NASA Facts

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Greenbelt, Maryland 20771

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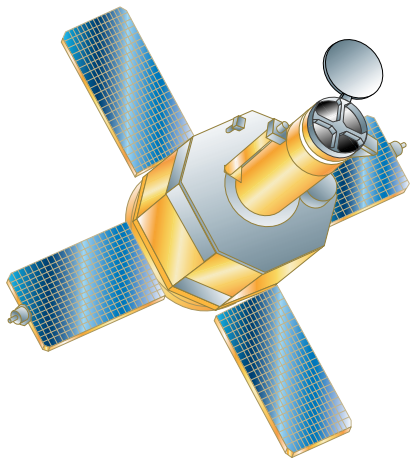
NASA's Small Explorer Program: Faster, Better, Cheaper

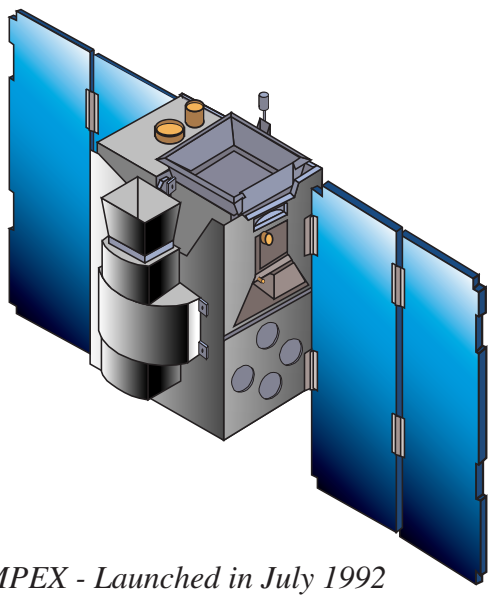
NASA's Small Explorer (SMEX) Program is comprised of a series of small, quickly developed, relatively low-cost missions. The program has produced spacecraft with extraordinary performance while fully embracing the essence of "smaller, faster, cheaper." Since its inception in 1988, the SMEX Program has worked to provide frequent flight opportunities for highly focused and relatively inexpensive space science missions in the disciplines of astrophysics and space physics. In spite of their small size, SMEX missions investigate some of the most important questions raised in these two areas. The program conducts focused investigations which probe conditions in unique parts of space, complement major missions, prove new scientific concepts or make significant contributions to space science in other ways.



TRACE is scheduled for launch in 1998

The first SMEX mission, the Solar Anomalous and Magnetospheric Explorer (SAMPEX), has accumulated over 5 1/2 years of successful on-orbit observations. The second mission, the Fast Auroral Snapshot (FAST) has accumulated over 1 1/2 years of successful on-orbit operations. The third SMEX mission, the Submillimeter Wave Astronomy Satellite (SWAS), is ready and awaiting launch on a Pegasus XL launcher. The fourth SMEX mission, the Transition Region and Coronal Explorer (TRACE) is preparing for launch in March 1998. The fifth mission, the Wide-Field Infrared Explorer (WIRE), is in integration and test, preparing for launch in September 1998.

The program is unique in that it is multi-mission. A team has been formed and continues to work together across several mission boundaries. Mission developments are overlapped such that the program can provide a launch opportunity every year. The missions are intended to be developed for flight in approximately 3 1/2 years. The program is structured to accept increased risk to mission suc-



SAMPEX - Launched in July 1992

cess in order to achieve reduced costs and a high flight rate. By having a short development time, the SMEX missions also provide training opportunities for NASA's next generation of scientists and engineers.

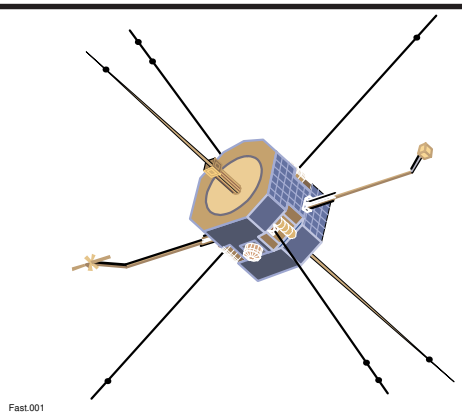
The SMEX program is managed by the Engineering Directorate of the Goddard Space Flight Center in Greenbelt, Md., for NASA's Office of Space Science. The project manager for SMEX is Jim Watzin. Project scientists are selected individually for each SMEX mission.

The Small Explorers are part of NASA's Explorer Program which since 1958 has launched small and moderate-sized science mission payloads into space. The launch of the Japanese Solar-A mission in August 1961 started a string of very successful U.S. and cooperative-international scientific space missions which are part of the Explorer Program. Explorer missions have served both to pioneer new fields of space science and to investigate in detail one particular aspect of science.

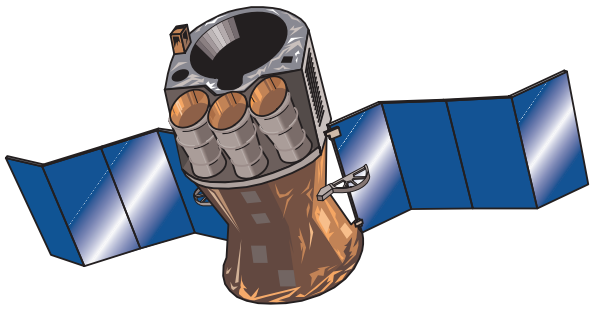
Current and past Small Explorer missions include:

• **Solar, Anomalous, and Magnetospheric Particle Explorer (SAMPEX) -** Since its launch July 3, 1992, on a Scout rocket from Vandenberg Air Force Base, Calif., SAMPEX has been successfully investigating the composition of local interstellar matter and solar material, and the transport of magnetospheric charged particles into the Earth's atmosphere. Dr. Glenn Mason, University of Maryland, is the principal investigator for SAMPEX.
Dr. Dan Baker, formerly of the Goddard Space Flight Center, served as the NASA Mission scientists. The 350 pound (161 kilogram) spacecraft was placed in a 344 mile by 422 mile, 82 degree inclination orbit. For more information about this project, visit the SAMPEX home page at the following address:
http://sunland.gsfc.nasa.gov/smex/sampex/

• **Fast Auroral Snapshot** (FAST) **Explore**r - FAST was launched August 21, 1996, on a Pegasus XL from the Air Force's Western Range at Vandenberg Air Force Base, Calif. FAST has probed the physical processes that produce aurora, those dazzling displays of light that appear in the upper atmosphere in the Earth's polar regions. In studying these processes, FAST complemented investigations carried out simultaneously by missions of the International Solar Terrestrial Physics program.



FAST - Launched in August 1996



SWAS is scheduled for launch early in 1999
SWAS.001

Dr. Charles W. Carlson, University of California, Berkeley, is the principal investigator for FAST. Dr. Robert Pfaff from the Goddard Space Flight Center serves as the NASA mission scientist. The 422 pound (192 kilogram) spacecraft was placed in a 218 mile by 2,625 miles, 83 degree inclination orbit. For more information about this project, visit the FAST home page at the following address:
http://sunland.gsfc.nasa.gov/smex/fast

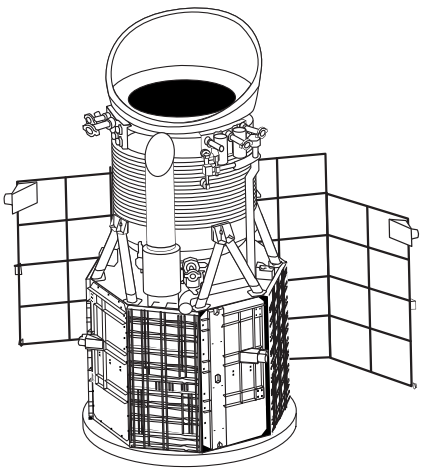
• **Submillimeter Wave Astronomy Satellite (SWAS) -** SWAS is scheduled for launch in January 1999 on a Pegasus XL rocket to be released from an L-1011 jet at the Air Force's Western Range on Vandenberg Air Force Base, Calif. SWAS will provide the first look at the water and molecular oxygen thought to dominate the chemistry of interstellar clouds, and at carbon monoxide and atomic carbon, which are believed to be major reservoirs of carbon in these clouds. The principal investigator is Dr. Gary Melnick, of the Harvard-Smithsonian Astrophysical Observatory, Cambridge, Mass. Dr. Melnick heads a team of 11 co-investigators from institutions across the U.S. and Cologne, Germany. Dr. Gordon Chin from Goddard serves as the NASA mission scientist. The 622 pound (282 kilogram) spacecraft will be placed in a 375-mile circular, 70 degree inclination orbit for two years of operation. For more information about this project, go to the SWAS home page at the following address:
http://sunland.gsfc.nasa.gov/smex/swas/

The fourth and fifth missions in the SMEX series are the **Transition Region and Coronal Explorer (TRACE)** and the **Wide-Field Infrared Explorer (WIRE)**. They are nearing completion and preparing for launches in March 1998 and September 1998, respectively.

• The TRACE mission will observe the Sun to study the connection between its magnetic fields and the heating of the Sun's corona. Dr. Alan Title of the Lockheed Martin Advanced Technology Center in Palo Alto, Calif., is the principal investigator. His team includes 13 other scientists from the United States, Sweden, the United Kingdom and the Netherlands. TRACE is scheduled for launch in March 1998. NASA mission scientist for TRACE is Dr. Richard Fisher also from Goddard. A Pegasus XL launch vehicle will lift the spacecraft into orbit after being released from a L-1011. The 465 pound (211 kilogram) spacecraft will be placed in a 360-mile (600 kilometer) Sun-synchronous orbit for its one year of operation. For more information about this project, visit the TRACE home page at the following address:
http://sunland.gsfc.nasa.gov/smex/trace

• The WIRE mission is currently scheduled for launch in September 1998. Once lifted into space by a Pegasus XL rocket, the explorer will study the evolution of starburst galaxies and search for protogalaxies. WIRE was proposed by Dr. Perry B. Hacking of NASA's Jet Propulsion Laboratory/Jamieson Science and Engineering in Pasadena, Calif., with co-investigators from the Cornell University, JPL, California Institute of Technology and Ball Technologies. The instrument

consists of a cryogenically-cooled, 30-centimeter imaging telescope which will detect faint astronomical sources in two infrared wavelength bands. NASA mission scientist for WIRE is Dr. Harvey Moseley also from Goddard. The 595 pound (270 kilogram) spacecraft will be placed in a 292-mile (540 kilometers), 97 degree inclination, Sun-synchronous orbit for its four months of operations. For more information about this project, go to the WIRE home page at the following url:
http://sunland.gsfc.nasa.gov/smex/wire



WIRE - Scheduled for launch in 1998