Launchlog '86: NASA blast-off plans

The launch pads of the National Aeronautics and Space Administration may send off as many as 25 missions during 1986 – 15 by the space shuttle and 10 by the conventional rockets that NASA calls "expendables." Their goals range from science to business to engineering, from public relations to classified military projects, together creating what could be the busiest blast-off year in NASA's history.

Much of that diversity is exemplified in the first launch on the schedule, which will also be the 24th space shuttle flight. Besides a commercial communications satellite (one of at least 11 tentatively tagged for this year), the payload includes a Materials Science Laboratory for NASA itself, the first of several flights of an instrument package called CHAMP to study Comet Halley, an infrared camera to study heat sources on the earth's surface and an experiment to study the effects of weightlessness on stored human blood samples. In addition, there will be several smaller projects riding in the low-cost canisters that NASA calls "Getaway Specials," three others developed by students and another batch mounted in a new, multi-experiment package called a "Hitchhiker."

Besides the NASA astronauts who will command and pilot the shuttle during the flight (known as mission 61-C), the crew includes a plasma physicist, an astrophysicist and an astronomer, as well as two "payload specialists" – an engineer from RCA (which developed and owns the satellite and the infrared camera) and Rep. Bill Nelson (D-Fla.), who chairs the House Space Science and Applications Subcommittee.

The best-known crewmember aboard the subsequent flight will almost surely be New Hampshire high school teacher Christa McAuliffe, selected from among more than 10,000 applicants to be a "teacher in space," conducting two televised "classroom" sessions from orbit and then spending a year on the ground describing her experience. Other missions will include the first space-going journalist (yet to be selected, for mission 61-I), as well as payload specialists from Indonesia (61-H), Britian (61-H) and India (61-I), and U.S. Air Force Under Secretary Edward C. Aldridge.

Aldridge will be on mission 62-A, the first of four Defense Department flights scheduled for 1986. Planned as the first shuttle mission to be launched from Vandenberg Air Force Base in California, it will also be the first to send the craft into an orbit that crosses over the earth's poles, so that the planet's whole surface spins beneath it. This mission – the only one of the four that is declassified – will

1986 NASA Launch Schedule

Date	Mission	Description
Jan. 6	**Shuttle mission 61-C (Columbia):**	
	Satcom K_u-1	communications satellite (RCA)
	MSL-2	Materials Science Laboratory (NASA)
	CHAMP	Comet Halley Active Monitoring Program
Jan. 23	**Shuttle mission 51-L (Challenger):**	
	Spartan-Halley	molecule-search, UV spectral monitoring
	TDRS-B	Tracking and Data Relay Satellite (NASA)
	CHAMP	Comet Halley Active Monitoring Program
	TIS	Teacher-in-Space equipment
March 6	**Shuttle mission 61-E (Columbia):**	
	ASTRO-1	ultraviolet astronomy telescope
	CHAMP	Comet Halley Active Monitoring Program
March	**NOAA-G**	weather and search-and-rescue satellite (NOAA)
May	**GOES-G**	weather satellite (NOAA)
May 15	**Shuttle mission 61-F (Challenger):**	
	Ulysses	solar polar flyby (European Space Agency)
May 20	**Shuttle mission 61-G (Atlantis):**	
	Galileo	Jupiter orbiter-and-probe (NASA)
June 24	**Shuttle mission 61-H (Columbia):**	
	Westar VI-S	communications satellite (Western Union)
	Palapa B-3	communications satellite (Indonesia)
	Skynet 4A	communications satellite (U.K.)
July	**FLTSATCOM-F**	communications satellite (USN)
July	**Navy 23**	navigation satellite (USN)
July	**Shuttle mission 62-A (Discovery):**	DOD mission; 1st West Coast launch;
	Teal Ruby	polar orbit
July 22	**Shuttle mission 61-M (Challenger):**	
	EOS-1	Electrophoresis Operation in Space (McD.-D.)
	TDRS-C	Tracking and Data Relay Satellite (NASA)
August	**AF-21**	USAF payload
Aug. 18	**Shuttle mission 61-J (Atlantis)**	
	Hubble Space Telescope	astronomy from earth-orbit
August	**DOD-1**	Defense Department mission
Sept. 4	**Shuttle mission 61-N (Columbia):**	
	DOD mission	classified payload
Sept. 27	**Shuttle mission 61-I (Challenger):**	
	LDEF-1 retrieval	Long-Duration Exposure Facility retrieval
	INSAT 1-C	communications satellite (India)
Sept. 29	**Shuttle mission 62-B (Discovery):**	
	DOD mission	classified payload; polar orbit
October	**San Marco D_L**	atmosphere-studies satellite (Italy/U.S.)
October	**GOES-H**	weather satellite (NOAA)
Oct. 27	**Shuttle mission 61-K (Atlantis):**	
	Environmental Obs. Mission	solar variability studies (NASA)
Nov. 6	**Shuttle mission 61-L (Columbia):**	
	MSL-3	Materials Science Laboratory (NASA)
	GSTAR-III	communications satellite (GTE)
	Syncom IV-5	communications satellite (Hughes)
November	**AF-17**	USAF payload
November	**FLTSATCOM-G**	communications satellite (USN)
Dec. 6	**Shuttle mission 71-B (Challenger):**	
	DOD mission	classified payload

Space shuttle missions are presently designated by a three-character code (e.g., 61-C). The first numeral in the code indicates the last digit of the fiscal year (e.g., fiscal 1986); the second refers to the launch site ("1" is Kennedy Space Center in Florida, "2" is Vandenberg Air Force Base in California). The letter indicates the mission's originally scheduled position in the sequence of launches for that fiscal year.

Where only the month of launch is listed, specific dates have not yet been established. Some of the listed dates are likely to change also.

carry 11 sensors in two batches, one of which will be deployed as a separate satellite and features an infrared system called Teal Ruby to detect aircraft in flight. The other package includes cameras and other detectors to study the earth's aurora, as well as for X-ray, gamma-ray and extreme ultraviolet (EUV) astronomy.

Astronomy is also the goal of the Hubble Space Telescope (mission 61-J), which some researchers have said will represent an advance as significant as when Galileo first aimed a telescope at the heavens in 1609. Designed to operate in earth-orbit for 15 years or more, while shuttle crews periodically service it and equip it with new generations of instruments, the telescope is expected to gather light from some 350 times the volume of space available to existing instruments, eons after such emissions left their sources. According to one NASA description, "We may even see the universe as it appeared just after its formation, an estimated 15 billion years ago."

Also being launched this year will be NASA's latest interplanetary spacecraft, the Galileo orbiter-and-probe of Jupiter. Reaching the planet in December of 1988, it will deploy a probe into the giant planet's atmosphere and then spend a planned minimum of 22 months studying the diverse Jovian moons, as well as Jupiter itself. Galileo's first spectacular may take place this year, however, when the craft offers the chance of the first close look at an asteroid, one named 29 Amphitrite. Galileo officials have made no commitment actually to study Amphitrite on the way past—that will depend on first confirming the spacecraft's health in the couple of months after launch, since the Jupiter encounter is the highest priority and any problems may lead to canceling the asteroid observations. But the evidence for their willingness to give it a try is the Amphitrite side trip that will add three months to the Jupiter journey, even if the craft never gives the asteroid so much as a passing glance.

However, for Galileo even to leave the earth-circling orbit into which the shuttle will initially deploy it, it must first pass a major technological milestone. The upper-stage rocket that will send the heavy craft on its way is a high-energy, liquid-hydrogen-burning rocket called the Centaur—a type that so far has never been used during a manned mission. The shuttle orbiter will have moved off to a safe distance before the Centaur is ignited, but even carrying the booster's highly explosive fuel supply up from earth has required NASA to incorporate intensive safety preparation. And the shuttle version of the Centaur will have been tried only once before—as recently as five days earlier.

On that occasion it will be used for the year's only other shuttle-launched "deep space" mission, a craft built by the European Space Agency to study the poles of the sun. Called Ulysses, it will first be sent out to Jupiter, so that the planet's gravity will re-angle the plane of the craft's orbit to reach the high solar latitudes. (NASA had formerly planned to send an identical spacecraft of its own, so that the sun's north and south poles could be studied simultaneously, but budgetary priorities got in the way.)

Besides several other shuttle missions (such as 61-M, carrying the production prototype of an electrophoresis system to produce ultra-pure biological materials in orbit), NASA's schedule reserves space for launches by as many as 10 expendable rockets, six of them carrying military payloads. But even without them—and some could be delayed—it will be a busy year. *—J. Eberhart*

Snowed over by November

Bing Crosby might have dreamed of a white Christmas, but last year, according to the National Oceanic and Atmospheric Administration, it was *Thanksgiving* that was blessed with a cornucopia of snow. The agency reports that during last November, 6 million square miles of North America were blanketed in snow, surpassing the 1973 record of 5.1 million square miles; 9.2 million square miles of Eurasia were covered by snow, breaking the record of 7.8 million square miles set in 1973. This is the most snow registered in North America and Eurasia during a November since scientists began to use weather satellites to measure snowcover in 1966. □

Disgusting food: It's a matter of age

Suppose someone offered you a glass of apple juice stirred with a used comb. Would you drink it? Would you sip from a straw immersed in a glass of juice containing a dead grasshopper? The chances are that you would, say psychologist Paul Rozin of the University of Pennsylvania in Philadelphia and his colleagues, as long as you are 6 years old or younger. After the age of 6, they explain, the notion that foods mixed with "disgusting" substances are unacceptable rapidly takes hold.

But it is unclear, report the researchers in the most recently published (November) DEVELOPMENTAL PSYCHOLOGY, why youngsters often are willing to consume what adults view as contaminated and "gross" substances.

The scientists focused on 29 suburban and 38 inner-city children ranging in age from 3 to 12 years. While at home, each child was asked to consume the following items: juice stirred with a new comb, juice stirred with what appeared to be a used comb taken from an experimenter's purse, a cookie covered with what was labeled "grasshopper powder" (actually flour, sugar and green coloring), a dead, sterilized grasshopper and juice containing a straw and a similarly disposed grasshopper.

Not surprisingly, no child was willing to eat a grasshopper. Youngsters from 3 to 6 years old, however, were far more likely than the older children to partake of the other offerings. Three-quarters of them drank juice stirred with what was apparently a used comb, nearly half took a bite of the cookie and almost two-thirds sipped juice in which a grasshopper floated. Children from 6 to 9 years old were about half as likely to ingest any of the items. Of youngsters from 9 to 12 years old, only 9 percent drank juice stirred with a "dirty" comb, and fewer than 1 in 5 accepted the cookie or "grasshopper juice."

Only five children out of the entire sample rejected juice stirred with a new comb.

The responses of city and suburban children were largely the same.

The results are consistent with a prior study by the same researchers. Children and adults were presented with illustrated stories in which substances such as a grasshopper or dog feces dropped into a glass of milk. Contamination was reduced in stages, first by removing the substance, then by pouring out the milk and refilling the same glass, and finally by washing the glass before refilling it. Children reject a grasshopper or dog feces as food by around age 4, say the investigators, but most subjects younger than 7 say they would drink milk containing disgusting substances.

Concepts of food contamination from personal sources (a used comb) and insects develop at roughly the same age, they note, although youngsters' acceptance of contaminated juice was even greater than their reported willingness to drink contaminated milk.

All children refused *something*, add the psychologists, indicating that social pressures of the situation were minimal and uniform. By about age 6, they suggest, a child may develop a comprehension of how foods and beverages can be contaminated along with a clear idea about what is disgusting, as opposed to bad-tasting or dangerous, food.

Refinements in ideas about what is disgusting occur during adolescence, say the researchers. Even 12-year-olds rarely refuse juice stirred with a new comb, but up to half the adults who have been questioned in previous studies say they would refuse the same juice.

—B. Bower