned program, employed Titan II boosters developed and procured by Space Systems Division. The Gemini Target Vehicle, an Agena upper stage, was also developed by Space Systems Division. The Agena was later modified by NASA and employed extensively by both agencies. The Centaur upper stage, the most powerful upper stage in the national inventory, was born as an Air Force program before being transferred to NASA in 1960. It is noteworthy that much of this cooperation in developing and using launch vehicles was the result of a carefully considered series of written agreements--initiated in 1959 and expanded during the early 1960s--which made up a National Launch Vehicle Program.

During the 1970s, NASA developed a Space Transportation System employing a manned, reusable Space Shuttle to replace most expendable launch vehicles. In addition to monitoring the development of the Shuttle to ensure that it would satisfy DOD's requirements, SAMSO contributed several important elements to allow DOD to make full use of the system. It developed and almost completed a launch and landing site at Vandenberg AFB to allow the Shuttle to be launched into polar orbits. It also developed the Inertial Upper Stage (IUS), an upper stage for large Shuttle payloads requiring higher orbits. The IUS was adapted for use with the Titan III and, later, the Titan IV expendable system as well. Although it had a troubled and costly developmental period, the IUS came to be considered one of the most accurate and reliable launch systems ever built.

In January 1986, a Space Shuttle exploded during launch, killing the crew of the orbiter Challenger. NASA was forced to suspend all Shuttle launches while it investigated the cause of the explosion and assessed its implications. Military payloads as well as civilian payloads scheduled for the Shuttle had to obtain launches on expendable boosters or wait. Shuttle flights did not resume until September 1988. The disaster had further implications for SSD. Development of the Shuttle facilities at Vandenberg ended after the disaster because design changes in the Space Shuttle diminished its capability for polar launches.

Although eventually the Air Force was able to shift some of its most critical payloads to Titan vehicles, the Titan program happened to be suffering from launch failures of its own when the Challenger disaster occurred. After consecutive launches of Titan 34Ds failed in August 1985 and April 1986, further launches were suspended while the causes were investigated. They resumed in October 1987, restoring the only available alternative to the Space Shuttle for large payloads.

The Challenger disaster gave added weight to the argument for having a variety of expendable launchers available, so that failures in one type would not again affect so many payloads. Space Division had already begun the development of a larger, more capable Titan booster known as the Titan IV in 1985. Launched for the first time in June 1989, the Titan IV could be used with either an IUS or a newly-developed version of the Centaur upper stage. It was capable of placing 10,000 pounds into geosynchronous orbit using the Centaur. The Titan IV's performance would be considerably enhanced by upgraded solid rocket motors. Their development was delayed when the first qualification motor exploded during a test firing, but they successfully completed the final test firing in September 1993. For some smaller payloads, Space Division began converting the 55 obsolete Titan II ballistic missiles removed from their silos in 1982-1987. They could place about 4,200 pounds into low-earth, polar orbit, and the first was launched in September 1988.

During the suspension of Shuttle flights, Space Division began procuring two new medium launch vehicles--the Delta II and the Atlas II. Development and production of the Delta II, an improved version of the Delta launch vehicle, began in January 1987. It was procured primarily to launch the constellation of 24 operational Global Positioning System (GPS) satellites, and it did so without a single failure. The Delta II was developed in two consecutive configurations. The first of these launched the first nine GPS satellites from February 1989 to October 1990, while the second, more powerful version launched the later, heavier GPS satellites from November 1990 to March 1994, completing the constellation. During this entire period, a Delta II successfully launched a GPS satellite about every two months, an accomplishment without equal. Delta IIs also launched other payloads, both military and commercial. In April 1993, SMC awarded a contract for additional Delta II launch vehicles to replenish the GPS constellation. Development and production of the Atlas II, an improved version of the Atlas/Centaur launch vehicle, began in June 1988. The Atlas II would be able to launch somewhat heavier payloads in the medium-weight class, and DOD intended it for Defense Satellite Communications System (DSCS) satellites as well as some experimental satellites. It was also used in many commercial launches. The Atlas II launched its first commercial payload in December 1991, and its first DSCS III satellite in February 1992. Although launches of the Atlas II and the Centaur upper stage suffered some delays because of failures that occurred during commercial launches, no failures had occurred during Air Force launches as of September 1995. At that time, the Atlas II was just beginning a period of intense launch activity.

Programs to develop a new generation of launch vehicles had more trouble getting off the ground. In 1987, the Air Force and NASA had begun a cooperative program to develop a more efficient family of boosters to replace the Space Transportation System and expendable launch vehicles. The program was known at first as the Advanced Launch System and later as the National Launch System before Congress ceased to fund it. In 1993, the Air Force and SMC tried a new, more frugal approach known as the Spacelifter program, which intended to develop a new launcher for medium and heavy payloads using existing technology. Nevertheless, the Secretary of Defense canceled it for reasons of cost later that year. Efforts to develop a new, more efficient launcher received a badly needed endorsement when President Clinton signed a National Space Transportation Policy in August 1994. Among other things, it assigned responsibility for expendable launch vehicles to DOD and directed DOD to prepare for the evolution of an expendable launch vehicle. The response was SMC's Evolved Expendable Launch Vehicle (EELV) program, which aimed to develop a family of launch vehicles for medium to heavy payloads, based on existing vehicles or their components using existing technology. SMC awarded contracts for the initial phase of the EELV program in August 1995. The program was one of the Air Force's standard bearers in streamlined acquisition reform.

Military satellite projects were added to the mission of the Western Development Division in the mid-1950's and came to play an increasingly important role in the activities of the Division's successors. The first satellite program was known as the Military Satellite System (WS 117L), and the Division was given responsibility for it in February 1956. WS 117L was to be a family of separate subsystems that could carry out different missions, including photo reconnaissance and missile warning. By the end of 1959, WS 117L had evolved into three separate programs--the Discoverer Program, the Satellite and Missile Observation System (SAMOS), and the Missile Detection Alarm System (MIDAS). Discoverer and SAMOS were to carry out the photo reconnaissance mission, and MIDAS was to carry out the missile warning mission.

The Discoverer program aimed at developing a film-return photo reconnaissance satellite. The satellite would carry a camera that took pictures from space as it passed over the Sino-Soviet bloc. Film from the camera would be deorbited in a capsule. A parachute would be deployed to slow the descent of the capsule, and the capsule would be recovered either in mid-air or in the ocean. It should be emphasized that the photo reconnaissance mission of Discoverer was not revealed to the public at the time. Discoverer was presented as an experimental program to develop and test satellite subsystems and explore environmental conditions in space.

A C-119 aircraft about to recover an object in the same manner as it would a Discoverer capsule. After the capsule was separated from the satellite, a retro-rocket would be fired to put it into a descent trajectory. Two parachutes-- a drogue chute and a main chute-- would later be deployed to slow the descent of the capsule. An airplane would then fly across the top of the descending parachute and catch it in a trapeze-like framework. The capsule would then be winched aboard the plane.

The Discoverer Program carried out 38 launches and achieved many breakthroughs in the process. Discoverer I, launched in February 1959, was the world's first polar orbiting satellite. Discoverer II, launched in April 1959, was the first satellite to be stabilized in orbit in all three axes, to be maneuvered on command from the earth, to separate a reentry vehicle on command, and to send its reentry vehicle back to earth. Discoverer XIII, launched in August 1960, ejected a capsule that was subsequently recovered in the Pacific Ocean--the first successful recovery of a man-made object ejected from an orbiting satellite. Discoverer XIV, launched later the same month, also ejected a capsule, and it was recovered in mid-air northwest of Hawaii by a C-119J aircraft--the first successful aerial recovery of an object returned from orbit. The capsule of Discoverer XIV was the first to return film from orbit, inaugurating the age of satellite reconnaissance. Satellite reconnaissance filled a crucial need, because President Eisenhower had suspended aerial reconnaissance of the Soviet Union just three months earlier, after the Soviets had shot down the U-2 spy plane piloted by Francis Gary Powers.

The Discoverer Program was officially ended after the launch of Discoverer XXXVIII in February 1962. In reality, it continued until 1972 under the secret code name CORONA--the name by which Discoverer was known in the intelligence community. CORONA's first major accomplishment was to provide photos of Soviet missile launch complexes. It also identified the Plesetsk Missile Test Range, north of Moscow, and provided information as to what missiles were being developed, tested, and deployed. These and other accomplishments were revealed when the CORONA Program was declassified in February 1995.

SAMOS--the second program that evolved from WS 117L--aimed at developing a heavier reconnaissance satellite that would be launched by an Atlas booster rather than the Thor used to launch the Discoverer. SAMOS had two launches--one in October 1960, which failed, and one in January 1961, which was successful. In 1962, a veil of secrecy was drawn across the SAMOS program, and the Air Force stopped releasing information about it. Unlike Discoverer (AKA Corona), it has never been declassified.
The MIDAS program--the third offshoot of WS 117L--aimed at developing a satellite that would carry an infrared sensor to detect hostile ICBM launches. The first MIDAS satellite, launched in February 1960, failed to achieve orbit. MIDAS II, launched in May 1960, did achieve orbit, but its telemetry system failed two days after launch. MIDAS III, successfully launched in July 1961, also achieved orbit and was the heaviest US satellite launched up to that time. As was the case with SAMOS, a veil of secrecy was drawn across the MIDAS program in 1962. , MIDAS eventually evolved into the Defense Support Program (DSP), and the DSP mission was declassified following the Persian Gulf war of 1991. Today, the satellites, ground stations, and mobile ground terminals of DSP perform MIDAS's original mission of detecting and reporting on hostile missile launches.

Weather observation is the mission of the Defense Meteorological Satellite Program (DMSP), which maintains a constellation of at least two weather satellites in polar orbits about 450 miles above the earth. Space Systems Division began development and deployment of weather satellites and associated ground stations and weather terminals during the 1960's. The system made its first major contribution during the southeast Asian conflict, when data from weather satellites was used to plan air operations. The existence of a military weather satellite system was secret during the war but was declassified in 1973. Since the Vietnam era, all elements of the system have been upgraded repeatedly. The Block 5D-2 satellites currently in orbit carry primary sensors that provide images of cloud cover over the earth's surface during both day and night, and they also carry other sensors that provide additional types of data on weather and on the space environment. All this information is supplied to the armed services to support military operations and also to the National Oceanic and Atmospheric Administration to support civilian weather forecasting. DMSP satellites have shown themselves to be an economical and effective means of detecting and tracking tropical storms, especially in the western Pacific.

The navigation mission is carried out by the Global Positioning System (GPS). The system consists of satellites that broadcast navigation signals to the earth, a control segment that maintains the accuracy of the signals, and user equipment that receives and processes the signals. By processing signals from the nearest four satellites, a user set is able to derive the location of each satellite and its distance from each one, and from that information, it derives its own location in three dimensions.

GPS had two ancestors--a technology program called 621B, started by SAMSO in the late 1960s, and a parallel program called Timation, undertaken by the Naval Research Laboratory in the same period. 621B envisioned a constellation of 20 satellites in synchronous inclined orbits, while Timation envisioned a constellation of 21 to 27 satellite in medium altitude orbits. In 1973, elements of the two programs were combined into the GPS concept, which employed the signal structure and frequencies of 621B and medium altitude orbits similar to those proposed for Timation.

The Deputy Secretary of Defense authorized the GPS program to start in December 1973. The system was acquired in three phases--validation, development, and production. During the validation phase, Block I navigation satellites and a prototype control segment were built and deployed, and advanced development models of various types of user equipment were built and tested. During the development phase, additional Block I satellites were launched to maintain the initial satellite constellation, a qualification model Block II satellite was built and tested, and manufacture of additional Block II satellites was initiated. In addition, an operational control segment was activated, and prototype user equipment was developed and tested. During the production phase, a full constellation of 24 Block II and IIA satellites was deployed, and user equipment was produced and put into operation--i.e., issued to foot soldiers and installed in ships, submarines, aircraft, and ground vehicles. The full constellation of Block II and IIA satellites was completed in March 1994, allowing the system to attain full operational capability in April 1995. The system is able to support a wide variety of operations, including aerial rendezvous and refueling, all-weather air drops, instrument landings, mine laying and mine sweeping, anti-submarine warfare, bombing and shelling, photo mapping, range instrumentation, rescue missions and satellite navigation.

Various satellite systems have been developed for communication purposes, and the first of these was fielded by the Initial Defense Communications Satellite Program (IDCSP). The program began in 1962, following cancellation of an earlier, unsuccessful program called Project Advent. The IDCSP system consisted of small, 100 pound satellites launched in clusters, and a total of 26 such satellites were placed into orbit in four launches carried out between June 1966 and June 1968. The IDCSP provided an experimental but usable worldwide military communications system for the Defense Department until a more sophisticated system could be developed.

That more sophisticated system was known as the Defense Satellite Communications System, Phase II (DSCS II). The DSCS II satellites were much larger than the IDCSP satellites and offered increased communications capacity, greater transmission strength, and longer lifetimes. In addition to horn antennas for wide area coverage, they had dish antennas that were steerable by ground command and provided intensified coverage of small areas of the earth's surface. The DOD gave the go-ahead for development of the DSCS II satellite in June 1968. The first two satellites were put into geosynchronous orbits in November 1973. Two launch failures delayed completion of the satellite network, but by January 1979 the full constellation of four satellites was in place and in operation. A total of 16 DSCS II satellites were built and launched during the life of the program, with the last launch occurring in 1989.

DSCS satellites were developed to serve users who transmit message traffic at medium to high data rates using relatively large ground terminals. satellites were also needed to serve users who transmit at low to medium data rates, using small, mobile or transportable terminals. During the 1960's, experimental satellites were placed into orbit to test technology that might perform this tactical communications mission. Lincoln Experimental Satellites 5 and 6, launched in July 1967 and September 1968, were solid-state, ultra high frequency communication satellites built by Lincoln Laboratory. The 1,600 pound Tactical Communications Satellite, launched in February 1969, operated in both ultra high frequency and super high frequency and tested the feasibility of communications with small, mobile, tactical communications equipment that could be used by ground, naval, and air forces. In July 1970, an initial operational capability for tactical communications was established, using the Tactical Communications Satellite and Lincoln Experimental Satellite 6.

These experimental satellites paved the way for the Fleet Satellite Communications System (FLTSATCOM), the first operational system serving tactical users. The Navy managed the overall program, but SAMSO managed acquisition of the satellites. Development of FLTSATCOM was authorized in 1971, and five satellites were launched between February 1978 and August 1981. Four achieved orbit and went into operation, but one was damaged during launch and never became operational. Three replenishment satellites were launched between December 1986 and September 1989. Two reached orbit, but one was lost when its booster was hit by lightning.

In addition to the long-haul users served by DSCS and the tactical users served by FLTSATCOM, there was a third group of users--the nuclear capable forces--who could be satisfied with very low data rates but required high availability, worldwide coverage, and the maximum degree of survivability. The Air Force Satellite Communications System (AFSATCOM) was developed to serve their needs and allow the Air Force to command and control its strategic forces. The space segment of the system relied on transponders (receiver/ transmitters) placed on board FLTSATCOM satellites and other DOD spacecraft. The space segment of AFSATCOM was declared operational in April 1978, and the terminal segment attained initial operational capability in May 1979.

The newest space communications system acquired by SMC is Milstar. Milstar I satellites carry a low data rate payload that provides worldwide, survivable, highly jam-resistant communications for the National Command Authority and the tactical and strategic forces. Space Division awarded concept validation contracts for the satellite and mission control segment of Milstar I in March 1982 and a development contract in February 1983. The first Milstar I satellite was successfully launched in February of this year. In October 1993, SMC awarded a contract for development of the Milstar II satellite, which will carry both low and medium data rate payloads. The addition of the medium data rate payload will greatly increase the ability of the tactical forces to communicate within and across theater boundaries.

The communications satellites discussed up to this point were all acquired for the US military, but other communications satellites were acquired for the United Kingdom and the North Atlantic Treaty Organization. The British Skynet program began in 1966. The first of two Skynet I satellites was placed into orbit in November 1969 and provided the United Kingdom with its first military communications satellite system. The second Skynet satellite was launched from Cape Canaveral in August 1970, but a malfunction in the launch vehicle caused permanent loss of contact with the satellite. In 1970, SAMSO and the United Kingdom began development of a more advanced Skynet II satellite system. The first Skynet II satellite was launched in January 1974, but a malfunction in the launch vehicle again caused the loss of the satellite. The second Skynet II satellite, launched in November 1974, attained orbit successfully and was turned over to the United Kingdom in January 1975.

Development of the NATO satellites began in April 1968, with the initial series of satellites being known as NATO II. One NATO II satellite was placed in orbit in March 1970 and another in February 1971. Both the Skynet and NATO satellites were designed to be compatible and usable with each other and with the Defense Satellite Communications System. Work on a more advanced system, NATO III, began in 1973, and three NATO III satellites were successfully launched between 1976 and 1978. The constellation was replenished in November 1984, when a fourth satellite was successfully launched.

DOD satellites are controlled in orbit by the Air Force Satellite Control Network (AFSCN), which tracks the satellites, receives and processes telemetry transmitted by them, and sends commands to them. Dedicated control segments support individual satellite systems, but a common user element provides support to all DOD satellites. The common user element consists of two control nodes, two scheduling facilities (one at each node), nine remote tracking sites, and communication links connecting them.

The common user element of the AFSCN was originally activated to support the Discoverer program of the late 1950's and early 1960's. An interim satellite control center was initially established in Palo Alto, California, in January 1959, but by June 1960, a permanent control center had been established in Sunnyvale, California. The installation in Sunnyvale was originally referred to as the Satellite Test Annex, then as Sunnyvale AFS, then as Onizuka AFS, and finally as Onizuka AFB. The control center at Sunnyvale was complemented by tracking stations established at nine different locations between 1959 and 1961. In later years, some of those tracking stations were taken out of service and others were added, and a second control center was added--the Consolidated Space Operations Center (CSOC), located in Falcon AFB, Colorado.

The Consolidated Space Operations Center (CSOC) at Falcon AFB, Colorado. The CSOC was the second satellite control center activated by the Air Force. It was turned over to Space Command in September 1993.

The Secretary of Defense authorized development of the CSOC in 1979. Originally, it was to consist of two parts--a Satellite Operations Complex (SOC), which would be used for on-orbit control of DOD satellites, and a Shuttle Operations and Planning Center (SOPC), which would be used for the planning and control of DOD missions on the Space Shuttle. , the SOPC was canceled in 1987, leaving the CSOC with one mission--that of satellite control. The CSOC came on line gradually, starting in 1989. It successfully completed Initial Operational Test and Evaluation in August 1993 and was turned over to Air Force Space Command the following month.

The hardware and software used in the AFSCN has undergone numerous upgrades in the last three decades. One of the most significant upgrades was the Data Systems Modernization program, which introduced new computer hardware and software to perform command and control of orbiting satellites. The program was initiated in 1980, and by February 1992, the new hardware and software was able to perform all functions needed to support the satellites then in orbit. The new system was more reliable than the old one, cheaper to maintain, and faster in its operation, allowing it to support a steadily increasing satellite support workload.

Another significant upgrade was the Automated Remote Tracking Station (ARTS) program, which introduced new, modern equipment at the tracking stations. The contract for Phase I of the ARTS program was awarded in 1984 and the contract for Phase II in 1988. The Phase II contract expired in March 1995, and by that time, ARTS equipment had been installed at all the existing tracking stations and had been used to establish new tracking stations at Colorado Springs and on the island of Diego Garcia. The new equipment offered improved reliability, increased the operational capacity of the tracking stations, and automated many of the functions they performed. Automation and improved reliability reduced the manpower required to operate and maintain the tracking stations and reduced operation and maintenance costs.

In 1975, SAMSO began to develop an advanced concept for a follow-on antisatellite weapon system that would not use nuclear warheads. The most promising technology employed a miniature homing vehicle launched into space by a two-stage missile released from an F-15 fighter. The miniature vehicle used a longwave infrared sensor to acquire its target, steered toward the target by selectively firing small rocket motors, and destroyed the target by force of impact. The system was known as the Air-launched ASAT, and it achieved a high degree of technological success. Its first free-flight test took place successfully in January 1984. In September 1985, the ASAT was successfully tested against an orbiting satellite, which it destroyed by impact. Despite further successful tests, the Air-launched ASAT program was terminated by the Air Force in March 1988 because of budgetary constraints and Congressional restrictions.

In 1983, DOD began work on developing a national defense against ballistic missiles. Originally, the effort was known as the Strategic Defense Initiative (SDI) and was directed primarily at strategic missiles launched by the Soviet Union. By the early 1990s, the Cold War was winding down, and certain third world countries were posing a new threat, exemplified by the Scud missiles launched by Iraq in the Persian Gulf War of 1991. In response to the change in circumstances, the missile defense effort was redirected toward a more limited protection of U.S. territory, troops and allies from the more limited threat posed by third-world ballistic missiles. The new overall concept was called Global Protection Against Limited Strikes (GPALS), and the Strategic Defense Initiative was renamed Ballistic Missile Defense (BMD).

Included under the umbrella of SDI, and later BMD, were programs for surveillance systems to detect and track enemy missiles and for directed and kinetic energy weapons to destroy those missiles. Funding and direction for these programs came from OSD's Strategic Defense Initiative Organization (SDIO), later renamed the Ballistic Missile Defense Organization (BMDO). Space Division was involved in the earliest studies and continued to execute the major programs assigned to the Air Force. In August 1987, the Defense Acquisition Board selected three of SSD's programs for demonstration and validation: the Boost Surveillance and Tracking System, which would track enemy missiles in the early phase of their ballistic trajectory; the Space Surveillance and Tracking System, which would track them in the mid-course phase of their ballistic trajectory; and the Space-Based Interceptor, an orbiting, rocket-propelled weapon system that would destroy enemy missiles by impact. These systems were expected to become part of the first phase of a Strategic Defense System. As the overall concept for that system evolved, the three programs were affected in different ways.

Partially successful hover test of a laboratory model of the Space-Based Interceptor (SBI), conducted at the Air Force Astronautics Laboratory, Edwards AFB, California, in November 1988. This pre-prototype interceptor was demonstrated successfully in three series of SBI hover tests at the Astronautics Laboratory. The first series tested the interceptor's guidance and propulsion systems. The second series demonstrated the ability of the interceptor's integrated seeker assembly to lock on to a thrusting rocket plume and then shift its aimpoint from the hot, bright plume to the relatively cold, dim body of the rocket. This was a critical and previously unsatisfied requirement for any anti-ballistic-missile weapon system using infrared seekers. The last hover, the only one in the third series, took place in April 1992. It tested a vehicle that was partially miniaturized and much closer in weight to an operational interceptor. The hover accomplished almost all of its objectives despite an anomaly late in the test. The SBI pre-prototype interceptor became the pre-prototype for SDIO's preferred space-based weapon system, Brilliant Pebbles, which was terminated in 1994 for lack of funding.

The Space-Based Interceptor (SBI) system was to consist of groups of interceptors housed in orbiting modules with housekeeping and battle functions. In 1990, the SDIO decided to pursue an alternate system based on a weapons concept called Brilliant Pebbles--many highly autonomous interceptors floating independently in orbit. Development of Brilliant Pebbles was transferred from the BMDO to SMC in FY 1993. By that time, , the program was being cut back, and it was terminated in 1994 as interest shifted away from defense against strategic missiles and toward defense against theater ballistic missiles launched by third-world countries. In August 1994, OSD approved a concept for a Boost Phase Interceptor (BPI) that would respond to the new threat. It endorsed a BPI technology demonstration led by the Air Force, and SMC was to manage the program and acquire the BPI missile. Congress appropriated funding for the BPI for 1995, but future funding support from the Air Force and BMDO appeared uncertain.
The SDIO's decision to replace the SBI system with a system using many highly autonomous interceptors affected the Boost Surveillance and Tracking System (BSTS) as well as SBI. Independent targeting capabilities to be incorporated into each autonomous interceptor reduced SDIO's requirements for separate systems of sensors such as BSTS, and management of BSTS was e transferred to the Air Force. As an Air Force program, the system would improve upon and replace the existing DSP system. It would detect and track enemy missiles but would not have to provide extremely accurate targeting information that would allow kinetic or directed energy weapons to shoot the missiles down.

After being transferred to the Air Force, BSTS was renamed the Advanced Warning System (AWS) and then the Follow-on Early Warning System (FEWS). In November 1993, the FEWS program was canceled and replaced with a cheaper alternative called the Alert Locate and Report Missiles (ALARM) program. Before the ALARM program could really get started, , it was replaced in its turn by the Space-Based Infrared System (SBIRS). SBIRS was to be an integrated missile warning system that would support several missions--missile warning, missile defense, battlespace characterization, and technical intelligence--and it was to consolidate various infrared systems into a single architecture and employ constellations of different satellites in different orbits--geosynchronous, elliptical, and low earth. OSD approved the plan for SBIRS in November 1994 and soon approved the program's entry into the early phase of development. SMC awarded contracts in August 1995. The program's rapid first steps occurred through one of the earliest and most thorough applications of the Air Force's initiatives in streamlined acquisition reform.

The space systems acquired by SMC's predecessors during the 1970's and 1980's proved their worth in the Persian Gulf during 1990 and 1991, when the US and its allies mounted Operation Desert Shield and Operation Desert Storm in response to the Iraqi invasion of Kuwait. Once sufficient ground terminals were brought into the region, DSCS was able to supply 84 percent of the super high frequency, long haul, intertheater communications required to support operations, and it supplied much of the short range, intratheater communications as well. The GPS Program Office made emergency buys of Small Lightweight GPS Receivers (SLGRs), and SLGRs and other kinds of GPS user equipment made a significant contribution to Desert Shield/Desert Storm, helping ground troops find their way around the desert, helping naval vessels map mine fields and navigate through them, and helping Air Force and Navy aircraft deliver their weapons more accurately. DMSP quickly procured a new weather terminal--the Rapid Deployment

Imagery Terminal (RDIT)--to support American forces in the Gulf, and older weather terminals (Mark IV's, SMQ-10's, and SMQ-11's) were deployed to the Middle East in support of Desert Storm. They provided commanders with high resolution, near real time weather information that was very helpful in planning air and ground operations. Finally, DSP played a significant role during Operation Desert Storm, when it detected short-range Scud missiles that Iraq fired at targets in Israel and Saudi Arabia.

Lieutenant General Donald L. Cromer, Commander of SSD at the time, pointed out that Desert Storm was the first space war--the first war in which space systems were used by operational commanders and integrated into their daily decision-making processes. This, in turn, influenced the attitude of military leaders toward space. Previously, said General Cromer, "space people used to be pushed off to the side. We had to fight for everything. We had neither understanding nor strong support for all the things that space could do for the Air Force." As a result of Desert Shield/Desert Storm, , commanders acquired a new appreciation of the value of space systems. In the General's words, "Operations Desert Shield and Desert Storm will be a water shed for recognizing that space is as much a part of the Air Force and military infrastructure as the airplanes, tanks and the ships. . . . All future wars will be planned and executed with that in mind." As SMC began its fifth decade, e, it could take pride in the fact that space systems had finally come into their own, and their importance could only increase in the future.

USAF Releases Rocket Engine Prototype RFP —Marc V. Schanz The USAF Space and Missile Systems Center released a formal request for proposals on June 2, seeking prototype ideas for new rocket engine systems. The RFP is part of the service's plan to wean itself off of the Russian-produced RD-180 engine, which is used on United Launch Alliance's Atlas V rocket, and establish a domestic launch market. USAF will award a "portfolio of investments" on a rolling basis in as many as four "rocket propulsion system" solutions, each of which will last between 12 and 18 months, and will build a foundation for establishing competitive domestic launch systems and secure launch service commitments, states the release. At the same time, USAF will continue competing launch service contracts to "certified providers who demonstrate the capability to design, produce, qualify, and deliver launch systems and provide the mission assurance support required to deliver national security space satellites to orbit," the announcement states. USAF certified SpaceX for national security space launches, after a two-year review period, late last month. SMC Commander Lt. Gen. Samuel Greaves said the goal is to have two or more domestic commercially viable launch providers to meet National Security Space needs, which he said is "essential in order to solidify US assured access to space, transition the [Evolved Expendable Launch Vehicle] program away from strategic foreign reliance, and support the US launch industry's commercial viability in the global market," he said. 2015

A United Launch Alliance Atlas V rocket blasted off from Cape Canaveral AFS, Fla., at 11:05 a.m. on May 20, carrying the X-37B Orbital Test Vehicle, according to a May 20 release. The launch marked the fourth time the unmanned space plane has deployed into low earth orbit, with all four missions launched aboard an Atlas V rocket. The current X-37B mission carries important new USAF experiments on board, such as the Hall thruster, which will be used to improve similar units onboard Advanced Extremely High Frequency communication satellites. Service officials have said USAF plans to continue using the spacecraft to test reusability concepts in space. The launch also marked the 83rd successful launch of the Evolved Expendable Launch Vehicle, noted Space and Missile Systems Center Commander Lt. Gen. Samuel Greaves in a statement. The AFSPC-5 mission also included 10 CubeSats on the rocket's Centaur upper stage, a collaboration between SMC and the National Reconnaissance Office. Col. Thomas Falzarano, the 45th Operations Group commander, who served as the launch decision authority for the mission, thanked the Patrick AFB and Cape Canaveral teams for the launch success of the "very important mission" in a May 20 release. 2015

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Air Force Historical Research Agency. U.S. Air Force. Maxwell AFB, AL.
The Institute of Heraldry. U.S. Army. Fort Belvoir, VA.
Air Force News. Air Force Public Affairs Agency.