

# Space Hustlers

There's gold in the sky, and a motley bunch of Houston oilmen, a California libertarian, three whiz kids from Harvard, and one retired astronaut are all rushing past NASA to get the biggest chunk of it first. Forget Sputnik. **The new space race has begun**

NASA Road 1 may be eighteen miles southeast of downtown Houston, but from the looks of it the strip might as well be in Atlantic City, New Jersey. Same sort of faded grandeur tenuously rekindled, same type of neurotic boomtown atmosphere. The hotels, the fast-food joints, the antiseptic office park where Rockwell and General Dynamics peddle their wares to the Johnson Space Center across the street—all have a look so hurried and prefabricated as to suggest that any minute the Space Shuttle, NASA's main product, will suddenly fly away and never return.

Down the road, in a gleaming new office building, Maxime Faget sits staring out into space. "At one time, we were not gonna be satisfied just sending a man to the moon," recalls the sixty-two-year-old engineer. "We were gonna make interplanetary trips to Mars." But that was back in the Sixties, before NASA's retrenchment. "The Shuttle program had finished, and there wasn't anything else, and the

**by Randall Rothenberg**

RANDALL  
ROTHENBERG'S  
book, *The  
Neoliberals*,  
will be  
published  
by Simon  
and Schuster  
in June.

prospect of them starting one very soon was kinda slim," says Faget softly, explaining how he got to this office. "Being that I was working for the government as a matter of patriotism, I didn't have any more reason to stay." So Max Faget left NASA and formed a private company whose goal is to develop and launch an orbiting industrial park.

Faget knows that to talk of building an orbiting industrial park makes him sound suspiciously like a Wild-eyed Fanatic, but he also knows that he has the credentials to get away with it. The manned space program's chief of engineering, Faget helped develop the one-man Mercury space capsule and led both the Apollo and Shuttle design teams. And he is hardly the only convert to private enterprise in space. A floor below him sits Eagle Engineering, a consortium of sixty engineers who left government service to provide an intellectual clearinghouse for private space businesses. In California a group of former Apple Computer executives are readying their own rocket for a water launch sometime this year. In Virginia three young Harvard M.B.A.s are busy designing an engine that will transport satellites from the Space Shuttle's cargo bay to higher orbit.

In fact, Max Faget is far from alone—which may ultimately be his problem. For Faget and the others are all trafficking the same busy intersection, the place where the right stuff meets the green stuff. Telecommunications, drug and semiconductor manufacturing, earth-resources sensing, alloy processing, solar power transmission—these are only a few of the areas in which there are billions of dollars to be made by the companies that get there first. So it's not surprising that in this country, particularly, a critical mass is imminent: the coming together of engineers, entrepreneurs, ex-astronauts, investors, inventors, and idealists who all believe that the next industrial revolution will occur, is occurring, several hundred miles above the earth.

Because the profit possibilities are enormous, this motley assortment of dreamers are determined to exploit the weaknesses of NASA and rocket to their own rewards. But NASA is bent on survival. In this pay-as-you-go age, that means NASA wants the outer space business all to itself. President Reagan seemed to give the agency at least some of that in his State of the Union address last January, when he called for the U.S. to build a permanent, manned space station to further science and commerce—something NASA has been pushing for years. But he also confounded the agency by promoting private-sector launch services—a government nod that privateers will need if they're going to survive. Meanwhile, the race is shaping up. The major aerospace giants are aligned with NASA; against

them stand a set of disparate but intertwined space entrepreneurs. At stake: commercial control of the cosmos.

## The Libertarian and the Entrepreneur

Midway between Max Faget's office and the gleaming towers of downtown Houston stands an inconspicuous office complex built a decade ago by NASA to house contractors who never moved in. In one small room a picture—a large painted insignia—has been carefully placed over the reception desk: within a dark circle, a covered wagon is pulled by two horses above and across a blue-green earth; on the left is an American flag, on the right, the banner of the state of Texas. This is the emblem of Space Services Inc.

Space buffs argue about when the commercial space industry was truly born, but it's beyond dispute that the general public first became aware of the capitalist opportunities of the Great Beyond on September 9, 1982, when David Hannah Jr., a millionaire Houston real estate developer, launched a rocket named the *Conestoga I* (hence the covered wagon on the company's emblem) from Matagorda Island in the

Outer-space industrial colonies could be just a launch away. Imagine the possibilities in materials processing alone: a long-haul vehicle, similar to the Shuttle, drops off supplies from Earth and transports back new alloys to create stronger, lighter metals, faster computers, or new-age pharmaceuticals.

Gulf of Mexico. TEXAS ROCKET BUILT ON 'SHOESTRING' CARRIES FREE ENTERPRISE INTO SPACE, read the *New York Times* headline, in unusually free-spirited language for the front page.

Actually, all the *Conestoga* carried into space was a mock payload, or cargo, of forty gallons of water; it reached a suborbital altitude of 196 miles before splashing down 321 miles away after a flight of ten and a half minutes. Short, but very, very sweet. For the remarkable thing about the *Conestoga*, a shiny white thirty-six-foot-tall cylinder, was that it flew at all—flew untouched by government hands, unhindered by government regulations.

David Hannah Jr. is also not a Wild-eyed Fanatic. This distinction is critical, because there are a lot of WEFs out there in and around the space business, but Hannah is not of their ilk. Tall and soft-spoken, the sixty-two-year-old Hannah is a self-made plutocrat and an impeccably polite elder emeritus of Houston's First Presbyterian Church. Susie Anders, Space Services' secretary, says, "Mr. Hannah, he's just such a *happy* man." A happy man who has spent several million dollars building and blowing up rockets, for fun if not yet for profit.

Hannah's fire-and-sparks crusade began in 1976 on an airline flight, when a



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traveling companion handed him a copy of *Smithsonian* magazine with an article inside by Gerard K. O'Neill, a Princeton physicist who has dedicated himself to popularizing the possibilities of man's future in outer space. O'Neill's was pretty much a lonely voice at the time, but his scenario intrigued Hannah. "I looked at Dr. O'Neill's article as saying that the space habitat is just another country, a new physical ground that would be developed," Hannah would remark later. "I think it was the exploration aspect where the article hit me."

At first Hannah's motives were pristine and patriotic. He became obsessed with the idea that the government should lead America to the development of space, just as it had fostered the settlement of the West. So for three years Hannah knocked on government doors, even prevailing upon a mutual friend to arrange an audience for him with presidential candidate Jimmy Carter. The real estate man spent half an hour telling the future Chief Executive that we're closer to space than we think we are. But Carter wanted nothing to do with it.

So David Hannah took a different tack. He joined with a small group of native sons who had already begun plotting a lobbying campaign to reassert the city of Houston's primacy in space. The first word spoken from the surface of the moon, after all, had nothing to do with small steps or giant leaps, it was *Houston*, and to the men who organized the Space Foundation, that transmission had a mystical significance. In 1979 Hannah became the foundation's first president. His initial act was to find a lecturer who could put together an audiovisual presentation for an inaugural dinner aimed at attracting local leaders to their cause. Minor as the decision seems, it would prove critical. And to make it, Hannah turned to Art Dula for help.

Art Dula looks, talks, and acts like a Wild-eyed Fanatic. He runs his law firm out of a converted Masonic temple whose walls are lined with framed posters of Jupiter's moons and paintings of manned lunar bases. Dula talks of Houston as one leg of a megalopolis he calls Space Triangle, a sort of Silicon Valley for outer space commerce, where entrepreneurs will create a multi-billion-dollar industrial center based on the exploitation of the firmament.

If Dula's style was a bit fanciful, it was nevertheless abundantly clear that he knew his stuff. His law firm, the first in the nation to dedicate itself to space law, was thriving. He counted among his clients and friends some of the most visionary members of the aerospace community. One of them was a fellow named Gary C. Hudson, and Dula, thinking that he might fill the bill, told David Hannah about him.

For in 1979 Gary Hudson was already

## What They're After Pennies from heaven

**DESPITE THE WIDELY held belief that the only product to emerge from the space program was Tang, space-related technology is already an integral part of dozens of American industries—including broadcasting, agriculture, defense, mining, and computers. As the markets grow, the amount of money to be made in space will increase at a corresponding (and astonishing) rate. Princeton physicist Gerard K. O'Neill estimates that outer space will be the basis of a \$100 billion industry in this country by the end of the century. Commerce should fall into four broad categories:**

### TELECOMMUNICATIONS

Back in 1945 science-fiction writer Arthur C. Clarke posited the possibility of communications satellites stationed in geosynchronous orbit; now telecommunications is indeed expanding at a dizzying pace. Meanwhile, Comsat, the public corporation that has had a virtual lock on the American telecommunications business since its creation by Congress in 1962, is seeing its monopoly crumble. The result will be more and more companies scrambling not only to build, but to operate, the birds and an increased need for various rockets to get the birds flying.

Already, bids are in to loft satellites that will serve as conduits for two-way wrist-telephone conversations (à la Dick Tracy). Other companies are talking about "beeper" paging systems

that will reach all the way across the country.

One of the hottest fields in telecommunications is direct-broadcast satellites (DBS), which beam television programming directly to the home through dish antennae. Comsat's Satellite Television Corporation is in a race with United Satellite Communications to be the first firm to offer a reasonably priced system.

Old-line aerospace firms are also getting into the telecommunications satellite business with a vengeance. And considering the boom in long-distance telephone services and the explosion of international television broadcasting, the market for satellites seems very healthy.

### REMOTE SENSING

A remote-sensing satellite is like a huge camera in the sky. In 1958 the

Vanguards, the first satellites of this type, sent back data that helped scientists prove the earth is pear-shaped, not round. At present there is no remote sensing market because the government gives away its pictures for free, but if the U. S. goes ahead and surrenders its Landsat satellites to the private sector, or if it simply doesn't replace them when they die, whoever can deliver those critical detailed photographs of the earth will stand to make a lot of money. Space Services estimates that there's a \$2 billion remote-sensing market, hence the Houston company's interest in getting its Aeros satellites up as soon as possible.

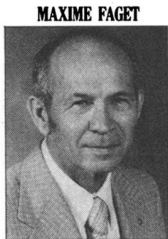
Space Services faces heavy competition from abroad. The SPOT Image Corporation, a joint venture between the French, Belgian, and Swiss governments, plans to launch its first remote-sensing satellite aboard the French *Ariane* in January 1985. Klaus Heiss, the Shuttle economist, has organized a joint venture between MBB Erno (the German aerospace giant), Comsat, and the Stenbeck Reassurance Group to

something of a cult figure in commercial space circles. A twenty-nine-year-old college dropout with a self-confidence that bordered on arrogance, Hudson believed he could build rockets of his own design

better, cheaper, and quicker than NASA. "I am," says the thin young man with the piercing eyes, "one of the five best launch-vehicle designers in the country." Despite his youth, he had managed to convince not a few educated people on that score. Including Art Dula, who came to believe that "Gary Hudson has the potential to be like Howard Hughes in this. Someday, the world is going to wake up and find there's a hundred tons of Gary Hudson vehicles in orbit." Those spacecraft would all be versions of a rocket that Hudson called, generically, the Big Dumb Booster, a semireusable system capable of launching twenty-five thousand pounds of man or satellite into high orbit at a fraction of NASA's cost. Hudson had made his reputation lecturing various groups at \$2,500 a

shot on the feasibility of private space travel, and when Art Dula told him about the Space Foundation's need for a lecturer, Gary Hudson obliged. It was a crucial connection. For though the Houstonians were not about to stampede into space after viewing Hudson's slide show, Hudson smelled a sugar daddy in Hannah. He left the dinner determined to push the millionaire further than he was prepared to go.

Politically, Hudson was a libertarian. He moved with a coterie of California free-marketeers who called themselves the Space Cadets. Hudson made the argument to David Hannah that the government would never, could never, move quickly enough to capture the opportunities inherent in space travel, and that most businessmen were simply too conservative to recognize the potential. Somebody had to break new ground, Hudson said, working Hannah hard. Why not them? The sales talk lasted a full year. "Gerry O'Neill cast his net wide," Hudson would gloat in recollection, "and I reeled David in. I realized that I had a good shot



MAXIME PAGET

launch an earth-resources bird off the Space Shuttle this August. Heiss's group intends to sell the data to firms and governments concerned in geological exploration, fishing, environmental monitoring, and map making.

An additional use for remote-sensing satellites was revealed last summer when an Air Force jet navigated its way from Iowa to Paris employing only signals beamed from the experimental *Navstar* satellite. As a result, the Air Force will have eighteen *Navstars*, an entire Global Positioning System, in orbit in 1989—and enterprising members of the transportation industry will no doubt follow suit.

## MATERIALS PROCESSING

The need for new alloys of metal, for drugs that cannot be refined on the earth, and for superpowerful semiconductors is attracting a variety of companies to outer space. It's a lucrative business. McDonnell Douglas, which has been carrying out drug production experiments aboard the Shuttle with Johnson & Johnson, has conducted studies that point to an annual market of \$23 billion

in pharmaceuticals alone.

John Deere & Company has signed an agreement with NASA to study alloy processing in space, with the goal of identifying a process to make stronger, lighter metals. Microgravity Research Associates also has a contract with the space agency to research the manufacture of gallium arsenide crystals, which may one day be the components of computers more powerful than any yet built. Also contemplated is the production of superpure glass for optical fibers—a key element for another communications revolution just waiting to happen.

## LAUNCH SERVICES

In last January's State of the Union address, President Reagan delivered a commitment to "help an expendable-launch-services industry get off the

ground." Estimates of the market potential for launch services vary. Arianespace claims that 180 commercial satellites will need a push into orbit between 1985 and 1991; at \$30 million a launch, that adds up to \$5.4 billion. William F. Rector, vice-president of space programs for General Dynamics, on the other hand, says that some 245 commercial satellites will need launching between 1986 and 1995, generating \$10 billion in business. And Phil Salin, the founder of Starstruck, a California firm that intends to launch its first rocket, *Dolphin*, from a pad in the Pacific Ocean later this year, believes that the current \$30 to \$60 million launch costs (the figures in this field vary widely) can be cut by a factor of ten by companies like his own and Space Services.

**SPACE CAN AND undoubtedly will be used for other purposes. Solar power transmission, either from the moon or from satellites in geosynchronous orbit, has been studied inside NASA and at the California Space Institute. Mining and manufacturing on the moon's surface is within reach; even tourism and colonization are foreseen.**

**And there are things we cannot yet imagine. As Tom Brosz, editor of *Commercial Space Report*, puts it, "The *Fortune* 500 of space—four hundred of them will be in things we don't yet know are worthwhile."**

for the first time to go ahead with what I'd been envisioning."

Hudson had found the perfect mark. Hannah was as pragmatic and sophisticated a businessperson as ever sold an acre in the Southwest, but his compulsion to emulate the western pioneers finally got the better of him. If Gary Hudson lacked the credentials to go around hammering together rockets (not to mention the skills to launch a spaceship), Hannah was nevertheless convinced. "Gary," says Hannah, "performed in the audiovisual field with a specific accomplishment, at a budget that was set, that he didn't go over, and he turned out a very good product. And we said, Well, if he can do it in the audiovisual field, can he do it with a rocket? So we took that next step."

But Hudson moved carefully. He knew the \$40 million price tag of the Big Dumb Booster was too much too soon to spring on the real estate man, so he proposed a scaled-down version of his spacecraft. In August 1980 Hannah

brought a group of potential investors out to Silicon Valley, where Hudson had formed a company of his own, GCH Inc., to develop the rocket. At the end of the day, David Hannah committed himself to financing the project personally, to the tune of \$400,000. Hudson went out, hired two dozen designers and engineers, and five months later unveiled his plan for the *Percheron*. He knew it couldn't be built for four hundred grand, or

even half a million (it would take at least a million dollars), but he figured that he would build the rocket, get it to the pad, fire up the engines, and then go back to the investors for more cash. "When you're twenty-nine years old and you're offered the opportunity of a lifetime," he explains, "it's hard to say no."

David Hannah, of course, had an entirely different idea. The *Percheron* would fly, and the sight of that fifty-five-foot reusable liquid-fuel bird soaring into the

heavens would immediately open up new channels of investment; it would prove he was capable of delivering earth-resources satellites into low earth orbit—the acronym is LEO—about 150 miles up, and of sending larger telecommunications satellites to geosynchronous orbit (where an object remains stationary above a fixed point on the globe), 22,300 miles up.

From January to July 1981 the pace was frenetic as Hudson and his technical crew prepared the *Percheron* for launch, and Charlie Chafer, another young man, who'd been doing graduate work at Georgetown University on space, reconnoitered the regulatory maze in Washington. David Hannah, with attorney Art Dula's help, incorporated the venture, calling the baby company Space Services Inc., while he scurried around trying to put together a limited R&D partnership for \$1.2 million.

When they finally got the *Percheron* mounted, it was on Matagorda Island, on land owned by Toddie Lee Wynne, an eighty-five-year-old multimillionaire oilman. But the launch was not to be. First a glitch in the ignition system postponed the engine test, so the bird had to sit in its nest for an extra week. Finally, it was time for the countdown. They pressed the button: the *Percheron* blew up.

Yet it's a funny thing about Texans. Disaster only strengthens their resolve. What they had discovered was that the supercold liquid oxygen had frozen some dew that had accumulated on the fuel valves. And that wasn't enough to stymie a team of entrepreneurs living out the legacy of the oil pioneers. "There are people in these parts who are used to putting a hundred million dollars into poking a hole in the ground," explains Dula. "And if they're lucky, that hole has oil at the other end. They're used to standing back and taking a look at a geophysical report and saying, 'In a couple years, that sucker's gonna have a billion dollars' worth of oil comin' out of it,' and, by God, they put together two hundred million, even three hundred million at a throw."

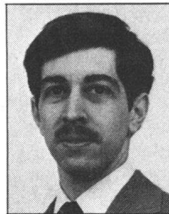
Toddie Lee Wynne exemplified this Texas élan. When someone asked him why he'd invested in a rocket ship, Wynne pointed to an offshore oil rig. "That well cost about thirty million dollars," he said. He swung around and pointed in the direction of the *Percheron*. "To get that economically viable, it'll take maybe thirty million." Then he looked back out toward the Gulf. "Y'know, that well may come up dry. And that rocket there may not fly. But if I had my choice, what would I rather leave my grandchildren—the hydrocarbons under that? Or the economic potential of *that*?" An old man, Toddie Lee Wynne would die the day before the next launch.

For David Hannah, just physically putting the rocket on the stand, seeing it

DAVID HANNAH JR.



GARY C. HUDSON



shine there against the sky, knowing that except for one little hitch "all the bells and whistles worked"—that was enough to convince him to press on. Gary Hudson and his Space Cadets retreated to California. But David Hannah would build another rocket.

## The Engineer and the Fly-boy

The first announcement of NASA's "early-out" retirement option arrived in July 1979, at the same time David Hannah and his fellow astronautical aficionados were organizing the Space Foundation. Hubert Davis, whose job was to assess projects for NASA's next decade, threw the notice in the trash. After all, he had helped build the lunar excursion module *Eagle*, which floated Neil Armstrong and Buzz Aldrin down to the surface of the moon on July 20, 1969. And only ten years, almost to the day, after that triumphant moment, Hugh Davis, forty-nine, was hardly ready to think about retirement.

Ever the engineer, Davis designed a computer program to help him make the decision. Into it he plugged all the variables—retirement pay, potential future assignments—"and I very soon concluded that I should erase the program and destroy it, because there was no case in which a person who had any residual self-confidence whatsoever could rationally decline the invitation to leave." So Hubert Davis joined hundreds of the agency's best and brightest and left NASA.

He hadn't much choice. By the mid-Seventies, growth, the god of the Fifties, was a fallen idol and technology, the driver of growth, was now the enemy. The space program, the nation's most visible symbol of technological progress, became the inevitable target for massive cutbacks. The Shuttle became NASA's only reason for being, and soon it became obvious that once the Shuttle flew there would not be much else for the few remaining people on the inside to do.

Still, the civilian world's appeal was also limited. The big aerospace companies were one avenue. And NASA's support contractors in Houston were another; but going back to the inside as an outsider would be a comedown, a disappointment. The only solution that appealed to Hubert Davis and his friend and fellow engineer Owen Morris was to form a consulting firm. They called the company Eagle Engineering, a reminder of their work on, and their pride in, the lunar lander. Attorney Art Dula incorporated them. When Max Faget left NASA, he came on board to begin designing his orbital manufacturing facility. Soon, five dozen former NASA engineers found their way to Eagle. "We wanted to keep at critical mass these five hundred man-years of manned space flight talent which otherwise would have

been lost, to keep it for whatever uses the nation might put us to until the topic of space became stylish again," says Davis of Eagle's creation. "I perceived that to be four or five years." He draws on his pipe. "So far, we're right on schedule."

David Hannah called Hubert Davis in October 1981, three months after the *Percheron* explosion. Chris Craft, the director of the Johnson Space Center, had graciously sent a man down to survey the rocket's wreckage; the engineer suggested that Space Services switch from liquid to solid fuel. Davis agreed. Then Hannah told him that he'd found a small aerospace contractor willing to build the solid-fuel rocket. Could Eagle Engineering visit the contractor's factory and assess the company's expertise? And, maybe, just maybe, supervise Space Services' next launch?

The following day, on a flight to the West Coast, Hubert Davis drafted a plan for the launch of Space Services' second rocket. Hannah gave the go-ahead to the new project less than twenty-four hours after reading the report.

And yet the new project, although well defined, was something of an unintentional mystery, even to the participants. For all the market surveys, scenario-projections, and late-night talk, what they would do with the rocket after it flew remained a question mark. They simply wanted to prove that a private rocket launch was a realistic possibility. And reality was quickly taking shape: with Davis aboard, Space Services now had its contractor, its launch specialists, its Washington-based regulatory halfback. And NASA, which at the time was amused at, even a little impressed by, David Hannah's pluckiness, had offered to sell the company a surplus, off-the-shelf Minuteman booster—the rocket's bottom stage—at cost, \$340,000. So the only item missing was a mission director. Here, too, NASA proved helpful. It provided Donald "Deke" Slayton.

Smack against the wall of the Space Services work space sits a mobile tap of Coors beer. Atop it perches a grinning skull: Deke Slayton's going-away present from NASA. On the floor is a bearskin rug; Slayton shot the bear.

Deke Slayton was not your typical Space Services recruit. He was an astronaut. In fact, he was supposed to be the second astronaut to orbit the earth—supposed to make three circuits of the globe, like John Glenn had. But then, just a few weeks after he'd watched all the ticker tape showering down on his now famous colleague, thinking he would be next, Major Deke Slayton of the U.S. Air Force, veteran of sixty-three B-25 missions in World War II and Edwards Air Force Base test pilot, was grounded for idiopathic atrial fibrillation, or

irregular heartbeat. This was not news. The problem had first been noticed in 1959, well before the six weeks of exhaustive physical and mental examinations that preceded his appointment to the seven-man Mercury crew. But all of a sudden the doctors concluded that Major Slayton's ailment was such that, given the stresses of space flight, they could not recommend him for a solo flight in space. "Naturally," the major said at the time, "I'm greatly disappointed."

"Bitter" might be more accurate. But Slayton quit smoking, stopped drinking coffee, even gave up liquor. The two-man Gemini program came and went. The three-man Apollo missions started and ended. But Deke Slayton's

heart kept on fibrillating.

Then, for no apparent reason, the problem went away. Disappeared. He lobbied hard now, and on March 13, 1972, Slayton was cleared for flight status. Still he waited. Then, in the midst of that ancient period we call *détente*, on July 15, 1975, 12:20 Greenwich mean time, the Russian ship *Soyuz 19* lifted off from the Baikonur Cosmodrome carrying three cosmonauts. Fifty-one hours and forty-nine minutes later it docked with *Apollo XVIII*. Millions of TV viewers watched as the hatches were unlocked, and Alexei A. Leonov leaned through the tunnel to grasp the hand of Thomas P. Stafford and state, in English, "Glad to see you." Behind Stafford was Deke Slayton. At fifty-one, he was the oldest man ever to fly in space.

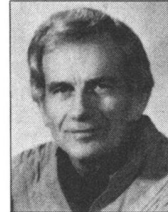
The early-out offers came four years later. "They had the laws so goddamned screwed up," he would recall, "it was hard *not* to retire! Couple of us figured out it would've cost us something like a quarter million dollars not to retire. That's civil service for you."

For two years Slayton, along with dozens of others, went on retired-rehired status. "A lot of us signed on, on a year-to-year basis, to get the Shuttle off the ground." Once the *Columbia* flew in 1981, Deke Slayton officially took his leave.

That's when David Hannah called. He'd heard Slayton was on the loose and offered to hire him as a consultant. The astronaut knew of the little company and was aware that its first rocket had blown up on the pad; Hannah filled him in on the rest. "It sounded more challenging than working for the big boys," Slayton reasoned, and he accepted the offer. He moved in, carting with him twenty-four years' worth of memorabilia—an *Apollo VIII* patch, an *Apollo XI* flag, the beer tap.

With Slayton on the team, everything moved forward in a rush. It was the beginning of 1982, and Space Services wanted a launch before year's end. Hannah eventually found fifty-seven investors willing to kick in a total of \$6 million to see a rocket disappear. Slayton's work was trying to

DONALD "DEKE" SLAYTON



HUBERT DAVIS



get through the political and bureaucratic problems. "There weren't any technical difficulties to what we were trying," Slayton says, but that wasn't entirely true. Working within a lean budget was a very real technical challenge, even if the *Conestoga* was going to be just a little rocket.

By midsummer the *Conestoga* was done and the rocket transported to its launch pad. If everything went as planned, the 1,097-pound payload would reach apogee, descend, and then release forty gallons of water, which would crystallize to create a brilliant visual display in the midmorning sky. Deke Slayton would direct the whole affair, retaining the most serious responsibility of all: the decision whether to destroy the vehicle if it should veer off course. For all the money invested in the project, it still had the feel of a bare-bones, family affair. After some two hundred reporters were led on a tour of the launch facilities, David Hannah's wife, Catherine, was espied bagging the accumulated garbage.

At ten-thirty P.M. the night before the launch a glitch appeared, and the launch was delayed. Memories of the *Percheron* fiasco were vivid, particularly as unfriendly weather reports threatened to postpone the blast even further. It turned out to be a minor problem—the gyroscope that controlled the direction of the spacecraft's flight was broken. It was replaced the next day, and the launch was rescheduled for Thursday, September the ninth.

The weather, despite the predictions, was calm and clear. The countdown, broadcast from the control booth by Charlie Chafer's wife, Sally, went without a hitch. At 10:17 A.M. the thirteen-foot-long surplus NASA Minuteman booster began to burn, providing fifty thousand pounds of thrust. And David Hannah's \$2.6 million spaceship shot off the pad. "The *Conestoga I*," announced Sally Chafer, "the world's first free-enterprise rocket, is on its way." The crowd cheered. The first stage burned for nearly a minute. About half a minute later two tiny thruster rockets pushed the payload out and up. Five minutes and nine seconds into the flight it reached apogee—196 miles above the earth. Another minute, and the forty gallons of water were ejected. There was no brilliant visual display, but at that point nobody cared. The *Conestoga* had fulfilled its purpose: to prove that a private company could successfully launch a rocket capable of delivering payloads into low earth orbit. Later, back at the press site, Charlie Chafer and Gerry Gartner threw two newsmen into the swimming pool. "A lot of people went into the pool that day," remembers Gartner.

### The Investor and the M.B.A.s

Neither David Hannah nor the Houston group he had successfully hooked on space were content to stop with one mere rocket

launch. So Space Services went off searching for more money to go the next step—the company hoped to orbit a satellite they called the *Aeros*—but in the meantime a seed they had planted a year before was starting to flower.

The preceding winter the Space Foundation (from whose presidency David Hannah had retired to attend to his rocket business) had run an ad offering thirty-six thousand dollars' worth of prizes to graduate students doing research on the commercial possibilities in space. When David Thompson spotted the ad in *Aviation Week* magazine in May 1981, his thoughts could not have been further from Texas. He was living in Cambridge, Massachusetts, about to graduate from the Harvard business school and was preparing, after a life of schooling, to enter the real world as special assistant to the president of Hughes Aircraft. But the ad piqued his interest. The twenty-seven-year-old Thompson had been nuts about space since the day his elementary school class had been dismissed so the children could watch Alan Shepard's first Mercury ride into the cosmos. During the 1980–1981 academic year he had organized a team of students from the business and law schools at Harvard and approached NASA with an offer to examine the possibilities of and barriers to commercial activity in space. In part because he had worked summers as an aerospace engineer for the agency, NASA agreed, and by late spring the project was complete. "On a flier," recalled Thompson, "I sent the Space Foundation our final report." He got no response to his application, however, and assumed his position at Hughes Aircraft.

In September the Space Foundation finally completed its review of the students' papers and sent a telegram to David Thompson notifying the Harvard team that it had won one of the foundation's prizes. At the awards dinner Thompson told the assembled bankers, oilmen, venture capitalists, lawyers, professors, and developers that space represented new jobs for the future, "but... only if we encourage men and women with good ideas to strike out on their own."

Like Gary Hudson two years earlier, Thompson came to Houston a dreamer with long-range plans. And like the California Space Cadet, he left Houston with a hidden agenda. Back east, Thompson joined with two of his pals—Scott Webster, who had taken a marketing job, and Bruce Ferguson, a lawyer who had just joined a large corporate firm—to begin a mission. "We had respectable jobs," recalled Thompson, "but we stole as much time as possible from them and began to work on a business plan to turn our Harvard study into a real business venture."

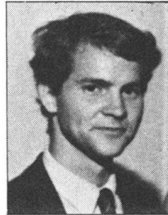
Back in Texas, David Hannah, Deke

Slayton, and the Eagles were readying the *Conestoga* for launch, NASA was exultant over the success of its Shuttle, and to the average businessman outer space was beginning to seem a lot closer than it had ever seemed before. In summer 1982 David Thompson called Sam Dunham IV, the Space Foundation's new president, about a potential commercial enterprise that promised a significant payback if only some capital could be found quickly. Dunham knew that Hannah was preoccupied with the *Conestoga* but had no difficulty in coming up with another name. "I know one guy, an oil and gas exploration guy, so he's used to taking risks," Dunham told Thompson. "And he's aviation-minded, likes space. Go see Fred Alcorn."

Fred Alcorn had met the M.B.A.s before, at the Space Foundation's awards dinner. He had been invited by Dunham, an old friend, and as a favor to him forked over the seventy-five-dollar admission fee. An aviation buff, the kind of fellow "who'd rather fly a P-51 Mustang than anything else in the world," he was a natural target for the Harvard kids.

Alcorn was above all an oil and gas man, a rich one, whose elegantly framed maps of the Arkansas, Louisiana, and Texas fields in which he's sunk his cash attest to the fact that he thrives on risk. When the

DAVID THOMPSON



M.B.A.s entered his office, they launched into a speech on the merits of a beast called the TOS, for "transfer orbit stage," and its appeal—a direct payoff. Part of the M.B.A.s' award-winning project had been a market survey to assess which specific areas of space possessed the greatest commercial potential. The survey revealed an enormous gap in the market for what are called upper-stage rockets, vehicles that can boost satellites from a low orbit to a higher, more productive corner of the sky. Unlike Space Services' *Conestoga*, the TOS upper stage would push large payloads of up to six thousand pounds, primarily telecommunications satellites, from the Space Shuttle's cargo bay to geosynchronous orbit, an extra twenty-two thousand miles straight up. NASA's own research had concluded that the TOS was a missing link in the American space effort, one that the agency was disposed to develop on its own. But, the M.B.A.s told Alcorn, if a private company stepped in and offered to develop the rocket, NASA might back off.

The boys made their pitch, asking Alcorn to lend them the money. The oilman was indignant. "No, I will not *loan* you any money," he said. "I'm doing this because, if it's valuable, I want it." The M.B.A.s, in short, had a partner.

Trying to line up additional capital locally, however, proved tricky. Alcorn would call acquaintances in Houston and tell them, "Hey, I've got this great poten-

tial investment," only to hear, "Gosh, Fred, I'm already in Space Services" or "I'm in Max Faget's space station deal." But several people were interested, and on the day the M.B.A.s returned to Houston to make their presentation, arrangements for a half million dollars' worth of financing were completed. Alcorn put up 50 percent himself.

Thompson, Ferguson, and Webster quit their jobs and incorporated their venture as the Orbital Systems Corporation (they later changed the name to Orbital Sciences Corporation). By October, a month after the world had marveled over the flight of the *Conestoga I*, the three young men from Harvard decided that the time was ripe to approach NASA officially, and a few weeks later they submitted their proposal.

NASA was immediately receptive—not only did the organization want to implement the mandate handed down to them from the White House to hasten the commercial use of outer space (a happy President meant larger budgets, after all), but also individuals within the agency had sentimental, nostalgic motives. Early in the negotiations, Philip Culbertson, NASA's highest-ranking nonpolitical employee, told the M.B.A.s: "When I was your age, I was involved in an exotic government project called the Atlas. And I had the opportunity of helping and watching a rocket blow up on the launch pad." If age was no barrier to destroying the rocket that would eventually cart men to the moon, it was certainly no bar to creating the vehicle that would eventually truck satellites to the geosink. Culbertson and others like him, Thompson would recall, "became our guardian angels."

But the deal would not go through until Orbital Sciences passed three tests; in seven weeks they had to demonstrate the ability to implement the project technically, to fund it, and to manage it. With great speed they concluded an agreement with Martin Marietta, the aerospace giant, to help design the thing. Then they offered a management plan to NASA that included several former NASA engineers as key players. And to prove they had the financial clout to pull it off, the M.B.A.s summoned their Texan to Washington. From start to finish, the agreement took twenty-three days.

NASA's haste was unusual. The quickest contracts usually took at least six months. But the agency was looking over its shoulder and seeing increased competition with the Space Shuttle from foreign firms and governments also entering the for-profit space business. They were also concerned that domestic companies like little Space Services would steal their thunder and consequently cause Congress to drain their budget. Then, too, signing a contract with Orbital Sciences set the prec-

edent of having America's commercial space effort tucked securely under NASA's wing. For a lot of reasons, their cooperation made sense.

The cooperative venture between NASA, Orbital Sciences, and Martin Marietta was announced in April 1983, just short of two years from the day when David Thompson saw the Space Foundation's ad in *Aviation Week*. Meanwhile, the Space Foundation's first president was working hard to make a contradictory point: that the way to make money out there was to ignore the Shuttle.

For what Hannah had been working on was the link that would make Conestogas useful. After all, there weren't many satellites just waiting to be sent into low earth orbit by a Space Services rocket.

So David Hannah was building his own satellite, the *Aeros*, which would transmit data back about the most likely spots to find natural resources here on Earth. He would then sell that information to oil companies, mining companies, and farmers wanting to know where to find gold and gas, or where to plant crops. "There's no market out there that you can say we can get a piece of," said Hannah. "We've got to generate a market."

Fred Alcorn was, not surprisingly, unimpressed with his fellow Houstonian's plan. "Everyone I've talked to in the space business, from astronauts to engineers, they've all said, 'Alcorn, what you're doing with OSC is far more viable than what Space Services is trying to do.' Space Services," he sniffed, "is not even a company. It's a hopeful concept." Fred Alcorn and his M.B.A.s would throw their lot in with the Shuttle.

## NASA and the Big Boys

The bird nestled on Pad 39A three miles in the distance. The threatened storm had not materialized, but the sky was cloudy enough that some tension remained over whether the sixth launching of the Space Shuttle *Columbia* with its cargo, the \$1 billion Spacelab, would go off. NASA knew how important this Shuttle launch would be economically. As a representative of the European Space Agency, the fourteen-nation consortium that built Spacelab, said at NASA's guest center: "Space is no longer an area where you do things because they're nice. Space is now a business-oriented area. You have to show there is a market reason to be there." Back in Houston, Fred Alcorn was banking on this miraculous machine; up in Virginia, the M.B.A.s had their fingers crossed. Although the first test of their TOS was still two years off, they knew that every delay in the launch of a Shuttle pushed back their target date further and further. And David Hannah

was no doubt hoping for a delay healthy enough to emphasize the need for a quick and dirty rocket like his *Conestoga*.

At the observation site, a large contingent from Rocketdyne, a subsidiary of Rockwell International (which built the orbiter) mingled with a crew from Morton-Thiokol (which manufactured the Shuttle's rocket-booster motors). The rest of the big boys—Lockheed, which has the Shuttle refurbishing contract; McDonnell Douglas, which took charge of payload integration; and MBB Erno, the West German company that built the Spacelab—had their own viewing area. Like little Orbital Sciences, these giants have also gambled that space commercialization and the profits from it will be entirely Shuttle-derived.

As the digital clock reached 00:00:00, smoke billowed, the engines flashed, and the crowd gasped. *Columbia* lifted ever so smoothly off the pad, climbing slowly, and a minute later passed out of sight. And with it flew the hopes of some and the fears of others, for the right combination of decisions from NASA just might preclude the entrepreneurial commercialization of space.

As the players shake down, the question they will be asking—that some of them are already asking—is this: What, finally, can the Shuttle do? Right now the Shuttle is seen as a fairly reliable, fairly cheap method of getting off the ground. But there are things it cannot do, like fly to high earth orbit. So companies can either try to enhance the Shuttle's capabilities (like OSC is doing), making themselves "Shuttle-dependent," or go the "Shuttle-independent" route, like Space Services. Hannah and his supporters argue that the Shuttle not only is limited but is also more expensive than originally anticipated. "The *Conestoga*," space attorney Art Dula emphasized, "is a niche-market vehicle. It is for a specialized market that is not well served by the Shuttle."

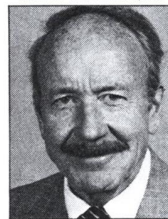
Official NASA doctrine is that the Shuttle can do it all, and the agency has gone to great lengths to convince major corporations that the real money-making possibilities lie in Shuttle-dependent manufacturing. "The place for people to commercialize is at the place where you can make a profit," said Glynn Lunney, NASA's Houston-based manager of the Space Shuttle program. "That is at the microchips, at the pharmaceutical level. . . . U.S. industry and the investment dollar would be very well served by investing as near to the end product as possible." Concluded Lunney, "The buck is not in the blast-off."

Given NASA's proven expertise in the space business, one would be hard pressed to disagree with it on the issue of launch competition. Yet it's like so many contests between a lion and a mouse: the lion is bigger, but the mouse is quicker on its feet. "The decision to go ahead with the

FRED ALCORN



PHILIP CULBERTSON





*Conestoga* was made in twenty-four hours," says Eagle Engineering's Hubert Davis. "That's another reason why I look for small companies to grow rapidly and exploit this new environment more effectively than the Rockwells, Exxons, and ITTs. Because they'd have entirely too many meetings before they could decide to go ahead with something."

Experience shows that NASA and the big boys have indeed missed important opportunities. Since 1972, for instance, the agency has been inclined to phase out the country's expendable launch vehicles (ELVs), which had served the world faithfully for nearly two decades, hauling satellites into geosynchronous orbit. NASA figured the Shuttle would soon be able to do that, and it was no secret that they wanted to remove anything that might compete with it.

But several countries in Western Europe weren't willing to wait; they asked for permission to develop a Space Tug—a sort of reusable version of Orbital Sciences' TOS. The U.S. government said no to the Europeans; it wanted to reserve that right for itself. So the European Space Agency asked for permission to privatize the Delta ELV system, and again the United States said no. Peeved, the Europeans walked away and developed their own expendable shuttle-independent launch vehicle, called the Ariane. Although the Ariane has not been trouble-free, it has managed to lure some valuable business away from the Shuttle. "The basic idea that was missed was that we cannot rely on one system, the Shuttle. We need a backup," said Klaus Heiss, the economist whose NASA-sponsored studies of the Shuttle helped convince the U.S. government to build the system. Heiss estimates that the Ariane is now taking away about a billion dollars in launch business from this country. The disastrous deployments of two communications satellites from the Space Shuttle *Challenger* last February only underscores the Ariane threat. Both satellites were lost, apparently when their upper-stage rockets misfired.

But if the Ariane story illustrates how government policies created opportunities for entrepreneurs at home and abroad, it also has dark overtones. The space privateers fear that the same sort of technological protectionism that gave rise to Ariane will kill their operations. Their worry is that the federal government will continue to subsidize Shuttle prices for satellite launches below their actual costs, making private launch services financially unattractive. Such actions would, they contend, prevent the flowering of a vigorous commercial presence in outer space, at a time when only such a commercial presence can successfully withstand the kind of foreign competition represented by Ariane. President Reagan's statement last January that "companies in-

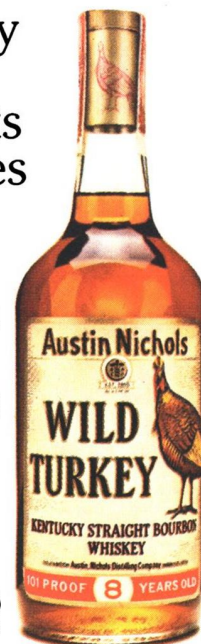


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terested in putting payloads into space must have ready access to private-sector launch services" should have at least allayed the entrepreneurs' worries. But while his support certainly helps, fears linger. A few days after his State of the Union speech the President, in another policy statement, seemed to give NASA much of the responsibility for assuring and directing commercial investments in space. Not very comforting to the little guys.

In the meantime, NASA's attitude toward the entrepreneurs has gotten more testy. By late 1983 Chris Craft, who as director of the Johnson Space Center had sent an engineer to Matagorda Island to help David Hannah review the *Percheron's* wreckage, said that he believes fervently in "a cooperative venture between government and industry to get us into space." To the launch privateers "cooperation" sounds suspiciously like "subsidization" of the Shuttle and the aerospace giants who stand to profit from it. "Until you can capture the market, you've got to subsidize it," admitted Craft. The entrepreneurs who cry for the government to get off their backs and remove all barriers to their entry into space are, Craft believes, motivated by nothing but greed. "Their arguments," he says, "are full of crap."

"We've had our Magellans and Christopher Columbuses of space, just going out

and exploring the territory," says I. Don Brown of Fedex SpaceTran, a division of Federal Express created to research the company's needs in space. "Now, finally, we've reached the point where we have our Hudson's Bay Companies ready to go out and exploit it."

It is early winter 1984. Gary Hudson is back in California, his company having disbanded after the *Percheron* disaster. Hudson still believes that liquid fuels are the only sensible way to leave the earth and has created a new enterprise, Pacific American Launch Systems, to continue the development of a new version of his old standby, the Big Dumb Booster, whose costs are now estimated at \$150 million. "We went through a lot of soul-searching after *Percheron* blew up," says Hudson. "Should we be like Space Services and go for a quick orbit, or plan to dominate the launch business in 1990?" The choice was easy. "We decided to go for the whole hog. I figured, why not? I'm young."

Fred Alcorn has become chairman of OSC's board. So caught up did he become with the idea of space commercialization that he has also taken the chairmanship of the Space Foundation, the place where it all began. He and the M. B. A. s have identified three hundred potential paying customers who will need their TOS between now and 1999; they expect to have thirty flights under their belt before 1990. At \$20

million a launch, that's "a rather staggering sum," says Alcorn. "The return on investment is... well, astronomical."

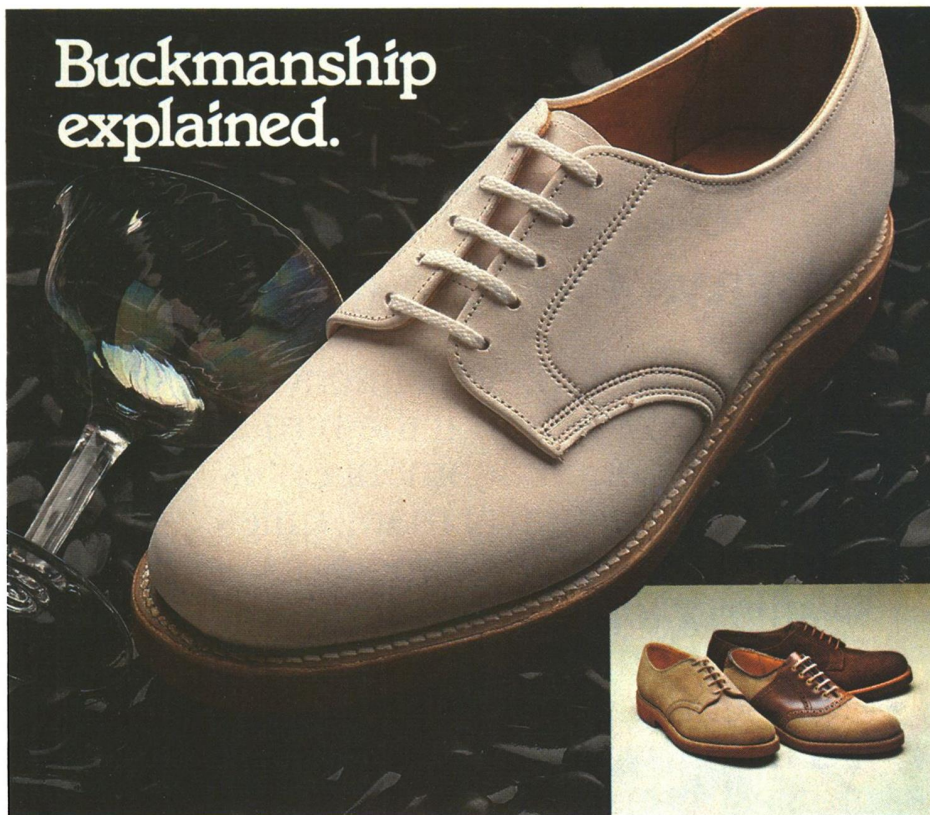
Deke Slayton, for his part, has become a total convert to the ways of the entrepreneurial upstarts. Of his former NASA colleagues he says, "The Shuttle can't haul twelve payloads to twelve different orbits. I say, 'Hell, you tell me when your Shuttle can launch *our* satellite, and I'll agree with you.'" By 1990 *his* satellite—the *Aeros*—should have a sister in orbit, with a third and fourth bird in the works. Space Services also intends to have an interpretation station here on the ground spitting out photographs culled from the radio blips sent down from on high. And then there's also the *Conestoga II*, and *III*, and so on—for paying customers with their own satellites. "We look at it as a \$2.3 billion business by 1994," reports Slayton.

But because it will take many new investors before this projection is realized, David Hannah, the first entrepreneur to break the private barrier to outer space, spends much of his time on the telephone hustling money. He dismisses the notoriety that's befallen him. "I've had my conversation with myself and decided that [fame is] not what I really want. I'm just enjoying what I'm doing," he says. "And if it leads to a large economic bonanza, well... I'll be tickled to death."

Ten miles away, just around the corner from NASA Road 1, Hubert Davis is buoyant after leaving Eagle Engineering's latest board meeting. He and the other former NASA engineers have decided to go "bullish" on their company's future. Besides Hannah's enterprises, Max Faget's orbiting industrial park is "very real." "Two thousand and one will not be as Arthur C. Clarke portrayed it," predicts Hugh Davis, "but we won't be nearly so far away as most people think."

One floor above, Maxime Faget stares out the window and contemplates the rockets he helped build. Faget, like so many of the others, has his own company now, called Space Industries Inc. "This is an adventure," he says of the manufacturing facility he hopes to have in orbit by the decade's end. "It's something—something new to us. The big difference is that we're not trying to find new ways to do something, as we were doing in the Mercury and Apollo, when we didn't know it could be done at all. Here we're trying to find ways to do something at a cost that makes it commercially feasible. It's just that one new element..."

Faget's voice trails off. For all the excitement the future holds, the unfinished noncommercial business of the past still intrudes on his memory. "Practically nobody talks about a manned trip to Mars anymore," he says. He is asked whether it will ever happen. "Oh, sure," he says, with the same kind of confidence that sent men to the moon. "Of course it will." ☉



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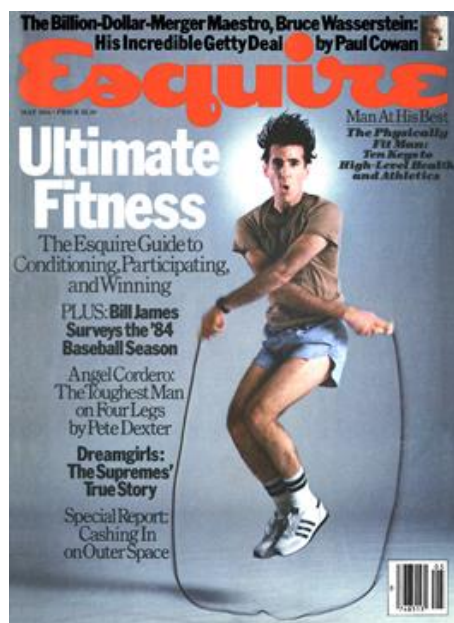
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