together. An array of such snippers, each snipping sequentially, piece after piece from long magnetic bubble strips, writes the memory. The device has been experimentally tried, and it works, Humphrey says. For example, with a pair width of 0.2 microns and a strip 1 centimeter long one could write 50,000 bits per strip. According to the experimenters, the limit of information density seems to be about 10 billion bits per square centimeter.

The little bubbles that are made can be arranged, bubble in, bubble out, in logical patterns, to perform the logical operations of a computer, such as OR and AND.

In addition, this kind of memory is easily addressable and quick to read out. Time to search the memory for information is a serious limitation on all kinds of computers. For instance, Humphrey says, when you stick your card into a sidewalk teller machine, it will say, "Please wait, your request is being processed." It's not that hundreds of other people are trying to use the system at the same time — at midnight you may be the only one using it — but that it needs the time to search its memory for your file. A VBL memory should yield in about two-thousandths of a second the information it now takes 10 seconds to find. —*D.E. Thomsen*

False start at TMI

It was a busy week of ups and downs for those engaged in the debate over whether the Harrisburg, Pa.-based General Public Utilities (GPU) Nuclear Corp. should be allowed to restart the undamaged nuclear reactor (Unit 1) at Three Mile Island (Pa.). The unit has been closed since 1979, when its twin unit was the site of the worst commercial nuclear accident in history.

On Aug. 27, a federal appeals panel in Philadelphia issued a 2-1 decision rejecting claims that the Nuclear Regulatory Commission (NRC) had approved the restart without sufficiently investigating GPU for allegedly falsifying safety records in the months prior to the 1979 accident. This decision was thought by NRC and GPU to effectively permit reopening of the plant, according to GPU spokesperson Gordon Tomb. But apparently just a few minutes before GPU flipped the switch on Aug. 29, the court issued an order saying the Aug. 27 decision hadn't reversed a June 7 order blocking the restart. That order will be in effect pending appeals on the Aug. 27 ruling, according to a spokesperson in the Third District Court.

"We were expecting a final go-ahead for 4:00 p.m. on Thursday [Aug. 29] when we got word of a court order preventing the operation of the plant," says Tomb. Unit 1, he adds, has been "on hot, standby condition using non-nuclear heat since June 8 at the cost of $40,000 a day for fuel oil and electricity." He declined to estimate how much that was costing consumers. □

Syncom 3: Dropping the first shoe

Demonstration of the space shuttle's capability as a satellite service truck has been a gradual affair, even if the reason has been in part that many satellites are out of reach of the shuttle's low-altitude orbits. Yet the work carried out on the Syncom 3 communications satellite during the just-completed mission of the shuttlecraft Discovery (though the payoff will not be known until late next month) is a major step in that direction.


Wide World

Van Hoften (right), Fisher and Syncom 3.

Even back when the shuttle was just a gleam in its designers' eyes, NASA scientists hoped that one of its roles would be to facilitate the repair, in orbit, of multi-million-dollar satellites that sometimes succumb to ills as trivial as blown fuses. In 1972, with the shuttle's first space flight still many years away, NASA began working on plans for a family of modular satellites with interchangeable parts, conceived specifically to take advantage of such fix-it potential.

Things drag on, however, and when the first shuttlecraft finally saw space in 1981, only one of the modular satellites, called the Solar Maximum Mission or Solar Max, had even been launched. But almost as though the fix-it-in-space lobby had been writing the script, Solar Max was already suffering from blown fuses, and in a dramatic mission in April of 1984, a crew of shuttle astronauts fixed it (SN: 4/21/84, p. 245). And again as if looking to the future, the team replaced not only an easily swapped module designed for the purpose, but also a key component that had been built with no such convenience in mind.

Syncom 3 is like that, but if it had been successfully rocketed up to its lofty duty station from the altitude at which the shuttle deployed it barely four months ago, any repairs at all would have been out of reach. Syncom 3's problem was that it never got there. Its built-in rocket motor never fired, and an apparently successful attempt to move an unthrown lever by means of the shuttle's remote-control arm still proved to no avail (SN: 4/27/85, p. 261). But thinking about the effect on future satellite costs of collecting on the $85 million device's insurance, its builder, Hughes Communications in Los Angeles, commissioned NASA for about $8 million to make one more try.

As Discovery's crew approached Syncom 3 last week, they thus faced a device armed with a fully fueled rocket that had failed to fire for reasons that could only be guessed at. Astronaut James van Hoften (whose one previous space mission had been spacewalking through the repair of Solar Max) rode out on the shuttle's arm, seized the satellite by hand and handed it over to colleague William Fisher. Fisher's first task was to "safe" the device, disconnecting and rerouting certain components so that the rocket would not fire unexpectedly even if it were somehow to have fixed itself (SN: 6/15/85, p. 377).

The only problem turned out to be with the arm, which astronaut John M. Lounge had to operate in a more time-consuming, "manual" fashion due to a malfunctioning computer in the arm's "elbow." The delay resulted in officials deciding to spread the spacewalk over into a second day. Indeed, the first day's jaunt set an "extra-vehicular activity" (EVA) record of 7 hours 8 minutes.

The next day's EVA (4 hours 20 minutes) consisted primarily of installing a device to allow the rocket to be fired on command from the ground. With the device in place, van Hoften gave Syncom 3 a series of shoves — again by hand — until mission control radioed him that the satellite was spinning at a stable two revolutions per minute. Elated NASA and Hughes officials reported that it seemed to be operating correctly, as it responded to ground commands that increased its spin to its planned 22 rpm.

But there is still another shoe to be dropped. Will the rocket fire? Hughes does not plan to try until about Oct. 29, by which time Syncom 3 should have reached its proper position and, the company hopes, its propellant will have thawed out from four untended months in the cold of space. Preliminary indications were that no fuel lines had ruptured and that the thawing was proceeding, though the long chill could turn out to have had other consequences. (Cold-ruptured fuel lines were also a concern when another spacecraft, ICE, had to spend half an hour out of sunlight in the moon's shadow on the way to its upcoming rendezvous with Comet Giacobini-Zinner, but ICE survived [SN: 1/7/84, p. 6].)

Before servicing Syncom 3, Discovery's crew had already deployed three other communications satellites, including Australia's first, AUSSAT-1, and a fourth Syncom. Later, the mission ended with a smooth, predawn landing in the California desert. — *J. Eberhart*