PROFILE A. P. J. ABDUL KALAM

The Political Ascent of an Indian Missile Man

Indian scientists are pleased that for the first time the country's next president will be one of them

NEW DELHI—He's an aeronautical engineer, a devout Muslim, and a workaholic who shuns the limelight. But however one describes India's new president, Avul Pakir Jainulabdeen Abdul Kalam hardly fits the mold of his predecessors, career politicians being rewarded for decades of faithful service. Indeed, his scientific colleagues hope that Kalam's election will send a new message to the country's 1 billion citizens: Technology can take you to the top.

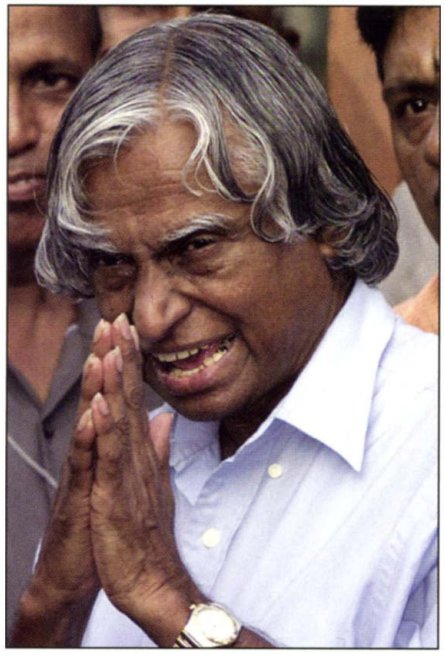
"If somebody had told me 30 years ago that Abdul Kalam will one day be a *Bharat Ratna* [the country's highest civilian honor, literally 'India's Jewel'], I would have said, 'What's new?' " says Vasant Gowariker, one of Kalam's first colleagues at the Indian Space Research Organisation (ISRO) and subsequently his boss. "But if the forecaster had told me that Kalam would one day be president of India, that would have sent me in orbit round the moon!"

The metaphor is an apt one. Kalam's election last week caps a 42-year career in India's space and defense establishment. The first person with a technical background to hold the office, the 71-year-old engineer has parlayed talent, persistence, and exemplary administrative skills into a venerated status as the father of the country's missile program. "What makes Kalam stand out is that he is not afraid of taking risks," says V. S. Ramamurthy, a nuclear physicist and secretary of the Department of Science and Technology.

The Indian presidency is largely ceremonial, with the prime minister holding all executive power. Still, the president is supreme commander of the country's armed forces, principal trustee of the constitution, and prime mover in the selection of the prime minister if the election yields no clear majority. He serves a 5-year term.

Kalam declined repeated requests from *Science* for a personal interview, but he has discussed his upbringing and worldview in speeches and two recent books. Kalam's father was a struggling boatmaker in the small seaside town of Rameshwaram in southern India, and his sister pawned her jewelry to pay for his engineering training. One of Kalam's first jobs was designing hovercrafts at a little-known defense laboratory in Bangalore, where he caught the eye of the well-known Indian physicist M. G. K. Menon.

With Menon's support, Kalam's career began to take off. At ISRO he spent almost 20 years mastering India's first-generation launch vehicle. He was project leader of the satellite launch vehicle in the Department of Space, where he worked with Satish Dhawan, one of India's top rocket scientists. In 1982 he moved to the Defence Research and Development Organisation (DRDO), becoming director-general in 1992. There he spearheaded India's indigenous guided missile program, including the Agni ballistic missile, which has a range of more than 2000 kilometers and can carry a nuclear payload. He also played a pivotal role in the country's 1998 nuclear tests (*Science*, 22 May 1998, p. 1189).



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Coming together. Muslim A. P. J. Abdul Kalam extends a Hindu greeting of peace to well-wishers familiar with his key role in developing Indian missiles.

Kalam strongly defends the need for India's nuclear weapons program. But he veers from the official government line in arguing that it, not conventional weapons, has prevented recent crises with Pakistan from escalating into full-scale war. "War did not take place because we had nuclear weapons," he asserts.

At DRDO, the projects he worked on personally had a mixed record. Of the five missiles that his team set out to design and build, only two have moved into production and only one has been delivered to the armed forces. There also have been chronic delays in ambitious projects such as the Light Combat Aircraft and the Main Battle Tank.

Despite these problems, Kalam's prominent role in these high-profile projects appears to have boosted his standing among government leaders and the general public. His personal asceticism appeals to India's majority Hindu populace, which has warmed to the image of a devout Muslim who is a strict vegetarian and a teetotaler. Likewise, his contribution to making India more self-reliant in several high-tech fields draws praise from the country's intelligentsia and helps explain his 30 honorary doctorates from Indian universities.

"He is extremely hard-working," recalls V. S. Arunachalam, a metallurgist at Carnegie Mellon University in Pittsburgh and former DRDO head. "He is totally committed to his job and lives a simple, almost spartan life." Hubert Curien, president of the French Academy of Sciences and former head of the French space agency, recalls Kalam's "matter-of-fact manner" and close attention to detail during a collaborative project in the 1970s to develop a new civilian rocket. "He was very qualified" to lead the project, adds Curien, one of the few foreign scientists to have interacted with him.

Not everybody holds Kalam in such high regard, however. A close aide who has shared the same corridors of power called Kalam's move into the presidency "akin to making a mason the chief architect of a building." To be sure, Kalam is cloaked in the sort of scientific invisibility that is not uncommon among government science managers: He has never studied overseas, never published a peer-reviewed research paper, and never been awarded a patent in his own name. This spring the prestigious Indian Institute of Science in Bangalore spurned an effort to name him a visiting professor, purportedly because he did not hold an advanced degree. And in the late 1980s Kalam was repeatedly denied election to the Indian National Science Academy in New Delhi.

Last year, after spending 2 years as principal scientific adviser to the government, Kalam returned to his alma mater, Anna University in Chennai (formerly Madras) in southern India. He's trying to "ignite the minds" of students toward a career in science, part of a campaign to transform India by 2020 into what he calls a "developed country ... using technology as one of the tools." It's the sort of grand challenge that Kalam has always relished, say Ramamurthy and others, and one for which the presidency should offer the perfect bully pulpit. —PALLAVA BAGLA