OTS satellite: 5,4,3,2,1—poof

The nations of western Europe were on the verge of beginning intra-European television transmissions by satellite and of experimenting with telephone transmissions and high-speed data links for science and technology. The European Space Agency had prepared a satellite, the Orbital Test Satellite (OTS), which NASA was going to put in orbit for them on the evening of Sept. 13. The rocket carrying OTS-A left the pad at 7:31 p.m. and exploded about a minute off the ground.

Such a disaster is a rare occurrence. Sometimes when a space vehicle is launched, something will happen that makes injection into the desired trajectory difficult or impossible, but an explosion of the launch vehicle before the thing hardly gets off the ground almost never happens nowadays. In fact, the last two times the same type of launch vehicle (called Delta 3914) was employed, it quite successfully launched two RCA communications satellites. This was the second Delta 3914 assigned to OTS-A. The first had developed trouble with one of its solid-fuel strap-ons. However, Brian Stockwell, the ESA's project manager for OTS, says that he can see no connection between the two mishaps.

The next date at which a back-up vehicle could be launched is not for more than half a year—in late April 1978. This will delay the OTS programs, probably push off the European Communications Satellite (ECS), for which OTS is to be the test satellite, and force the payment of many millions of dollars in insurance. The back-up satellite, which already exists, was designed to serve either OTS or MAROTS, a European maritime communications satellite. The OTS program will use the back-up, and the MAROTS program will collect the insurance.

Among the programs now awaiting launch of the OTS back-up are two experiments in high-speed data transmission, one to serve the North Sea oil exploration program, the other to serve Europe's high-energy physics laboratories. According to an announcement from CERN, Western Europe's international physics laboratory, the Council of Ministers of the European Economic Community (the Common Market) has recently approved funding of 1.2 million Swiss francs for a ground station at CERN for use with OTS in transmitting data among CERN and three other laboratories—the Rutherford Laboratory in England, Saclay in France and DESY in Germany.

The need for such a program arises because, as high energy physics is organized in Europe, experiments are often set up in one laboratory (especially at CERN, which has the continent's most energetic equipment), but their data are analyzed in other laboratories. This makes it necessary for the computers that monitor the experiment to talk directly to computers in the distant laboratory. This can be done by land lines, but the ground transmission does not go as fast as the computers can process the data. The satellite program, called STELLA (Satellite Transmission Experiment Linking Laboratories), is expected to make the speed and will also test a new high frequency waveband (11-14 gigahertz) for such transmissions. The hope had been that STELLA would be operating by 1979. How much postponement will now be required is not yet clear. □

Potential cancer agents from within

Rapid, inexpensive tests have accelerated screening for chemicals likely to cause cancer. The most widely used test measures the effect of substances on the genes of bacteria. But such a test may miss cancer-causing chemicals that appear harmless until they are activated by reactions within a person's body. Other chemicals may appear dangerous, but might be made less toxic by biochemical reactions.

At the meeting of the American Chemical Society in Chicago last week, researchers reported results of experiments on chemicals after human internal processing. The new data emphasize links between cancer and both cigarette smoking and diet.

Bruce Ames, originator of the bacterial test, reports that urine from seven people, each smoking 15 to 44 cigarettes a day, shows changes in bacterial genes. Such a genetic effect has about a 90 percent correlation with the ability of a chemical to cause cancer in animals or people, according to work in several laboratories. Ames and Edith Yamasaki of the University of California at Berkeley find that the potency of the smokers' urine drops appreciably in a comparison between an evening sample and a morning sample (which follows 6 to 10 hours of nonsmoking). Urine from nonsmokers and smokers who do not inhale shows no mutagenic activity.

These experiments rely on a new method of concentrating the critical material found in urine, Ames and Yamasaki report in the August PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES. The investigators propose that urine testing should be able to detect unsuspected carcinogens among a large population of nonsmokers and could also be used to monitor special groups—such as people who dye their hair—that scientists suspect may be absorbing cancer-causing chemicals.

Mutation-causing chemicals show up not only in the urine of smokers, but also in feces of nonsmokers (feces of smokers have not yet been tested). "The feces of many normal humans do indeed contain mutagenic compounds, which may be carcinogenic," says William Robert Bruce of the Ontario Cancer Institute in Toronto. "While the source of the mutagenic compounds is not known, the fact that the food of our donors contained little measurable nitroso activity or mutagenic activity, when compared with the samples present in their feces, indicates that these compounds are made in the human body." Bruce compares the amount of mutation activity measured in the feces to that in two packages of cigarettes. The evidence so far suggests that nitroso compounds are responsible for the activity since they are present in feces, are strongly mutagenic and can be formed from food nitrogen compounds in the stomach or small intestine.

The amount of activity in feces varies among individuals. Feces from some people show 100 to 1,000 times the mutagenic activity of others. Bruce and colleagues are currently examining whether people who develop cancer have more than average mutagenic activity in their feces.

Diet also appears to influence the level of activity. For example, when volunteers decrease their fat consumption from 150 grams a day, typical of a western diet, to 50 grams a day, the level of mutations drops by more than a factor of two. This result is consistent with epidemiological studies that link high fat intake with cancer of the breast and colon. The level of mutagens drops similarly when subjects eat a tablespoon of bran or two grams of vitamin C daily. Vitamic C may inhibit the production of the nitroso compounds, Bruce says.

In addition to screening chemicals in the bacterial test, Ames and co-workers are now in the process of "digesting" the whole world's cancer literature, Ames said at the ACS meeting. The researchers want to make interpretation of animal tests quantitative, rather than just indicative of whether a chemical does or does not cause cancer. Ames says the result will be a Richter scale of cancer potency. So far the scale covers a range of one million: the mold product aflatoxin is one million times as potent as saccharin in giving experimental animals cancer. The researchers hope eventually to relate the number of mutations a chemical produces in a bacterial test to its potency as a carcinogen in animals and humans.

Both Ames and Bruce compare the current state of chemical screening, where more and more compounds are found to cause cancer, to the state of bacteriology around 1860. Then, more and more microorganisms were found to cause diseases. That frightening host of agents was eventually organized into recognizable groups, where they could be studied and often countered. The cancer researchers expect similar rules to emerge for carcinogens in the near future. In the meantime, Ames says that "every discovered carcinogen is better than an undiscovered carcinogen." □