# Free Market Counterplan

## Privatization Solvency

### Private companies can do the plan – promotes economic feasibility and innovation

Greenberg 11/4/10 (Andy, Staffwriter for Forbes Magazine. “Nanosatellites Take Off” <http://www.forbes.com/forbes/2010/1122/technology-pumpkin-inc-andrew-kalman-toasters-in-space.html>) MFR

The average American consumer might not yet realize the purpose of launching his own personal box of silicon and aluminum into space, admits Andrew Kalman. In fact, Kalman isn't quite sure of it himself. Then again, the 46-year-old Stanford professor points out, a few decades ago no one quite saw the point of putting a box of chips and software--the personal computer--into American homes. Since Kalman's firm, Pumpkin Inc., entered the satellite business ten years ago, the four-person San Francisco company has become the world's **top supplier** of "CubeSat" kits--collections of components for building 2-pound, 4-inch-tall Rubik's cubes of hardware **ready to be launched** into Earth's orbit. Those $7,500 packages have made Kalman the closest thing the space industry has to a Henry Ford as he works to put a pint-size unmanned spacecraft in every garage in America. Pumpkin's satellite kits include an aluminum frame, a motherboard, software, memory and processors--all plucky enough to resist the vibrations, vacuum and temperature fluctuations of space. Want to keep an eye on hurricanes as they approach your beach house? Or beam a space-borne message to radio operators in North Korea? Plug some solar panels, a camera or a radio transmitter into the kit's ready-made framework, find a rocket launch to piggyback on, and you'll have your own unmanned spacecraft circling the globe 400 miles overhead. "This **used to be** the realm of people with billion-dollar budgets. Our first customer to orbit was a tiny observatory in Bogota, Colombia--nine people who had no space experience," says Kalman. Other Pumpkin buyers--mostly universities--have built CubeSats for lightning research, tracking ships across oceans and testing the behavior of radar waves in the upper atmosphere. "No one knows yet what these cheap little satellites are capable of. But we want to be the vehicle that makes them the next great thing in space," says Kalman. So far Pumpkin has sold around 280 nanosatellite kits, a nanosize business compared with the $13.5 billion market for large satellites built by giants like Lockheed Martin ( LMT - news - people ) and Boeing ( BA - news - people ). Most years its revenue has remained under $1 million, with **modest profits**. Just five Pumpkin CubeSats are in orbit, though twice that many will likely launch in 2011. The biggest barrier to CubeSat sales remains the cost of a launch. While CubeSats can be loaded on to most rockets in a three-cube, spring-loaded deployer called a P-POD, renting space on a NASA or foreign-agency rocket can require complex negotiations and cost tens of thousands of dollars. Pumpkin's cheap-hardware approach got a boost last year, however, when the National Reconnaissance Office, the spy satellite wing of the U.S. government, commissioned 12 fully built satellites from Pumpkin--each three cube-units in length (about a foot long)--for $250,000 apiece, including custom engineering and testing. At least two of those spacecraft will take a new path to orbit, strapped into a rocket that Hawthorne, Calif.-based private firm SpaceX will launch in November. "The government and the military are demonstrating that the CubeSat platform has **gone beyond being a novelty**," says Kalman. After getting a Ph.D. in electrical engineering and cofounding a sound-equipment company, Kalman started Pumpkin in 1995 with the aim of building analysis hardware for race-car drivers. That meant creating an operating system that could run on the tiny orange computing boxes he installed in the cars--hence the company's name. The product never made it to market--the necessary GPS equipment, he says, was still too expensive. Kalman took a consulting position at Stanford in 1998, and engineering professor Robert Twiggs soon approached him with a problem. Twiggs had helped create the CubeSat standard to make nanosatellites deployable on any rocket. But his students couldn't build them fast enough--a course would end before they could finish assembling the hardware. The kit Kalman created for Twiggs, using the same operating system he developed for race cars, cut the development time **from years to months**. His core idea was to treat satellites less like unique technological marvels and more like commodity PCs. Instead of special memory and processors designed and tested for space travel, he plugged in standard parts like SD storage cards and Texas Instruments ( TXN - news - people ) processors. "Satellite makers tend to go out and buy very expensive components designed 15 years ago," Kalman says. "Our approach is: Screw that and use commercial parts. Why spend $1,000 for memory when I can get something that will probably work for $2?" Traditionalists naysayed his gamble on commodity components, but Cal Poly San Luis Obispo aerospace engineering professor Jordi Puig-Suari, one of the originators of the CubeSat movement and inventor of the P-POD deployer, argues that Kalman opened the field to a wider user base. "People started matching the Pumpkin standard, so you could buy more and more stuff off the shelf," he says. "He took a risky bet, and it became a new way of looking at a satellite." Big players have dabbled in nanosatellites, too. (Boeing has been involved in nine projects, with another ten coming next year.) But Kalman argues **they'll never focus on nongovernment customers the way Pumpkin does**. "They're not really interested in something that will earn them less than $10 million," says Kalman. "That's why there's always an opportunity for someone like us to try to pull off something this risky." It's a strategy, he notes, that worked for Apple ( AAPL - news - people ) in last century's computing industry. Big risks--and revolutions--are sometimes best approached by the very small.

### No barriers – you don’t have to be a large company to do the plan, the mechanism is in line with innovative processes of small businesses

Business Week 11 (“20 Small Businesses of the Future” <http://images.businessweek.com/slideshows/20101105/20-small-businesses-of-the-future/slides/15>) MFR

Nanosatellite The Idea: Smaller is better Stage: **Getting cheaper all the time** As satellites get smaller, the costs of launching them get lower. That's the major limiting factor. Nanosatellites and the even-smaller picosatellites can be packed with all sorts of useful equipment that have business applications. "The types of nanosatellites and microsatellites that can be built by small companies and universities **will become more robust**," says Peter H. Diamandis, a pioneer in the field of commerical space flight. "We're heading in a direction where small teams and small companies will be able **to do far more in smaller packages."**

### Even a small engineering team could do the plan – it’s cheap and easy

Sweeting 10/10/01 (Martin, chief executive of Surrey Satellite Technology Ltd, Surrey Space Centre. “Micro/NanoSatellites - A Brave New World” http://www.guardian.co.uk/education/2001/oct/10/highereducation.engineeringgeneral) MFR

Yet, like the dinosaurs, the climate has rapidly changed in a post-cold-war era and a smaller, 'warm-blooded', responsive and quick-thinking species has arisen to compete in this new space environment - it is the age of the microsatellite. Life often develops in surprising places, where the conditions at a certain time are just right to promote new growth. Modern microsatellites emerged, not from the technically advanced and well-funded space agencies, but in the UK from the University of Surrey. This is not the occasion to recount the detailed chronology of the development of microsatellites at Surrey, but it is interesting to reflect upon the circumstances that catalysed such an innovation. As usual it was no single factor, but rather a confluence of personalities, ideas, tools and environment coincident at the right place at the right time. My personal fascination with both space and telecommunication, coupled with the realisation that the micro-electronic devices emerging onto the commercial market in the mid-1970's enabled complex and sophisticated functions to be achieved within greatly reduced mass and power requirements, made feasible the 'dream' that a small team of (then) **young engineers on a tiny budget** could build, launch & operate a small satellite in orbit. Of course, at the time, there were many prophets of doom and few believed that, even if such a small and inexpensive satellite was possible, that it could have any significant practical use. There was even debate as to what exactly constituted a small satellite. However, as with Edison's earlier observations on alternating current - paraphrased as "interesting but of no practical value" - **such views were there to be challenged.**

## Prize Solvency

### Prizes solve and have been done before

SatelliteTODAY 7/14/10 “NASA Offers $2 Million Prize for Nanosatellite Competition” http://www.satellitetoday.com/st/headlines/34564.html MFR

NASA has initiated a nanosatellite Centennial Challenge contest, offering a prize purse of $2 million for technological achievements by independent teams who work without government funding, the agency announced July 13. The Nano-Satellite Launch Challenge involves placing a small satellite into Earth orbit twice in a week. NASA said the goals of this challenge are to stimulate innovations in low-cost launch technology and encourage creation of commercial nanosatellite delivery services. “NASA sponsors prize competitions because the agency believes student teams, private companies of all sizes and citizen-inventors can provide creative solutions to problems of interest to NASA and the nation. Prize competitions are a proven way to foster technological competitiveness, new industries and innovation across America,” NASA Chief Technologist Bobby Braun said in a statement. NASA has conducted 19 competition events in six challenge areas since 2005 and has awarded $4.5 million to 13 different teams.

# International Counterplans

## Other Countries Solve

### Even less developed countries have the requisite expertise and technology to build nano and mini satellites

Sweeting 10/10/01 (Martin, chief executive of Surrey Satellite Technology Ltd, Surrey Space Centre. “Micro/NanoSatellites - A Brave New World” http://www.guardian.co.uk/education/2001/oct/10/highereducation.engineeringgeneral) MFR

Know-How Transfer & Training Using Microsatellites Although microsatellites are physically very small, they are nevertheless complex and exhibit virtually all the characteristics of a large satellite - but in a microcosm. This makes them particularly suitable as a focus for the education and training of young scientists and engineers by providing a means for direct, hands-on experience of all stages and aspects (both technical and managerial) of a real satellite mission - from design, construction, test and launch through to orbital operation. The low cost, rapid timescale and manageable proportions makes this approach **attractive to emerging space nations who wish to develop and establish a national expertise in space technology** through an affordable small satellite programme. Ten highly successful international know-how transfer programmes have been completed by Surrey & SSTL (with Pakistan, South Africa, Portugal, Chile, Malaysia, Korea, Singapore, Thailand, China) and new programmes with Algeria, Nigeria and Turkey are under way. Each know-how transfer and training (KHTT) programme is carefully structured according to the specific requirements or circumstances of the country or organisation concerned, but the first phase typically comprises: academic education through MSc/PhD courses; hands-on engineering training within satellite teams; installation of a groundstation in their home country; design construction & test of a microsatellite and a Know-How Transfer package of documentation and software. Over 100 engineers have been trained through these in-depth KHTT programmes at Surrey - a further 450 students from countries world wide have graduated from the MSc course in satellite communications engineering unrelated to these KHTT programmes. Once developing space nations have mastered microsatellite technology, the more complex minisatellite provides a logical next step in the development of **an increasingly capable national space infrastructure.**

## China Solvency

### China has the requisite support and technology to build small satellites

Cosyn 5/1/2001 (Philippe, Staffwriter, “China Plans Rapid-Response, Mobile Rocket, Nanosatellite Next Year” <http://www.spacedaily.com/news/china-01zc.html>) MFR

The People's Republic of China is making rapid progress with the development of its first all-solid propellant small satellite launcher, according to Yin Xingliang, Vice President of China Aerospace Machinery and Electronics Corp. (CAMEC), during a space symposium held here from 17-20 April. The symposium, jointly organized by the Chinese Society of Astronautics (CSA) and the Paris-based International Academy of Astronautics (IAA) brought together some 150 experts from China, Germany, France, Russia, the USA and other countries gathered to discuss the economics of space flight and ways of bringing the benefits of space technology down to earth. Hosted by the Shanghai Academy of Space Flight Technology (SAST), the meeting was addressed by ranking space agency and industry officials, including Prof. Luan Enjie, Administrator of the Chinese National Space Administration (CNSA); Prof. Jin Zhuanglong, President of SAST; Mr. Alain Bensoussan, President of the French Space Agency (CNES) and chairman of the ESA Council; and Dr. Jean Michel Contant, IAA Secretary General and head of marketing and commercial planning of EADS Launch Vehicles Company in Les Mureaux, France. In his opening address, the president of SAST hailed the practical approach of the Chinese space programme and said that, thanks to communication satellites, "China has already established the national satellite communication system, the national satellite television education system, the national TV and broadcasting system, the long-distance medical system and a large number of VSAT applications." Other satellites serving the country's needs included weather satellites for short- and long-term forecasting, the prevention of disasters ; remote sensing satellites to provide for sustainable economic development and recoverable satellites, "which have made it possible to develop wheat, rice and vegetables with high yields and quality". To continue along this road, China is to launch a unique "Seeds Satellite" early next year. Prof. Guo Baozhu, CNSA Vice Administrator said that under the 10th five-year plan, China's space industry would give particular emphasis to seven areas: communication satellites with large capacity, high performance and a long-life cycle; a new generation of non-toxic, non-polluting, high-performance, low-cost launch vehicles; new polar-orbit and geostationary weather satellites; the launching of maritime satellites to observe ocean colour and temperature and to protect the marine environment, reduce disasters and develop marine resources; two double-star satellites to study the space environment and the earth-sun interactions in conjunction with the European Space Agency's Cluster satellites; successors to the CBRS-1 and -2 (ZY-1 and -2) earth observation satellites developed with Brazil and "small satellite constellations for earth environment and disaster monitoring". "During the next five years, China will also launch two optical earth resources satellites and one radar satellite," with more being planned, Guo said. Rapid-reaction system, 10-kilo microsatellite to be tested next year According to Yin Xingliang, Vice President of CAMEC, a company created from the former China Aerospace corp., and President of its Second Academy (CCF), there is a need for 300-500 kg class satellites to be put into orbit "within hours upon request from a customer" in order to monitor and manage disasters such as forest fires, floods and marine pollution, along with "scientific, economic and national security needs". To this end, "CAMEC is developing a solid-propellant launch vehicle with a capacity to get into working state rapidly" and which could be launched from a mobile, truck-based platform, "anywhere in the country". "This launch vehicle requires to be modulized and serialized and be suitable for different payloads and orbit requirements," Yin said. "In addition, the launch vehicle must be produced in sufficient numbers in order to be put into operation rapidly." The satellite must be able to be put into operation during the first orbit circle and be able to interact with ground stations as soon as possible. To that end, "the tracking, telemetry and command method and the TT&C system must conform to features of mobile launch". Development of the launcher is "in progress" and the vehicle could be tested as early as next year, Yin said. Chinese speakers also devoted much attention to new nano- and picosatellites now under development by Tsinghua and Harbin universities and their commercial spinoffs, in collaboration with foreign partners including Surrey University in Britain and the former Dornier Company, now Astrium, in Friedrichshafen, Germany. TS-1, a 150-kg microsatellite with a 10-meter stereo resolution observation capacity is being developed with input from Astrium, according to Dr. Zhang Yingchun of the Harbin Institute of Technology (HIT). Dr. Zhang Xiaomin, of Tsinghua University Space Center (TSC), discussed the success of the 50-kg Hangtian Tsinghua-1 microsatellite which was jointly developed with CAMEC and Surrey Space Center (SSC) and has been in orbit since June 2000, providing ground pictures with a resolution of 40 meters. Hailing the work of non-governmental entities, he said his institute was working on three nanosatellites, including a 10-kg MEMS technology test platform, to be launched in 2002, along with a 50-kg and a 100-kg nanosatellite, the latter to be developed jointly with Surrey. Also under development, according to Zhang, is a 1-kg picosatellite. In another noteworthy development, Mr. Philippe Couillard, President and CEO of EADS Launch Vehicle Company in France, expressed regrets that "China is not participating in the international space station as a space power", but "if your nation confirms its ambitions towards manned space flight, it is conceivable that such cooperation will be possible in the future. "As a European, I would be very open to any China-Europe cooperation that might develop initially, specifically out of the ISS." Thanks to Ariane-5 and the European Automatic Transfer Vehicle, Couillard said, "Europe is able to send freight to the ISS. Could not something be built along this idea?" Chinese speakers, including Tsinghua University's Dr. Zhang also expressed interest in finding ways to participate in the International Space Station (ISS), proposing the development of a "companion" (free flyer) satellite "with a mass no more than 100 kg" to carry out small experiments as a means of performing microgravity experiments, testing new technologies and providing a means of entering cooperation with the ISS "without changing its program or mission".

## European Space Agency Solvency

### The ESA can do the plan

Muth 10/13/10 (Annmarie, “Solutions for Space Debris” <http://www.ehow.com/list_7328431_solutions-space-debris.html>) MFR

Additionally, it has introduced two new programs to increase its surveillance capability, launching Boeing's Space-Based Space Surveillance satellite which tracks every satellite in geosynchronous orbit once every 24 hours; and a Space Fence, a series of new ground-based sensors, scheduled to deploy in 2015. The European Space Agency (ESA) has signed a contract with Spain's Indra Espacio, S.A., to design a surveillance radar system for early detection of hazardous objects in low orbits in order to perform collision avoidance maneuvers. Removing Debris Scientists at the Surrey Space Centre, U.K., will begin space trials of a 3 kg nanosatellite CubeSail in 2011. Funded by the European space company EADS Astrium, CubeSail will deploy a 5-by-5 m polymer solar sail to shift defunct equipment out of orbit in order to speed it to its terminal reentry. The device uses the pressure of sunlight to get around in space, and atmospheric gases make the deployed sail act like a parachute, slowing it down so that it "drags" the satellite. Lead researcher Vaios Lappas says that the CubeSail could become the standard add-on system for end-of-mission, low-cost de-orbiting of satellites with a mass of less than 500 kg. Withstanding Impact The ESA is developing "self-healing" surface materials for spacecraft. Headed by materials scientist Christopher Semprimoschnig, engineers at the University of Bristol, United Kingdom, are testing the merits of surface materials incorporating hollow glass fibers containing liquid resin. On impact, the fibers would break open, releasing resin and hardeners much like superglue to repair the surface quickly before superficial cuts and gashes grow into more destructive ones

# Spending

## Spending Link

### Nanosattelites cost a lot – bulk production requires millions

SAUSER 5/16/11 (BRITTANY, “Nanosatellite Will Look for Alien Worlds” <http://www.technologyreview.com/computing/37577/?a=f>) MFR

The nanosatellite has a volume of three liters; it's 10 centimeters tall, 10 centimeters wide, and 30 centimeters long. "It was an engineering feat getting all the hardware, including the necessary processing power and data storage, into such a small package," says Tuohy. **Each nanosatellite** **will cost** as little as $600,000 once in production—ExoPlanetSat cost approximately **$5 million**—and their estimated orbital lifetime is one to two years. (NASA's Jet Propulsion Laboratory and Goddard Spaceflight Center provided a small amount of money for ExoPlanetSat's development, and Goddard will conduct performance testing on the spacecraft on a volunteer basis.) Eventually, Seager says, the researchers hope to launch a whole fleet of nanosatellites surveying the nearest and brightest stars.

### Bulk deployment means the cost is in the millions

Pentagon Brief 1/27/11 <http://pentagonbrief.blogspot.com/2011/01/arny-tests-nanosatellite-earth.html> MFR

While the one nanosatellite covers 1,200 miles, to get the type of continual coverage of a traditional satellite, the Army would need a constellation of 30 to 40 nanosatellites. But, at a cost of $300,000 to $400,000 each, the nanosatellite is much more affordable than one traditional military or communication satellite that costs in excess of a billion dollars, London said.