THE LONG MARCH LAUNCH SERVICES - YOUR RELIABLE PARTNER TO SUSTAINABLE EXPLORATION IN SPACE
Contents

1. The Development of Long March Launch Vehicle

2. CGWIC’s Commercial Launch Services
China Aerospace Science and Technology Corporation
3 academies for system integration + 5 academies for sub-systems development

China Academy of Launch Vehicle technology
(CALT)

China Academy of Space Technology
(CAST)

Shanghai Academy of Space Flight Technology
(SAST)

China Great Wall Industry Corporation
(CGWIC)

Launch Vehicle for GTO/LTO/SSO/LEO Mission
Satellite for Meteorological/Remote Sensing Launch Vehicle for SSO/LEO Mission

1. CGWIC 100% owned subsidiary of China Aerospace Science and Technology Corp. (CASC)
2. The gateway of China’s space industry to the world
From 1970-2019:

◆ On April 24th, 1970, China launched its first man-made satellite, Dongfanghong-1.
◆ As of today, China has developed the Long March (LM) launch vehicle with high reliability and strong capability, which include the LM-2C/D, LM-2F, LM-3A, LM-4B series and New Generation launch vehicles including LM-5/6/7/11 etc.
For the future

Environmental friendly New Generation launch vehicle are under planning and development.

LM-6A:
First flight planned in 2020;

LM-7A
5.5 ton~7 ton for GTO orbit

LM-8
5 ton for 700km SSO; first flight planned in 2020

LM-9
50 ton~140 ton for LEO
Meet All Kinds of Customers Requirements

- 9 series Long March LV in services and some kinds of LVs are under development can send the payloads with different configurations to different orbit

High Reliability:

- As of today, Long March family has conducted 301 flights:
  - The overall success rate: 95.68%;
  - The successful rate for the LV in services: 97.49%
High Speed Development:

- The 1st 100 Long March launches: 37 years (1970.4.24-2007.6.01);
- The 2nd 100 Long March launches: 7 years (2007.07.05-2014.12.07);
- The 3rd 100 Long March launches: 4 years (2014.12.11-2019.03.10)
The newly built fourth launch site, Wenchang Spacecraft Launch Center (WSLC, 19 degrees north latitude), located in the Hainan Island, is used for the new generation of Long March launch vehicles.
LONG MARCH-11M (Sea Launch)

LM-11M (sea launch based) shares the same flight vehicle hardware with LM-11 that is launched from inland launch sites of China. The differences between the two types are mainly the way of launching.

The standard launch capacity of LM-11M:
- 620kg for 500km Equatorial Earth Orbit;
- 430kg for 500km SSO.

LM-11M is capable for the low inclination orbit launch mission in particular.
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CGWIC Overview

Your Reliable Partner to Success

Launch Services
- Launch Vehicle Design & Development
- Manufacture, Assembly & Testing
- Mission Analyses
- LV Interface Coordination
- Flight Safety Engineering

Satellite TT&C
- Launch Site Technical Interface Coordination TT&C
- Ground station
- Launch Safety
- Planning & Organization

Satellite and Ground Facilities Manufacture
- Spacecraft Design Development, Manufacture, AIT
- Satellite Control Facilities
- KHTT
- Technical Support for Launch & In-Orbit Delivery

Project Financing
- Business Loan
- The Preferential Export Buyer's Credit
- Chinese Government Concessional Loan

Project Insurance
- Pre-launch insurance arrangement
- Launch plus 1 year in-orbit insurance arrangement services

Technical Training
- Operation Training
- On-site Training
- Academic Training

Consulting Services
- Frequency and slot consolation
- Insurance support and consultation
- Project Feasibility study
1st launch of Chinese communication satellite for international customer
14 May 2007

7 Apr. 1990
1st commercial launch

Announcement to provide international launch services
26 Oct. 1985

1st launch of Chinese Remote Sensing Satellite for international customer
29 Sep. 2012

Provide Launch Services to Chinese Domestic Customers
From 2016

65 International Commercial Launches Conducted
17 Piggyback mission completed
16 Satellite In-Orbit Delivery Contracts Signed
13 Satellite IOD Program Launched and Delivered

26 Satellite made in US
8 Satellite made in Europe
CGWIC’s Launch Services in 2018

Conducted 11 flight missions and sent 36 satellites successfully into the designed orbit

- 2 IOD;
- 2 Dedicated International Launch Services;
- 6 Piggyback Launch Services:
  - both for international and domestic customers;
  - 32 piggyback satellites into the orbit and 1 payload on Change’ mission
The recent international piggy back launch since 2016

<table>
<thead>
<tr>
<th>Launcher</th>
<th>Date</th>
<th>Payload</th>
<th>Country</th>
<th>Orbit</th>
<th>Customer</th>
</tr>
</thead>
<tbody>
<tr>
<td>LM-4B</td>
<td>20160530</td>
<td>ÑuSat-1 / ÑuSat-2</td>
<td>Argentina</td>
<td>SSO</td>
<td>SATELL\O\GIC</td>
</tr>
<tr>
<td>LM-2D</td>
<td>20160819</td>
<td>Cat-2</td>
<td>Spain</td>
<td>SSO</td>
<td>UPC</td>
</tr>
<tr>
<td>LM-4B</td>
<td>20170615</td>
<td>ÑuSat-3</td>
<td>Argentina</td>
<td>SSO</td>
<td>SATELL\O\GIC</td>
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<tr>
<td>LM-11</td>
<td>20180119</td>
<td>KIPP</td>
<td>Canada</td>
<td>SSO</td>
<td>KEPLER</td>
</tr>
<tr>
<td>LM-2D</td>
<td>20180202</td>
<td>ÑuSat-4 / ÑuSat-5</td>
<td>Argentina</td>
<td>SSO</td>
<td>GOM\SPACE</td>
</tr>
<tr>
<td></td>
<td></td>
<td>GOMX-4A / GOMX-4B</td>
<td>Denmark</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LM-2C</td>
<td>20181029</td>
<td>BSUSat-1</td>
<td>Belarus</td>
<td>SSO</td>
<td>STATE UNIVERSITY</td>
</tr>
</tbody>
</table>
Why Long March

✓ 60+ years of step by step development, 301 flights;
✓ 9 series flight proven Long March LV and some new LV underdevelopment;
✓ High Reliability based rigorous and constantly enhanced QA system;
✓ LV batch production and Four Launch Centers assure customers launch schedule arrangement
Why CGWIC

✓ more than thirty years experiences in the international launch services market;
✓ Cost-effective solution;
✓ Oriented to the Customer, One stop services
✓ Compliance with the regulations and strong government support;
✓ Familiar with financial, insurance, legal background, logistic support, etc.
Sustainable Long March Launch Services

✓ Competitive Launch Services Price for the dedicated launch
✓ Cost-effective price for the piggyback launch services
✓ For the launch services mission, a general debris mitigation plan is addressed and it’s mandatory requirement:
  • Satellite: De-orbit at the end of life;
  • The orbital end stage launch vehicle: depletion and venting;
✓ For each satellite:
  • government approvals or third party insurance arrangement;
  • Frequency Coordination Result and the radio station license
In order for better meeting the launch requirements, including small satellites and LEO constellation, CGWIC with the support of CALT & SAST, develop and provide the customized “Long March Express” launch services solution, including:

✓ the Dedicated Launch
✓ the Piggyback Launch
✓ the Cluster Launch

based on its Long March launch vehicles, and upper stages & CubeSat deployers.
For Dedicated Launch:
Different LV with Various Launch Capability and fairing Meet the Requirement

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Stages</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Orbit</td>
<td>LEO/SSO</td>
<td>LEO/SSO</td>
<td>GTO</td>
<td>SSO</td>
<td>LEO/GTO</td>
<td>LEO/SSO</td>
<td>LEO/SSO</td>
<td>LEO/SSO</td>
</tr>
<tr>
<td>Capability</td>
<td>3.85t/1.9t (600km)</td>
<td>1.2t (700km)</td>
<td>5.5t</td>
<td>2.5t/3t</td>
<td>25t/14t</td>
<td>1t (700km)</td>
<td>13.5t/5.5t (700km)</td>
<td>0.7t/0.38t (700km)</td>
</tr>
<tr>
<td>Fairing Diameter</td>
<td>3.35m</td>
<td>3.35m</td>
<td>4.0m</td>
<td>3.35m</td>
<td>5.2m</td>
<td>2.6m</td>
<td>4.0m</td>
<td>1.6m</td>
</tr>
<tr>
<td></td>
<td>4.2m</td>
<td>3.8m</td>
<td>4.2m</td>
<td>3.8m</td>
<td>4.2m</td>
<td>2.0m</td>
<td>4.2m</td>
<td>2.0m</td>
</tr>
</tbody>
</table>
Smart Dragon-1 (SD-1) solid launch vehicle is newly developed by CALT based on the mature technology and planned for its maiden flight in Q2 2019.

Length : 19.5m  
Diameter : 1.2m  
Takeoff Mass : 23100kg  
Takeoff Thrust : 544kN  
150kg/500km SSO
For Piggyback Launch:
- Launch opportunities for different orbit;
- The affordable price;
- Flight Proven POD for CubeSat;
- The diversified and flexible payload layout within the fairing
## Piggyback Launch Opportunities

<table>
<thead>
<tr>
<th>No.</th>
<th>Slot</th>
<th>Orbit (km)</th>
<th>LTDN</th>
<th>Margin (kg)</th>
<th>Fairing/Envelop</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>LM-6</td>
<td>SSO</td>
<td>2020</td>
<td>700</td>
<td>8:00</td>
</tr>
</tbody>
</table>

**SSO**

- **LM-6 SSO opportunities for piggyback payloads in 2020**
  - 2.6m / TBD

| 2   | 2020   | LEO       | TBD   | 2000        | 2.6m / TBD      |
| 3   | 2020   | 655       | TBD   | 100         | 2.6m / TBD      |
| 4   | 2020   | 688       | 14:00 | 100         | 2.6m / TBD      |
| 5   | 2020   | 688       | TBD   | 100         | 2.6m / TBD      |
| 6   | 2020   | 747       | 10:30 | 200         | 2.6m / TBD      |
| 7   | 2021.01| 500       | 6:00  | 500         | 3.35m or 4.2m   |
| 8   | 2021.03| 500       | 6:00  | 500         | 3.35m or 4.2m   |
| 9   | 2021.12| 782       | 10:30 | 300         | 3.35m or 4.2m   |
| 10  | 2021   | 500       | 14:11 | 300         | 3.35m or 4.2m   |
| 11  | 2021   | 700       | 8:00  | 200         | 3.35m or 4.2m   |
| 12  | 2021   | 700       | 14:00 | 200         | 3.35m or 4.2m   |
| 13  | After 2021 | 500 | 10:30 | 300         | 3.35m or 4.2m   |

**LEO**

| 14  | 2021   | 635 (29°) | -     | 700         | 3.35m / TBD     |
| 15  | 2022   | 650 (29°) | -     | 600         | 3.35m / TBD     |

**GTO**

- There are some piggyback opportunities in 2019 and 2020.
LM-6 is a 3 stage cryogenic liquid New generation Launch;

By using “three horizon” test-launch mode, LM-6 can accomplish the quick-launch, mainly for SSO and LEO mission.

LM-6 supports a variety of launch types including the single, multiple-satellites launch and constellation networking etc.

September 20th, 2015, the first flight of LM-6 launch vehicle was conducted successfully, sending twenty satellites into the designed orbit.

Two flights have been performed successfully.
Proposed LM-6 Cluster Launch in 1st Q 2020

The main specifications:

✓ overall length 29m with 103t lift-off mass
✓ the 1st stage is 3.35m diameter, and the 2nd & 3rd stage is 2.25m diameter
✓ two typical mechanical interfaces: Φ660 and Φ937 or customized interface
✓ 1000kg for 700km SSO.

Proposed LM-6 Cluster Launch

✓ Target Launch Date: 1st Q of 2020;
✓ Orbit: Follow the customer requirement;
✓ Price Principle: to occupy all the launch capability to reduce the price for each customer.
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谢谢！