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THE ORIENTAL MARITIME SPACE PORT: CHINA'S SEA-BASED SPACE EXPANSION

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KEY TAKEAWAYS

- The Oriental Maritime Space Port (OMSP), located in Haiyang, Shandong Province, is China's fifth spaceport and first attempt at sea launch, which is intended to offer greater launch efficiency, flexibility, and safety.
- It has met with significant success thus far, achieving 13 successful launches with 75 satellites sent into space as of mid-December 2024. Eight of those launches occurred between September 2023 and the end of 2024.
- The Port has launched four types of rockets thus far: state-owned enterprises CASC's Long March 11 and CALT's Jielong-3 and private companies Galactic Energy's Ceres-1 and Orienspace's Gravity-1.
- The launches have taken place from a few kilometers off the coast, as well as hundreds of kilometers off the coast, mostly on repurposed ships. However, it has recently introduced a purpose-built sea launch ship, the *Oriental Maritime Space Port*, which boasts greater capabilities than its predecessors.
- The Port is an integrated space industry center, including both rocket launches as well as a set of industrial park areas for research, development and manufacturing, applications, and tourism focused on rockets and satellites, as well as other space industry components. This integration, which has included the production of all four types of rockets launched at the Port thus far, offers greater efficiency and lower costs compared to production and launch occurring in separate areas.
- The Port has set ambitious goals, including meeting 70 percent of China's commercial satellite launch needs; and by 2027, achieving 100 sea launches, 100 rockets produced, 100 satellites placed in space, and 10 billion RMB (roughly 1.37 billion USD) in operating revenue generated.
- Thus far, the Port produces 20 solid-fuel rockets a year, and as of September 2024, the park has attracted 23 aerospace industry projects and enterprises, which comprise a total investment of about 27.3 billion RMB (roughly 3.75 billion USD).
- In terms of operations and management, a PLA Aerospace Force unit, the Taiyuan Satellite Launch Center Sea Launch Mission Team, likely Unit 63725, is responsible for the launches, while the Oriental Aerospace Port (Shandong) Development Group Co., Ltd., owned by the Yantai government, operates the industrial park areas.

INTRODUCTION:

China's fifth spaceport, the Oriental Maritime Space Port (OMSP) [东方航天港], also known as the Dongfang Spaceport, in Shandong Province, is a facility responsible for both the manufacture and launch of rockets. The Port represents a significant step forward in China's ambitious expansion of its space capabilities. As with the rest of China's space sector, the People's Liberation Army (PLA) remains centrally involved, but the Port's unique combination of operating sea-based launches, producing rockets on site, and hosting a comprehensive industrial park positions it as a key player in the country's growing commercial space sector. While it has not yet been able to meet its ambitious launch targets or fully realize its broad range of intended functions, the Port's successful track record to date, coupled with its ongoing development, suggests that it will continue to play an important role in China's space program. This report investigates this little-discussed addition to China's growing space infrastructure.

Since its first launch in 2019, OSMP has conducted 13 rocket launches from mobile sea platforms.[1] As of mid-December 2024, it had launched 75 satellites and expanded access to space launches for China's growing commercial space sector.

Located in the city of Haiyang (under the jurisdiction of the city of Yantai), the purpose of the Port is to integrate research and development (R&D), manufacturing, and launches into one space industry cluster.[2] The motivation for developing the Port stemmed from increasing Chinese demands for commercial space services running up against limited launch capabilities, particularly slots for commercial launches.[3] The solution to this need for more commercial launch slots has come in multiple forms, including expansions into commercial launch activities by all of the other Chinese launch sites except the Taiyuan Satellite Launch Center: the Hainan Commercial Launch Site [海南商业航天发射场] by the Wenchang Space Launch Site, which saw its first launch at the end of November 2024;[4] commercial launch pads at the Jiuquan Satellite Launch Center;[5] and a commercial spaceport run by the Xichang Satellite Launch Center.[6] There are also the long-awaited plans for a launch site in Ningbo, Zhejiang Province.[7]

The OMSP is the result of a new approach, launches from entirely new sites at sea. Chinese officials and experts have provided a variety of reasons for the decision to pursue sea launches, including increased safety for populated areas, increased launch efficiency and payload capacity, flexibility in launch locations and orbit choices, and cost reduction and improved logistics.[8] Haiyang was chosen because it was found to be suitable for sea launches, due to the fact that its seaport is not too busy and has relatively favorable weather.[9] In a sign of the Port's importance to the government, its sea launches were highlighted in China's 2021 space white paper,[10] and the construction of the Port was listed in the Shandong provincial government's work report for two consecutive years. It was also included in Shandong Province's "14th Five-Year Plan."[11]

OMSP is the only launch center in China that offers on-site rocket production.[12] Pursuant to that, in addition to its role in launching rockets, the Port is intended to be a commercial space industrial park, with segments dedicated to rocket, satellite payload, and sea launch platform R&D and manufacturing, as well as space applications, components, and culture and tourism.[13]

Because of this diverse range of intended uses, the Port is comprised of several different neighboring areas: a sea launch technical services port from which the mobile launch platforms set off, a space industry manufacturing park where spacecraft are manufactured, a space industry supporting park where supporting components are produced, and a space applications culture and tourism park.[14]

Plans for the Port officially began a little over a month after the successful first sea launch in June 2019, as a joint project between local governments and China's main space contractor, China Aerospace Science and Technology Corporation (CASC) [中国航天科技集团有限公司].[15] In July, the Yantai government, CASC subsidiary China Academy of Launch Vehicle Technology (CALT) [中国运载火箭技术研究院],[i] and China International Marine Containers (CIMC) [中国国际海运集装箱(集团)股份有限公司/中集集团] signed a strategic cooperation framework agreement, laying the foundations for promoting the construction of this spaceport.[16] The Port was officially founded in 2020, the same year in which phase one of its construction was completed.[17] It is intended to be a manufacturing base for solid-fuel rockets and a technological center for satellites.[18]

Construction of the Port is intended to be fully complete by October 2025.[19] According to provincial documents, the total investment in the project was 20 billion RMB (~2.75 billion USD) in 2022,[20] but was estimated to be 60 billion (~8.2 billion USD) in 2023, of which the Port development company would provide 12 billion (~1.7 billion USD).[21] The reason for the 40 billion (~5.5 billion USD) increase in the estimate just a year later is unclear, as the project has an estimated cost of 26.3 billion RMB (~3.6 billion USD).[22] When complete, it aims to be able to launch satellites into space, produce rockets on land, and manufacture ships for sea launches.[23] It also aims to be a world-class commercial sea launch spaceport and a national-level aerospace information industry park.[24] It has set a goal of achieving "100 sea launches, 100 rockets produced, 100 satellites in space, and ten billion in operating revenue" by 2027.[25] The milestones the Port has set for itself include rocket assembly, R&D, production, launch of solid- and liquid-fuel rockets, and both coastal and high-seas launches.[26] At the time of writing, it had achieved all of these milestones except launches of liquid-fuel rockets.

Figure 1: Port logo

[i] Also known as the CASC 1st Academy [航天科技集团一院].

- **Websites**:
  - https://dfhtg.net/
  - http://dfht.iyimiao.cn/
- **Alternate Names:**
  - Dongfang Spaceport[27]
  - 海阳东方航天港 [28]
  - Haiyang Oriental Aerospace Port[29]
  - Eastern Aerospace Port[30]
  - Dongfang Aerospace Port[31]
  - Dongfang Spacecraft Launch Port[32]

CAPABILITIES:

Figure 2: A model of the planned layout of the Port (partially complete, as of mid-December 2024).[33]

In total, as of mid-December 2024, the OMSP has carried out 13 launches, with a total of 75 satellites sent into space.[34] It has demonstrated the capability to launch satellites from both near-shore (a few kilometers off the coast) and open-ocean (potentially 90 to a few hundred kilometers away from the coast) locations[ii] at latitudes from 35°N to the equator into low-Earth orbit (LEO),

[ii] The exact locations of launches are not officially disclosed. However, in multiple cases, "near-shore" launches have been described as happening around three kilometers off the coast (see: "China promotes sea launches and Oriental Spaceport completes 4 sea launches" [中国推动海上发射 东方航天港完成 4 次海上发射], China News Service, October 8, 2022, https://www.jl.chinanews.com.cn/gnyw/2022-10-09/215629.html; "The thirteenth sea launch mission was a complete success! Eight satellites "carpool" into space in Haiyang" [第十三次海上发射任务取得圆满成功！八颗卫星在海阳"拼车"上太空], Poster News [海报新闻], September 25, 2024, https://jinan.dzwww.com/xinwenzhutu/shenghuo/202409/t20240925_14854393.htm; "Visitors from Shandong

sun-synchronous orbit (SSO), and other orbits with inclinations from 0° to 41.5°.[35] This spaceport has formed a "one-stop" launch service model, with the ability to carry out "two near-coastal launches per week, and one high-seas launch every two weeks," and it can reportedly meet 70 percent of China's commercial satellite launch needs.[36] Its layout and capabilities have been described as a "port in front and factory behind, solid [rocket production] in the north and liquid [rocket production] in the south, system integration, and launching upon leaving the factory," highlighting the advantages and efficiencies of having spacecraft production and launch at the same location.[37]

The Port is responsible for rocket technology preparation; satellite mounting; on-dock training; long-distance remote control; testing and launch; measurement, control, and communications; and maritime transport.[38] In addition to its space launch functions, it appears to retain its other seaport and civil functions as well, such as commercial shipping.[39] It is working to construct a sea launch support system comprised of "one port, two systems, three ships, four sets of core equipment,[iii] and numerous supporting plants."[40] By 2027, in addition to achieving the goal of more than 100 launches, it aims to have built and put into operation two semi-fixed offshore launch platforms, multiple solid/liquid launch pads, one mobile launch vessel, one command ship, and a sea-launch port for commercial rockets that supports both solid and liquid fuel rockets, both cold and hot launches, and both mobile and near-shore launches.[41] At least one of the semi-fixed platforms can be used for large liquid-fuel rocket launches,[42] and at least one semi-fixed platform (possibly the same one) is to be fixed to the bottom of the sea [坐底式半固定海上发射平台].[43] One of those is intended to be placed two to 30 kilometers from the Port, and will reportedly be able to launch all of China's existing land-launched rockets.[44]

With regards to the launch pads, no location or other further information was available. However, it seems plausible they may be on land, thus giving the Port a land-based launch capability. In particular, there appears to have been an experimental test flight for a reusable rocket (a Long March 12) from a what could be launch pad on an island immediately adjacent to the location from which the launch ships set out.[iv][45] In addition, there was one liquid rocket static firing test (and another planned but possibly not yet carried out) from a liquid-fuel rocket propulsion testing area.[v][46] It seems possible these could be some of the planned launch pads.

Haiyang witnessed the "New Year's First Flight" of the Sea Rocket" [游客山东海阳见证海上火箭"新年首飞"], China News Network [中国新闻网], January 13, 2025, https://news.qq.com/rain/a/20250113A07BH800. There don't appear to any such details from official sources. However, online observers often make estimates of actual launch locations based off of publicly-issued Notices to Airmen (NOTAMs). See for example: https://forum.nasaspaceflight.com/index.php?topic=51854.msg2438404#msg2438404 and https://x.com/cnspaceflight/status/1599695659955019776.

[iii] It is unclear what these refer to.

[iv] There has been no official confirmation of the test, which appears to have ended in failure. In addition, the island it reportedly took place on, Lianli Island [连理岛], is also where tourists can watch sea launches. That island is partially visible in the bottom left of Figure 4.

[v] A static firing test involves igniting the rocket without it actually lifting off. This test area is also visible on the map in Figure 3.

LAUNCHES

All of the Oriental Maritime Space Port's 13 launches (as of mid-December 2024; see Appendix A for details) have been successful so far, an impressive achievement given China's lack of prior experience in sea launches, the divergent technical requirements for sea launches as compared to land-based launches, and the resulting generally higher difficulty of sea launches.[vi]

At least six trends are evident in the launches completed so far. First, there has been a distinct increase in the pace of launches, with one in 2019, one in 2020, three in 2022, three in 2023, and five in 2024. Most have occurred in the afternoon or evening during the autumn, winter, or spring months. Most launches (eight out of 13) from the Port occurred between September 2023 and December 2024. While this is a significant acceleration, it is worth nothing that the current pace of launches is still far from the Port's stated capability of multiple launches per week. In addition, the Port will need to accelerate its launch pace even further in order to hit its goal of over 100 launches by 2027.

Second, the Port's launches to date have involved four different rocket models, all solid-fueled: CASC's Long March 11 [长征十一号], CALT's Jielong-3 [捷龙三号], commercial operator Galactic Energy's [星河动力] Ceres-1 [谷神星一号], and commercial operator Orienspace's [东方空间] Gravity-1 [引力一号]. The first several launches were all Long March-11s, but that rocket has not been used for the last year and appears to have been phased out in favor of CASC subsidiary CALT's Jielong-3. The Jielong-3[vii] and the Gravity-1 have not been launched from any locations besides the Port, indicating that they may have been designed specifically for sea launch. The Long March-11 and the Ceres-1 have both also been launched from land sites. All but the Gravity-1 are small-lift launch vehicles,[47] with the Long March 11 able to send payloads of 500 kg to SSO,[48] the Jielong-3 able to send 1.5 tons to SSO,[49] and the Ceres-1 able to send 300 kg to SSO and 400 kg to LEO.[50] The Gravity-1 is a medium-lift vehicle with a LEO payload capability of 6.5 tons and a SSO capability of 4.2 tons.[51]

Third, of the Port's 13 launches thus far, most have been linked to SOEs. Four were conducted by the SOE CALT's commercial subsidiary ChinaRocket,[viii] while five were launched by SOEs themselves. Four were conducted by the fully private companies Galactic Energy and Orienspace.

Fourth, the Port appears on its way to achieving its goal of both producing and launching rockets. The Long March-11 was previously produced at the Port, but it is unclear if it that is still the case. The Jielong-3 is built on site,[52] and the Ceres-1 will soon also be built at the Port. Construction on Ceres-1 production facilities began in 2021, but it is not clear if they are operational yet.[53] The Gravity-1 is assembled at the Port, but all of its components are produced elsewhere. [54]

Fifth, most launches (nine out of 13) have taken place in the Yellow Sea, with the largest number launched from off the coast of Haiyang, Shandong Province. There have also been

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[vi] See here for a description of some of the difficulties from the launch unit's commander: "Let's start again in pursuit of the dream of sea and sky—a conversation with Yang Xiao, commander of Taiyuan Satellite Launch Center's Maritime Space Launch" [逐梦海天再出发——对话太原卫星发射中心海上航天发射指挥长杨晓论], *PLA Daily*, September 18, 2020, http://news.yunnan.cn/system/2020/09/18/030977744.shtml.

[vii] Also known as the Smart Dragon-3 (SD-3).

[viii] Also known as China Long March Rocket Co., Ltd. [中国长征火箭有限公司/中国火箭公司].

launches from off the coast of Rizhao, Shandong, elsewhere off the coast of Shandong, and in the Yellow Sea far from the coast.[ix] There has also been one launch in the East China Sea (the location was unspecified, but apparently not in the Yellow Sea section of the East China Sea),[x] and three in the South China Sea off the coast of Yangjiang in Guangdong Province.[xi] In addition, around two-thirds of launches have taken place near the coast, which is in line with the Port's stated capability of conducting two near-sea launches and one high-sea launch per week. Of note, the only rockets launched in the South China Sea and on the high seas were CASC's and CALT's, while the private companies have only launched close to the shore of Shandong. This may indicate that the SOE-produced rockets are more reliable or can withstand longer sea voyages.

Sixth, the development of launch platforms appears ongoing. Of the five that have been used so far, at least the first two were converted barges, and all except the most recently deployed have been phased out. At the very least, the first three platforms ceased being used with the first use of the ship *Borun Jiuzhou*, which was in turn phased out for the purpose-built *Oriental Maritime Space Port*. The latter now appears to be the Port's primarily mobile launch platform, although it will be complemented by other, semi-fixed platforms (see below for more details on the latter ship and the fixed platforms).

Launch Platforms

All of the launches at the Port have taken place on mobile floating launch platforms, mostly barges and other repurposed ships. The platform most recently used, the *Oriental Maritime Space Port,* is China's first ship that was purpose-built for sea launches and appears more capable than its predecessors. It is 162.5 meters long and 40 meters wide.[55] The main deck has a load capacity of 20 tons per square meter (equivalent to the weight of more than a dozen family cars),[56] and can carry up to 22,000 tons,[57] including multiple rockets at the same time.[58] It has both hot and cold[xii] launch capabilities, and can launch large- and medium-sized solid rockets, as well as small- and medium-sized liquid launch vehicles.[59]

The *Oriental Maritime Space Port* supports autonomous and unmanned operation, can independently collect information, has a DP2 dynamic positioning system, and can reach a speed of 12.5 knots.[60] It has a range of about 10,000 nautical miles.[61] It reportedly also has the capability to retrieve rockets, likely by means of having them land on the ship itself.[62] This could indicate an intent to use it for the retrieval of reusable rockets in the future. Haiyang Xingang Shipping Service Co., Ltd. [海阳兴港船舶服务有限公司] invested in the ship.[63]

Launches that occurred prior to the deployment of the *Oriental Maritime Space Port* directed launches using a command ship located near the launch platform,[64] but construction on a command

[ix] There is sometimes no official confirmation of specific locations.

[x] Wikipedia suggests a location just outside of the Yellow Sea: "Dongfang Spaceport" [东方航天港], Wikipedia, accessed December 2024, https://zh.wikipedia.org/wiki/%E4%B8%9C%E6%96%B9%E8%88%AA%E5%A4%A9%E6%B8%AF.

[xi] Situated roughly midway between Hong Kong and the island province of Hainan.

[xii] The Port's cold launches, which appear to have been confined to the LM-11, involve ejecting the rocket out of a tube-like container placed on the deck of the ship followed by rocket ignition, whereas hot launches involve directly igniting the rocket on the deck. When the ability to carry out hot launches was achieved in China, Chinese media celebrated it as a milestone.

center at the Port itself began in April 2021[65] and may have already been in use as of October 2024.[66][xiii]

For future launches, in order to complement the *Oriental Maritime Space Port,* the Port aims to put into operation two semi-fixed offshore launch platforms, multiple solid/liquid launch pads, one mobile launch vessel, and one command ship by 2027.[67]

PORT INDUSTRIAL PARK AREA

The Port's industrial park area, which may be known as Haiyang Aerospace Town [航空航天特色小镇], has a planned area of 34.19 square kilometers.[68] Of that, the space industry manufacturing park was intended to be roughly eight million square meters (eight square kilometers), the rocket assembly general plant(s) 6,000 square meters, the space industry supporting park roughly 867,000 square meters, the sea launch technical services port roughly 910,00 square meters, the command and control center 20,000 square meters, and the culture and tourism area 8,520 square meters.[69] It contains both production and R&D facilities, both of which are detailed below.

[xiii] At that time, at least a sea launch command center was in use, but the source was unclear if this refers to the structure constructed on land or a mobile, floating one.

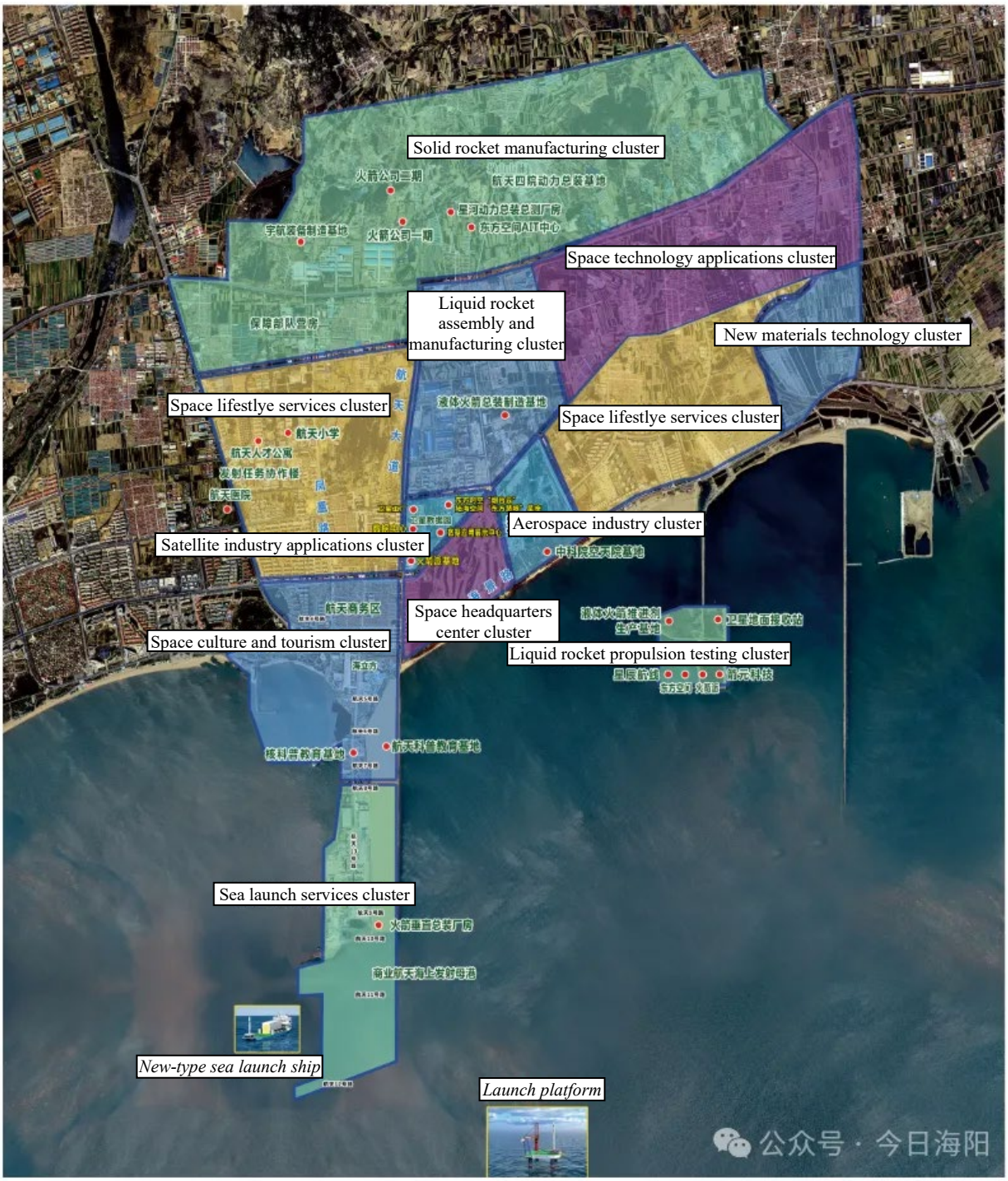

Figure 3: A map of the Port as of January 2024, with the launch service area at the very bottom (in green), solid rocket production at the top (in green), liquid-fuel rocket production in the center (in blue), and liquid-fuel rocket propulsion testing offshore to the bottom right (in green).[70]

Figure 4: An earlier expanded map of the planned areas, which is somewhat different than what has actually been constructed. [71] *The space industry supporting park [航天产业配套园区] is on the upper left, just to the west of the map in Figure 3 (it's unclear if that is where it actually ended up).*

Production Facilities

As of September 2024, the park had attracted 23 aerospace industry projects and enterprises, which comprise a total investment of about 27.3 billion RMB (~3.75 billion USD).[72] However, that number might include other non-space aviation projects, as well as possibly the area surrounding, but not actually part of, the Port.

The space industry manufacturing park is comprised of a space propulsion manufacturing area in the east—apparently occupied by CASC's 4th Academy [航天四院],[73] also known as the Academy of Aerospace Solid Propulsion Technology—and an intelligent rocket and satellite assembly, integration, and test (AIT) center in the west. The latter performs functions such as intelligent assembly, system integration, and intelligent testing of rockets and satellites.[74] It is intended to be China's largest rocket assembly and testing base,[75] and aims to fully realize its mass production capacity in 2027.[76]

Those production facilities are also responsible for the entire maritime launch technology center, which includes the rocket assembly and testing area(s), satellite test area(s), satellite and rocket docking/mounting area(s), and satellite fueling area(s).[77] Under emergency situations like bad weather, the production facility can store the rockets and allow the opening of fairings to inspect satellites that have already been mounted.[78]

For example, for the second launch, after the Long March-11 rocket was partially assembled in Beijing, all preparations were carried out in in an integrated technical workshop at the Port. Those preparations included rocket stage docking, testing, loading, satellite mounting, and rapid transfer onto a vessel, all followed by transportation to the maritime launch site and launch.[79]

All of the companies that have launched from the Port have rocket production facilities there. CALT's facilities are especially prominent because they are the Port's first and primary set of

facilities. As noted above, CALT was involved with the founding of the Port, but its subsidiary ChinaRocket has been specifically reported in official media as jointly constructing the Port with the municipal government.[80] Notably, ChinaRocket and its own subsidiary, ShandongRocket,[81xiv] operate a commercial solid rocket industry base at the Port for the production of the Jielong-3.[82xv]

Private, commercial companies also have a presence at the Port. For instance, Galactic Energy operates a commercial solid-launch vehicle innovation R&D and manufacturing base there,[83] while Orienspace has a Rocket AIT Center. The latter center covers 67,000 square meters and carries out rocket completion and acceptance, assembly of sub-stage products, unit testing, and system assembly and testing.[84]

The initial plan for CALT's rocket production base included three areas: central, southern, and northern. The central area was to be the main production plant, covering an area of roughly 567,000 square meters that would host two large-scale, integrated satellite-rocket intelligent assembly and testing plants, as well as facilities such as rocket storage and pyrotechnic assembly and testing plants. The southern area was to house a section assembly plant, covering an area of roughly 134,000 square meters.[85] The second phase of the base construction was due to finish in 2023, although it is not clear which parts of the plan were completed at that stage.[86] There is also a Haiyang solid launch vehicle assembly and test base for the Jielong-3 in the vicinity, which may just be a component of the base.[87]

When it was constructed, the base had a goal of being able to produce 20 solid-fuel rockets a year, and as of June 2023, it had reached that goal.[88] It also is capable of producing 50 liquid-fuel rocket tanks per year.[89] The 20 rockets per year are intended not just for use at the Port, but also at other launch sites.[90] Furthermore, the space industry manufacturing park also hosts a solid-fuel rocket manufacturing technology center,[91] which might also be known as a solid-fuel rocket launch technology center.[92] It is unclear if this is related to or part of CALT's Jielong-3 manufacturing facilities at the Port.

The site also hosts a liquid-fuel rocket engine test base[93] and a liquid-fuel rocket assembly base.[94] A new national new-type aerospace launch vehicle propulsion test center[95] at the base might also be used for liquid-fuel rockets. It is not clear which companies operate these facilities, but CASC seems possible given its status as the main rocket manufacturing entity in the park.

Besides rockets, multiple official reports have stated that the base will extend its development focus to "satellites, rockets, missiles, spaceships, and spacecraft."[96] No other details are available, so it is unclear if this was meant literally. Missiles and spaceships, in particular, are not currently being produced at this site.

Other notable space industry manufacturing entities include a space intelligent manufacturing center,[97] a satellite payload R&D and manufacturing center,[98] a sea launch platform R&D and

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[xiv] Also known as Shandong Long March Rocket Co., Ltd. [山东长征火箭有限公司].

[xvxv] Known in Chinese variously as 商业固体运载火箭产业基地, 商业固体火箭海阳产业基地, 商业固体火箭产业基地, and potentially a solid rocket assembly and testing base [固体火箭总装测试基地], a rocket R&D and manufacturing center [火箭研发制造中心], a solid launch vehicle Haiyang industrial base [固体运载火箭海阳产业基地] and a commercial solid rocket assembly base [商业固体火箭总装基地].

manufacturing center,[99] and a Shandong space equipment manufacturing base [山东宇航装备制造基地].[100] The locations of non-rocket production space industry entities are unclear, but they seem most likely to be in the space industry support park (as opposed to the space industry manufacturing park, which focuses on space rocket and satellite production).

Other Support Facilities

The industrial base area also includes a space industry support park. This is intended to be a high-end support center for satellites, rockets, and launch support, including high-end space support industries such as digital mechanical processing, new material research and development, electronic product integration, and integration of supporting equipment.[101] A maritime aerospace technology innovation center was established in conjunction with Ludong University [鲁东大学] to gather industry leaders and high-end talent in order to support the endeavor.[102] Less information is available on this area, but it continues to be referred to alongside the other major industrial park sectors.[103]

Both commercial and private enterprises operate support facilities at the base. The private company R.SPACE [北京九天行歌航天科技有限公司] has a commercial rocket core components industrial base at the Port,[104] along with other space support enterprises.[105] There are also 16 national- and provincial-level scientific innovation platforms, including a Shandong Province micro-nano satellite innovation center and a maritime space equipment innovation center.[106] The Chinese Academy of Sciences Aerospace Information Research Institute (AIR) Haiyang Research Academy [中科院空天院海阳研究院] and a space life science experimental base from the private company Rocket Pi [火箭派空间生命科学实验基地] are also located at the Port.[107]

The base also hosts a satellite data industrial park, which includes a satellite data intelligent computing center, a satellite intelligent AIT center, and a research and development science and technology innovation center.[108] This park is intended to create a vertical satellite industry chain that integrates satellite intelligent manufacturing, payload testing, data supercomputing, transactions, applications, and disaster recovery.[109] The satellite data intelligent computing center might be also known as a satellite data application development center [卫星数据应用开发中心].[110]

Furthermore, the base hosts a space industrial headquarters center whose purpose and function are not clear in publicly available sources.[111] It has its own section in the park (as seen in the map at the top of this section), but the company in charge of the industrial park, detailed in the "Operations and Management" section below, is not located in this area. A PLA unit (detailed below) carries out the launches at the base and may have a headquarters there, but there is no direct evidence linking it to this headquarters center. The Port's industrial park areas, or possibly nearby areas, also host other entities involved in the aviation industry.

OPERATIONS AND MANAGEMENT

The operations and management of the Port and launches are split: a PLA Aerospace Force (ASF) [军事航天部队] Taiyuan Satellite Launch Center (TSLC) [太原卫星发射中心] sea launch team is in charge of launches, and is assisted in each case by the company whose rocket is being launched.[xvi] A Port company, Oriental Aerospace Port (Shandong), is in charge of the industrial park areas. Both organizations are profiled below.

PLA UNIT: AEROSPACE FORCE TAIYUAN SATELLITE LAUNCH CENTER

China's second-oldest space launch base, the Taiyuan Satellite Launch Center, operates launches at the Oriental Maritime Space Port. Also known as PLA Base 25 / the 25th Testing and Training Base [第 25 试验训练基地], with military unit cover designation (MUCD) 63710, the TSLC is located roughly 500 miles from the Port, in the neighboring province of Shanxi.[xvii] It carries out various types of launches, specializing in the same orbits as the Port: LEO and SSO.[112]

Despite the distance, the Taiyuan Satellite Launch Center Sea Launch Mission Team [海上发射任务团队],[113] one of the Center's launch groups [发射大队],[114] is in charge of the launches from the Port.[115] It was founded in late 2017,[116] and it carries out both sea and land launches.[117] In particular, it has carried out at least one CASC Long March-6 launch,[118] possibly on November 21, 2017,[119][xviii] as well as at least two CASIC ExPace Kuaizhou-1A [快舟一号甲] launches, all in six hours on December 7, 2019.[120] It may have a command department.[121][xix] In a possible sign of

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[xvi] As evidenced by the presence and involvement of personnel from the relevant rocket companies on-site for preparation and launch. For example, see: Zheng Enhong [郑恩红], "The first sea launch home port is under construction and is expected to produce 20 rockets per year" [首个海上发射母港在建，预计年产 20 发火箭], China Space News [中国航天报], September 14, 2020, https://mp.weixin.qq.com/s?__biz=MzA5NTgxNTQzMA==&mid=2650568684&idx=1&sn=d8c7b49239160386a35b3d901d90ddfa&chksm=88b14585bfc6cc935a6d8670b55d6b5cea9e40f768a1d20493153cd745b195dfaa175b529ead#rd; Zheng Enhong [郑恩红], "One rocket hits nine satellites in the sea! Chang 11 sea launch will become normalized" [海上一箭打九星！长 11 海射将进入常态化], China Space News [中国航天报], September 14, 2020, https://mp.weixin.qq.com/s?__biz=MzA5NTgxNTQzMA==&mid=2650568680&idx=1&sn=47cfef437cd0589b7c2dab6b9e2ae184&chksm=88b14581bfc6cc973cafad1c54dcd05ea3ec0744a53277f85f0e59a4fc342327c471d4757ccd#rd; "China's first commercial rocket enters solar orbit! Ceres 1 launches 4 satellites from the sea, with a transportation capacity that is twice that of the United States and only half the cost. 4 commercial rockets are launched in one month and are officially mass-produced! 【Cheers for you】" [中国首枚进入太阳轨道的商业火箭！谷神星一号带 4 颗卫星海上发射，运力超美国 2 倍，成本仅为一半，一个月发 4 枚商业火箭正式量产！【为你喝彩】], BRTV Official Channel [北京广播电视台官方频道], November 16, 2024, https://www.youtube.com/watch?v=GRftUYlbiGk.

[xvii] For more on the Center, see CASI's "China's Ground Segment: Building the Pillars of a Great Space Power," China Aerospace Studies Institute, March 2021, https://www.airuniversity.af.edu/Portals/10/CASI/documents/Research/Space/2021-03-01%20Chinas%20Ground%20Segment.pdf?ver=z4ogY_MrxaDurwVt-R9J6w%3d%3d.

[xviii] The commander of the team in 2019-2020 was commander of a Taiyuan Center launch group that carried this out.

[xix] It appeared to have one for the second launch at least.

the importance of the unit and its launches, the Center's director, Li Zongli [李宗利], attended the second launch in 2020. [122]

The team's commander, at least as of the first two launches, is Yang Xiaolun [杨晓论].[123] Of Han Chinese ethnicity from Shangrao, Hebei Province, he was born in April, 1968 and joined the PLA in September 1985.[124] After rising up through the ranks serving in various positions,[xx] he was a Taiyuan Center telemetry and control station commander [测量控制站站长] in 2012.[125] In 2006, he was a member of Taiyuan's Unit 63726[xxi] in Yinchuan, Ningxia Autonomous Region.[126] He was also commander of a Taiyuan Center launch group that carried out the November 21, 2017 Long March-6 launch, which may have been the team's first launch mission.[127]

Figure 5: Unit commander Yang Xiaolun at the 2017 launch.[128]

Xu Guozhi [许国志] was identified as a leader of the team [该团队领导] in May 2022.[129] As of 2020, the unit's political commissar appears to be Zhao Shixin [赵世欣]—he was identified as

[xx] Specifically, assistant engineer, squadron commander, group commander, office director, regiment chief of staff, deputy regiment commander, deputy brigade commander [助理工程师、中队长、队长、科长、团参谋长、副团长、副旅长].

[xxi] Likely a tracking unit, like the one he commanded in 2012.

the party secretary in December 2019[130] and the command department's party committee secretary in September 2020. [131]

Li Cheng [李成] was commander for the first two launches at the Port[132] (the No. "01" commander ["01"号指挥员] for at least the first launch).[xxii] He had previously been a commander [阵地指挥] in the Long March-6 launch's first launch, which occurred in 2015 (not at this spaceport),[133] and he was in a command position for the September 2023 launch at the Port.[134] As of the first launch in 2019, he had already participated in more than 100 launches elsewhere.[135]

Feng Wei [冯伟] was the No. 1 commander for the December 2022 launch at the Port, and he was the team's most experienced engineer at the time.[136] He was also interviewed in relation to the September 2023 launch there, indicating his continuing importance in the unit.[137]

As of February 2023, the team was broadly described as young, with an average age of 32 years. Some commanders for key positions were no older than 30 years, and numerous people 25 or under had repeatedly served as front-end operators [前端操作手].[138]

Figure 6: Launch team group photo from first launch in 2019.[139]

Publicly available information on the team is sparse, but some details about its training have emerged. As of the end of 2019, it was carrying out rotation, change of post, and part-time post training, and it rotated personnel who excelled in their primary roles across multiple posts for learning and training. This process is designed to give team members both individual specializations and broad experience with the team's responsibilities: to generate "one mastery, multiple specializations" [一精多专], "one specialty, multiple capabilities" [一专多能], and "one

[xxii] It appears each launch may have its own launch commander, who may not always be the overall commander of the unit.

person, multiple billets" [一人多岗]. Likely as a result of these efforts, more than 90 percent of the team's front-line personnel at the time had the ability to perform tasks in multiple similar or adjacent specialties.[140]

In May 2022, the team was also using an "integrated collaborative training simulation system" to carry out billet practical training, a "command intelligent operation system" to strengthen collaborative document editing abilities, and a "VR simulation training system" for daily job functions training.[141] In December 2022, possibly in relation to the Port's fifth launch at that time, a logistics and support team led by element commander [分队长] Pan Wenwu [潘文武] had worked to expand its scope from a narrow focus on food support to the element's current work on vehicle transportation, printing and transmission, health and epidemic prevention, and security.[142] It communicated with relevant work units and carried out cooking skills, vehicle driving, and other pre-billet cultivation and training.[143]

The MUCD for this unit is likely 63725. Unit 63725 has multiple patents associated with sea launches, with the patents' inventors having several of the same names as the launch team's leadership personnel noted above.[144] In addition, an equipment procurement bid by the unit in June 2020 (just after the second launch from the Port) for satellite communications equipment specified vehicle/boat equipment with a waterproof and salt-resistant plug interface.[145] As this is the only sea launch center in China, it is unlikely such interests would be for a different purpose. 63725 also fits in the Taiyuan Center's MUCD range (likely 63710 to 63749).[xxiii]

Various equipment procurement bids posted online list Unit 63725's location as Kelan County, Xinzhou, Shanxi,[146] where the Taiyuan Center is located. Furthermore, another bid for a temporary mess hall listed the village of Antang [安糖村], also in Xinzhou.[147][xxiv] One journal article listed a Weinan [渭南], Shanxi location.[148] Unit 63725 has a minimal presence online, and has only publicly published two papers. The earliest reference to it online appears to be August 2019.[149]

PORT COMPANY: ORIENTAL AEROSPACE PORT (SHANDONG)

Oriental Aerospace Port (Shandong) Development Group Co., Ltd.[150] [东方航天港（山东）发展集团有限公司] was established in 2020 and operates the industrial park components of the Port. It was jointly established by Yantai Guofeng Investment Holdings Group Co., Ltd. [烟台国丰投资控股集团有限公司][xxv]—which is 90 percent owned by the Yantai municipal government[151]—and Haiyang Haifa Water Group Co., Ltd. [海阳市海发水务集团有限公司]. Overall, Yantai Guofeng Group owns 51 percent and Haifa Water owns 49 percent of the company.[152] Although it is jointly owned, the Port company is a subsidiary of and controlled by Yantai Guofeng.[153]

[xxiii] Base 26's MUCD is 63750 – see Kevin Pollpeter and Kenneth W. Allen (eds.), "The PLA as Organization. v2.0," Defense Group Inc., 2012, https://www.airuniversity.af.edu/Portals/10/CASI/documents/Research/Other-Topics/2015%20Old%20PLA_as_Organization_v2.pdf.

[xxiv] The village might be a misspelling of 安塘村, which is right by the Taiyuan Center.

[xxv] Also known as 烟台国丰集团, 国丰集团, 国丰.

However, a few years later in December 2024, the company had three shareholders, with Haifa Water's stake unchanged but Yantai Guofeng Group's direct stake reduced to 32.67 percent and new shareholder Yantai Bofeng Industrial Development Co., Ltd. [烟台伯丰产业发展有限公司] holding a stake of 18.33 percent.[154] Yantai Bofeng is a wholly-owned subsidiary of Yantai Guofeng.[155] Its ultimate ownership[xxvi] appears to be the Haiyang Municipal Finance Bureau [海阳市财政局].[156] In 2024, it signed a strategic cooperation agreement with the Beijing "Rocket Street" commercial space R&D project and the Hainan commercial space launch site company.[157]

Port Company Details:

- Address: No. 120, Haixiang Middle Road, Fengcheng Street, Haiyang, Yantai City, Shandong Province [山东省烟台市海阳市凤城街道海翔中路 120 号][158]
- Year established: 2020[159]
- Number of employees: 22[160] (as of 4/22)

The Port company's business operations are still controlled and operated by Yantai Guofeng Group, and it has been managed [代为管理] by the Haiyang Space Industry Development Office [海阳市航天产业发展办公室].[161] The Office appears to have re-launched itself in 2022 as Haiyang's Aerospace Industry Service Center [航空航天产业服务中心].[162] The Port company appears to have had a close relationship with that Office; it has shared the same office space,[163] and the two seem to have jointly run the Port's WeChat account, with both listed at the bottom of articles under the same address at the municipal government.[164] However, the two have maintained different email addresses.[165] The Office was set up as a temporary organization responsible for the industrial park's planning and construction, investment promotion, project negotiation, and corporate services.

The Office's successor, the Aerospace Industry Service Center, is a government section head-level public benefit category-one state institution [正科级公益一类事业单位] directly subordinate to the municipal government, it was founded to help the government support the development of the local aerospace industry. The institution has three departments supporting its main responsibilities and businesses: an office, an industry development department, and a project promotion department. It has 12 staff members and has recruited eight high-level talents in the aerospace field (it is unclear whether individuals can be in both categories).[166]

[xxvi] Suspected actual controller [疑似实控人].

Port Company Aliases:

- 东方航天港（海阳）产业园开发有限公司 / Oriental Spaceport (Haiyang) Industrial Park Development Company, Ltd.[182] (former name, until April 2021) [183]
    - Variation: 东方航天港（海阳）产业园有限公司 / Oriental Spaceport (Haiyang) Industrial Park Company, Ltd.
        - This name was previously listed with the email address dfhtghycyyyxgs@163.com,[184] which includes the pinyin abbreviation for the name and was also listed elsewhere as an official email address[185]
- 东方航天港集团 / Oriental Spaceport Group[186]
- 东方航天港发展集团 / Oriental Spaceport Development Group[187] (possible name)

The Port company handles the industrial park area and the Port's business operations, such as construction of industrial park infrastructure, management, attracting investment, and financial services.[188] Possibly with support from its subsidiaries, it appears to be responsible for construction of at least some industrial park projects, at times in cooperation with the enterprises that control those projects.[189] It had a registered capital of 1.5 billion RMB (roughly 206 million USD) when it was founded,[190] and three billion RMB (roughly 412 million USD) as of 2024.[191]

Port Company Key Personnel (all as of October 2024 unless otherwise noted):

- Gao Zhongqian [高中前] – legal representative [法人代表], chairman and general manager [董事长兼总经理][167]
    - He was also a deputy mayor of Haiyang when the Port was founded,[168] and at least until late 2021.[169]
    - Also deputy general manager of Port company shareholder Yantai Guofeng (2/23)[170]
- Zhang Hua [张华] – deputy general manager [副总经理] (9/24)[171] and director / board member [董事][172]
- Zhou Xueliang [周学良] – director / board member [董事][173]
- Sun Nan [孙楠] – director / board member [董事][174]
- Zhang Jixiang [张继祥] – director / board member [董事][175]
- Qu Xiaofeng [曲晓峰] – director / board member [董事][176]
- Wang Qingchun [王清春] – director / board member [董事][177]
- Liu Xin [刘欣] – supervisor [监事][178]
- Xin Zhangbo [辛张波] – supervisor [监事][179]
- Luo Jian [骆健] – supervisor [监事][180]
- Xiang Changqing [项长青] – former legal representative [法人代表] (4/22)[181]

Port Company Subsidiaries:[192]

- Shandong Maritime Commercial Space Launch Services Co., Ltd. [山东海上商业航天发射服务有限公司]
- Oriental Maritime Space Port Group Big Data Industry Operation Services Co., Ltd. [东方航天港集团大数据产业运营服务有限公司]
- Oriental Maritime Space Port Group Cultural Tourism Co., Ltd. [东方航天港集团文化旅游有限公司]
- Oriental Maritime Space Port (Haiyang) Industrial Park Operation Management Co., Ltd. [东方航天港(海阳)产业园运营管理有限公司]
- Haiyang Rungang Construction and Development Co., Ltd. [海阳市润港建设发展有限公司]
- Oriental Maritime Space Port Group Intelligent Technology Co., Ltd. [东方航天港集团智能科技有限公司]
- Oriental Xingge (Haiyang) Aerospace Technology Co., Ltd. [东方行歌（海阳）航天科技有限公司]
- Oriental Junhang (Shandong) Industrial Development Co., Ltd. [东方君航（山东）产业发展有限公司]
- Haiyang Oriental Spacetime Industry Investment Partnership (Limited Partnership) [海阳市东方时空产业投资合伙企业（有限合伙）]
- Space Power (Haiyang) Industrial Park Development Co., Ltd. [空间动力（海阳）产业园开发有限公司]
- Haiyang Ruixing Industry Investment Partnership (Limited Partnership) [海阳市睿星产业投资合伙企业（有限合伙）]

APPENDIX A: LAUNCHES[193]

	Date	Location[xxvii]	Platform	Rocket (Manufacturer)	Satellites	Orbit Type	Launch Type	Rocket Serial No.
1	**6/5/2019**	Yellow Sea	*Tairui*	LM-11 (CASC)	Bufeng-1 A [捕风一号 A] Bufeng-1 B [捕风一号 B] "Jilin-1" Gaofen-03A ["吉林一号" 高分 03A] Xiaoxiang-1 04 [潇湘一号 04] Tianqi-3 / Taoxingzhi Jiaoyu-1 [天启 3 号/陶行知教育一号] Zhongdianwangtong-1 A [中电网通一号 A] Zhongdianwangtong-1 B [中电网通一号 B]	LEO	Cold	Haiyao-1

[xxvii] Unsourced, but potentially based on NOTAMs, maps of the reported launch locations for the first several years of launches have been posted on Chinese space Youtube channel and Chinese-language Wikipedia: "Why China Wants to Massively Launch from the Sea," Dongfang Hour, accessed Deecmber 2024, https://youtu.be/VgdOSwVDEbc?t=98&feature=shared; "Dongfang Spaceport" [东方航天港], Wikipedia, accessed December 2024, https://zh.wikipedia.org/wiki/%E4%B8%9C%E6%96%B9%E8%88%AA%E5%A4%A9%E6%B8%AF#%E5%8F%91%E5%B0%84%E7%82%B9%E4%BD%8D%E5%88%86%E5%B8%83%E5%9B%BE.

2	**9/15/2020**	Yellow Sea	*Debo-3*	LM-11 (CASC)	3 Gaofen-03C video-streaming satellites (高分 03C 视频星) [高分 03C01~03] and 6 Gaofen-03B scanning satellites (高分 03B 推扫星) [高分 03B01~06 星]	SSO	Cold	Haiyao-2
3	**4/30/2022**	East China Sea	*Tairui*	LM-11 (CASC)	Jilin-1 Gaofen 03D 04-07 [吉林一号高分 03D 卫星 04] Jilin-1 04A [吉林一号 04A]	SSO	Cold	Haiyao-3
4	**10/7/2022**	Yellow Sea	*Defu 15002*	LM-11 (CASC)	Weili Kongjian Beidou Digui Daohang Zengqiangxitong S5 [微厘空间北斗低轨导航增强系统 S5] Weili Kongjian Beidou Digui Daohang Zengqiangxitong S6 [微厘空间北斗低轨导航增强系统 S6]	LEO	Cold	Haiyao-4
5	**12/9/2022**	Yellow Sea	*Tairui*	Jielong-3 [捷龙三号] (CALT)	Jilin-1 Gaofen 03D (47-50) [吉林一号高分 03D 卫星 47-50] Fengtai Shaonian Erhao [丰台少年二号] Dongpo 08-10 [东坡 08-10 星] Jilin-1 Platform 01A01 [吉林一号平台 01A01] Tianqi-07 [天启星座 07] Jiaotong Wuhao / Hede Erhao H [交通五号/和德二号 H]	SSO	Hot	Haiyao-1

					Jinzijin-1 05/06 [金紫荆一号 05/06 星] Hujuyihao 01 [火炬一号 01]			
6	**9/5/2023**	Yellow Sea	*Defu 15002*	Ceres-1 [谷神星一号] (Galactic Energy)	Tianqi-21 – Tianqi-24 [天启星座 21 星-24 星]	LEO	Hot	Haiyao-1
7	**12/6/2023**	South China Sea	*Borun Jiuzhou*	Jielong-3 [捷龙三号] (CALT)	Satellite Internet Technology Test Satellite / Weixing Hulianwang Jishu Shiyan Weixing [卫星互联网技术试验卫星]	LEO	Hot	Haiyao-2
8	**12/26/2023**	South China Sea	*Borun Jiuzhou*	LM-11 (CASC)	Shiyan-20 C1-C3 [试验二十四号 C1-C3]	SSO	Cold	Haiyao-5
9	**1/11/2024**	Yellow Sea	*Oriental Maritime Space Port*	Gravity-1 [引力一号] (Orienspace)	Yunyao-1 18-20 [云遥一号 18 星-20 星]	LEO	Hot	Yao-1

10	**2/3/2024**	South China Sea	*Borun Jiuzhou*	Jielong-3 [捷龙三号] (CALT)	Xing Shidai 18-20 [星时代 18-20] Zhixing-2A Xing/Jigaokechuanghao [智星二号 A 星/济高科创号] Xunming Laojia 1/DRO-L [寻茗老家一号/DRO-L 星] Yantai-2/ Dongfanghuiyan Gaofen 01 [烟台二号/东方慧眼 高 分 01/] Weihai-1 01-02 [威海一号 01-02] NEXSAT-1 [埃及 NExSat-1/ NEXSAT-1 星]	SSO	Hot	Haiyao-3
11	**5/29/2024**	Yellow Sea	*Oriental Maritime Space Port*	Ceres-1 [谷神星一号] (Galactic Energy)	Tianqi-25 – Tianqi-28 [天启星座 25 星-28 星]	LEO	Hot	Haiyao-2
12	**8/29/2024**	Yellow Sea	*Oriental Maritime Space Port*	Ceres-1 [谷神星一号] (Galactic Energy)	Yunyao-1 (15-17) [云遥一号 15 星~17 星] Jitianxing A-03 /JTX-A-03 [吉天星 A-03 星/JTX-A-03 星]Suxing-1 01 [苏星一号 01 星] Tianfu Gaofen 2 [天辅高分二号]	SSO	Hot	Haiyao-3

13	**9/24/2024**	Yellow Sea	*Oriental Maritime Space Port*	Jielong-3 [捷龙三号] (CALT)	Tianyi 41 [天仪 41] Xing Shidai-15 [星时代-15] Xing Shidai-21 [星时代-21] Xing Shidai-22 [星时代-22] Yuxing-2 05 [驭星二号 05] Fudan-1 [复旦一号] Tianyan 15 [天雁 15] Jitianxing A-01 [吉天星 A-01 星]	SSO	N/A	Yao-4

Notes:

- Launch 1: China's first sea space launch.
- Launch 2: A space launch reportedly normally takes over 1,000 people, but this time the Taiyuan Satellite Launch Center did it with under 100, which appears to have been the first time with such a small amount.[194]
- Launch 6: The first sea launch for a private Chinese rocket company.
- Launch 9: The Gravity-1 is the world's most powerful solid-fuel rocket.

APPENDIX B: LAUNCH PLATFORMS USED

Launch platforms used:[195]

Platform Name	Type	Max Load (tons)	Launch / Success Count	Rockets Supported	Rocket Types
Tairui [泰瑞号]	Semi-sub barge	36268	3	LM-11, Jielong-3	Solid
Debo-3 [德渤 3 号]	Deck barge	20244	1	LM-11	Solid
Defu 15002 [德浮 15002]	Deck barge	16445	2	LM-11, Ceres-1	Solid
Borun Jiuzhou [博润九州号]	Deck cargo ship	N/A	3	LM-11, Jielong-3	Solid
Oriental Maritime Space Port [东方航天港号]	Self-propelled sea launch ship	22000	4	Ceres-1, Jielong-3, Gravity-1	Solid and liquid

ENDNOTES

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