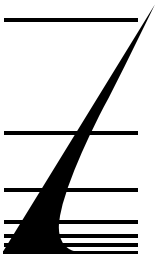
The Market for Expendable Launch Vehicles

Product Code #F621

A Special Focused Market Segment Analysis by:



FORECAST INTERNATIONAL

Analysis 1
The Market for Expendable Launch Vehicles
2010 - 2019

Table of Contents

* * *

PROGRAMS

The following reports are included in this section: (**Note:** a single report may cover several programs.)

Angara
Ares I (Crew Launch Vehicle)
Ariane 5
Atlas V
Cyclone
CZ-2 (Long March 2)
CZ-3 (Long March 3)
CZ-4 (Long March 4)
CZ-5 (Long March 5)
Delta II
Dnepr
EELV
Falcon Launch Vehicles
GSLV
H-2A/H-2B
J-2 (GX)
M-V Launch Vehicle
Pegasus XL
Proton
PSLV
Rockot/Strela
Sea Launch
Shavit
Soyuz
Start/Start-1 Launch Vehicles
Taurus
Vega
Zenit/Land Launch

Introduction

For years, the expendable launch vehicle suffered from a downturn in demand, especially in the commercial sector. This has left only two major players in the commercial launch market, International Launch Services (ILS) and Arianespace. Other launch vehicles heavily rely on government contracts to keep up demand.

However, there has been a recent spike in satellite purchases by the major commercial communications satellite operators. These new satellites will need to be launched, creating a boon for the launch vehicle industry. The lack of competition allows these two companies to charge higher prices, making them a more sustainable level of profitability forward in the future.

Going forward, the industry will have to focus on a number of issues. While the current satellite building boom is helping the industry, the expected drop in satellite purchases will reduce demand for launches. In addition, a number of new players, as well the return of older players into the market, will increase competition. Space Exploration Technologies (SpaceX) hopes to compete with established launch vehicle providers by selling services on its Falcon-9 launch vehicle at much lower prices. In addition, Sea Launch expects to exit bankruptcy protection and begin operations shortly.

The following are the expendable launch vehicles for which a production forecast is provided in this analysis:

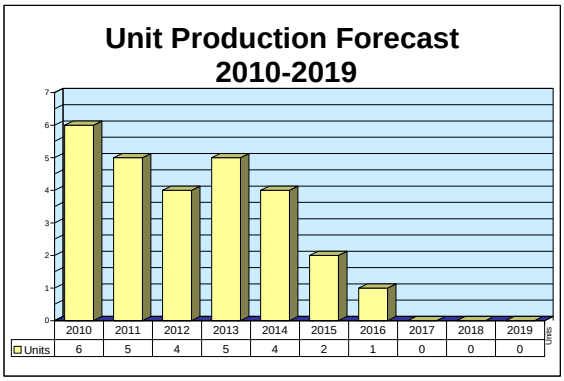
Angara
Ares I
Ares V
Ariane 5
Atlas V
Cyclone
CZ-2 (Long March 2)
CZ-3 (Long March 3)
CZ-4 (Long March 4)
CZ-5 (Long March 5)
Delta II
Dnepr
EELV (Delta IV derived, Atlas V derived)
Falcon-1
Falcon-9
GSLV
H-2A/H-2B
J-2 (GX)
M-V
Pegasus XL
Proton
PSLV
Rockot/Strela
Sea Launch
Shavit
Soyuz
Start
Taurus
Taurus 2
Vega
Zenit

* * *

CZ-3 (Long March 3)

Outlook

- Long March 3B failure in Aug. 2009 was the first Long March failure in 13 years
- Commercial launches originating from China will most likely take place on Long March 3B rockets
- Feng Yun (FY) and Beidou spacecraft will continue to launch on Long March 3A rockets



Orientation

Description. The CZ-3 is a series of three-stage expendable launch vehicles.

Sponsor. People's Republic of China's Ministry of Aeronautics.

Status. Production; the CZ-3A and CZ-3B became commercially available in 1993 and 1995, respectively. China has retired the standard CZ-3 variant.

Total Produced. More than 40 CZ-3s have been produced.

Application. The CZ-3 (also known as Long March 3) series is designed to carry medium-to-large payloads into geostationary transfer orbit (GTO).

Price Range. CZ-3, about $40 million; CZ-3A, $45 million; CZ-3B, $65 million.

Contractors

Prime

China Aerospace Science & Technology Corp, (CASC)	http://www.spacechina.com, 9 Fucheng Rd, PO Box 949, Haidian District, Beijing, 100830 China, Tel: + 86 6837 0043, Fax: + 86 6837 0080, Email: casc@spacechina.com, Lead Contractor
China Great Wall Industry Corp	http://www.cgwic.com, 30 Haidian Nanlu, Beijing, 100080 China, Tel: + 86 10 6874 8888, Fax: + 86 10 6874 8876, Email: cgwic@cgwic.com, Prime

Subcontractor

China Academy of Launch Vehicle Technology, CALT	http://www.calt.com.cn, Building Number 19, Wanyuan Rd, PO Box 9200, Beijing, 100076 China (CZ-3 - Long March 3; Principal Long March Design & Production)
Shanghai Academy of Space and Technology, SAST	http://www.sast.org.cn/en/index.htm, 100 Qinzhou Rd, Shanghai, 200235 China, Tel: + 86 21 6470 3918, Fax: + 86 21 6470 4007, Email: juan@tic.stn.sh.cn (Long March Design & Production)

Comprehensive information on Contractors can be found in Forecast International's "International Contractors" series. For a detailed description, go to www.forecastinternational.com (see Products & Samples/Governments & Industries) or call + 1 (203) 426-0800.

Contractors are invited to submit updated information to Editor, International Contractors, Forecast International, 22 Commerce Road, Newtown, CT 06470, USA; rich.pettibone@forecast1.com

CZ-3 (Long March 3)

Technical Data

(CZ-3)

Design Features. The CZ-3 family is China's principal means of delivering satellite payloads to geosynchronous transfer orbit (GTO). Of this group, the CZ-3B is the most powerful and is China's rocket of choice for placing Western commercial communications satellites in GTO.

A three-stage booster, the CZ-3 borrows the two stages of the CZ-2C; indeed, the majority of the technology and flight hardware used in the CZ-3 was flight qualified on the CZ-2C. The CZ-3's first stage, designated L140 or YF-6, is powered by a cluster of four 75-ton thrust YF-20 liquid rocket engines burning unsymmetrical dimethylhydrazine (UDMH) and nitrogen tetroxide (N_2O_4). The second stage, which is designated L-35 or YF-24, uses a YF-22 engine with a burn time of 130 seconds. For in-flight control, the second stage is also equipped with four YF-23 vernier rocket engines, which also use UDMH fuel and N_2O_4.

The cryogenic third stage uses a YF-75 engine burning liquid oxygen and liquid hydrogen. Following the first flight of the CZ-3 in 1984, the PRC became only the third space entity, after the United States and the European Space Agency, to successfully use a cryogenic propellant system.

On a typical geosynchronous mission, the CZ-3 places its third stage and payload into an initial orbit that ranges from 310 kilometers to 450 kilometers at an inclination of 31.1°. As it nears the equator on its first southbound pass, the third stage re-ignites to place the satellite into GTO. A few days later, the satellite's apogee kick motor ignites to place the satellite in geosynchronous orbit. China has retired the common CZ-3 baseline variant in favor of the CZ-3A, CZ-3B and CZ-3C.

(CZ-3A)

Design Features. The CZ-3A is a three-stage vehicle incorporating the mature technologies of the CZ-3 but adding a considerably more powerful cryogenic third stage. The rocket uses the L180 first stage from the CZ-2E, but carries less propellant and consequently has a shorter burn time. Borrowed from the CZ-2C is the L35 second stage. The new H-18 cryogenic third stage is powered by a YF-75 liquid rocket engine that burns liquid oxygen and liquid hydrogen.

	Metric	U.S.
Dimensions		
Rocket overall length	52.5 m	172.2 ft
Stage 1 length	23.3 m	76.4 ft
Stage 2 length	11.5 m	37.7 ft
Stage 3 length	8.8 m	28.8 ft
Fairing length	8.8 m	28.8 ft
Stage 1 diameter	3.35 m	11 ft
Stage 2 diameter	3.35 m	11 ft
Stage 3 diameter	3 m	9.8 ft
Fairing diameter	3.35 m	11 ft
Weight		
Rocket launch weight	241,000 kg	531,308 lb
Performance		
Payload to GT	2,700 kg	5,952 lb
Payload to GEO	7,200 kg	15,873 lb

Propulsion

Stage 1	(4)	YF-20 liquid rocket engines, 2,962 kN (665,857 lbf) total thrust
Stage 2	(1)	YF-22 liquid rocket engine, 742 kN (166,801 lbf) thrust
	(4)	YF-23 liquid propellant vernier engines, 47 kN (10,565 lbf) total thrust
Stage 3	(1)	YF-75 liquid rocket engine, 157 kN (35,293 lbf) thrust

(CZ-3B)

Design Features. The CZ-3B's core stage is identical to that of the LM-3A except that the LM-3B's second stage fuel tanks are longer. The strap-on boosters are identical to those of the LM-2E.

	Metric	U.S.
Dimensions		
Rocket overall length	54.8 m	179.8 ft
Stage 1 length	23.2 m	76 ft
Booster length	15.3 m	50 ft
Stage 2 length	11.6 m	38 ft
Stage 3 length	8.8 m	28.8 ft
Fairing length	9.2 m	30 ft
Stage 1 diameter	3.35 m	11 ft
Booster diameter	2.25 m	7.3 ft
Stage 2 diameter	3.35 m	11 ft
Stage 3 diameter	3.0 m	9.8 ft
Fairing diameter	4.0/4.2 m	13.1/13.7 ft
Weight		
Rocket launch weight	425,800 kg	938,718 lb
Performance		
Payload to GTO	5,000 kg	11,023 lb

Propulsion

Stage 1	(4)	YF-20 liquid rocket engines mounted on core stage, 2,962 kN (665,857 lbf) total thrust
	(4)	YF-20 liquid rocket engines mounted on strap-on boosters, 740 kN (166,352 lbf) thrust each
Stage 2	(1)	YF-22 liquid rocket engine, 742 kN (166,801 lbf) thrust
	(4)	YF-23 liquid propellant vernier engines, 47 kN (10,565 lbf) thrust
Stage 3	(1)	YF-75 liquid rocket engine 157 kN (35,293 lbf) average thrust

(CZ-3C)

Design Features. Another member in the CZ-3 series, the CZ-3C resembles the CZ-3B in all aspects except its first stage, which has two LM-2E boosters instead of four. Its GTO payload capability is 3,800 kilograms.

	Metric	U.S.
Dimensions		
Rocket overall length	54.8 m	179.8 ft
Stage 1 length	23.2 m	76 ft
Booster length	15.3 m	50 ft
Stage 2 length	11.6 m	38 ft
Stage 3 length	8.8 m	28.8 ft
Fairing length	9.2 m	30 ft
Stage 1 diameter	3.35 m	11 ft
Booster diameter	2.25 m	7.3 ft
Stage 2 diameter	3.35 m	11 ft
Stage 3 diameter	3.0 m	9.8 ft
Fairing diameter	4.0/4.2 m	13.1/13.7 ft
Weight		
Rocket launch weight	425,800 kg	938,718 lb
Performance		
Payload to GTO	3,800 kg	8,377 lb

CZ-3 (Long March 3)

Propulsion

Stage 1	(4)	YF-20 liquid rocket engines mounted on core stage, 2,962 kN (665,857 lbf) total thrust
	(2)	YF-20 liquid rocket engines mounted on strap-on boosters, 740 kN (166,352 lbf) thrust each
Stage 2	(1)	YF-22 liquid rocket engine, 742 kN (166,801 lbf) thrust
	(4)	YF-23 liquid propellant vernier engines, 47 kN (10,565 lbf) thrust
Stage 3	(1)	YF-73 liquid rocket engine 157 kN (35,293 lbf) average thrust

A Long March CZ-3C

Source: CGWIC

Variants/Upgrades

CZ-3. Three-stage expendable launch vehicle (phased out in late 1990s).

CZ-3A. Replaces the CZ-3 for commercial launches.

CZ-3B. Most powerful version of the CZ-3. Three-stage version equipped with four strap-on liquid propellant boosters.

CZ-3C. Same as the CZ-3B, but with only two strap-ons.

New Upper Stage. China Great Wall Industry Corp offers a new satellite perigee kick motor for the CZ-3, called the EPKM/FG-46. Manufactured by the Hexi Co subsidiary of China Aerospace Corp, the motor features a carbon/carbon-fiber exhaust nozzle and a glass-fiber motor casing. It carries 5,444 kilograms of HTPB fuel.

Program Review

Background. The Long March 3 (CZ-3) launch vehicle, a three-stage version of the Long March 2 (CZ-2), was designed for missions to geosynchronous orbit. Feasibility studies for the launcher began in 1975, followed by engineering development in 1977.

The CZ-3's initial flight occurred in 1984, and though this flight was only partially successful (the new third stage failed to ignite for a planned second burn), the PRC claimed that this mission was a technical success. The satellite carried on the first flight, China 14, was SW-1 (Shiyan Weixing, an experimental communications satellite), China's first SW-series geosynchronous satellite.

A Long March 3 successfully placed an experimental STTW (Shiyong Tongxin Weixing) geostationary communications satellite in GTO in 1984.

Dong Fang Hong 2 (DFH-2) was launched on a CZ-3 in 1990. Its orbit was circularized two days later, and it arrived on station at 98.5° E several days later.

Door Opened for Commercial Operations

The PRC said that the CZ-3 launcher was available for commercial operations beginning in 1988. That year, the United States agreed to allow China to launch up to nine satellites using U.S. technology through 1994. The first of these, an AsiaSat communications satellite, was launched by a CZ-3 rocket in 1990 and marked China's entry into the commercial launch vehicle business. The following year, a CZ-3 launched an STTW, Zhongxing-4 (DFH-2A4), a domestic communications satellite, into a parking orbit. The H-8 third stage re-ignited in an attempt to place itself and the payload into a 200 x 35,800-kilometer transfer orbit, but the YF-73 engine shut down early. The next day, the onboard apogee kick motor raised the satellite to an orbit with an apogee of 35,800 kilometers, where it was able to provide limited communications.

The CZ-3A model's first launch occurred in 1994 from Xi Chang. Two payloads, a Shi Jian 4 (Practice 4) drum-shaped science satellite and a KF-1 dummy payload, were released into a geosynchronous transfer orbit.

Two more successful launches took place in 1994: a CZ-3-launched Apstar 1, owned by APT Satellite Co Ltd and based on the Hughes Space and Communications (now Boeing Satellite Systems) HS-376 satellite bus; and, later in the year, a Chinese DFH-3 communications satellite, placed in orbit by a CZ-3A. However, on its way to geosynchronous orbit, the latter satellite sprung a leak in its attitude control propellant system. The satellite never reached its final geostationary orbital slot and was declared a loss.

The original CZ-3 variant was phased out in the late 1990s.

CZ-3B Failure Has Far-Reaching Effects

A CZ-3B rocket, with a $126 million Intelsat 708 telecommunications satellite built by Space Systems/Loral, crashed about half a minute after lift-off in 1996, marking the second failure in the Long March series in 13 months. A China Great Wall Industry Corporation report released in 1996 blamed the CZ-3B's loss on a faulty inertial guidance system. An independent review committee later determined, and CGWIC concurred, that the inertial measurement unit follow-up frame was the source of the failure.

That accident, another one involving the CZ-2E and Hughes Space and Communications satellites, and the subsequent investigations involving Chinese, Loral, and Hughes personnel, would have far-reaching effects on China-U.S. satellite export regulations. A report of the U.S. House of Representatives' special committee investigating the loss of sensitive technology to China – known as the Cox Committee Report (after Rep. Christopher Cox, chairman of the House panel) – was critical of the way Hughes and Loral handled the investigations.

In the wake of the accident investigations, the White House ordered that U.S. satellites be placed on the U.S. Munitions List and that responsibility for satellite export licenses be shifted from the Commerce Department back to the State Department. Hughes was forced to pay a hefty fine and to develop an internal computer system designed to track all international transactions.

The CZ-3 program returned to operation in July 1996 with the successful launch of Apstar 1A, a Hughes-376 communications satellite. That August, however, a CZ-3 left the Chinasat-7 communications satellite stranded in an incorrect orbit after the third stage's second burn stopped 48 seconds too soon. The velocity shortfall resulted in an apogee 18,880 kilometers short.

The year 1997 brought three consecutive successes for the CZ-3. A CZ-3A carried the Chinese-made DFH-3A communications satellite into orbit in May. A month later, a CZ-3 launched the Feng Yun-2 geostationary meteorological satellite, developed by the Shanghai Academy of Spaceflight Technology. In August, the CZ-3B model returned to service after its disastrous 1996 debut, boosting a 4-ton Mabuhay commercial communications satellite to GTO. The Space Systems/Loral FS-1300-based spacecraft was renamed Agila 2 in orbit, and serves the Asia/Pacific region.

CZ-3B launches in 1998 placed Chinastar-1 and Sinosat-1 in orbit. Equipped with 24 C-band and 24 Ku-band transponders, Chinastar-1 is owned by China Orient Telecomm Satellite Co Ltd (China Orient). Sinosat-1, based on Aerospatiale's Spacebus 3000 bus, is China's first European-built satellite. Sinosat-1 features 24 C-band and 14 Ku-band transponders.

CZ-3B Loses Atlantic Bird-1 Launch to Ariane 5. In 2001, Alenia Aerospazio chose the Long March 3A to launch its Atlantic Bird-1 satellite in the second quarter of 2002. Coincidentally, Alenia had received a contract from China Aerospace Corp to design a data relay satellite. However, the satellite carried U.S.-built components, which requires a U.S. export license to fly on a Chinese rocket. Alenia could not obtain a license, and the Atlantic Bird-1 flew on an Ariane 5 in August 2002 along with the MSG-1 weather satellite for the European Meteorological Satellite (EUMETSAT) organization.

CZ-3 (Long March 3)

APT Contracts Alcatel for Apstar 6. In December 2001, Hong Kong's APT Satellite Holdings awarded a $118 million contract to France's Alcatel Space (now Thales Alenia Space) to build the Apstar 6 spacecraft, which would be launched on a CZ-3B in 2004 (delayed to April 2005). By March 2002, Alcatel had received unconditional approval from the French government for the delivery of the French-made satellite to China.

The satellite is based on the Spacebus 4100 platform design and provides broadcast and telecommunications services throughout Asia.

SS/L Fined in Alleged Export Violation. On January 9, 2002, Loral and the U.S. State Department entered into a consent agreement settling and disposing of all civil charges and penalties associated with alleged SS/L violations of the Arms Export Control Act. SS/L was fined a grand total of $20 million over seven years. The agreement clearly stated that it in no way had any effect on the ability or authorization to launch Chinasat-8 or Apstar 5 on Chinese launchers.

China's Third Navigation Satellite. In May 2003, China successfully put its third navigation and positioning satellite into orbit, indicating that the country had completed its indigenous system. The satellite, dubbed Beidou-1C, was launched on a Long March 3A and marked the 70th Long March flight since the inception of the series.

Chang'e Lunar Mission Takes Shape

China has made it clear that going to the Moon is a priority. The first phase of the program was approved by the Chinese government, and construction of the first unmanned orbiter began in early 2006. The orbiter is scheduled to launch in late 2007. The program will consist of three phases. The first will send the lunar orbiter to create a three-dimensional map of the surface. The two phases that follow will involve subsequent missions to send wheeled robotic rovers to conduct soil science operations, and hopefully, the return of lunar rock and soil samples. Luan Enjie, director of the China National Space Administration, has announced that China will finish the first phase by 2010, with hopes of robotic landings by 2017 and a manned landing by 2024. Initial launches will take place on Long March 3As from the Xichang Satellite Launch Center in Southwest China. The orbiter will be based on the Chinese Dong Fang Hong 3 communications satellite.

Chinese Rocket Designer, Accomplice in Lockup

The Chinese government sentenced a leading rocket designer to life in prison after convicting him of corruption and embezzling $19.9 million from public funds. Li Jianzhong is the former head of the Chinese Academy of Launch Vehicle Technology, which developed the rockets for the Shenzhou and satellite programs. He also worked on Long March expendable launch vehicles for China's Shenzhou manned space program. The court also sentenced Zhang Lingying, the former chief finance officer at the academy, to 20 years in prison for helping Li to embezzle funds totaling $13.3 million. Li was placed under house arrest following an investigation that was started shortly after China launched its first manned space flight in October 2003.

Lunar Probe Program Has No Military Purpose, China Says

China's first lunar probe program has no military motives, either in its engineering or scientific objectives, said a spokesman with the China National Space Administration (CNSA) in November 2007. "China has undertaken astronautical activities with the principle of 'peacefully utilizing space,'" Pei Zhaoyu, the spokesman, said during a press conference in Beijing. Another expert at the conference said that Chinese scientists are able to fully control the satellite to enter lunar orbit when it comes close to the Moon, which is a vital process for the success of the Chang'e-1 program.

In April 2009, a Long March 3C rocket placed a Chinese navigation satellite into orbit from Xichang Satellite Launch Center in April 2009 and placed the Compass G2 satellite into geosynchronous transfer orbit. The satellite was described by the Chinese media as the second in the planned Compass navigation satellite constellation, which will consist of satellites in geosynchronous and medium-Earth orbits. The first Compass satellite was launched in 2007.

A CZ-3B carrying an Indonesian commercial communications satellite, the Palapa D, failed to place the satellite in the appropriate orbit on August 31, 2009. Investigators later discovered that some foreign matter or humidity leaked into the third stage, causing icing in the liquid-hydrogen injectors. This caused one of the two engines in the third stage to fail. This was the first failure of a Long March 3 launch vehicle in 13 years. Thales Alenia Space, the manufacturer of the satellite, was still able to put the satellite into geosynchronous orbit. However, the satellite will have a 10.5 year lifespan, rather than 15 to 16 years because of the propellant needed to move the satellite.

The next Long March 3 launch occurred in January 2010 when a CZ-3C lifted a Compass navigation satellite into orbit.

Timetable

Month	Year	Major Development
	1977	Engineering development begun
Jan	1984	First CZ-3 launch, with SW-1; third stage fails, but CGWIC claims mission a technical success
Apr	1984	STTW launched on CZ-3
Jan	1986	STTW-1 launched on CZ-3
Mar	1988	STTW-2 launched on CZ-3
Dec	1988	STTW-3 launched on CZ-3
Feb	1990	STTW-4 launched on CZ-3
Apr	1990	AsiaSat-1 launched on CZ-3
Dec	1991	STTW-5 launched on CZ-3 but fails to reach proper orbit when third stage shuts down prematurely
Feb	1994	CZ-3A maiden mission launches SJ-4 research satellite
Jul	1994	Apstar 1 launched on CZ-3
Nov	1994	DFH-3 launched on CZ-3A
Feb	1996	Maiden launch of CZ-3B with Intelsat 708 on board crashes shortly after liftoff
Jul	1996	CZ-3 launches Apstar 1A
Aug	1996	CZ-3B third-stage motor failure leaves Chinasat-7 in useless orbit
May	1997	DFH-3 launched on CZ-3A
Jun	1997	Feng Yun-2 launched on CZ-3A
Aug	1997	Mabuhay (Agila 2) launched on CZ-3B
Oct	1997	Apstar 2R launched on CZ-3B
May	1998	Chinastar-1 launched on CZ-3B
Jul	1998	Sinosat-1 launched on CZ-3B
Jan	2000	Zhongxing-22 (Chinasat-22) launched on CZ-3A
Jun	2000	Feng Yun-2B launched on CZ-3
Oct	2000	Beidou-1A launched on CZ-3A
Dec	2000	Beidou-1B launched on CZ-3A
May	2003	Beidou-1C launched on CZ-3A
Nov	2003	Chinasat-20 launched on CZ-3A
Oct	2004	FY-2C launched on CZ-3A
Apr	2005	Apstar 6 launched on CZ-3B
Sep	2006	ZX-22A launched on CZ-3B
Dec	2006	FY-2D launched on CZ-3A
Feb	2007	Beidou-2A launched on CZ-3A
Apr	2007	Beidou-5 launched on CZ-3A
May	2007	Nigcomsat-1 launched on CZ-3B
June	2007	SinoSat 3 launched on CZ-3A
July	2007	ZX-6B launched on CZ-3B
Oct	2007	Chang'e-1 launched on CZ-3A
Apr	2008	TL-1 launched on CZ-3C
Jun	2008	ZX-9 launched on CZ-3B
Oct	2008	Venesat-1 (Simon Bolivar Satellite) launched on CZ-3B
Dec	2008	FY-2E launched on CZ-3A
Apr	2009	Beidou-2B launched on CZ-3C
Aug	2009	CZ-3B failed to lift the Palapa D satellite into geosynchronous transfer orbit
Jan	2010	Compass G1 launched on CZ-3C

Forecast Rationale

Since 2006, Long March 3 mission tempo has been high. In 2006, two CZ-3 missions were performed; six missions were performed in 2007, and four were performed in 2008. In 2009, the launch failure of a CZ-3B and the ensuing investigation limited CZ-3 launches to only two. However, the investigation was completed by the end of the year, and Long March 3 operations began by early 2010.

China's push for lunar exploration missions will continue to drive a need for CZ-3 launch vehicles. CZ-3s will also continue to get commercial launch contracts, particularly for satellites based on China's

CZ-3 (Long March 3)

DFH-4 platform, because these satellites are not restricted by U.S. international traffic in arms regulations (ITAR). The U.S. does not allow any satellite with U.S.-built components to be launched by Chinese launch vehicles. The Chinese government also uses the CZ-3 to launch government spacecraft, such as Compass navigation satellites.

Beyond the CZ-3, China is developing a number of new launch vehicles. The new launch vehicles will be based on a modular design. The most important of these is the heavy-lift CZ-5. However, there has been talk of a medium-weight CZ-7 and a lighter-weight CZ-6 as well. These new families of launch vehicles will most likely take market share away from older Chinese launchers, such as the CZ-3.

However, CZ-3 production will continue for some time. Any setbacks with the new launch vehicles will extend production of legacy Long March systems. Under current schedules, the CZ-5 will not enter operational service until 2014. Until that time, CZ-3s will continue to be a vital part of China's space program. The launch vehicle will be used for both commercial launches and government launches, particularly to place China's Compass (also known as Beidou) satellite navigation system into orbit.

Ten-Year Outlook

ESTIMATED CALENDAR YEAR UNIT PRODUCTION												
Designation or Program		**High Confidence**				**Good Confidence**			**Speculative**			
	Thru 2009	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**Total**
China Great Wall Industry Corp												
CZ -3 A												
	18	3	3	2	3	2	1	0	0	0	0	14
CZ -3 B												
	25	2	1	1	1	1	1	0	0	0	0	7
CZ -3 C												
	2	1	1	1	1	1	0	1	0	0	0	6
Subtotal	45	6	5	4	5	4	2	1	0	0	0	27
Total	45	6	5	4	5	4	2	1	0	0	0	27

FORECAST INTERNATIONAL

ORDER FORM

FOR PROPER SHIPPING, PLEASE PROVIDE ALL OF THE FOLLOWING INFORMATION.

Name _____ Title _____

Company _____

Street Address _____

City _____ State/Prov. _____ Country _____ Zip _____

Phone _____ Fax _____

E-Mail _____

Cardholder Name _____

Card# _____ Exp. _____ csc# _____

Billing Address (if different from above) _____

_____

☐ Check Enclosed
☐ Bill Company
(Purchase Order # and Signature Required)
☐ Quotation Requested
☐ VISA ☐ MasterCard
☐ American Express

Name of Product/Service	Code	E-Mail Address	Qty.	Price

Please include your e-mail address to receive twice-weekly E-Market Alert Newsletters.

E-Market ALERT

Subtotal _____
Shipping _____
In Connecticut add 6% sales tax _____
Grand Total _____

SHIPPING AND HANDLING RATES

	U.S.	World
Market Intelligence Services		
Binder	$45	$85
DVD	$50	$95
Binder & DVD	$95	$180
Binder & RT	$45	$85
Worldwide Inventories		
Aerospace Systems		
CD	$50	$95
Weapons Systems		
Hard Copy	$45	$85
CD	$50	$95
Power Systems		
Hard Copy	$45	$85
Focused Market Segment Analyses		
Hard Copy	$25	$45

	U.S.	World
Market Intelligence Libraries		
Complete Library (Civil/Commercial & Military)		
Binder	$1,575	$2,975
DVD	$50	$95
Military Market Library		
Binder	$1,440	$2,720
DVD	$50	$95
Civil/Commercial Library		
Binder	$360	$680
DVD	$50	$95
Market Intelligence Group Libraries		
Aerospace		
Binder	$360	$680
DVD	$50	$95
Electronics		
Binder	$360	$680
DVD	$50	$95

	U.S.	World
Governments & Industries		
Binder	$540	$1,020
DVD	$50	$95
International Military Markets (A Subset of G&I above)		
Binder	$270	$510
DVD	$50	$95
Naval		
Binder	$90	$170
DVD	$50	$95
Power		
Binder	$90	$170
DVD	$50	$95
Weapons		
Binder	$180	$340
DVD	$50	$95

NOTE: No charge for Real-Time format.

2011 Historic Art Calendar $5.95 $12.95

NOTE: ORDERS CAN TAKE UP TO 5 BUSINESS DAYS TO SHIP.

22 Commerce Road, Newtown, CT 06470 USA • Phone: 203.426.0800 • Fax: 203.426.0223
Toll-Free (U.S. and Canada): 800.451.4975 • E-mail: sales@forecast1.com • Website: www.forecastinternational.com

WORLDWIDE SALES OFFICES

HEADQUARTERS USA

FORECAST INTERNATIONAL INC.
22 Commerce Road, Newtown, CT 06470 USA
Phone: 203.426.0800 Fax: 203.426.1964

SALES/CUSTOMER SERVICE/MARKETING
Phone: 203.270.0633 Worldwide
Toll-Free: 800.451.4975 U.S. & Canada
Fax: 203.426.0223
E-Mail: sales@forecast1.com
E-Mail: info@forecast1.com
E-Mail: customerservice@forecast1.com

PROPRIETARY RESEARCH & CONSULTING
Phone: 203.426.0299 Fax: 203.426.1964
E-Mail: consulting@forecast1.com

EDITORIAL
Phone: 203.270.0111 Fax: 203.426.4262
E-Mail: queries@forecast1.com

TECHNICAL SUPPORT
Phone: 203.270.0629 Fax: 203.426.0223
E-Mail: support@forecast1.com

WEBSITE ADDRESSES
www.forecastinternational.com
www.fiplatinum.com

HEADQUARTERS EUROPE
(INCLUDING RUSSIA)
HAWK ASSOCIATES LTD.
UNITED KINGDOM
Templehurst House
New Street, Chipping Norton
Oxon, OX7 5LJ, U.K.
Phone: (44) 1608 643281
Fax: (44) 1608 641159
E-Mail: support@hawkinformation.com
Website: www.hawkinformation.com
Contact: Mr. Michael Hobbs

HAWK ASSOCIATES LTD.
FRANCE
6 Rue de Levis, Paris 75017 FRANCE
Phone: (33) 1 4294 0693 Fax: (33) 1 4294 0433
E-Mail: france@hawkinformation.com
Contact: Mr. Edward Hobbs

CHINA AND SOUTHEAST ASIA
CHINA NATIONAL PUBLICATIONS
I & E GROUP CORPORATION
PO Box 88
16 Gongti East Road
Chaoyang Beijing 100020 CHINA
Phone: (86) 10 6506 6688 ext. 8307
Fax: (86) 10 6586 6970
E-Mail: xiaoxiao0640@hotmail.com
Contact: Mr. Xiaoxiao Zhang

JAPAN
AVIATION RESEARCH INSTITUTE
1-427-2 Takano
Misato City Saitama Pref
Tokyo 341-0035 JAPAN
Phone: (81) 489 71 5040
Fax: (81) 489 55 7151
E-Mail: max@arijapan.com
Website: www.arijapan.com/forecast
Contact: Mr. Kenichi Oyama

REPUBLIC OF KOREA
PAMANONG TRADING COMPANY
275-2 Yangjae Dong
Seocho-Gu Seoul 137-722 KOREA
Phone: (82) 2 572 4349 or (82) 2 572 4371
Fax: (82) 2 572 4370
E-Mail: nhk@forecast1.com
Website: www.forecast1.co.kr
Contact: Ms. Nam Hee Kim

TERMS AND CONDITIONS

DISCOUNT PRICING
Discount Pricing – Codes prefaced by CH, RH, Z, P or RTPS, and multi-user subscriptions, include a discount that is reflected in the marketed cost.

BOOKSELLER DISCOUNTS
For information, call 203.270.0633 or 800.451.4975 (Toll-Free U.S. & Canada). E Mail: info@forecast1.com.

NEW CLIENTS
Payment in full is required with the initial order.

TERMS
Net 30 days. For overdue accounts we reserve the right to assess interest of 12% annually, and add collection fees.

PURCHASE ORDER
If company requires, please submit a purchase order to ensure timely delivery.

RETURNS OR REFUNDS
Due to the nature of our products, no returns are accepted and no refunds are provided.

FORMS OF PAYMENT
We accept VISA, MasterCard, American Express, or a company check drawn on a U.S. bank in U.S. dollars. Wire Transfer Details: Contact customerservice@forecast1.com or call 203.270.0633.

Please ensure bank charges are not deducted from the total amount due. Note: Include the quotation or invoice number with your payment.

DATA USAGE
Photocopy/Copyright Permission: Forecast International observes all Copyright laws. Reproduction and distribution of any product is prohibited by law. To obtain a release, please call 203.270.0633 or contact customerservice@forecast1.com.

ELECTRONIC DATA LICENSING
All products provided on DVD or CD, or in Real-Time, are sold and licensed for single-site, single-user applications. Multi-site, multi-user licensing is available. Call 203.270.0633 or contact sales@forecast1.com to discuss your requirements.