report, the Department of Trade lacks a sense of urgency in negotiating international agreements on standards for oil tankers and controls to monitor the competence of crews. The hydrographic survey of shipping lanes around Britain is also inadequate. The report recommends that the government should extend the limit of territorial waters from three to twelve miles and that permission for oil drilling in areas of the North Sea designated environmentally important should be refused.

The brunt of the criticism, however, is reserved for contingency plans to cope with oil spills. Apart from divided responsibilities, the commission criticizes the emphasis put on the use of chemicals — themselves more dangerous to marine life than oil — for dispersing oil slicks on the open sea. More attention, it says, should be paid to coping with oil in harbours and on the sea shore. Local authorities should remain responsible for minor spills, especially those inshore, but a small permanent core of experts should be available nationally to coordinate clean-up operations and advise on major spills.

The commission rejects the government's proposal to set up local Coastal Pollution Coordination Centres when major spills occur, on the grounds that their remit to achieve concensus between interested bodies will render them ineffective. Instead, it recommends that the existing Marine Pollution Control Unit, responsible to the Department of Trade, should be revamped to take on the task. The unit's operations at sea should remain under the trade department but operations onshore should come under the responsibility of the Department of the Environment. **Judy Redfearn**

Indian satellites

November launch

New Delhi

India is hoping to launch its second Earth observation satellite, Bhaskara II, some time in November before it takes a major step in space communication technology when Indian National Satellite IA (INSAT IA) is launched in April 1982. Bhaskara II, an improved version of Bhaskara I, is now being transported to the cosmodrome at Volgograd in the Soviet Union for installation on board a Soviet launch vehicle.

Bhaskara I, launched on 7 June 1979, was expected to function for a year, but continued to operate normally until 1 August this year. The satellite achieved most of its goals in the process. Bhaskara II is to carry a two-band television camera for visible and near infrared imaging and a three-frequency radio meter operating at 19,22 and 31 GHz frequencies.

Meanwhile, INSAT IA is being prepared for launch on a Delta vehicle from Cape Canaveral in the United States. INSAT IA is a three-axis stabilized satellite like Apple, India's experimental communications satellite launched last June. INSAT IA is to be stationed in a parking orbit at longitude 74°E; this will facilitate nationwide television and radio broadcasting and long distance telephone connections during its seven years in orbit.

India's meterorological department is setting up a meteorological data utilization centre in Delhi, 110 data collection platforms on land and sea all over the country and 100 disaster warning sets in the coastal areas to operate in conjunction with the meteorological payloads to be provided by INSAT-IA. The telecommunications component will provide more than 8,000 two-way long distance telephone circuits, round-the-clock weather forecasting and mapping of the entire country.

INSAT-IA will be followed by INSAT-IB to be parked in the 94°E geostationary orbit.

The International Telecommunications Satellite Organization has agreed to increase by 12 per cent the capacities of the two Indian satellites to be placed in the geostationary equatorial orbit. This would make possible more intensive use of the telecommunications capacity of INSAT.

Sunil Saraf

Sun–comet collision

Extreme conditions

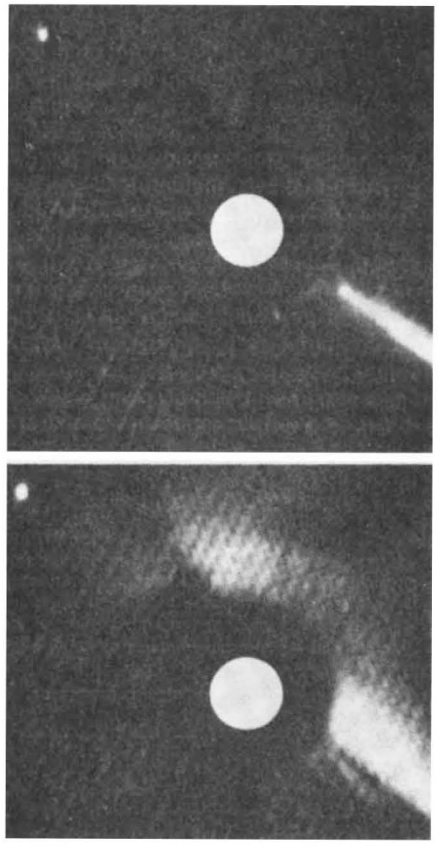
The first ever recorded collision between a comet and the Sun was detected by a US Air Force satellite in mid-1979, the Department of Defense has revealed. The news has only just emerged because the satellite experiments had been given low priority, and the data tapes have only just been analysed.

Dr Donald J. Michels, the Naval Research Laboratory scientist whose "Solwind" coronagraph detected the collision, estimates that the impact velocity was 640,000 miles per hour. But the orbit is not very well determined because the comet only appears on eight frames, covering 138 minutes, before it disappears behind the occulting dish of the coronagraph. A few hours later, a gigantic cloud of debris is visible extending a few million miles above the solar surface. The record continues for about 24 hours after the collision.

Michels' experiment was not designed to detect comets, but to collect data on coronal transients which might later be correlated with magnetic storms or aurora on Earth — phenomena which can interfere with missile warning systems. It consists of a one-inch telescope designed to give high rejection of scattered light. It is aimed at the Sun, with an occulting dish shadowing a region of about two and a half times the solar radius. Thus the apparatus did not detect the actual moment of contact on 30 August 1979, but only the approach of the comet and the coronal events after the collision.

The telescope — still in operation — records a white light image on a videcon tube, so there is no spectral information. But it is possible to extract some polarization information, Michels says.

Michels is not a cometary scientist, and to analyse the data he will work with Dr Zdenek Sekanina, an expert on cometary dust at the Jet Propulsion Laboratory, Pasadena.



A Sun-grazer comet collides with the Sun on 30 August 1979, observed by a US defence satellite. Above: the approach. Below: the debris. The Sun is obscured by an occulting dish to the equivalent of 2.5 solar radii, but the white disk indicates the Sun's position and size. Venus appears to left. Eleven hours separate the two pictures.

According to Sekanina, the most important missing factor is the cometary orbit. Without that it is difficult to analyse the three-dimensional motion of the dust and tail. So Michels has put out a request for other observers to check their data to see if there are any earlier pictures of the comet on the way to the Sun. So far they have had no success.

But even without the orbit it will be possible to learn something from the pictures, says Sekanina. The time evolution of the tail in the intense radiation environment close to the Sun should yield new data on dust particle sizes and composition. For instance, it would be interesting to estimate the distance from the Sun at which the particles start evaporating.

The collision is an extreme case, in extreme conditions, says Sekanina, and that is bound to reveal something.

Robert Walgate

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