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AEROSPACE AMERICA

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Conversations with Douglas Barrie

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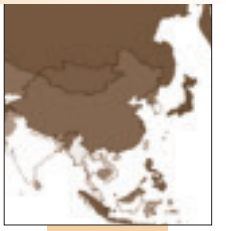


A question of leadership

CELEBRATIONS MARKING INDIA'S 100TH space mission in early September were a time for reflection—and a certain amount of angst from at least one top Indian space program leader. The milestone is certainly a worthy achievement for India, even though the total includes Indian satellites launched on other nations' rockets. But the apparent choice for a space exploration role model provides much food for thought, partly because the model selected was not the U.S. but China. The logic is understandable, but the result may be less than optimum.

In terms of humankind's overall scientific progress in space, India's accomplishment added luster to NASA's earlier success in seeing through a rapid-fire descent sequence that culminated with the landing of the exploration vehicle Curiosity on the surface of Mars on August 6. High hopes for the rover's postlanding progress have also been fulfilled; it has been sending back new images of the Martian surface and holds promise for much new scientific analysis and discovery.

India at a crossroads

In and of itself, however, India's space program is at something of a crossroads. Its 100th mission involved the launching of two satellites into LEO—the 1,569-lb Spot 6 Earth observation satellite for Europe's Astrium Services, and the 33-lb Proiteres amateur radio satellite built by Japan's Osaka Institute of Technology. Carrying them to an altitude of roughly 435 mi. was India's Polar Satellite Launch Vehicle. With a payload capacity of about 1.5-2 tons, this reliable midweight rocket has demonstrated a success rate of around 90% in 21 launches.

When it comes to heavier launch weights, however, the third stage of India's much larger Geosynchronous Satellite Launch Vehicle (GSLV) has run into problems. The GSLV has suffered four failures in seven launches since 2010, mostly the result of India's being forced to switch to building its own hardware for the rocket's cryogenic third stage. The move was mandated by the terms of its agreement with Russia, which only permitted the export of completed (that is, Russian-built) third stages to India, so any improvements to the basic Russian design were impossible unless India took over the whole job. Another launch attempt with an Indian-sourced GSLV is due later this year.

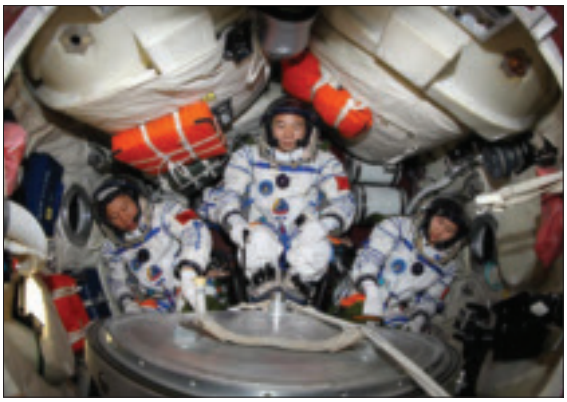
India's technical environment is changing in any case. India has long been a buyer of Russian technology, but in recent years it has been turning slowly toward the West. Restrictions on its access to U.S. technology began loosening with the easing of U.S. high-technology and dual-use technology export rules last year—rules that still hamper China.

But technology is only one of the pressures controlling the pace and direction of India's space program development. Social pressure (the availability of resources—money as well as scientists and engineers) and defense (meaning military ambitions) also play large roles, and under those broad headings must fall items such as high-tech education, local and international communications, and foreign relations.

China rising

This last point was one underscored by Manpreet Sethi, senior fellow at the Centre for Air Power Studies in New Delhi. Emphasizing the importance of China's success this year in performing manual dockings between spacecraft, she said in August, "…a Chinese space station and the demonstration of capabilities towards that objective have tremendous symbolic value for power projection. Achieving these tasks re-

Prime Minister Manmohan Singh (center) visits the PSLV launch facility on the eve of India's 100th space mission in September.



China achieved its first manual space docking in June.

flects favorably on the scientific, technological, and industrial/manufacturing capability of the country. Not only does this enhance the reputation of China to provide commercial services to global customers, it also enhances the soft power of the country."

China had performed automatic dockings last year, thus demonstrating reliability of its technology and showing it could replenish stores for a future space station—a feat already performed by both Russian and Japanese rockets for the ISS—and ultimately lunar landings and a manned lunar station. But manual dockings take the process a step further—China's spacecraft are human rated, unlike those of Japan, India, or, for the short-to-medium term at least, the U.S.—now that the space shuttle has been retired.

The manual dockings, and China's inclusion of a woman as a crewmember on its June mission, led Sethi to comment: "Each one of these feats is meant to fit into the long-term objective of having a Chinese manned space station in outer space by sometime towards the end of this decade. Such a goal was first articulated by the standing committee of the Politburo in 1992 when it approved the manned spaceflight program."

Sethi added, "As China enhances its space capabilities, it raises its profile amongst smaller nations taking tentative steps into this new domain. China plays upon the psychology of these nations by offering its space services as a means to break the monopoly of Western imperialism in a pioneering field of science and technology. That China gains commercially and strategically from such relations is self-evident."

Next steps

Of course, India has its own plans for its future in space. The next item on New Delhi's agenda is a mission to Mars, scheduled for November next year. But the Mars orbital probe is to be lofted on the proven PSLV, while a test flight of the larger (potentially two-man) GSLV with an Indian-built third stage (the Mark 2) is planned for later this year. A test flight of the still larger GSLV Mark 3 (with capacity for three crew) is proposed for early next year. China had its own Mars orbiter mission planned last year, but through no fault of China's it was unsuccessful—the Soyuz rocket on which it was carried failed to reach orbit, thus also losing the Russian Phobos-Grunt mission launched on the same flight.

A manned Indian spaceflight had been planned for 2016, to take two people in a 3-ton capsule into LEO for about a week. But the GSLV's technical problems and budget cuts have made this timetable look optimistic. The 2016 date was based on a crewed program's R&D phase starting in 2009, seven years from start to the mission itself, which would imply that a go-ahead now would mean the first manned mission launching in 2019 at the earliest.

Cooperation and 'soft power'

With the U.S. at present having no manned space launch capability, it is up to the Russians and their Soyuz fleet to feed people to the ISS until the gaggle of U.S. private operators trying to work up station resupply capabilities can break through into the manned flight business. That's a big jump. The other avenue, of course, is to book one of the Soyuz rockets that France's Arianespace has bought from Russia. There is no one else, except possibly China—which, having been isolated from U.S. rocket technology for a long time because of technology transfer and nuclear proliferation worries, has had to develop its own.

This, of course, it has done in a very deliberate fashion, with careful, long-term planning. But as things stand at present, China would be unable even to rescue the ISS crew in an emergency because its docking system would not fit the station's airlocks (and its capsules are not big enough to rescue a full ISS crew anyway). Perhaps a little cooperation in space would be a good idea, both for safety and to save money.

That is certainly the hope of the chairman of the India Space Research Organization, Krishnaswamy Kasturirangan, who said earlier this year that the Mars orbiter mission would stand India in good stead as credentials for joining multinational efforts in space.

As Sethi remarked in August, "Indeed, for the developing world, China has become a key provider of technology and other commercial launch services at competitive rates. But more importantly, China has taken upon itself the role of a mentor in space for many smaller countries in Asia. Since 2008, Beijing has led the Asia-Pacific Space Cooperation Organization. With headquarters in Beijing, it comprises Bangladesh, Indonesia, Iran, Mongolia,

GSLV-2

Pakistan, Peru, and Thailand. Training of foreign scientists at Chinese institutes and donation of ground stations to member countries to receive information from Chinese satellites are some of the activities that the organization has undertaken."

And apart from foreign influence, China also gains benefits at home, she said, because the space events "do wonders for the party's self-confidence and enhance its legitimacy at home. Secondly, they also allow China to participate in international negotiations on use of space from a position of strength. Not surprisingly, therefore, China perceives great value in these projects and will persist in its efforts towards setting up a space station by about the turn of this decade."

A Chinese space station, Sethi explained, would be in service at around 2020—at just about the time that the ISS venture between the U.S., Russia, Europe, Canada, and Japan is due to be decommissioned and deorbited. She added, "In the next decade then, China might be the only country with a permanent human presence in low earth orbit. It is a thought that should spur India into action."

It might also spur the U.S. Adding weight to that idea is a statement from the head of ESA's human spaceflight division, former German astronaut Thomas Reiter, who in early September said his 19-country agency is preparing to hold talks with Chinese officials about cooperating on astronaut training, docking systems, and life support technology. Some of Europe's astronauts, he said, have already begun Chinese language training.

A glimmer of hope for India came from the U.S. in July from NASA Administrator Charles Bolden. Speaking in Dublin at Europe's largest scientific conference, the Euro Science Open Forum, Bolden offered the hope that India would be able to use NASA's astronaut training facilities at Kennedy Space Center.

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It is impossible to argue that China is not a good role model in terms of planning and execution, but the political ramifications might well be impossible to overcome. Ability sometimes runs out of phase with capacity, and though NASA is facing severe budget problems at present, eventually India will probably be drawn to forge an alliance with the U.S. in space exploration based on the latter country's sheer financial and scientific capacity. That is, unless Arianespace or Japan manages to have any of its own rockets human rated in the meantime.

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