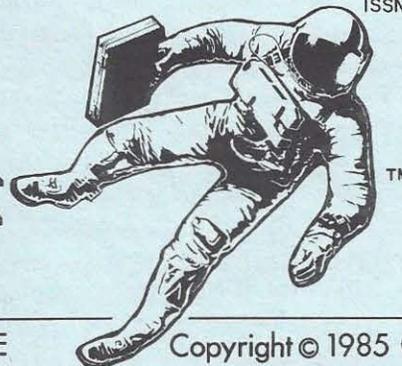


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ARC Lives Again

Several of the principals of the near-defunct Starstruck, Inc. of Redwood City, Calif. have gotten together to form a new firm called the American Rocket Company, or A.R.C. Starstruck's former name was ARC Technologies, and this new company may represent a return to the original policies of those A.R.C. personnel who were also founders of the original ARC/Starstruck (C.S.R., Oct. 1982, p. 3). One of these people is Philip Salin, who was the first president and C.E.O. of Arc Technologies/Starstruck. Salin was eventually succeeded as Starstruck's president by Michael Scott, who was succeeded in turn by Tucker Thompson. Salin's official position in the new company has not yet been disclosed.

The new company's C.E.O. is George Koopman (recently chairman of the board of Starstruck). According to Koopman, A.R.C. will be involved in the space transportation business, but no details have been released on the type of launch vehicles the company plans to develop.

The American Rocket Company is located in Palo Alto, Calif., a few miles from Redwood City.

White House Rejects Complaints Against Arianespace

President Reagan has rejected U.S. private launch industry complaints accusing the French company Arianespace of unfair trade competition. Transpace Carriers, Inc. of Greenbelt, Md. (marketing the McDonnell Douglas Delta launch vehicle), backed by others in the industry, lodged a complaint last summer with the Office of the U.S. Trade Representative under Section 301 of the 1974 Trade Act. The petition claimed that Arianespace (which markets the Ariane launch vehicle) was using "predatory" pricing techniques to undercut the U.S. expendable launch vehicle (ELV) market (C.S.R., June 1984, pp. 2-3).

According to a short item in the July 23, 1985 Wall Street Journal, Reagan stated that the space operations of all countries were subsidized, an important statement in light of upcoming Shuttle pricing policy decisions. However, the president promised to begin negotiations with U.S. trading partners to set international ground rules on the pricing subject.

Space Vector Announces Deal to Market Chinese Launch Vehicles

Space Vector Corp. of Northridge, Calif., has announced an agreement with Beijing Wan Yuan Industries Corp. of the People's Republic of China (PRC) trading marketing rights for their respective launch vehicle technologies.

Space Vector manufactures equipment for launch vehicles, including guidance packages, interstages, and most rocket parts except for the actual propulsion systems. Space Vector was at one time working with Space Services, Inc. (SSI) of

Houston, Texas, on SSI's Conestoga II launch vehicle, but went its own way to work on the LEO (Low Earth Orbiter) launch vehicle (C.S.R. Aug. 1984, pp. 5-6).

Beijing Wan Yuan manufactures the PRC's liquid-fueled "Long March" launch vehicles, outgrowths of Chinese ballistic missile technology. The rockets range in size from the CZ-1 up to the CZ-3 (illustrated in Fig. 1 below). The payload of these vehicles varies depending on orbital altitudes and inclinations. For example, given a circular orbit with an altitude of around 250 miles and an inclination of about 70 degrees, the CZ-1 has a payload of approximately 660 lbs., a performance slightly better than that of the U.S. Scout launch vehicle. For the same orbit, the CZ-1C payload would be about 1,100 lbs., and the CZ-2 payload would be about 4,400 lbs. (payloads can increase slightly for lower orbits, or some elliptical orbits). The CZ-3 (basically a CZ-2 with a liquid oxygen/liquid hydrogen upper stage) can place a payload of about 3,000 lbs. into geosynchronous transfer orbit. The CZ-2 has successfully placed over a dozen satellites into low earth orbit. The CZ-3, still a new vehicle, has been launched twice. The first launch failed due to guidance problems, but the most recent one, in April of 1984, successfully placed a communications satellite in geosynchronous orbit.

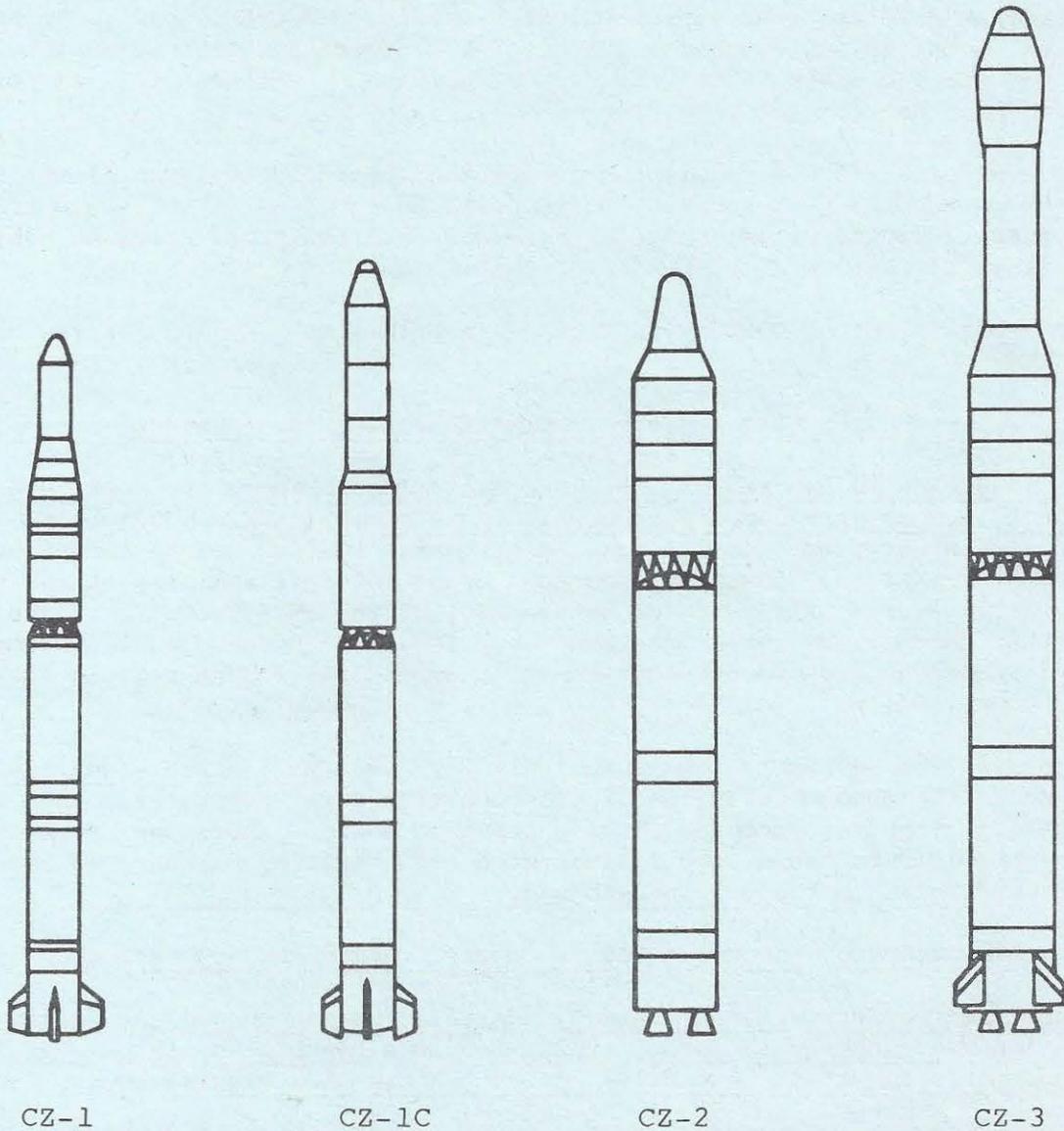


FIG. 1

According to Space Vector representatives, China will receive rights to Space Vector hardware (within export limits set by the State Department). In return, Space Vector will receive exclusive rights to market the Long March vehicles and subsystems in the United States, Pakistan, Argentina and Sweden (ironically, the State Department earlier turned down Space Vector's request to market Space Vector's own technology in Pakistan and Argentina). Space Vector may also decide to use Chinese rocket hardware to develop their LEO launch vehicle.

The deal has generated a certain amount of controversy. According to the July 19, 1985 issue of the Space Commerce Bulletin, there is some confusion within the elephantine Chinese bureaucracy as to whether or not a deal has been struck at all. Some Chinese officials claim never to have heard of Space Vector. Others say that the rights to the Long March launch vehicles are still open to negotiations, and that other companies, such as Space Services, are interested. Not a few Chinese officials seem to be completely ignorant of what is going on, and are trying to make contact with involved personnel in China. Space Vector president Richard Rasmussen, however, is confident that the signed agreement he has is legitimate.

No matter how it is finally arranged, China's entry into the marketplace will provide another blow to efforts to market U.S. launch vehicles. The National Aeronautics and Space Administration (NASA) Shuttle program will feel it, but the most damage will be done to those U.S. companies attempting to market expendable launch vehicles.

Chinese launch prices will probably be quite low. For example, a launch on the CZ-1 is expected to cost a customer around \$4.1 million. This price apparently includes moving the rocket, its equipment, and its Chinese launch personnel to the site of your choice. Other prices have not yet been set, although unconfirmed rumors have been floating around that a launch on the geosynchronous CZ-3 may cost as little as \$10 million, about half the price of a similar launch on Shuttle or Ariane.

A final note of interest: the same plant in Shanghai that builds the CZ-2 and CZ-3 launch vehicles also builds kitchen refrigerators. The factory's research department concerns itself with advanced technologies in both aerospace and appliances. One hopes that the bureaucratic confusion that seems to pervade this situation does not extend to the blueprints and engineers. I can imagine an incident involving a quick-frozen satellite and an unpleasant surprise for a Chinese housewife...

Space Services, Inc. To Raise More Capital

Decumen Securities of Houston, Texas, will be offering up to \$8 million worth of Space Services, Inc. stock in a private offering. If the private offering is successful, Decumen will attempt to raise about \$45 million in further funds through research and development limited partnerships. The funds will finance initial construction of the Conestoga II launch vehicles.

Space Services may also eventually issue stock to the general public once a successful orbital flight of the Conestoga has been accomplished, making SSI and Third Millennium, Inc. (the Space Van company) the only space transportation companies that currently intend to use a public stock issue to raise funds.

Space-related R & D limited partnerships are almost in the doghouse right now. The largest and best-publicized such limited partnership was one worth \$50 million placed by Shearson Lehman/American Express for Orbital Sciences Corp. last year. Orbital Sciences has yet to scrape up a customer for its Shuttle-launched upper stages, and if the company flops, it will cast a pall on all large-scale space investments.

A success on the part of Space Services, Inc., could go a long way towards improving the investment climate for the rest of the private space transportation industry. However, the Conestoga launch vehicle, like other U.S. ELVs currently being marketed, is matching itself against government-funded launch systems like NASA's Space Shuttle and ELVs from other nations such as Europe's Ariane, or the Chinese "Long March" vehicles mentioned earlier.

Take, for example, Space Services' widely publicized offer to launch a 300 lb. capsule containing cremated human remains into a 1,900-mile orbit around the Earth (C.S.R., Jan. 1985, pp. 1-2). At present, NASA policy does not permit such a payload aboard the Space Shuttle. However, the capability is there. For those customers satisfied with a low earth orbit, a pair of deployable "Get Away Special" canisters, about 150 lbs. each, could be ejected from the Shuttle for about \$20,000. A higher orbit would require additional propulsion, but this would not be much for a 300 lb. satellite. The total package in that case would almost certainly weigh less than 1,000 lbs. For such small payloads, space in the Shuttle cargo bay would almost always be available. As far as prices for the high orbit mission are concerned, although I don't have an actual quote, it seems likely that the capsule/propulsion package could probably be launched from the Shuttle for only a few million dollars (or possibly considerably less if part of a payload pallet under NASA's "Hitchhiker" program). On the other hand, Space Services plans on charging about \$14 million to place such a capsule into high orbit. Obviously, only NASA's current policy prevents the space agency from destroying Space Services' market in this area. The policy was arbitrary to begin with, and if NASA feels any competitive pressure, it can arbitrarily be done away with.

Currently, private ELVs appear to be just too vulnerable to their subsidized competitors to make them viable long-term investments. Even companies like Transpace Carriers or General Dynamics that are marketing existing, tried-and-true ELVs like Delta and the Atlas are having little luck. Those interested in investing in the future will have to look beyond ELVs and the Shuttle to the next generation of reusable, low-cost launch systems. I only hope the investment community will have the patience and the persistence to hold out until then.

* * *

Slow News Month Dept.: Possible Casualties In The Cola Wars

The current Shuttle flight (Flight 51-F) will carry newly designed zero-g soft drink cans of both Pepsi and Coca-Cola for testing in space. NASA had issued a general invitation for soft drink companies to submit designs (at their own expense) for cans which could handle carbonated drinks in zero gravity. The Coca-Cola Company, which had first approached NASA with the idea, had planned on being the first cola in space and developed a rather complex can design at a cost of about \$250,000. Coca-Cola was more than a little peeved when the Pepsi Company also managed to slip a can design under the wire in time to fly on the same Shuttle mission as the new Coke can. Both companies are granting NASA a license for unrestricted use of the can technology for future use in dispensing carbonated or non-carbonated beverages in space.

NASA has been looking for ways to encourage astronauts to drink more liquids. One of the effects of zero-g is to cause fluids to pool around the major organs and create false signals to an astronaut's body that there is too much fluid in it. The signals cause the sensation of thirst to be depressed and extra water to be eliminated through the kidneys. Possible dehydration can result if an astronaut does not make an effort to drink whether or not he is thirsty. So, from NASA's point of view, the cola can experiment could help by increasing the variety of liquids available to astronauts and encouraging them to drink more.

Of course, no one in either of the two major cola corporations gives a flattened cola can about the dehydration problem. The object of the game is to be the first cola to be drunk by the astronauts while orbiting the Earth, and to reap the favorable publicity which would follow.

What the cola companies don't realize is that there is a real potential for a major marketing blunder here. Coca-Cola, for one, could not really use another marketing blunder right now, so they should seriously consider the following:

I haven't done any sort of official research, but it is likely that there are few people who can drink an entire 8-oz. can of carbonated cola without issuing at least one healthy burp during or after the process. Harmless enough, but for one thing: it seems that in zero gravity it is almost impossible to burp. According to Skylab astronaut William R. Pogue in his book, How Do You Go To The Bathroom In Space? zero-g does not permit the liquid contents of the stomach to settle out and separate themselves from the gaseous contents. Hence, an astronaut who burps is likely to find considerably more coming up than the air he was expecting. Astronauts call this a "wet belch," and it is somewhat unpleasant (Pogue states that due to this problem he permitted himself to burp maybe twice during his 84-day Skylab mission). Astronauts have enough trouble with this syndrome as it is--the drinking water they use is produced as a byproduct of the space vehicle's fuel cells and is often charged with dissolved gases. The consequences of adding strongly carbonated beverages such as Coke or Pepsi to this situation can only be imagined.

An astronaut faced with a high-tech can containing a carbonated beverage on this or future missions has three major choices:

First, he can drink it, take his chances with a burp, and risk redecorating the Shuttle cabin with caramel-colored candy water. This is not likely to be a common choice (in spite of the fact that almost any decoration would be an improvement).

Second, he can grit his teeth and keep it down. Unfortunately, all that gas eventually has to come out somewhere, and it usually does, somewhat the worse for a few days' aging. This was the cause for many complaints on Apollo and Skylab missions (contrary to popular legend it was not the Tang that was the problem so much as the water they mixed it with).

However, space missions are not what they used to be. Astronauts are no longer, for the most part, a product of the fraternity-like atmosphere which pervaded the early astronaut program. Many are no longer test pilots, but scientists and engineers from sedate academic environments which are not (so I am told, and why should they lie?) conducive to the free expression of bodily functions which was characteristic (and, due to cramped quarters, even necessary) in earlier space-flights. Add to this the mixed-gender factor: despite a professed equality of the sexes, a certain reserve between men and women is usually maintained, particularly under professional circumstances, and few are those who would care to let fly under such circumstances.

Our hapless astronaut, if he insists on imbibing the fizzy stuff, and further insists on maintaining an iron control on his assorted sphincters, may risk inflicting upon himself a slow inflation which could eventually render his profile into something reminiscent of the famous dirigible, the Hindenburg. Perhaps his fellow astronauts, making the most of the resemblance, may endeavor to attach rubber-band-powered propellers to his NASA-issue coveralls, and sail him majestically about the middeck cabin as an amusing diversion. At least the victim can take some comfort in the fact that, unlike hydrogen, carbon dioxide is not flammable and at least he will not be required to provide further amusement for his colleagues by exploding and crashing in flames.

Of course, a less polite cola-drinking astronaut, in the interests of comfort, or even health and safety, will simply let nature take its course and let the excess gases pass when and where they might. Possibly he will sail around the cabin without benefit of propellers, and with considerably less amusement on the part of his fellow astronauts. The Shuttle is not a spacious ship, and if even one of the crew takes this course he may find himself confined to the airlock for environmental reasons. One of the Shuttle's zip-up rescue balls could also serve this purpose quite admirably--food and the cola fiend's beverages could be quickly passed through the opening before zipping it up again. The best solution would probably be to simply toss in a large quantity of full cola cans, zip up the ball, hook up the oxygen and simply ignore it for the seven-day duration of the mission. Upon landing, the ball and its occupant could be carried off the orbiter to a suitable decontamination chamber where the offensive astronaut could be released.

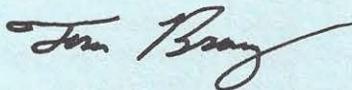
Of course, if the impolite cola fiend happens to be one of the flight crew, or if all of the crew turns out to be impolite cola fiends, then the only thing one can do is keep a stiff upper lip and keep wiping the condensation off the viewports until the landing, when the crew can then depart into fresher air, somewhat redder of eye and shorter of temper.

Naturally, the third and most likely alternative is that no experienced astronaut will touch the bubbly stuff with a ten foot pole. Then, of course, the astronauts would have to explain their reasons to the eager companies trying to find out which cola will be the Cola Of The Future. There is a chance that these explanations would be given on television. Possibly live television. The resulting publicity could hardly be what the cola companies would hope for.

Perhaps everyone will be lucky. Perhaps the higher atmospheric pressure of the Shuttle compared to Skylab or Apollo will alleviate the problems experienced on those earlier missions. We shall see.

If anyone is looking for a better idea, why not slake the astronauts' thirst with those frozen confections on a stick, like the Popsicle company makes? They would stay put in zero-g without dripping, they would be cold and refreshing, and they would not contain the dreaded dissolved gases. Also, one could save the wrappers for valuable prizes. What? You say the Shuttle has no freezer or refrigerator? Well, one could always be built. Primitive old Skylab had one, after all. It shouldn't cost NASA more than ten or twenty million dollars...In any case, no one asked my opinion on the subject anyway. Happy flying, guys, and keep a tight ship.

Until next time,



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