Mike Gold

Bigelow Aerospace has launched two expandable Pathfinder spacecraft—Genesis I and Genesis II—from Russia on Russian boosters. Tell us about that, including BA's experience with export controls, with the International Traffic in Arms Regulations [ITAR].

We had selected a private Russian/Ukrainian company called ISC Kosmotras, that is converting the Russian SS-18 ICBM into the commercial configuration called the Dnepr. I anticipated that there would of course be export control issues, since we were launching on a converted Russian nuclear missile, but what I didn't expect was that, second only to gravity, the ITAR had the best chance of keeping Genesis I and II on the ground. Due to the Herculean challenges presented by the export control process, the biggest moment of the campaign for me was getting our spacecraft to Russia. Launching it into space was the easy part, since technically space isn't a foreign country.

What happened?

A lot. We showed up at our first meeting in Moscow with just a handful of engineers, and across the table there were about a dozen representatives from Kosmotras. We—the U.S. entity at the table—had not one but two U.S. government officials monitoring our adherence to the regulations. We Americans hold ourselves out to be the bastion of freedom and of international business, and yet, if we had beamed down an alien from Mars and asked it which side of the table represented the free country, the Martian would have pointed directly at the Russians.

How did you react to that at the time?

It was startling and depressing, not only that U.S. government officials were monitoring us, but that we were paying for the monitoring at the rate of roughly $130 per hour, plus overtime, and for air travel and room and board expenses for the monitors. For our Genesis I campaign alone, DTSA [Defense Technology and Security Administration] charged us $223,208.10 just for export control review and monitoring fees. I joked with the Russians that in the Soviet era, the KGB may have spied on them, but at least they had the good courtesy to do it for free. We also had to pay outside counsel for assistance and paperwork.

If you totaled it all up, including my own time, we probably spent well over $1 million on everything related to export control and to implementing export control requirements. So I ask you, is this a regulatory environment that encourages the growth of innovative concepts and supports small business? No. Just the opposite.

Did the Genesis I program have any militarily sensitive technology?

No, and a lot of money and valuable government resources were wasted in monitoring systems that were not nearly as sophisticated as what the Russians themselves produce. And therein lies the fundamental flaw with the overly broad nature of the ITAR: It treats commonly available and well-understood space-related technologies under the same regime as sensitive space systems with real military applications. This should not be the case.

"[ITAR] treats commonly available and well-understood space-related technologies under the same regime as sensitive space systems with real military applications."

The current regime is tantamount to trying to conduct open-heart surgery with a chainsaw. Quality export control requires finesse and discretion, and unfortunately, current congressional law gives the Dept. of State insufficient amounts of both.

Go into greater detail about all that in the Genesis I case. What happened?

A good example of the problems is provided by the issues surrounding our Genesis I stand, which the spacecraft rested on at the launch base. The stand is simply a circular aluminum platform with four legs sticking out to support the spacecraft. In other words, for all intents and purposes, it is an upside-down coffee table. And yet, under our TAA [Technology Assistance Agreement], the stand fell under the auspices of the ITAR because it had been designed and built to fit the spacecraft. So BA was required to keep this metal coffee table under guard 24 hours a day, seven days a week.

Hard to see a national security issue in all that.

One can only imagine the national security repercussions of Russian agents gaining access to the Genesis I stand. Russia could have sold its secrets to Iran or North Korea, where our enemies could use its technology to build tables for serving coffee, or, in a worst case scenario, even tea. We eventually got the monitoring requirements surrounding the stand repealed, but it remains an excellent example of the overly broad nature of the ITAR.

What exactly is a TAA?

TAA is the initial document you file with the Department of State's Directorate of Defense Trade Controls [DDTC] describing what sort of collaboration you're planning, the type of information that will be shared, and who the foreign parties are. For us, gaining approval for TAAs took anywhere from three to six months and, unfortunately, was only the beginning of a lengthy and difficult process.

Interview by James W. Canan

A TAA involving space hardware and Russia inevitably includes numerous pages of provisos. One such proviso involves the development of a Technology Transfer Control Plan [TTCP], which is a much more specific document describing the exact process for foreign interactions, security protocols, and so forth. Drafting and gaining approval for a TTCP can take another two to four months. Export control is a paper-intensive, bureaucratic-laden process that would make the IRS green with envy.

Did you try to finesse the regulations in any way?

As I mentioned previously, BA applied for and was granted a waiver from the TAA provision requiring the 24/7 monitoring of our Genesis stand and of two other nontechnical metallic objects. But we still had to file more papers to gain clarification on several points, which added more work and a few more months to an already bizarre process.

What it came down to was that we had to spend the time, effort, and money to file paperwork to get permission not to guard a metal coffee table, and even then, even with the waiver, the table was still considered ITAR-controlled and had to abide by strict security protocols.

How do the Russians deal with all this?

As is always the case, the Russians have adopted a very pragmatic approach. The big difference between Russian and U.S. export control is that the Russians tend to focus only on systems that truly are sensitive, while we spend a lot of time worrying about metal coffee tables. The current implementation of ITAR basically treats U.S. commercial entities and their international partners as if they are criminals, and operates on a guilty-until-proven-innocent basis.

This sends a very poor message to our allies abroad. For example, the Japanese could not be a better friend of the U.S., respecting human rights and supporting global peace, and yet, under the overly broad ITAR, in many ways they are treated the exact same way as nations that don't share our common ideas and goals. I know many in Japan are both confused and insulted by this.

Mike Gold serves in dual roles as corporate counsel and director of Bigelow Aerospace's Washington, D.C., area office. He is responsible for overseeing a variety of areas, including contracts with launch providers, international export control, the company's relationship with NASA, and corporate strategic planning.

Prior to joining Bigelow Aerospace in a full-time capacity, Gold assisted the company as an attorney in the Washington office of Patton Boggs, LLP. While there, he supported several clients in high-tech and education-related fields with a specialty in advanced aerospace ventures. He also has served as a state aerospace business development officer, as an attorney in the office of McGuire Woods LLP, and as a summer law clerk at NASA Langley.

In September 2008, Gold was appointed by the Secretary of Transportation to serve a two-year term on the Commercial Space Transportation Advisory Committee, and is chairman of its Export Controls Working Group.

Gold is a member of the District of Columbia and New York State Bar Associations and a graduate of the University of Pennsylvania Law School, where he founded and was the first coordinating editor of the Journal of Constitutional Law.

"Our export control policies are caught up in the past, and it is devastating in terms of jobs, innovation, and opportunities."

Why is this the case?

Our obsolete policies live in a fantasy world of American technological hegemony that hasn't been the case for years, if not decades. Our export control policies are caught up in the past, and it is devastating in terms of jobs, innovation, and opportunities. If we don't do something to turn it around, it will simply be too late, and the lion's share of high-tech space work will be moved overseas.

Our European friends hate ITAR because it makes it hard for them to work with U.S. entities. On the other hand, it has created many opportunities for them by providing motivation to create their own technologies and systems. We basically forced other countries to develop their own space capabilities. Some of my foreign friends joke that ITAR should be called the European aerospace full-employment act. It helps them and hurts us, and—the real tragedy—makes us less safe in the process.

How would you describe the effect of ITAR on U.S. companies?

It's a bit of an oversimplification, but generally, ITAR is making our domestic companies less and less competitive in the international marketplace. When they are no longer competitive, they will go out of business, and then our government will end up dependent on European or other international suppli-

ers for critical components. The sick irony is that, to a large extent, the only nation whose aerospace expertise has been blunted by America's export control program is America itself. It would be laughable if it weren't so sad.

But you support export control in principle, don't you?

Absolutely. The ITAR and export control play a vital role in America's national security regime. We are in no way against export control. That's my point. We are patriots, we recognize that there are sensitive technologies that deserve heightened scrutiny and protection; however, metal coffee tables are not among them. If the United States Munitions List [which states what comes under ITAR control] were updated to reflect modern realities, then the Dept. of State and DTSA could spend their limited time and resources focusing on hardware that deserves protection, and stop wasting their efforts on obsolete and/or widely available technologies. This would make us all safer.

Do you have a sense of how government officials involved in the process feel about all this, by and large?

I know that the government officials who have to enforce the rules would applaud if Congress gave them the freedom to act with discretion. There are a lot of smart, great people at State, particularly in the leadership of the DDTC. We should be letting these officials do their jobs and decide what should and should not be controlled. Forcing these good people to abide by the current blanket regime is like having a Lamborghini in the garage but never driving it.

What do you advocate by way of change?

This is a delicate issue requiring that distinctions be made if the American industry is to survive. What we are in favor of is not getting rid of the ITAR entirely, or even any sort of radical reform per se, but simply fine-tuning the process so that government resources can be applied to monitoring and protecting only the technologies and systems that merit it. Again, if we stop paying attention to the coffee table and pay more attention to the ballistic technology, we would be doing both the private sector and the government a service. There is a false dichotomy that gets in the way of export control reform, that of national security versus commercial freedom. We can have both, and we must, especially in this time of recession and job losses. It makes more sense than ever to review all this and take a look at commonsense ways we can move forward.

Are there signs the Obama administration is moving in that direction?

President Obama was the only presidential candidate in the last election to explicitly include ITAR reform—I should say, export control reform—in his space policy. So we have high hopes that we will see commonsense progress in the future. I want to emphasize that there are some really excellent people at the Dept. of State and at DTSA who, like us, understand the issues, are patriots, and want to have effective export controls, and who recognize the problems with the current implementation of the ITAR.

Have you told your story, stated your position, to anyone in the new administration or in Congress?

Like many aerospace companies, we gave a briefing to the Obama space policy team during the presidential transition period, recounting our export control experience during the Genesis I and II campaigns.

What would you like to see happen?

Much greater flexibility via a case-by-case review of license applications. Export control is inherently a case-by-case issue and should be conducted on that basis, whether it's different technologies or different countries. One size does not fit all in the export control world. Again, we need a system that allows DDTC officials to act with discretion rather than simply abiding by blanket congressional prohibitions.

"...we need a system that allows DDTC officials to act with discretion rather than simply abiding by blanket congressional prohibitions."

Let's get back to Genesis I and II, to BA's teamwork with Kosmotras and the Russians. Tell us more about that.

The Russians did a phenomenal job for us with their space launches. One of the things we loved so much about working with Kosmotras was that the company is literally turning swords, in the form of the SS-18 ICBMs, into plowshares, the Dnepr launchers.

I grew up in fear of nuclear holocaust and never could have imagined standing on an active Russian strategic rocket forces base, pressing the button to launch a converted Russian nuclear ballistic missile with an expandable spacecraft prototype built by a Las Vegas entrepreneur, Robert T. Bigelow, and have it work so well. Twice. This causes people to redefine what is possible or impossible. A weapon of war transformed into a means of peaceful commerce. I am a Trekker—a *Star Trek* fan—and this is really what *Star Trek* was all about.

What do you mean by that?

That space is too difficult and complex to take on as a single nation or people. Instead, as the Genesis program demonstrated, we need to put aside our petty biases, bigotries, and prejudices in order to tackle space exploration as one people, as humanity. As Edward James Olmos—who played Adm. Adams in the critically acclaimed TV series *Battlestar Galactica*—said at the United Nations last March, there are no different races, there is only the human race. Space exploration forces us to face this fact.

The longest-running international collaboration is between us and the Russians, back to Apollo/Soyuz in the 1970s. The international space station is another example.

Why did you launch on the Dnepr, and where in Russia?

We needed the strength and power of Dnepr because our Genesis spacecraft are substantial in size, each more than 14 ft in length and 8 ft in diameter, post-deployment, and weighing nearly

3,000 lb. Previous Dnepr launches had taken place at Baikonur, Russia's primary commercial space launch facility in Kazakhstan, but the Genesis launch, for a variety of reasons, was shifted to what is now known as the Yasny Space and Missile Complex in the Orenburg region of Russia.

Genesis I was the first commercial launch at Yasny and the first launch ever of an expandable module prototype into space. It was also the first time that the Dnepr had ever carried a single large integrated payload instead of multiple smaller satellites. The Genesis I launch occurred on July 12, 2006, the Genesis II launch on June 28, 2007.

How did the launches go?

Both were outstanding. In the Genesis I launch, Kosmotras placed our spacecraft within 400 m of our desired orbital injection point. Genesis II was even better; their accuracy was phenomenal. With Genesis II, the Russians got our spacecraft to within 100 m of where we wanted it. Both spacecraft are out there now, operational. We are currently in the mode of studying long-term viability and durability, how the spacecraft stand up to the environment in terms of radiation and thermal resistance, their leak rates and so forth. They are having tremendous success in terms of validating the technology of expandable habitats.

Describe the inflatable modules.

The expandable envelope has micrometeorite and orbital debris shielding and, in addition, several layers of a Kevlar-like material, which is more durable and lighter than metal, more resistant to radiation, for example, and better able to stand up under the impacts of meteorites or space debris. Once in space, the compacted spacecraft is deployed by means of compressed air.

Take us back to the creation of Bigelow Aerospace in 1999. Why did Robert Bigelow form the company?

I don't want to speak for him, but my understanding is he became fascinated with microgravity research and development, particularly in terms of biotech and pharmaceuticals, and with transforming the world through space commerce.

Mr. Bigelow believed that expandable space habitat technology had the potential to revolutionize commercial applications and space exploration in general. He saw it as a way to create a platform for microgravity research to take place, and for many other scientific and commercial purposes as well. The applications of microgravity research are nearly limitless.

"There is no more pressing issue for government or the private sector than resolving the crewed transportation issue, and we see both moving forward with a relatively inexpensive commercial capsule on top of an EELV."

How would you describe BA's aspirations for space in general?

We want to see space become a much more active commercial venue, particularly in terms of crewed activities. Telecommunications and remote sensing are the only arenas where real economic activities are happening right now, resulting in hundreds of billions of dollars in business and in tens of thousands of jobs. We want to see people in orbit making this happen for a variety of crewed, commercial enterprises.

What's next for your company?

We had expected to encounter some significant problems with the Genesis spacecraft, whether due to rocket failure or to our own technological failings upon hitting orbit. But we did not. So Mr. Bigelow decided to go ahead and take the next step toward building an actual human-habitable spacecraft. That step is our Sundancer program.

Sundancer is still a subscale technology demonstrator in a literal sense, smaller than the spacecraft that we hope to deploy eventually as our standard module. But if it works, it will be able to support a crew of up to three, and would form the cornerstone of our future orbital space complex.

What is the status of Sundancer?

Sundancer is under construction right now. It will have its own propulsion system, and, for example, we awarded a $24-million contract to Aerojet to build part of that system. We plan to build and test two Sundancer spacecraft and then go on to our full standard module, the BA 330, which will have roughly 330 cubic meters of usable volume. The Sundancers can be linked up to the BA330 via a node/bus combination that will be launched after the first Sundancer is successfully deployed.

So would you say that the future looks promising for the BA space habitat program?

Yes, but our problem—our Achilles' heel—is that we still do not have a way to get people to and from our orbital habitats. When we began this project, we thought that space transportation would make steady progress. Instead, not only have we not seen that progress, but if anything there has been a global recession of human spaceflight capability—retiring the shuttle, for example. SpaceX represents one of the great hopes in this regard, with its emerging line of Falcon boosters and Dragon capsules. Putting a commercial capsule on top of an EELV may have great promise as well. But all this has to be worked out.

What about the shuttle. Could you buy and fly it?

Even if we could buy it, the shuttle system is prohibitively expensive and so dangerous that I wouldn't be able to sleep at night sending good people up on it. I'm not sure NASA should even be flying it now, just from a safety perspective. Most of us don't even own cars that are that old. But shuttle represents the past. I prefer to think about the future, and, again, if done correctly, I believe there is a great deal of potential in placing a safe and simple capsule on top of an existing EELV. That strategy could not only solve NASA's problems but would be a boon to industries.

There is no more pressing issue for government or the private sector than resolving the crewed transportation issue, and we see both moving forward with a relatively inexpensive commercial capsule on top of an EELV.