The High Ground

We Have It!
We Like It!
Can We Keep It?

As we begin to develop the required capabilities for the Objective Force's success, it is tempting after our run of past successes to assume that Space superiority is our birthright and a fixed reality. But is it?

By Tomás A. Pagán

War is perhaps the ultimate competition — a competition in which not only the lives of individual men and women are at stake, but also a competition where the fate of nations and the future of cherished principles hang in the balance. As in all competitions, future success depends heavily on the outcome of a continuous series of smaller, less obvious competitions. Our experience over the last decade has convinced us that our success in one of those competitions — providing access to Space-based assets for ground forces —was a key element in our success on the battlefield. Our assessment that it will be even more of an essential ingredient in the future has led to the catch phrase: Secure the high ground.

Our vision of the importance of Space to the Objective Force is clear.

The Objective Force aims for a quantum leap in strategic and tactical mobility in combination with the lethality and survivability equivalent to today's modern heavy force. In particular, the Objective Force will require tactical communications that support significantly increased data rates while on the move between highly mobile elements that are habitually out of line-of-sight with each other. These same forces will also need increased reach-back for support from non-organic fires and intelligence. These increased communications must be provided in an austere support environment without significantly burdening either strategic or tactical mobility. It should be expected that over-the-horizon targeting and situational awareness will be a significant contributor to Force survivability. For example, the Objective Force could use maneuver enabled by superior knowledge of both the friendly and enemy situations in place of physical armor. In a similar way, the Objective Force could benefit significantly from engaging targets before physical line-of-sight obtains.

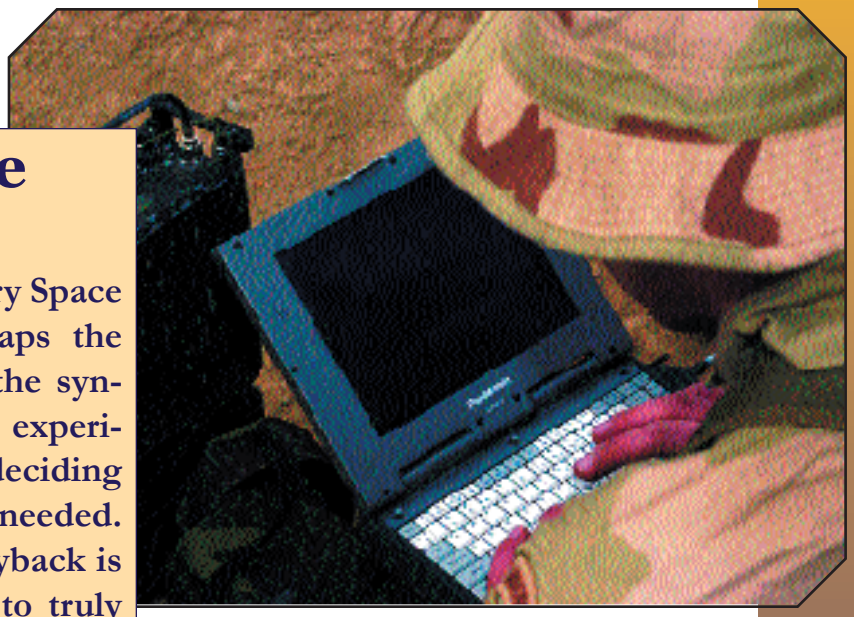
As we begin to develop the required capabilities for the Objective Force's success, it is tempting after our run of past successes to assume that Space superiority is our birthright and a fixed reality. But is it? Who is the competition today? What have been the ingredients in our success to date? Determining the ingredients of our past successes may give guidance to the future choices we make in providing Space capabilities to the Objective Force.

Possibility One. No amount of prior planning will ever replace dumb luck.

Whether we wish to admit it or not, there is an element of luck in almost every major undertaking even if it is just having the right people in the right place at the right time. Two of the most prominent Army Space accomplishments fall squarely in this category.

The Army Tactical Exploitation of National Capabilities (TENCAP) program has been (and continues to be) arguably one of the most significant successes of Army Space. The value added to the Army has been enormous; the cost has been very small in typical modernization terms — a few well-placed, dedicated men and women at the Army Space Program Office who developed a very smart way of doing business on a shoestring budget. But even the most ardent supporters of Army TENCAP use the phrase "picking the low-hanging fruit" to describe this effort. Those same supporters have been frustrated more than once when the Army has been reluctant to push hard for a new capability when faced with the prospect of substantial new investments. We would all agree that picking the low-hanging fruit is a smart way of doing business, but it then becomes a matter of chancing that others plant the right trees.

Another of our noted successes is the global positioning system (GPS). GPS receivers were indispensable to the rapid maneuver employed in the featureless desert during Operation Desert Storm and many would argue that this was the true origin of the Army's recognition of the value of Space support. Again, the availability of the small, lightweight ground receiver was due to a few dedicated men and women — this time at what was to become Army Space Command — and another shoestring.



Building the Space support segment

If we are to truly provide the necessary Space support to the Objective Force, perhaps the most difficult challenge may come in the synchronization of fielding. ... (we could) experiment with different techniques before deciding what to build and the quantities that are needed. The upfront investment is small; the payback is immediate. If the Objective Force is to truly rely on Space support for critical battlefield functions, then we have to be able to define how we will do that now — while the future combat system (FCS) is still being created. We have to be able to build and deploy the Space segment while the FCS is being developed and deployed. We have to define the ground equipment in time for it to be built into the FCS. Otherwise, Space is always going to be an add-on.

While one should always be prepared to take advantage of a good break, it is not wise to rely on it if the outcome is critical to success. Most agree that the whole Army, as opposed to small pockets within the Army, did not share the view that Space was critical to success on the battlefield prior to Desert Storm. Fortunately, neither did our opponents. Winning the competition for Space superiority in Desert Storm would have required only a small investment in the right places by our opponents. One reconnaissance satellite and a few GPS jammers might not have determined victory, but even that small an investment would have made it much more difficult for our forces. We were very lucky that the competition folded.

Possibility Two. The good news is: It is a replay of the Tortoise and the Hare. The bad news is: This time we are the Hare!

We should recall that the United States played catch-up in the first few Space events. In spite of the pioneering efforts of Robert Goddard, we obtained much of our initial rocket expertise from the Germans after World War II and the first satellite and first man in Space were not American, but Soviet. The Army has always taken some pride in helping rescue the national reputation when, two months after Sputnik, America's first orbiting satellite (Explorer 1) was launched on an Army Redstone rocket after several failures to launch the Vanguard satellite with the Navy's Vanguard rocket.

And it isn't over by any means. Although we may be very comfortable with our current position, it isn't a one-horse race. The Soviets always were a competitor in terms of launch capability. Now the Russians and Chinese both are significant players in the international launch business, joining Arianespace and the European Space Agency as real challengers. In spite of the rough start with Ariane V, we cannot take the international launch dollar as a U.S. possession.

It is very clear now that the Chinese are moving toward manned Space flight. With the successful recovery of Shenzhou IV ("Divine Vessel' IV) after a week in orbit, we expect a manned launch before the end of the year. In fact, with the inevitable hold on U.S. manned launches required by the traumatic loss of the Shuttle Columbia, we may face a period in which the only two operating manned launch systems will be the Chinese Shenzhou and the Russian Soyuz.

We all recognize that it is harder to hold a lead than it is to make one up; the bigger the lead, the easier it is to be convinced there really isn't any competition. The guy in the back has the advantage of a clearly defined path and a clear example to emulate — both good and bad. The guy in front has to make choices about the direction of the road ahead; choices that are often difficult and controversial.

An old quotable phrase says that making choices is easy; living with the results of those choices is hard. We are all too aware today as we face difficult transformation decisions of just how hard modernization is when there is an existing infrastructure to support. The current state of our Space assets has those same types of issues. As an example, most of us were surprised when one of the first of the Space Architect studies of our Space communications indicated that about half of our investment was in ground terminals.

(See High Ground, page 47)

It was one thing to advocate that the Air Force spend the money to modernize the Space segment; it was quite another to find an equivalent amount of scarce Army dollars to replace the ground segment. The result of such dilemmas is that we are often forced to take something other than the optimum path. A competitor, new to the scene, may not be burdened with such considerations. They will likely find it easier to proceed straight to a superior technical goal than we will. Short cuts can make the playing field more level for the competition.

Commercial success is another way of generating a shortcut. The Wideband Gapfiller is considered by some to be an excellent example of this success. Commercial success in geosynchronous, long-haul communications enabled us to get far more capability for the dollar than we could have obtained following the traditional development path that had served us so well in prior military systems. An opponent today can obtain that same bandwidth in a direct, commercial transaction. The same commercial shortcut is now available in low-Earth imaging satellites. The shortcuts get easier, they work to the advantage of the tortoise.

Possibility Three. Future challenges and dangers will remain unpredictable.

After four decades of Space development, the fielding of Space systems is still not routine. Recent problems with two of our major Space developments, the future imagery architecture (FIA) and the Space-based infrared system, have required a major infusion of scarce Space dollars to repair the programs. Even though both programs were thought to be natural extensions of previous efforts and not cases of dealing with the unknown, system development still has not progressed as planned.

Compounding the development problems is our lack of progress in developing the tools and procedures to understand how effectiveness on the battlefield depends on the specific technical capabilities of Space assets. The Army's combat simulations still do not contain an adequate representation of Space, whether it is reconnaissance or communications. As a consequence, we cannot quantify the contribution that these Space assets could make. The inevitable tradeoffs between spending more or less for capability on orbit always go for less because we cannot demonstrate the penalty for less capability.

Commercial success is also spotty. A decade ago commercial Space communications were predicted to be so numerous and capable by 2005 that some thought that dedicated military satellite communications systems would be a thing of the past. And while certain sectors continue to do well, Space Daily recently indicated "… satellite operators face numerous challenges that threaten to obstruct their path to greater profitability. Optimistic demand growth projections that led many operators to launch new transponders failed to materialize, leaving them with excess capacity and compelling them to reduce lease rates."

All is not well in the launch business either. The dramatic decrease in cost-to-orbit that was predicted a decade ago has not yet materialized, partly because of our unfulfilled technical optimism and partly because the launch market has sagged. In 2001, 39 launches worldwide generated nearly $3.3 billion in revenues according to one estimate. While this is not to be ignored, launch rates of more than 100 per year were predicted for the early 2000s as recently as a decade ago.

Additionally, the national competition for scarce Space dollars is going to get more intense. There are clearly competing military, intelligence, and civilian priorities. Some are mixed such as GPS modernization, which has both significant military requirements to increase the anti-jam margin and significant civilian needs such as a second civilian frequency, increased accuracy and proven reliability. As the war on terrorism becomes better defined, we are likely to see the need arise for new and different types of Space sensors that stress the monitoring of less traditional types of targets.

If the Objective Force is to truly rely on Space support for critical battlefield functions, then we have to be able to define how we will do that now — while the future combat system (FCS) is still being created. We have to be able to build and deploy the Space segment while the FCS is being developed and deployed. We have to define the ground equipment in time for it to be built into the FCS. Otherwise, Space is always going to be an add-on.

Even the most optimistic Space advocate among us should be wary of claiming that we know how to do this. We have more questions than we have answers. How do we guarantee the synchronization needed to support the fielding of the Objective Force? How do we support training? Is the Space segment all in Space or do we need a mix of satellites and high-altitude, long-endurance unmanned aerial vehicles (UAVs)? Can we — or anyone — afford the Space segment needed to provide the on-call, 24/7, priority support that the warfighter must have? How do we replace failures? [Launch-on-demand? Airships? UAVs?]

Could it be that the real competition is in answering these questions? Or, to paraphrase Pogo: "I have met the competition and they are us." Given the magnitude of the problem, it will take at least a few dedicated men and women to bring this off. But then that is where Army Space started. Now where did we put that shoestring?

Tomas Pagán is the Deputy Chief Scientist of the U.S. Army Space & Missile Defense Command Headquarters. He is a key technical advisor and principal consultant to the Commander and Chief Scientist and is a command representative on technical issues to the Headquarters of the Department of Army staff. He has primary Command Headquarters responsibility that includes identifying new technologies and ideas for application in the areas of Space, Missile Defense, Directed Energy Technology Programs, and advanced technologies.