THE FOUNDATION
COMMERCIAL SPACE REPORT

COMSATS: THE RACE TO SPACE HEATS UP

Domestic Satellite Service Business Attracts Major Corporate Players to Communication Game

While many observers of the space industrialization business look toward the promising future in space utilization, few realize that a thriving space industry already exists. Of course, that industry is the domestic communication satellite business. Just about half a decade ago, there were no domsats, yet today tens of millions of dollars have been invested in spacecraft and ground systems such as the RCA Satcoms, the Western Union Westars and the AT&T Comstars. On the drawing boards are more impressive plans, including the controversial Satellite Business Systems Corporation project and the advanced Westar. Why is that the domsat business is having a boom? And what lessons might those who are interested in promoting other space business activities learn from the comsat service industry?

Communications services in the United States has long been a virtual monopoly of the Bell System affiliates, headed by American Telephone and Telegraph company. With the exception of firms like GTE or ITT, few companies have had the capital to challenge AT&T in providing general voice and data services to business and the public at large. One obvious reason for this lack of competition in the $100 billion telecommunications market stems from the very nature of communications systems. Early in this century the only way to transmit voice or data was through wires or radio waves. The capital investment for wire service between two points can be very high, and the use of radio was uncertain and expensive. These facts allowed AT&T to force legislation closing the market to competition. With the advent of radar and microwave technology in the 1950's, however, one of the technical restraints to radio transmission was removed. This led to the formation of private and public data and voice networks transmitting data to selected users, usually large corporate or government users. These microwave networks made possible network television and computer time-sharing. By the time that satellite communications become technically feasible during the 1960's, the market was ready for lower cost service with much higher transmission capabilities.

Several large users of communications services were among the first to become involved with satellites. AT&T, through Bell Labs, designed the world's first comsat (Telstar) and some inside observers of the satellite business report that this prompted the Congress to establish the quasi-private Communications Satellite Corporation in 1963. As soon as the technology was proved, other private organizations wanted to get into the act. Following years of legal and regulatory proceedings, Western Union launched the first domestic comsat, called Westar, early in this decade. The spacecraft was an adaptation of the first domsat, Anik, launched for Canada several years earlier. Canada got its domsat prior to the U.S. only because of the regulatory delay caused here by the Federal Communication Commission.

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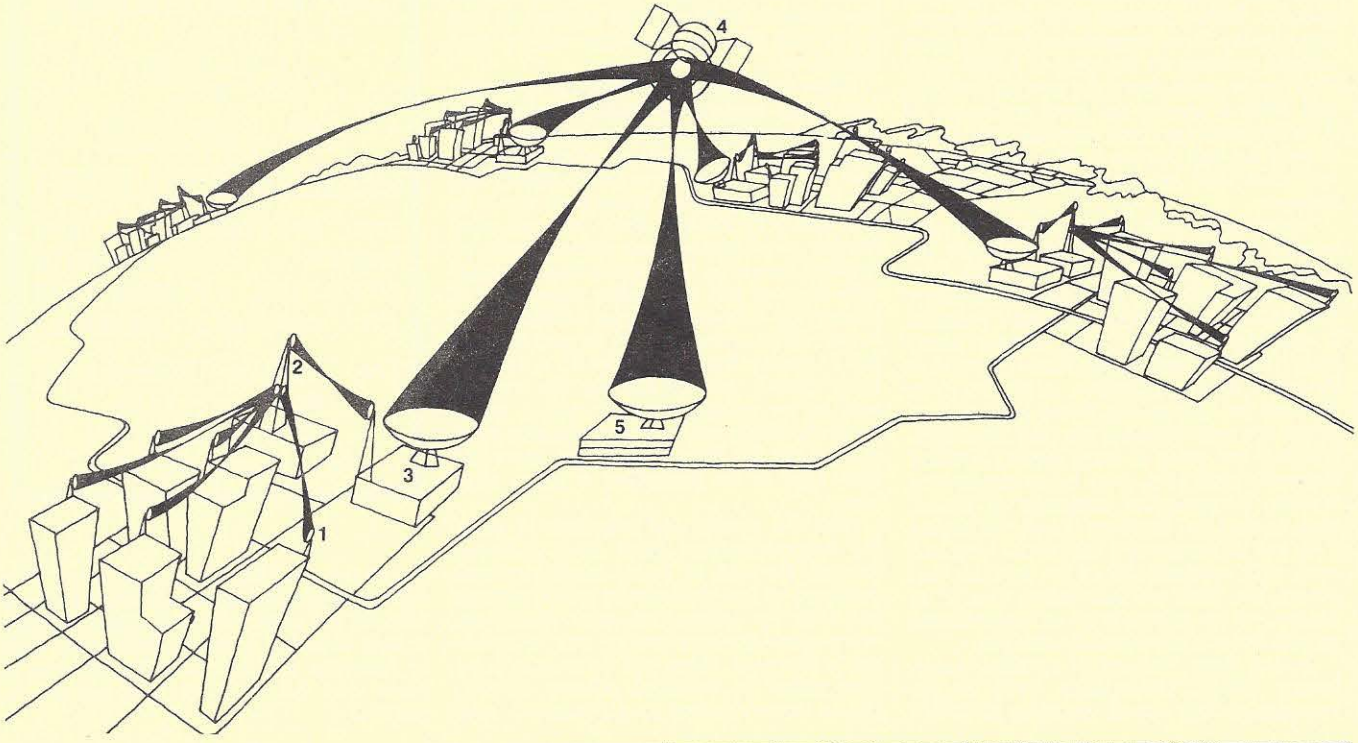
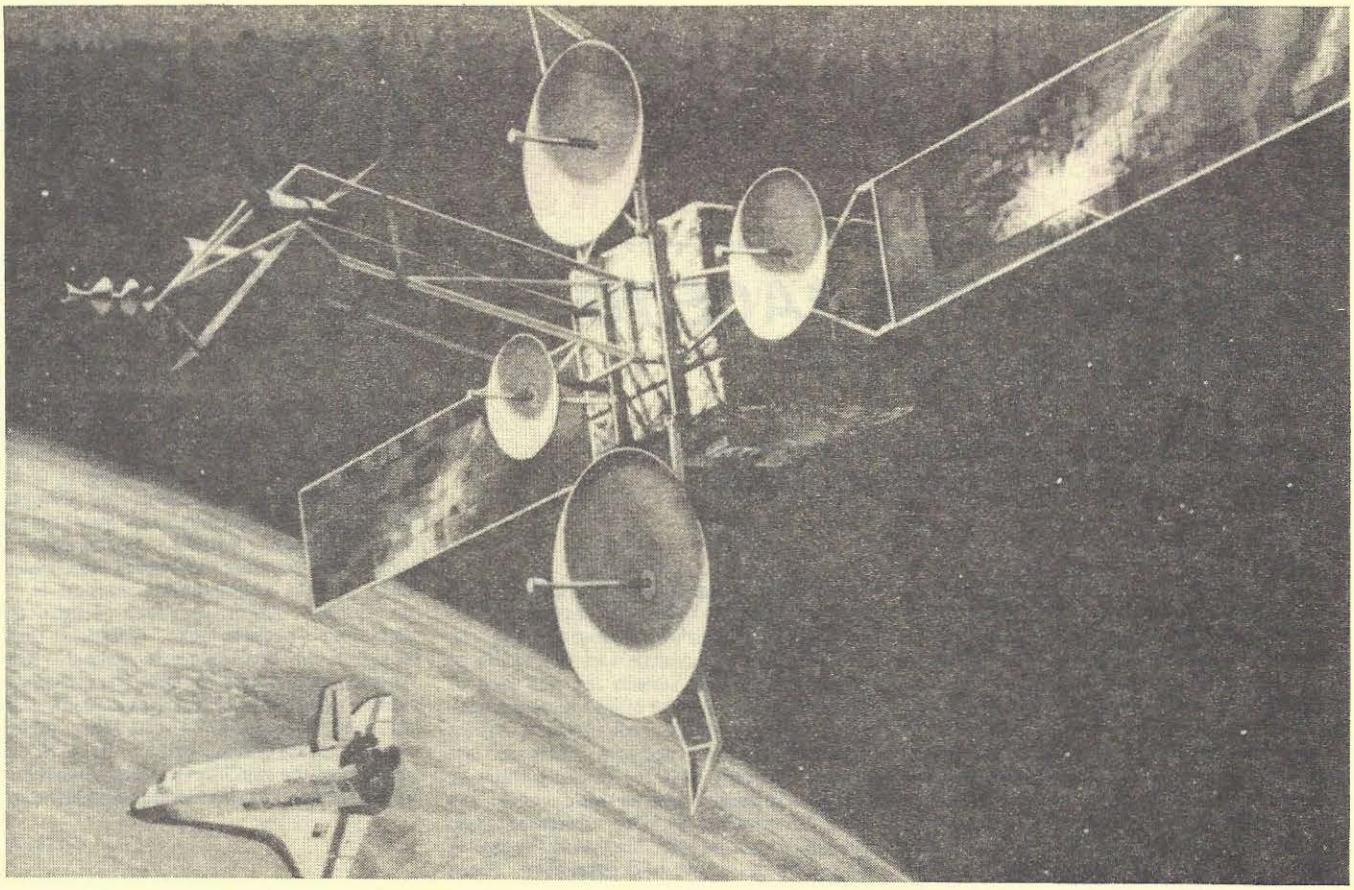


A communications network proposed by XEROX Corporation called XTEN. The user data would move from rooftop antennas (1) to a central substation (2), then to a ground station (3) and from there to the spacecraft (4) and then follow a reverse path to other users. Some messages may go into storage at a network control center (5). AmSat and SBS will use direct roof-top to satellite methods. See text. XEROX drawing.



(Above) The Intelsat V satellite in earth orbit after delivery by the Space Shuttle. First Intelsats will be launched by Atlas-Centaur boosters, but it has not been determined if the Shuttle or the European Ariane will orbit subsequent Intelsat payloads.

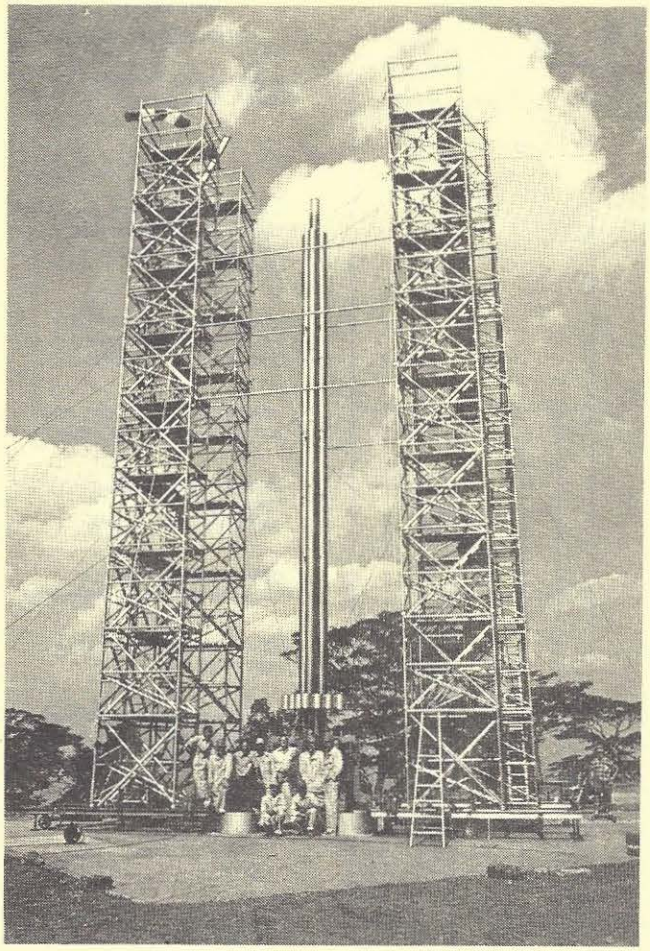
As soon as Westar became a reality, other companies began using its services, and some firms or consortiums began planning their own satellites. Among the latter is Satellite Business Systems, owned by IBM, Aetna and Comsat General (a domsat subsidiary of COMSAT Corp.). With a large satellite scheduled for launch within the year, SBS's plan to provide low-cost data transmission services is under attack by both the competition and the regulatory process. With a planned $500 million investment by the three companies, there is some natural concern on the part of AT&T as to SBS future plans. Since the service that SBS will offer is among the most profitable of AT&T's offerings, and because IBM is involved, the Bell System is attempting to prevent SBS from launching. Hearings are in progress.

Meanwhile, two other companies are moving to establish their own networks for data and voice. First, the Fairchild Corporation (builders of experimental comsats for NASA) has formed American Satellite Corporation (AmSat) using Westar satellites. The first user of the AmSat service is Western Bancorporation, with start-up planned for this month. Some business analysts are even claiming that the giant SBS, which is not going to begin leasing roof-top antennas until 1981, may be in competitive trouble. Recently the chairman of AmSat was quoted in *Business Week* as saying "We are in commercial operation, here and now, with substantially all the services that others, like SBS, are just talking about." In reality, AmSat service is not as sophisticated as SBS, but it is substantially cheaper.

Among those "others" is another powerhouse: XEROX Corporation. With an announcement last month unveiling its XTEN network, it will soon be in competition with AmSat. The XTEN network may use Westar transponders for the time being, thus avoiding the lead time necessary to designing and launching a new satellite. The AmSat network likewise uses Westar. Soon, however, the capacity of these networks employing existing spacecraft will be exceeded by demand, and what happens then is anybody's guess. One good guess is that a lot of money is yet to be made in the private satellite network business, and another is that AT&T will fight to the bitter end to shut them down.

There are lessons to be learned by promoters of the space industrialization from the experiences of firms in the domsat business. First is the need for space industry promoters to sell the service (or product) and not the fact that space is involved. Users do not care at all whether their data and voice travels over ground microwave nets or satellite networks. They are concerned only with the cost and the quality (reliability) of the service. Proponents of the Satellite Solar Power (SPS) concept would do well to learn this particular lesson. As a NASA-sponsored study recently pointed out, the SPS must be sold as an energy program, not a space program. While such a suggestion may seem obvious, so far little outreach to users has been seen in the promotion of space business.

Also, the profits and potentials of satellite communications have been achieved through the use of fairly small payloads delivered to geosynchronous orbits, without the need for humans on orbit. While not every space industry project can be operated in this way, there will be serious questions asked by financial officers of companies contemplating space ventures relating to the need for humans in space. This will not be greeted with enthusiasm by those who see the opportunity for space industry to help establish a space civilization. Only by lowering the cost of using humans in space can the goals of both parties be realized.



(Left) The launch site in Zaire operated by the OTRAG company. Note the new launch structure. A new method of vehicle mounting has also been tried, visible in this photo as cables which support the booster from the top. Lutz Kayser, president of the company, is standing in the center of the group of technicians without a hat. OTRAG photo.

OTRAG—WILL IT SURVIVE?

by Gary C. Hudson

In October of 1978, I had an opportunity to see that which most U.S. space experts have never seen, and indeed, don't even believe exists . . . the technical offices of Orbital Transport and Rockets, A.G. Better known as OTRAG, this medium-sized company has confounded the experts and annoyed or embarrassed half a dozen governments, of all political persuasion, across the globe.

My nearly unique opportunity came as a Lufthansa jet touched down at the Stuttgart airport, and I was met by the head of the technical staff of OTRAG. My first impression of the meeting was one of surprise. As I got into a 450 SEL Mercedes Benz with computerized radio-telephone and other ammenities, I reflected that OTRAG was not impoverished. That impression was reinforced many times during my day-long stay. From very expensive furniture and fittings in their technical offices to the most expensive lunch which I have ever consumed (about $100 for two), OTRAG seemed to be fully in command of its own destiny.

Such an impression is misleading. Powerful forces have been set in motion by the audacious OTRAG effort to build and operate commercial rockets. From the corridors of the Kremlin to the operations desk of the State Department, the councils of the superpowers and the Third World have been disturbed. The efforts of OTRAG have reawakened an anti-German hysteria in the Soviet Union while at the same time causing the Federal Government of West Germany embar-

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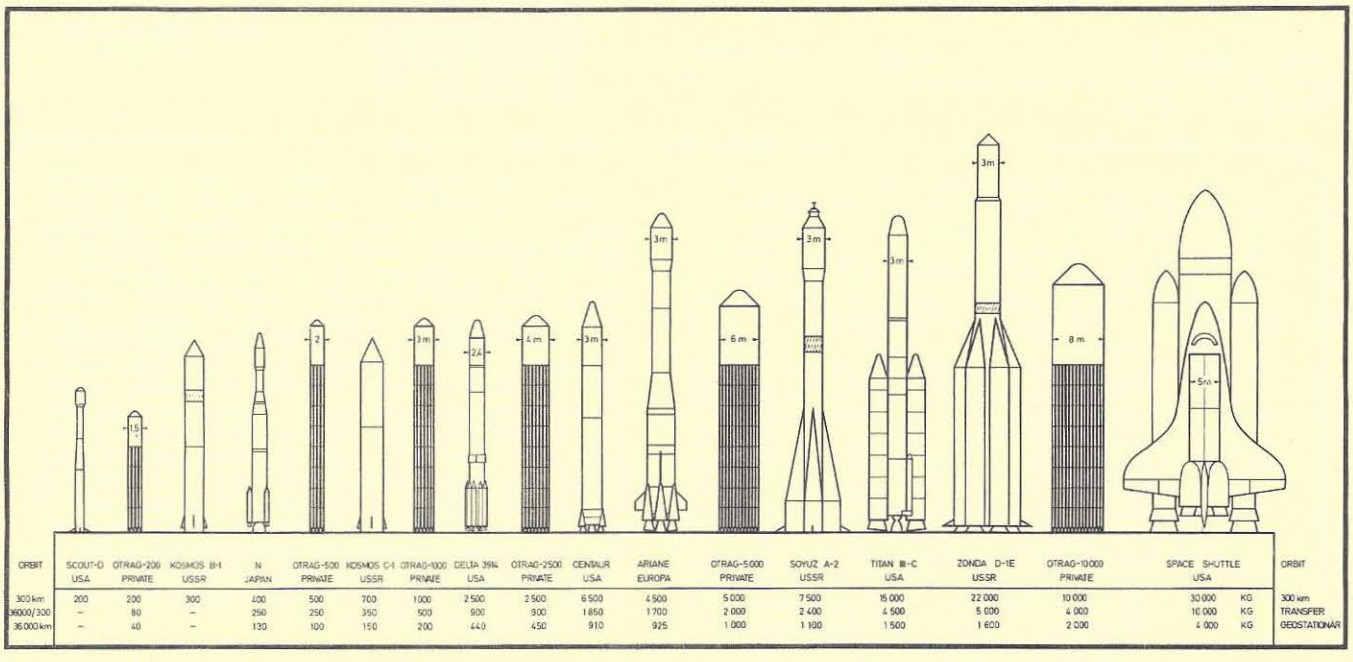
(Below) Chart comparing variations of the OTRAG vehicle with existing and planned space boosters. The cost of the OTRAG vehicles is generally between two and five times less than the equivalent competitive booster. OTRAG drawing.



ORBIT	SCOUT-D USA	OTRAG-200 PRIVATE	KOSMOS B-1 USSR	N JAPAN	OTRAG-500 PRIVATE	KOSMOS C-1 USSR	OTRAG-1000 PRIVATE	DELTA 3914 USA	OTRAG-2500 PRIVATE	CENTAUR USA	ARIANE EUROPA	OTRAG-5000 PRIVATE	SOYUZ A-2 USSR	TITAN III-C USA	ZONDA D-1E USSR	OTRAG-10000 PRIVATE	SPACE SHUTTLE USA		ORBIT
300 km	200	200	300	400	500	700	1000	2500	2500	6500	4500	5000	7500	15000	22000	10000	30000	KG	300 km
36000/300	–	80	–	250	250	350	500	900	900	1850	1700	2000	2400	4500	5000	4000	10000	KG	TRANSFER
36000 km	–	40	–	130	100	150	200	440	450	910	925	1000	1100	1500	1600	2000	4000	KG	GEOSTATIONAR

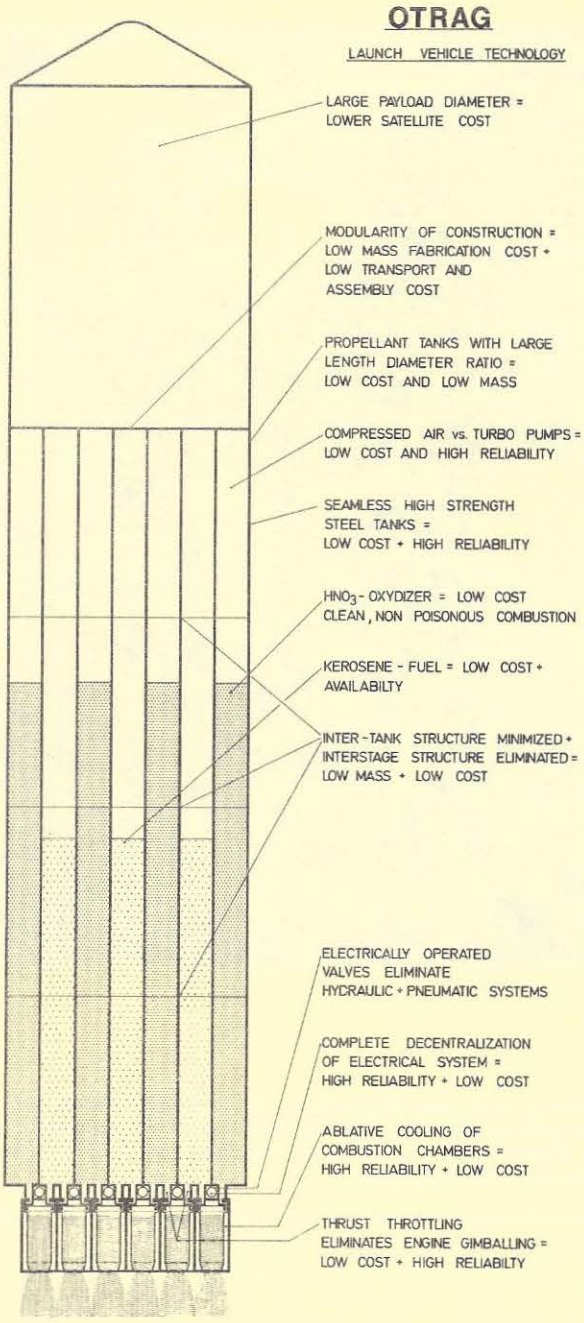
rassment in Africa.

Regular readers of this newsletter know the story: how after the first OTRAG test flights of 1977 the Soviet Union and East Germany went on a propaganda offensive in an attempt to discredit OTRAG, the west, and the concept of private space endeavors. I am sad to say that they seem to have succeeded. Even though the OTRAG company has raised tens of millions of DM for their booster development, it is probably not enough to counter the technical and economic problems as well as the political forces which are being *mobilized* against them.

The metaphor is not overdone. As has been pointed out by Don Kingsbury, writing recently in *Analog* magazine, the OTRAG attempt to build the world's first private launch vehicle was a part cause of the recent second invasion of the province of Shaba in Zaire, where the company has its launch site. It is known that the invasion was orchestrated by East German military advisors, and that captured rebels were found to have maps marked with the remote OTRAG site, which is a few hundred kilometers to the north of Kolwezi, scene of heavy fighting between the rebels and Belgian paratroops and French Legionnaires. Whether you believe this or not, it cannot be denied that OTRAG has since come under redoubled attack by several players in this game.

The German government, smarting from charges from Marxist and other African states, has banned the export of OTRAG rockets from Germany. We do not know if OTRAG has successfully found a way around this problem as yet. Further, the government is investigating OTRAG fund-raising methods. Meanwhile, the company is slowly being blackballed in developing nations where it would have had a great deal to offer a growing market for space technology. Even in this country, promoters of some space ventures have turned their backs on the OTRAG potential so as not to offend those who attack it.

OTRAG officials candidly admitted to me in Stuttgart that they had made a mistake by locating launch operations in Zaire, and that they would entertain thoughts of moving should another site be opened. The problem is now whether or not other countries would have them. Even if they find another site, it is highly possible that they will not be able to afford the additional expense of moving, coupled with the damage caused by political attacks against them. In any case, it will make it harder for companies which may be considering following in their pioneering footsteps. And if those that might have followed decide to play it safe, then we are all the losers.



(Right) Schematic of the OTRAG vehicle concept. For more information on OTRAG see back issues of this newsletter or Popular Science, *March 1978.* OTRAG drawing.

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NEWS NOTES:

NASA NAMES NEW SHUTTLES...Washington...National Aeronautics and Space Administration has named the Orbiters which will fly into space starting this fall. The first flying Orbiter will be named Columbia, after the 19th Century U.S. Navy frigate which sailed around the world. The other three vehicles will also be named after U.S. and British ships of exploration: Challenger, Discovery, and Atlantis. Orbiter 101, Enterprise, is not now scheduled to fly into space, though there is a possibility that if a fifth spacecraft is funded (an unlikely prospect at this time and for the next several years), it could be rebuilt. At the present, 101 is several thousand pounds overweight and unsuitable for orbital service. (Some observers feel that Enterprise will never fly, since they think it would be cheaper to start from scratch and build a new Orbiter.) Star Trek fans will no doubt be disappointed, but it is uncertain whether any effort to change these names might succeed since the political situation which resulted in the changing of the NASA name Constitution to Enterprise no longer exists.

ANOTHER NEW DATE FOR SHUTTLE FLIGHT...Washington...Pretty soon Johnny Carson will be making jokes about it. NASA Administrator Robert Frosch has told a Senate hearing that the first flight of the Shuttle has now been rescheduled for November 9th, this year. However, he said "it's more likely that it will be somewhat later than the 9th". The most recent delay involves the catastrophic failure of the Shuttle Main Engine in December of 1978 and problems associated with the thermal protective coating of the Orbiter.

THE SKY IS FALLING...Washington...Of course by now everyone has heard of NASA's plan to abandon the orbital Skylab space station, which will plunge to earth sometime this year or next, before the Space Shuttle could perform a rescue mission. NASA calculates that the probability of being struck from the debris is about the same as being hit by a meteor, which is a perfectly reasonable risk. However, a company called "Chicken Little Associates" in Washington, D.C. has begun selling predictions of the orbital path for persons or businesses which feel threatened. For $100 a month they will provide data (of an unspecified nature) and a warning call if Skylab is coming down in your area. Just in case anyone was wondering, this is not what we mean by space entrepreneurs.

NO GROWTH NASA BUDGET...Washington...While some members of the press have listed NASA among the "winners" in the new Administration budget just submitted to the Congress, actually no real growth can be detected upon closer reading. No new program starts, such as a cometary flyby mission or a follow-on Mars lander are included. Especially damaging to the NASA attempt to advance space processing was the loss of funding for the 25 Kilowatt auxillary power module intended for use aboard Shuttle for high power materials processing applications. An additional $185 million has been allocated to keep the Shuttle on schedule. Total requested budget is $4.725 billion.

GE SATELLITE TO PRC... Valley Forge, PA...Aviation Week & Space Technology magazine has reported that the People's Republic of China has been investigating the General Electric Direct Broadcast Comsat (BSE) which GE built for Japan. The first BSE was launched last April by NASA, but subsequent operational spacecraft may be orbited by the new Japanese "N" booster which is an adaptation of the McDonnell-Douglas Delta workhorse vehicle. The Japanese have also had discussions with the Chinese about the performance of the on-orbit BSE. The PRC has made no decision so far concerning implementation of a direct broadcast satellite.

ARIANE EXPLOSION... Paris...The first test flight of the European Ariane booster has been delayed about five months due to an explosion in the advanced technology hydrogen-oxygen third stage during testing last December. The Ariane is a competitor with the Space Shuttle for comsat traffic.

SPS STUDY...NASA...The Department of Energy has leaked information about the so-called "reference" satellite powersat concept which will be used to evaluate the idea. The concept, a joint effort of the NASA Marshall Space Flight Center and the Johnson Space Flight Center, has evolved into a 5 gigawatt, photoelectric cell platform of about 18 square miles total area. The SPS would be assembled in geosynchronous orbit from materials which had been launched from the ground, rather than extraterrestrial resources.

VOYAGER PROSPECTOR... As soon as reliable data is returned from the Voyager spacecraft on their way to Jupiter, the Commercial Space Report will publish an article on the economic resources of the Jovian moons. It is expected that water and other valuable resources will be found. Resolution of the Voyager cameras will permit imaging of features as small as a half kilometer on Io, and around five kilometers for Calisto and Ganymede.