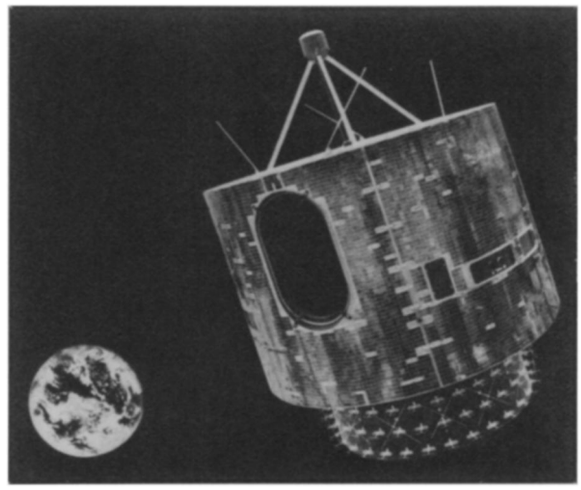
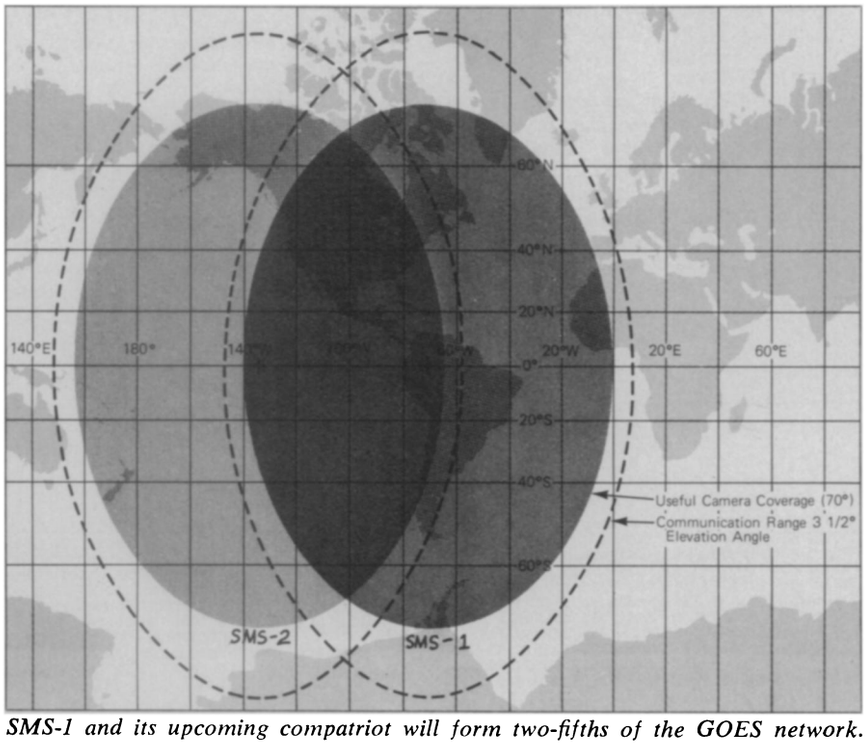


A new breed of weather satellite: The fixed stare

One of the most important weather satellites in the history of the species seems to have survived a weak launch last week, as ground controllers try to baby it into position to become the first probe that can sit fixedly in one spot and watch the weather happen.

SMS-1, the first Synchronous Meteorological Satellite, is the staggeringly versatile prototype for a network called the Geostationary Operational Environmental Satellite system. Besides simply monitoring the earth from above, it can request information from up to 10,000 data-gathering stations on the ground and at sea, order high-altitude balloons to drop instrument packages on command, and even watch out for solar flares. But despite all its versatility, the key word is "synchronous."

A synchronous satellite is one in an orbit carefully calculated to make the speed of the satellite exactly the same as that of the earth's surface beneath it, so that the satellite is always over the same spot on the globe. The numerous weather-watchers that preceded SMS-1 have done their looking from nonsynchronous orbits, which has meant that if they spotted an interesting feature developing, they had to wait until they passed over it again, often almost two hours later, to see how it had evolved. This has been adequate for observing slowly developing features such as hurricanes and general cloud patterns, but quick-forming ones such as tornadoes have been known to appear suddenly during one orbit, where an orbit earlier there was nothing. SMS-1, once it has been locked into its synchronous altitude of about 23,000 miles, should never stray from its assigned bailiwick, from where it will be able to view much of North America, all of South America, and most of the Atlantic.



SMS-1 and its upcoming compatriot will form two-fifths of the GOES network.

Getting it there, however, is proving to be a problem. The first stage of the rocket that launched it May 17 from Kennedy Space Center came up 650 feet per second short of its required speed. The upper stages made up for some of the weak push, but they were still unable to get the satellite into a path high enough and close enough to the plane of the equator to transfer it into its synchronous orbit SMS-1 has its own set of thrusters on board, but their fuel must be used sparingly to save some for the occasional fine tuning that will be necessary to sustain the synchronous orbit's required precision. The result is that controllers at the Goddard Space Flight Center in Maryland have been drafted into two weeks of 24-hour-a-day labors, carefully firing the thrusters in bursts calculated to get the most increase in height and change in plane with the least fuel.

Officials are optimistic, and now believe that by about June 1 they should have SMS-1 just about where they want it. Time is a factor, because the satellite's first job, even before the Goddard team has finished checking it out, will be to take part in a vast international weather study called GATE—the GARP (Global Atmospheric Research Program) Atlantic Tropical Experiment—whose field operations begin June 15. Together with five other kinds of weather satellites, 4,000 researchers and numerous ships, buoys and aircraft, SMS-1 will be helping in a comprehensive assault on the mysterious contributions of the tropics to the world's weather systems.

But being able to help with GATE is just frosting on the cake. The big job will still be ahead. Photographing the world day and night, SMS-1 will complete a new image every 30 minutes, revealing features as small as 0.9 kilometers by visible light in the daytime and 9.0 kilometers by infrared at night in a vast circle spanning 140 degrees of the earth's surface.

To make the most use of the satel-

lite's record lode of data, the National Oceanic and Atmospheric Administration has developed elaborate networks and sub-networks of stations to pass it around. From the main ground station at Wallops Island, Va. (where the staff has been doubled to 120 people to handle the load), data will be relayed to Suitland, Md., where it will be regionally divided and rushed on to sub-centers in Washington, Kansas City, Miami and San Francisco—all before the next batch is ready to go. Besides pictures, the data will include additions from a growing hoard of buoys, seismometers, rainfall gauges and other earth-based sensors. Some of them will transmit regularly at fixed intervals, others will be called up by weathermen who wish information about a particular area, again using the satellite as a communications relay. Still others will be on the lookout only for emergencies, such as flood-spotting rainfall counters, and will signal when they reach a preset danger level. And in September, 20 balloons will be launched from French Guiana to hover at about 100,000 feet, carrying parachute-equipped instrument packages that can be released on command through the satellite to float down through interesting weather features that may develop.

In October, NASA plans to launch SMS-2, the second link in the GOES network, to cover the eastern Pacific. In late 1976 or early 1977, Japan will put one over the western Pacific, the European Space Research Organization will add another over the eastern Atlantic, and the Soviet Union is expected to provide the fifth, over the Indian Ocean, giving the world its first coordinated, full-time, full-coverage weather watch. □

Laser-fusion claim: An evaluation

Some aspects of the business of inducing thermonuclear fusion with lasers are, to borrow a phrase from Winston Churchhill, "a riddle wrapped in a mystery inside an enigma." One reason is that the military is heavily interested in the field, and much of the information is classified. In the second place, private industrial interests are involved, and they have proprietary secrets to keep.

It is in this background of partial information and deliberate concealment that we must evaluate the recent announcement by KMS Industries of Ann Arbor, Mich., that its scientists have made a significant step in the direction of laser fusion. What they say they have done is recorded neutrons that are evidence of nuclear fusions taking place in the center of a pellet of fuel irradiated by laser light. This achievement would indicate that the approach chosen by KMS—and some others in the field—is a good way to go towards a possible eventual fusion reactor.

The basic idea is that a pellet of fuel is irradiated from several sides by laser light. The light causes an implosion that compresses and heats the fuel and causes fusions. The fuel is deuterium, one of the heavy forms of hydrogen, coated with something else. What the something else is, people in the work are reluctant to say, but the best educated guess it that it is probably uranium, maybe plutonium, and that in the details of the action nuclear fission helps fusion along.

When two deuterium nuclei fuse, one of the products is a free neutron that comes flying off. It is these neutrons that KMS physicists say they have recorded *from the center of the pellet.*

Contrary to impressions given by some published reports of this event, it is not the first time that fusion neutrons have been recorded from a laser experiment. But previous neutrons were obtained from outer reaches of the fuel pellet. KMS says that this is the first time so far as it knows that anybody has gotten them from the center, thus indicating that the laser-induced implosion does produce conditions compatible with fusion in the center of the pellet. (We, and KMS, must hedge slightly because Soviet scientists are also at work in the field, and their achievements are totally unknown—at least by anybody who will talk—on this side of the ocean.)

It must be said that there is skepticism among others in the field that KMS has done what it says it has done. (Before detailing the skepticism it may be wise to point out that this is a highly competitive field, and everyone in it is, as they say in court, an interested party. The interlaboratory gossip should be taken, to borrow a phrase from the elder Pliny, "*cum grano salis.*") The problem is one of numbers, and this is a bit difficult too, since people in the field have always been touchy about quoting hard numbers. The number floating around the corridors for KMS's neutrons is 10,000. If KMS's scientists are seeing what they say they are seeing, skeptics say, the number should be more like 10 billion. There is also a hint that KMS, being a small operation without great financial reserves, has a recurring need to interest private capital in the attractiveness of the project.

If the KMS claim be granted, the only way to go is up; up in the number of neutrons until more energy comes out of the fusions than the lasers have to put in to start them. This number for breakeven is still far greater than 10 billion neutrons. Then one can begin on the technological problems of designing a reactor to generate power from the fusions. □

A pint is still a pound . . . alas

The last place one needs quaint traditions is in the everyday business of weighing and measuring. True, the standard hundredweight from Elizabeth I's time is still preserved in Jewel Tower, Westminster, beside the standard bushel of Henry VII, but after mustering the courageous good sense, in the mid-1800's, to revise the definition of the gallon (a gallon of ale then held 20 percent more liquid than a gallon of wine), the British have gone on to irrevocably commit themselves to adopting the metric system. Not so, their American heirs.

Like the Founding Fathers who paid lip service to "going metric," but never legislated the conversion, the contemporary Congress has once again upheld the colonial tradition of measuring and weighing objects according to a system passed to their British forebears during the late Roman Empire.

"A pint's a pound the world around" now holds true only in a very shrunken world: the United States, Trinidad, Tobago, Yemen and a few other small nations. If American commerce were content only to trade within that select group, there would be no problem. But with rapidly growing pressures on the dollar and a galloping balance-of-trade deficit, what was once a quaint tradition has become a serious embarrassment.

The current problem lies in pressure on Congress by organized labor to have the Government subsidize conversion costs by, for example, purchasing new tools for workmen and paying for their "retraining." Such pressure led to addition of several amendments to the current bill aimed at coordinating metric conversion. The amendments would have created an "administrative monstrosity," an aide to the bill's sponsor, Rep. Olin E. Teague (D–Tex.), told SCIENCE NEWS. The bill's defeat May 7 followed unsuccessful parliamentary maneuvering to rid it of the amendments.

Meanwhile, private industries are beginning to take the initiative in adopting metric units, and several state boards of education have started training programs to educate children (and their parents) on how to use the new system. Federal help in this effort now seems unlikely to come from this Congress. □