Launchlog '87: Inching back into space

At the beginning of 1986, NASA announced plans for the year to include the most ambitious launch schedule in its history — as many as 25 missions, including 10 by space shuttle and 15 by "expendable launch vehicles" (ELVs). The first, by the shuttlecraft Columbia, was a success. Then Challenger exploded. On the next attempt, an "old reliable" ELV called a Delta had to be destroyed from the ground when its main engine shut off prematurely (and that was only two weeks after an Air Force Delta ELV had blown up in mid-ascent). NASA conducted only three more launchings in 1986, all with ELVs, and all of them worked.

This year, the agency plans ony six launchings, the number it actually ended up with out of last year's scheduled 25, and fewer than it had previously attempted since 1958, when NASA was born. None of the six payloads, furthermore, will be NASA's own. Four are military, one a weather satellite for the National Oceanic and Atmospheric Administration (NOAA) and the other a communications satellite for the government of Indonesia.

The first of the lot, scheduled to be sent up on Feb. 19, will be NOAA's GOES-H, which will be renamed GOES-East (after it is successfully launched) and stationed over the Atlantic Ocean. When that happens, the single GOES now aloft will be shifted to the Pacific region as GOES-West.

GOES-H will be launched by a Delta rocket, similar to the one that had to be destroyed last May 3 and in the process destroyed its payload, GOES-G. Confirmation that Deltas are ready to fly again comes from the fact that, four months after the GOES-G debacle, another Delta took off and successfully deployed a target for a test of the Defense Department's Strategic Defense Initiative (SDI) program.

NASA's second 1987 launching is scheduled for Feb. 26, only a week after the first. This time an Atlas-Centaur rocket, which had no 1986 mishap, will carry the latest addition to the U.S. Navy's Fleet Satellite Communications series, FLTSATCOM F-6. To be used not only by the Navy but also by the Air Force and other Defense Department customers, it will be part of a program to have three second-generation FLTSATCOMs working in orbit at the same time.

The next launching is set for one month later, on March 19, this time with another Delta rocket, carrying Indonesia's Palapa B2-P communications satellite.

Then comes FLTSATCOM F-8, at present listed for May 21, again riding atop an Atlas-Centaur rocket.

The other kind of NASA rocket that successfully put a payload in orbit last year was the smaller Scout, which on that occasion carried a satellite named Polar BEAR, for Polar Beacon Experiment and Auroral Research (SN: 12/6/86, p.361). This year's Scout will carry a pair of satellites together known as SOOS-2, for Stacked Oscars on Scout. Not to be confused with the OSCAR amateur-radio satellites (though some NASA officials have been known to make that mistake), SOOS-2 is a brace of navigation satellites for the Navy, of which a previous stack was launched in August 1985. Scheduled for September, it will also be NASA's only 1987 launching from the West Coast, using Vandenberg Air Force Base in California instead of Florida's Cape Canaveral.

The sixth and last NASA launch of the year is to be another test in the SDI program, and again lofted by a Delta. This will be the second of four planned Delta launches in this series.

NASA has not yet announced its schedule of ELV launches for 1988, but drawing more attention than any of them is expected to be the return to flight of the space shuttle. The agency's target date is Feb. 18, 1988, but officials stoutly maintain that the shuttle will not fly until its safety is assured, and it is not yet clear whether that date will turn out to have been overly optimistic. *— J. Eberhart*

Strings that blow bubbles in the cosmos

How the galaxies and clusters of galaxies formed in a universe where matter was smoothly and homogeneously distributed in the beginning is one of the great questions of cosmology. Cosmic strings, which are topological defects in the structure of space, are the latest things to be suggested as triggers of galaxy formation.

One recent theory proposes that the strong gravitational forces exerted by the strings gather matter around them and so start galaxy formation (SN: 5/12/84, p.294). A newer theory, by Jeremiah P. Ostriker, Christopher Thompson and Edward Witten of Princeton (N.J.) University, proposes just the opposite. Electromagnetic radiation from the strings, they suggest, blows bubbles in the primordial matter, compressing it in sheets between the bubbles so that galaxies form in the bubble walls.

In the view of modern cosmologists, space has properties similar to those of matter. It can be stretched, compressed, curved and twisted. It can also undergo phase changes analogous to freezing or boiling, and those phase changes can leave behind topological defects like the defects and dislocations that sometimes occur when crystals form. In the case of space, these defects are strings that form closed loops. These strings generate strong gravitational effects.

The new theory, as Witten described it recently at the 13th Texas Symposium on Relativistic Astrophysics in Chicago, proposes that the strings can also carry electric currents and generate strong electric and magnetic effects. The currents are formed by extremely heavy subatomic particles, of varieties yet unknown to experiment, with which the strings are endowed at their formation. If primordial magnetic fields exist, they can start these particles moving as electric currents inside the strings, and the currents are supercurrents — once started, they persist forever.

The strings also vibrate as if they had been plucked. As vibrating electric currents, they emit electromagnetic radiation at an extreme rate — for one typical string about 10,000 times as much as a bright quasar. The electromagnetic radiation couples to the matter surrounding the string and pushes it away, blowing a bubble in the cosmos. A lot of such strings blowing bubbles produces a froth in which the matter is compressed into narrow walls between the bubbles, and there galaxies and clusters form. This picture corresponds to, and may explain, an observation of a slice of the universe reported about a year ago by Valérie de Lapparent of the University of Paris and the Ecole Normale Supérieure in Paris, and Margaret Geller and John P. Huchra of the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass. (SN: 1/18/86, p.38).

The current in a given string has an upper limit, and when the limit is reached, the string begins to expel charged particles. If they belong to the class of particles called fermions, as Christopher Hill of Fermi National Accelerator Laboratory in Batavia, Ill., describes it, they will decay into a burst of very energetic particles. This burst, according to Hill, will consist of a mixture of charged particles, photons, neutrinos and particles yet unknown, with energies on the order of 10^{15} billion electron-volts.

Such bursts would be rare and come from long distances, more than 100 megaparsecs away. A detector might expect to record one per square kilometer of detecting surface per century, but there is a hope of detecting them with terrestrial equipment such as the Fly's Eye telescope in Utah.

If such an observation ever succeeded, astrophysicists would have evidence for the existence of superconducting cosmic strings. Furthermore, if such expulsion and creation of particles by cosmic strings really goes on, it could contribute a sizable amount to the total of dark matter that cosmologists think the universe needs in order to make it closed.

— D. E. Thomsen