

the light of competitive pressures from conventional television stations and cable television networks.

The commission is also expected to publish for comment a proposal for squeezing more domestic satellites into geosynchronous orbits, perhaps by reducing the separation of higher-frequency satellites from four to three degrees of longitude.

Such a change, says FCC, would allow the launch of an additional six satellites which had been promised to the commission, but which could not be authorized because of the shortage of available slots.

The launch of the 20 new satellites is likely to result in an increase from 160 to 612 in the number of satellite communications channels available by 1985. Each channel can transmit 1,000 telephone channels or a single television channel.

The new satellites will also create the first major challenge to the giant American Telephone and Telegraph Company (AT&T) in the field of long-distance communication. Two competing companies — General Telephone and Electronics Corporation and the Continental Telephone Corporation — are building their own satellites. AT&T, General Telephone, Southern Pacific Communications Corporation and Hughes Communications will each be constructing their systems for the first time, each having been given permission to build three satellites and launch two.

Local newspaper production could be revolutionized by plans that the Gannett Company is said to be developing for a national newspaper produced in Washington, but beamed to the presses of some of Gannett's 82 local newspapers.

Satellite transmission is already used by the *Wall Street Journal* to print seven editions simultaneously throughout the country. Although no official confirmation has been given of Gannett's plans, it is reported that the initial investment would be about \$100 million; some commentators have pointed out that setting up a single newspaper distributed throughout the country would provide Gannett with the opportunity to become a major voice in national affairs.

Comsat's plans for a satellite-based television network are included in a set of comments which the company has submitted to FCC as part of its preparations for the Region 2 Administrative Radio Conference of the International Telecommunications Union, due to be held in the summer of 1983.

Four satellites would be used to cover the United States, each covering a different time zone, with the most westerly satellite also broadcasting to Hawaii and Alaska. The service would be operated by Satellite Television Corporation, a newly-created subsidiary of Comsat. The market for direct-broadcast satellites is expected to be tested with the modification of two existing spacecraft designs.

David Dickson

Ariane development

More trouble

Ground tests of the principal rocket motors of Ariane, putative launch vehicle of the European Space Agency (ESA), have shown brand-new oscillations in the burn — and set the test programme back by a second three months.

Ariane's first test launch in late 1979 reached the planned trajectory, but the second — in May 1980 — ended moments after lift-off with a high frequency oscillation and loss of pressure in one of the first stage engines. A look back at the data for the first launch showed the same oscillation, but at low amplitude; and a re-run of the data accumulated during ground tests showed the same fault.

In October this year, ESA announced that the oscillations (at 2,300 Hz) could be cured by improving tolerances in the manufacture of the injectors, devices like a watering-can rose that mix the fuel and oxidant. This hypothesis will be tested at the end of this month, when new high precision injectors are tried for the first time. Meanwhile a new oscillation has appeared — at 2,700 Hz — and this sets in even with injectors that previously showed no sign of the vibration. While the 2,300 Hz problem "can be regarded as rectified" says ESA hopefully, the 2,700 Hz oscillation "is the subject of thorough investigation and action which still needs some time to complete".

Burn oscillations (called "buzz" or "screaming") are the *bête noire* of liquid fuel engine design and can destroy the engine if they reach high amplitude. One solution is completely to redesign the injector; another is to set Helmholtz resonators, tuned to the critical frequency, into the side of the combustion chamber in such a way as to absorb the oscillation energy.

Solutions such as this, however, verge on complete redesign of the engine — but this may be necessary in the end. The engines were originally designed for the French sounding rocket Diamant (in which similar instabilities were met and solved), but they

were stretched to the limit to meet Ariane's specification of 61 tonnes-weight thrust. The next series of engines, for a bigger Ariane, is based on a different design.

So it is seriously being questioned whether Ariane can meet its first commercial commitments: to launch the French MARECS B and SERIO 2 marine communications and meteorological satellites (which would go up together) and Intelsat V F6. These satellites, and the ESA X-ray astronomy satellite EXOSAT, were originally due for launch in 1981.

For the moment, ESA hopes to have the third test launch in June 1981, and the fourth in the autumn, beginning the commercial series later in the year. If, however, as some fear, the Ariane engines are inherently "marginal", redesign and retesting could take at least a year, and lucrative launch contracts might be lost to American competition. The lead that Ariane appeared to be establishing over the space shuttle — beset by its own problems but now believed to be running smoothly — is narrowing fast.

Robert Walgate

Halley missions

NASA to go?

Washington

Can the new US Administration be embarrassed into mounting a mission to Halley's comet when it passes through the Solar System in 1986? The proposal has already been passed to president-elect Ronald Reagan from scientists in his home state of California. They point out that the European Space Agency, the Soviet Union and Japan all have plans for separate Halley missions — and that for the United States not also to go would be a major blow to national prestige.

Revised plans for a Halley fly-by were developed earlier this year at the Jet Propulsion Laboratory (JPL) in Pasadena, run for the National Aeronautics and Space Administration (NASA) by the California Institute of Technology (Caltech). Following last year's rejection by the White House of a request for funds to develop an ion-drive — for which money

Beyond Saturn

Saturn, as seen by Voyager 1 on 16 November, four days after the encounter. Some of the dark spoke-like ring features (*Nature* 4 December) are seen as bright patches due to scattering of sunlight from particles within them. Voyager 1 will be monitored to as great a distance as possible in an attempt to detect the boundary between interplanetary and interstellar space, where the "solar wind" becomes undetectable. Voyager 2 will reach Saturn on 25 August 1981, Uranus in 1986 and Neptune in 1989.

