

香港衛星製造技術與發展

Technology and Development in Hong Kong Satellite Manufacturing

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聯席主席

Dr. George Lam, BBS
Co-Chairman



香港航天科技集團

01 **發展背景**
Background

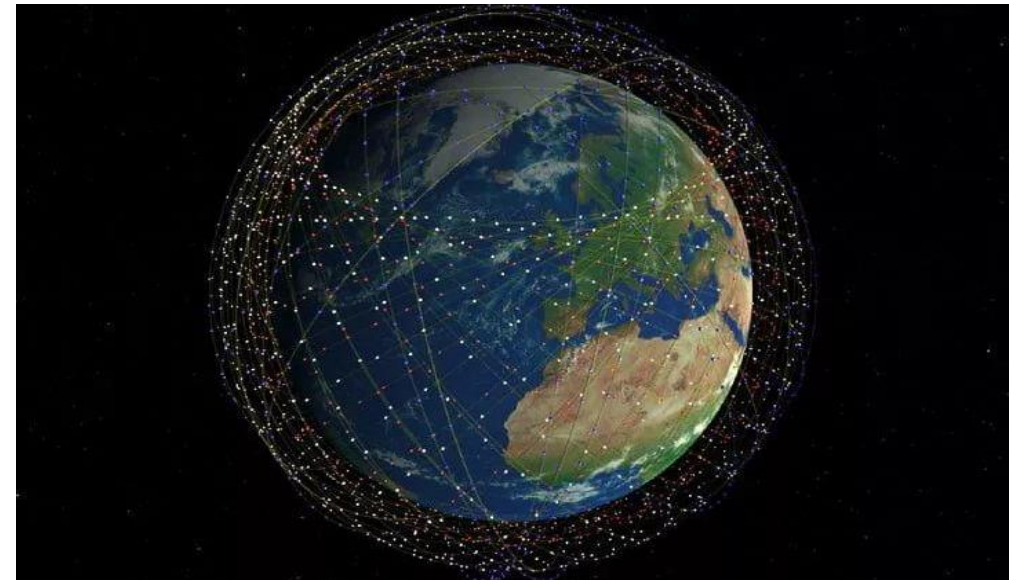
02 **香港造衛星的優勢**
Advantages of Hong Kong Satellite Manufacturing

03 **香港衛星製造方案與進展**
Progress of Hong Kong Satellite Manufacturing

04 **發展目標**
Development Vision

01 全球航天產業高速發展

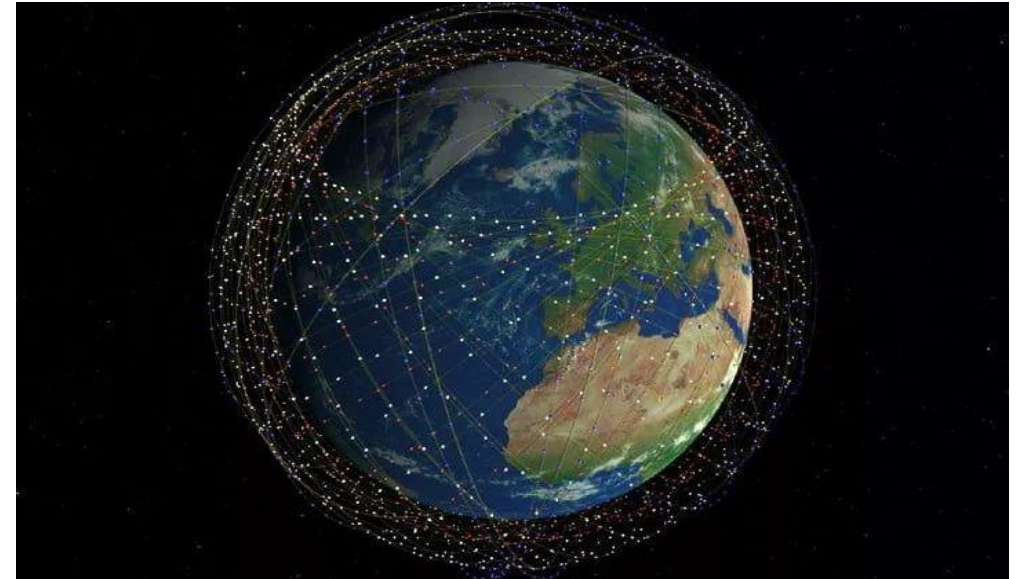
- 美國SpaceX的「星鏈計畫」宣佈發射4.2萬顆衛星，組成全球最大衛星星座，實現覆蓋全球的自組網絡，徹底擺脫光纖和基站的區域限制 (<https://observer.com/2019/10/spacex-elon-musk-starlink-satellite-internet-itu-fcc-filing/>)
- 據摩根士丹利估計，到2040年與太空有關經濟總量將超過1.2萬億美元
<https://www.morganstanleychina.com/ideas/space-investing-in-the-final-frontier>



01 The Rapid Development of the Global Aerospace Industry

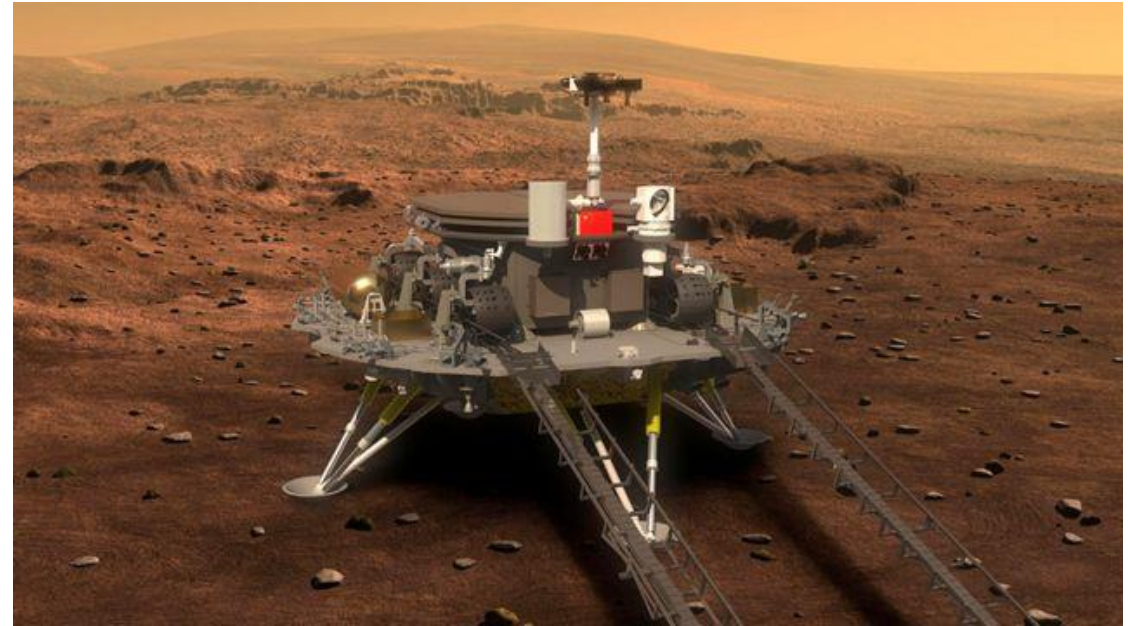


- The Starlink of SpaceX in the U.S. announced to launch 42,000 satellites to form the largest satellite constellation in the world, realizing an Ad Hoc covering the whole world, completely getting rid of the regional restrictions of optical fibers and base stations; (<https://observer.com/2019/10/spacex-elon-musk-starlink-satellite-internet-itu-fcc-filing/>)
- According to the estimates of Morgan Stanley, the total aerospace economy will exceed \$1.2 trillion by 2040. (<https://www.morganstanleychina.com/ideas/space-investing-in-the-final-frontier>)



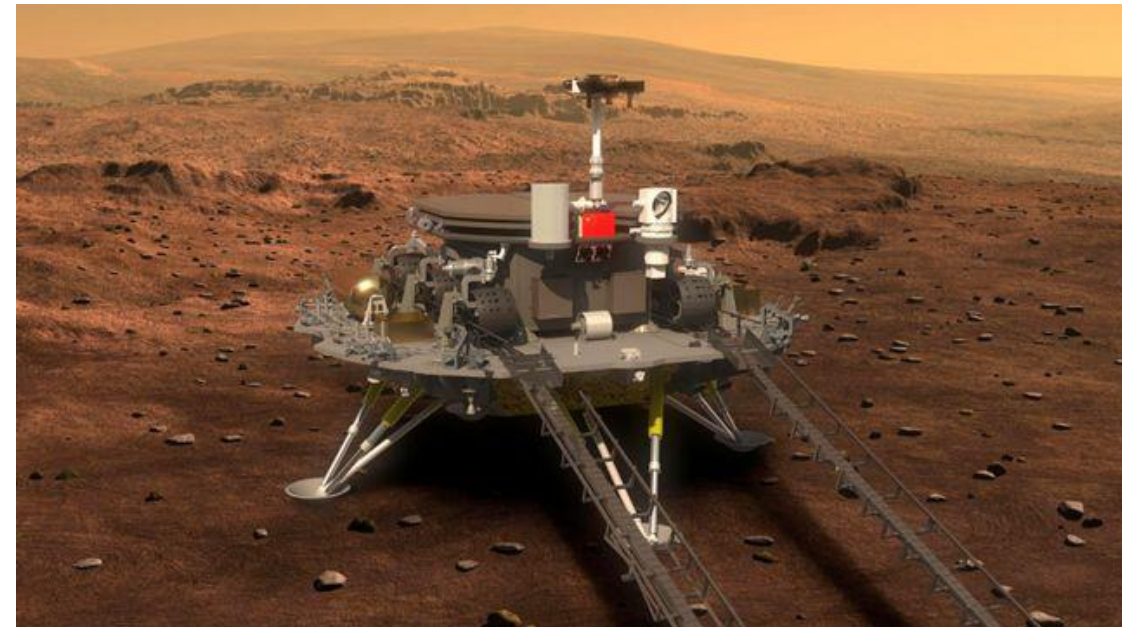
01 契合國家戰略發展規劃

- 航天科技是中國科技的靚麗名片，更是大國實力的重要表現。中國每一次航天事件都受到國家領導人的高度關注。暗物質粒子探測衛星——「悟空」號、問天一號發射、北斗三號全球衛星導航系統的建成開通等都受到了國家領導人的充分肯定。
- 香港地處大灣區核心區域，具有得天獨厚的創新優勢，積極參與航天事業的發展，推動本地精密製造業發展。



01 In Conformity With the National Strategic Development Plan

- **Aerospace science and technology not only represents a country's science and technological development, but also manifests its strength and capability. Every Aerospace event in China has been given due regard and attention, including by the state leaders. The launch of Dark Matter Particle Explorer and Tianwen 1, and the establishment and operation of the Beidou-3 have all received full acknowledgments by state leaders.**
- **Located in the focal point of the Greater Bay Area, Hong Kong has unique locatimal and other advantages to participate in the development of aerospace industry and promote the development of precision manufacturing.**



01 助力香港“再工業化”

- 在過去的3年中，特區政府已經投入了過千億元用於科技創新的研發，產學研推進正迎頭趕上。
- 2019年出臺的《粵港澳大灣區發展規劃綱要》明確提出了：支持香港在優勢領域探索「再工業化」。並把落馬洲河套地區劃為“飛地”，實行特殊經濟政策。
- 《粵港澳大灣區發展規劃綱要》為香港「再工業化」定位為科技創新，依託大灣區製造業體系的支撐，完成產學研合作。



01 Promote Hong Kong's "Re-industrialization"

- Over the past three years, the Hong Kong government has invested more than HK\$ 100 billion in the R&D of scientific and technological innovation, as well as on the IAR (Industry-Academia-Research) areas which are catching up.
- The Outline of the Development Plan for the Guangdong-Hong Kong-Macao Greater Bay Area issued in 2019 clearly stated that Hong Kong would be supported in exploring "re-industrialization" in its advantageous fields.
- The Outline of the Development Plan for the Guangdong-Hong Kong-Macao Greater Bay Area has also defined Hong Kong's "re-industrialization" as technological innovation, which is to complete the collaboration of IAR based on the manufacturing system in the Greater Bay Area.



Refs: https://www.bayarea.gov.hk/filemanager/tc/share/pdf/Outline_Development_Plan.pdf

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02 香港衛星製造國際營商優勢

- 香港是WTO四個獨立關稅區之一
- 國際貿易自由度保障香港精密製造裝備供應鏈
- 零關稅及零製造業稅為香港製造提供核心競爭力
- 香港國際化環境吸引全球高端航天人才
- 香港具有符合國際標準的知識產權保護法律法規
- 香港擁有高端製造業基礎，具備二次騰飛條件



02 Hong Kong Satellite Manufacturing International Business Advantage

- One of the four independent customs areas of the WTO.
- Free movement of goods in international trade guarantees the equipment supply chain of precision manufacturing.
- Zero tariff and zero manufacturing tax provide core competitiveness.
- Hong Kong's international environment attracts global high-end aerospace talents.
- Hong Kong has relevant laws and regulations for intellectual property protection that comply with international standards.
- Hong Kong has a high-end manufacturing basis and has the conditions for the second take-off of precision manufacturing.





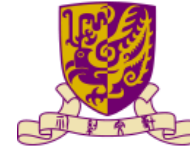
02 香港人才儲備優勢

- 香港有5所大學躋身世界百強，多所大学均开设精密制造与航天应用专业，香港航天人才储备丰富。
- 香港背靠内地「航天系」科研院所，為香港發展航天業提供了智力和人才支持。



香港大學

THE UNIVERSITY OF HONG KONG



香港中文大學

The Chinese University of Hong Kong



THE HONG KONG
POLYTECHNIC UNIVERSITY
香港理工大學



香港科技大學



中国航天

上海航天技术研究院

Shanghai Academy of Spaceflight Technology



中国航天

中国长城工业集团有限公司

China Great Wall Industry Corporation



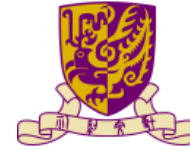
02 Hong Kong talent pool advantages

- Five universities in Hong Kong rank among the top 100 in the world, and many universities offer majors in precision manufacturing and aerospace applications.
- Hong Kong has a rich reserve of aerospace talents.
- Hong Kong is backed by the Mainland's "Astronautics Department" scientific research institutes, providing intellectual and talent support for the development of Hong Kong's aerospace industry.



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中国长城工业集团有限公司

China Great Wall Industry Corporation



02 香港航天科技集團技術優勢

香港航天科技集團

- 香港航天科技集團（簡稱HKATG）于2019年成立的香港第一家商業航天企業，2019年11月成爲國際宇航聯合會香港第一位機構成員。
- 香港航天科技集團依托香港國際中心城市地位，以構建衛星製造、衛星發射、航天測控及航天數據服務為產業核心，彌補航天產業區域商業空白，推動航天技術市場化，服務區域航天商業化需求。



「國際宇航聯機構成員」

股票代碼：1725.HK

02 Technology Advantages of Hong Kong Aerospace Technology Group



Hong Kong Aerospace Technology Group (HKATG) <http://www.hkatg.com>

- Hong Kong Aerospace Technology Group (HKATG) was established in 2019 as the first commercial aerospace company in Hong Kong. HKATG became the first Hong Kong member of the “International Astronautical Federation”(IAF) in November 2019.
- The core business of HKATG is satellite precision manufacturing, satellite launch, aerospace monitoring and control, and aerospace data services to promote the commercialization of aerospace technology and to meet the needs of regional aerospace demands.



[Member of IAF]

HKG: 1725



02 香港航天科技集團技術優勢

- 擁有全球傑出航天專家團隊
 - 多名院士專家
 - 商業小型衛星系統首席
 - 「千眼衛星星座」專家
- 精密高端製造產業鏈加盟
 - 中國航天科技集團
 - 中國長城工業集團
- 在研在軌技術積累
 - 金紫荊一號01星
 - 金紫荊一號02星

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 于明 加拿大工程院院士	 丁曉利 講座教授	 約翰·拉瑟姆 聯合國FAO地理研究部主管	 Clive S. Fraser 澳大利亞工程院院士	 Gerard Lachapelle 加拿大工程院院士	 Milan Konecny 國際歐亞科學院院士

02 Technology Advantages of Hong Kong Aerospace Technology Group



- **Global outstanding aerospace expert team**
 - **Multiple academicians and experts**
 - **Chief of Commercial Small Satellite System**
 - **Expert of "Thousand Eyes Satellite Constellation"**
- **Precision high-end manufacturing industry chain**
 - **China Aerospace Science and Technology Corporation**
 - **China Great Wall Industry Corporation**
- **Accumulation of in-research and on-orbit technology**
 - **Golden Bauhinia-1 01 Satellite**
 - **Golden Bauhinia-1 02 Satellite**

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 Yu Ming Fellow of the Canadian Academy of Engineering	 Ding XiaoLi Chair Professor of Geomatics	 John Stephenson Latham Head of Food and Agriculture Organization of the United Nations	 Clive S. Fraser Fellow of the Australian Academy of Engineering	 Gerard Lachapelle Fellow of the Canadian Academy of Engineering	 Milan Konecny Academician of International Eurasia Academy of Sciences

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03 香港衛星製造概述

- 在大數據、人工智能、信息技術、集成電路等產業的推動下，航天技術得到了快速推廣應用和普及，商業衛星的生產與數據應用逐漸形成未來發展趨勢，在軌運行的衛星平台將成為信息化社會的重要信息來源。
- 香港航天科技集團正計劃在香港構建衛星智能製造產業鏈，將具備衛星生產過程中的配套準備、總裝、集成與試驗全流程功能，並能夠模擬真空環境、火箭發射力學振動環境等，能夠作為常規商業衛星的生產基地。
- 通過發展衛星應用需求，聚焦衛星產業關鍵核心技術與產業共性技術問題，拓展衛星應用能力並構建共享型空天信息創新平台，有助於推動香港地區及粵港澳大灣區的衛星產業和智慧城市建设能力。

03 Hong Kong Satellite Manufacturing: Overview



- **Driven by big data, artificial intelligence, information technology, integrated circuit and other industries, aerospace technology has been rapidly promoted and popularized. The production and data application of commercial satellites have gradually become the trend of future development. In-orbit satellite platforms will become an important source of data in the information led society.**
- **Hong Kong Aerospace Technology Group is planning to build a satellite intelligent manufacturing industry chain in Hong Kong, which can effectively support the development of the satellite industry. It has the function of supporting the whole process of preparation, assembly, integration and testing in the satellite production process. With complete production functions, it can simulate the vacuum environment and the vibration environment of rocket launch mechanics, and can be used as a routine Production base for commercial satellites.**
- **By focusing on key core technical issues of the satellite industry, expanding satellite application capabilities and building a shared aerospace information innovation platform, it will help promote the satellite industry and smart city application in Hong Kong and the Guangdong-Hong Kong-Macao Greater Bay Area.**



03 香港衛星製造概述：戰略合作共建

香港航天科技集團與中國長城工業集團、上海航天技術研究院締結戰略合作關係，合作涉及商業衛星星座研發、製造、發射，商業衛星專業應用及航天專業服務等多種領域。

香港航天科技集團

香港航天科技集團（簡稱HKATG）于2019年成立的香港第一家商業航天企業，2019年11月成爲國際宇航聯合會香港第一位機構成員。香港航天科技集團依托香港國際中心城市地位，以構建覆蓋粵港澳大灣區十一座城市群的“金紫荊”衛星星座爲產業核心，以發展香港衛星精密製造業及月球資源探索爲戰略目標，實現航天技術市場化，服務航天商業化需求。

中國長城工業集團

中國政府授權的提供商業發射、衛星系統以及從事空間技術合作的商業機構。長城公司致力於中國航天國際化發展，已成爲航天產品及服務的系統集成商，能夠完整地提供商業發射服務、衛星在軌交付、衛星地面測控站建設、衛星應用、項目融資、保險、人員培訓及技術轉讓的綜合大型國有企業。

中國航天科技集團 上海航天技術研究院

中國衛星總裝製造、測試、試驗重要組成責任單位，主要承擔衛星工藝設計、部裝、總裝、航天器環境模擬與驗證試驗研究及相關設備研製，組織開展衛星產品化生產線建設，參與衛星發射試驗等工作，已開發固化了SAST1000、SAST3000、SAST5000等衛星公用平台，研製和發射十餘種型號、四十多顆衛星，形成氣象與環境衛星和新技术與試驗衛星等多個衛星系列，具備比較完整的衛星裝配、集成測試和試驗條件，是中國氣象衛星的研製基地。

03 Hong Kong Satellite Manufacturing: Strategic cooperation and co-construction



Hong Kong Aerospace Technology Group has established a strategic partnership with China Great Wall Industry Corporation and Shanghai Academy of Spaceflight Technology.

The cooperation involves commercial satellite constellation research and development, satellite manufacturing, satellite launch, satellite applications and aerospace professional services.

Hong Kong Aerospace Technology Group(HKATG)

Hong Kong Aerospace Technology Group (HKATG) was established in 2019 as the first commercial aerospace company in Hong Kong. HKATG became the first Hong Kong member of the “International Astronautical Federation” (IAF) in November 2019.

The core business of HKATG is satellite precision manufacturing, satellite launch, aerospace monitoring and control, and aerospace data services to promote the commercialization of aerospace technology and to meet the needs of regional aerospace demands.

China Great Wall Industry Corporation(CGWIC)

CGWIC is a commercial organization authorized by the Chinese government to provide commercial launches, satellite systems and space technology cooperation. CGWIC is committed to the international development of China’s aerospace industry and has become a system integrator of aerospace products and services. CGWIC can provide complete commercial launch services, satellite in-orbit delivery, satellite ground control station construction, satellite applications, project financing, insurance and personnel training, as well as comprehensive technology transfer for large state-owned enterprises.

Shanghai Academy of Spaceflight Technology(SAST)

SAST is responsible for manufacturing, testing and experimenting of China’s satellite final assembly, which is mainly responsible for satellite process design, partial assembly, final assembly, spacecraft environment simulation, and verification test research. SAST constructs production lines for satellite products and participates in satellite launch tests. SAST has developed SAST1000, SAST3000, SAST5000 and other public satellite platforms. SAST has relatively complete conditions for satellite assembly, integration test and trial, which is the research and development base of China's meteorological satellites.



03 香港衛星製造2階段發展計劃

Hong Kong Satellite Manufacturing: Two-Stage Development Plan

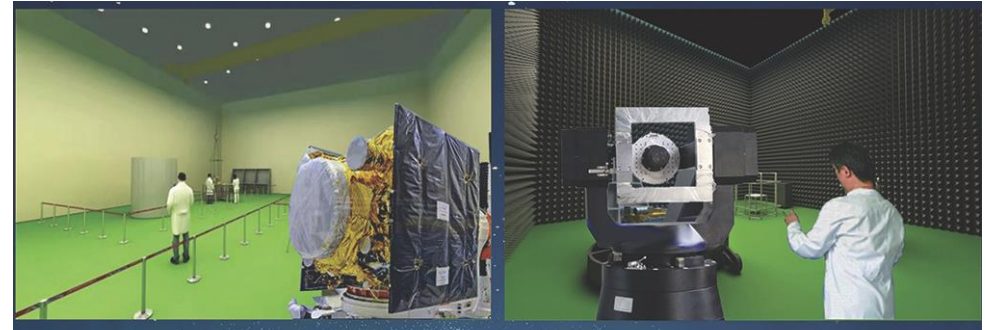
- **第一階段 AMC：衛星智能製造中心**
- **Stage I — AMC: Satellite Intelligent Manufacturing Center**

- **第二階段 香港航天衛星創科園**
- **Stage II — Hong Kong Aerospace Satellite Innotech Park**

03 香港衛星製造2階段發展計劃

衛星製造第一階段

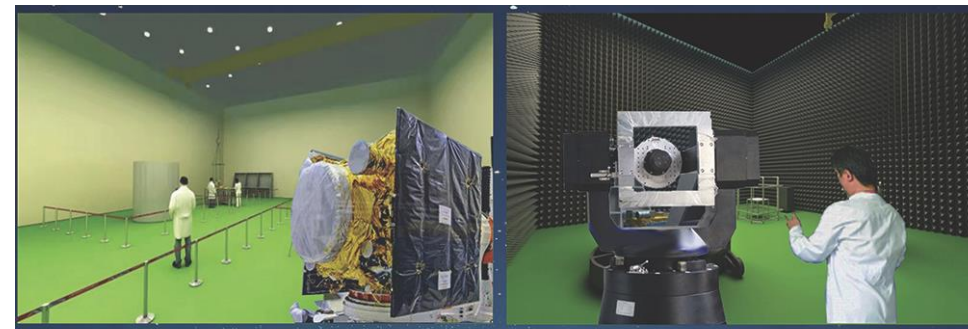
- 2021年8月通過香港特別行政區評審入駐香港先進製造中心; 建設190,000平方英尺的香港第一家衛星製造中心;
- 2022年4月香港衛星製造中心投入使用, 預計年產30~60顆光學衛星、雷達衛星及通訊衛星; 並提供光學通訊載荷設計及整星製造服務。



03 Hong Kong Satellite Manufacturing: Two-Stage Development Plan

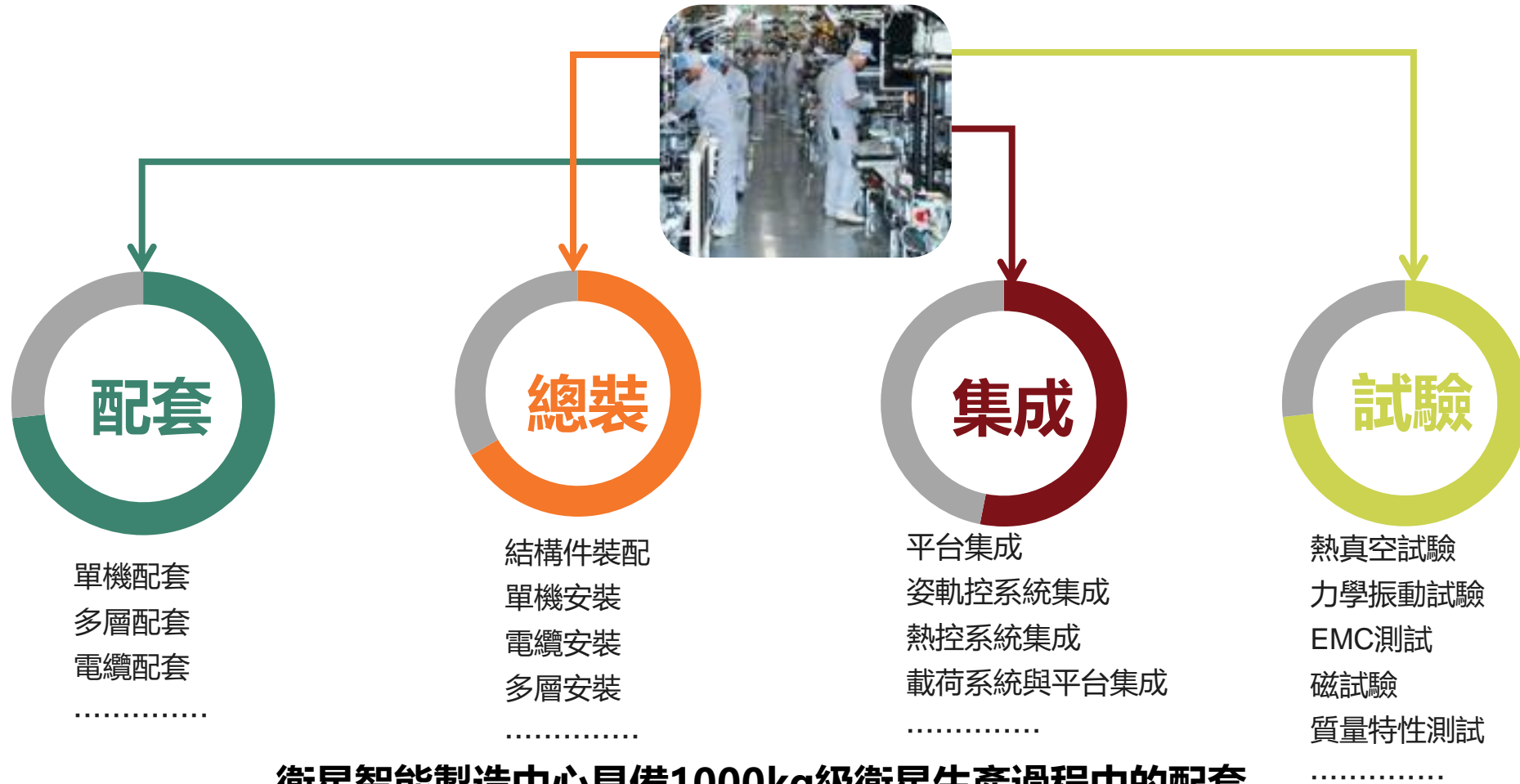
Stage I

- August 2021, officially reached the use of the Hong Kong Advanced Manufacturing Center, and will build the first satellite manufacturing center in Hong Kong with a 190,000 square feet.
- Hong Kong Satellite Manufacturing Center will be put into use in April 2022,
- With an estimated annual output of 30-60 optical satellites, radar satellites and communication satellites;
- Provide optical communication payload design and whole-satellite manufacturing services.



03 香港衛星製造2階段發展計劃

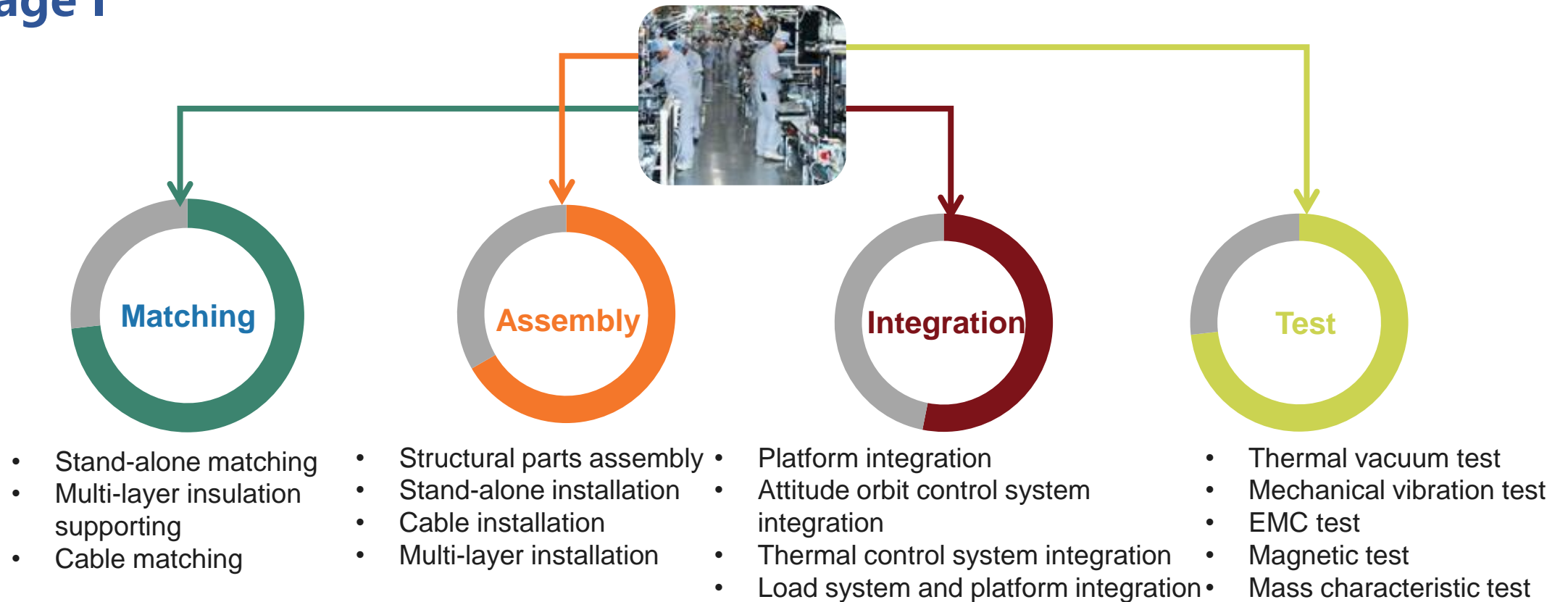
衛星製造第一階段



衛星智能製造中心具備1000kg級衛星生產過程中的配套準備、總裝、集成與試驗全流程功能，並具備拓展性。

03 Hong Kong Satellite Manufacturing: Two-Stage Development Plan

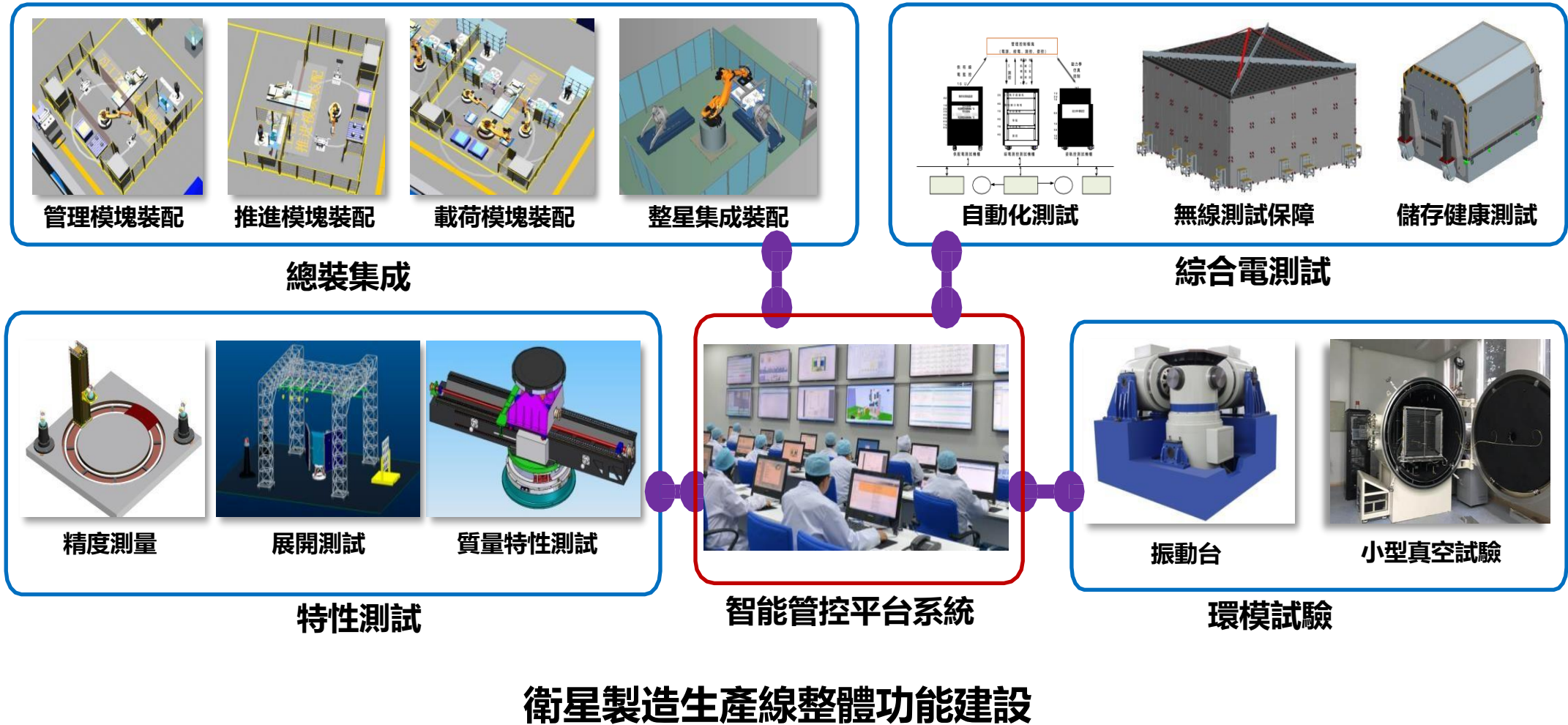
Stage I



To support the payload & bus test, final assembly, integration and testing of Satellites under 1000 kg level

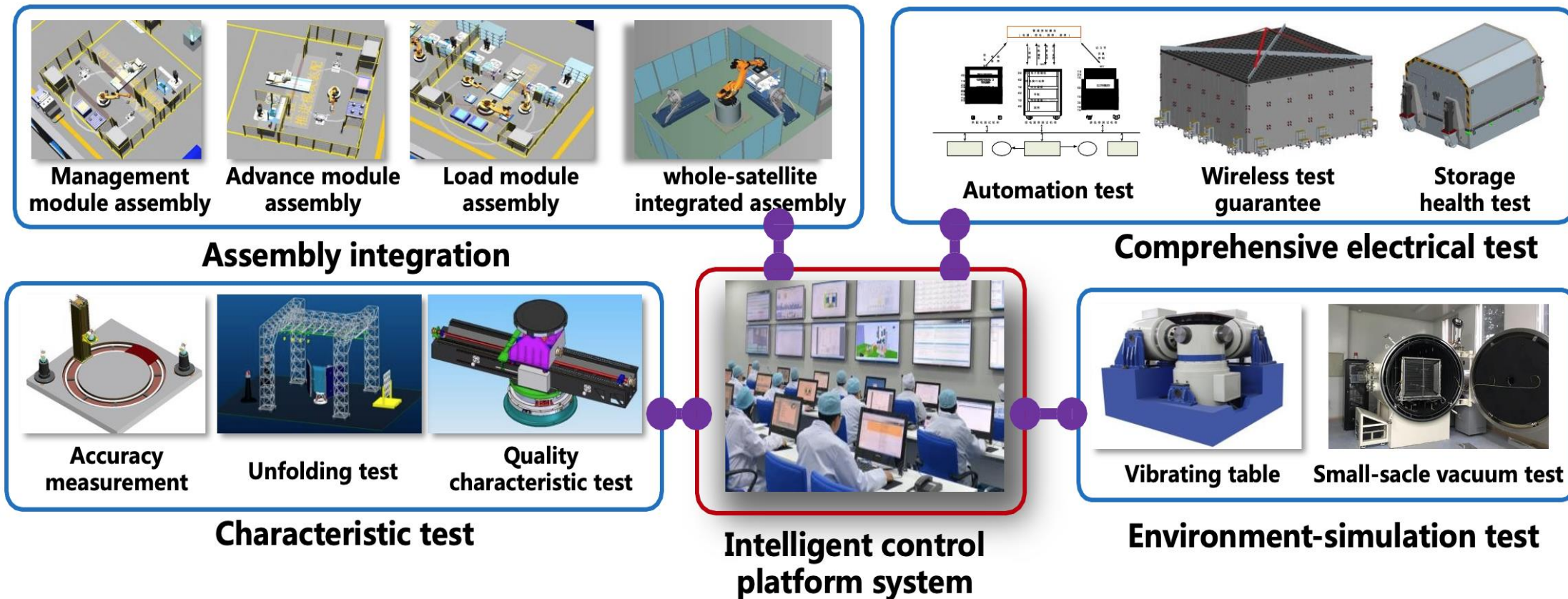
03 香港衛星製造2階段發展計劃

衛星製造第一階段



03 Hong Kong Satellite Manufacturing: Two-Stage Development Plan

Stage I

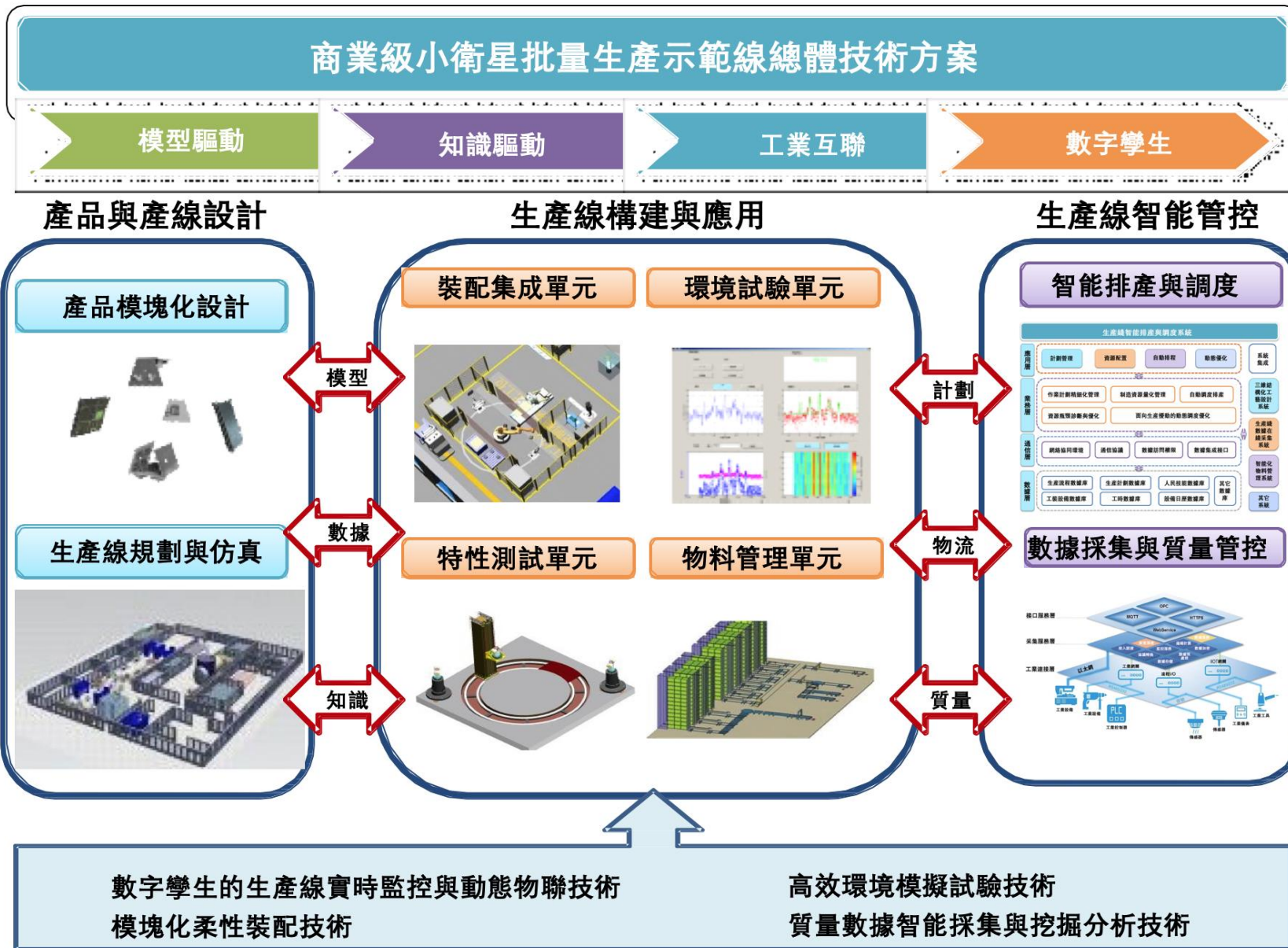


Hong Kong Satellite Manufacturing: Overall Function

03 香港衛星製造2階段發展計劃

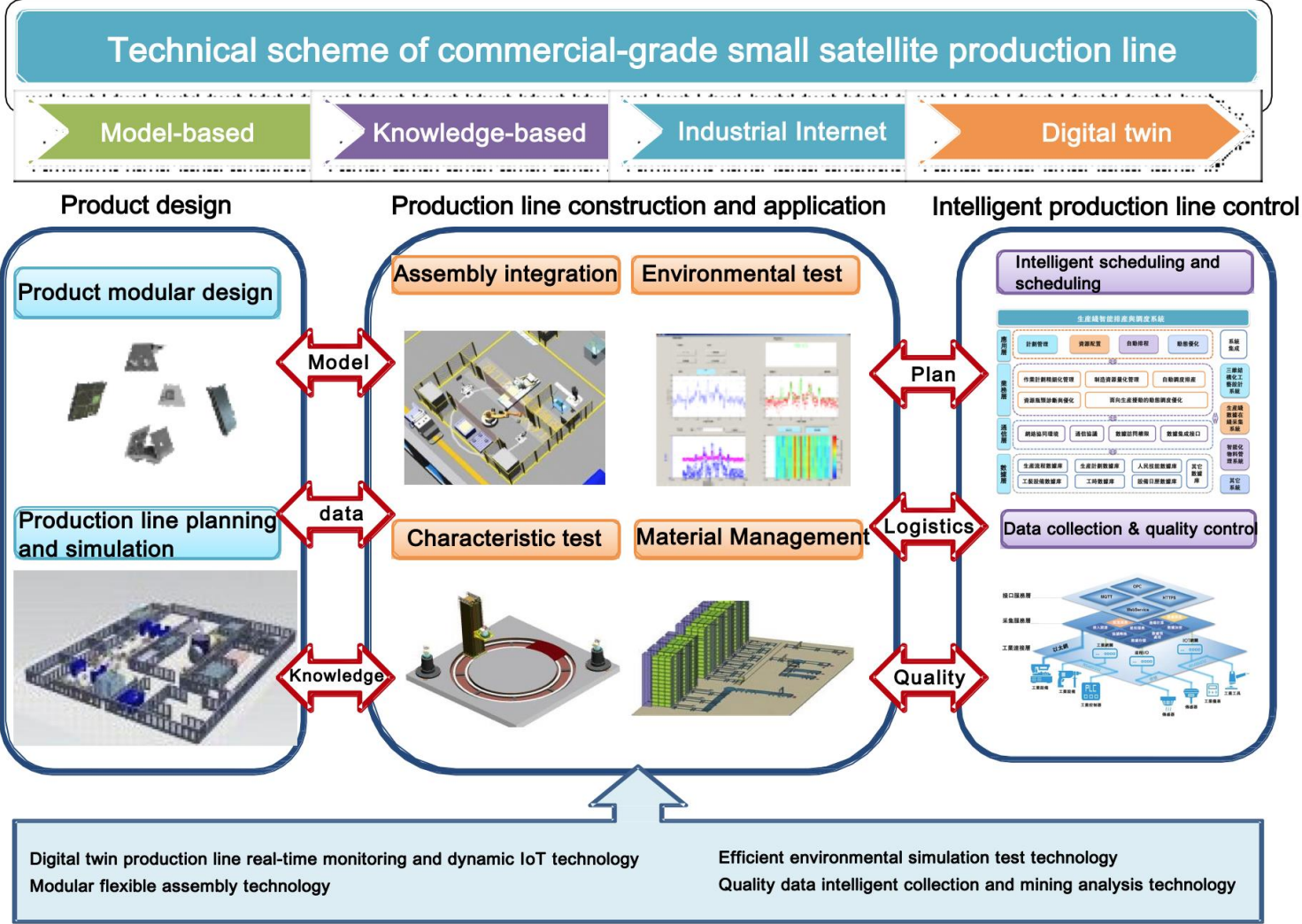
衛星製造第一階段

衛星
批量
生產
線
總
體
技
術
方
案



03 Hong Kong Satellite Manufacturing: Two-Stage Development Plan

Stage I



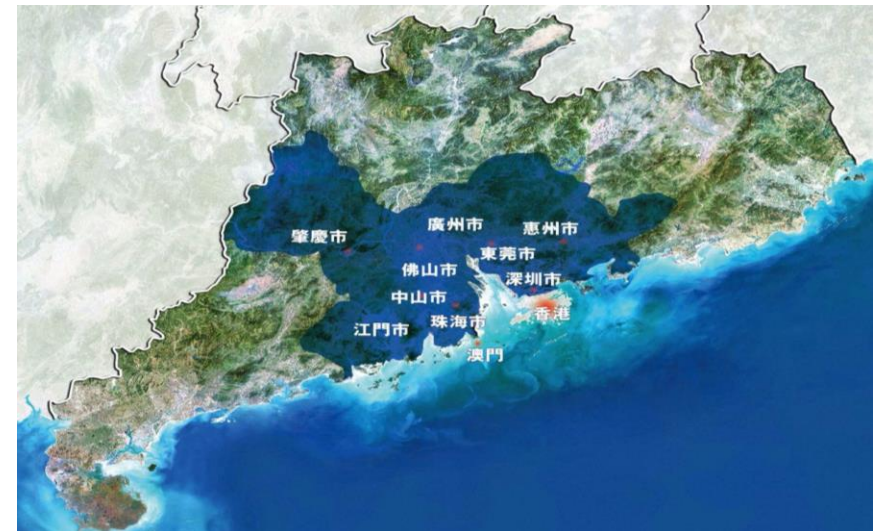
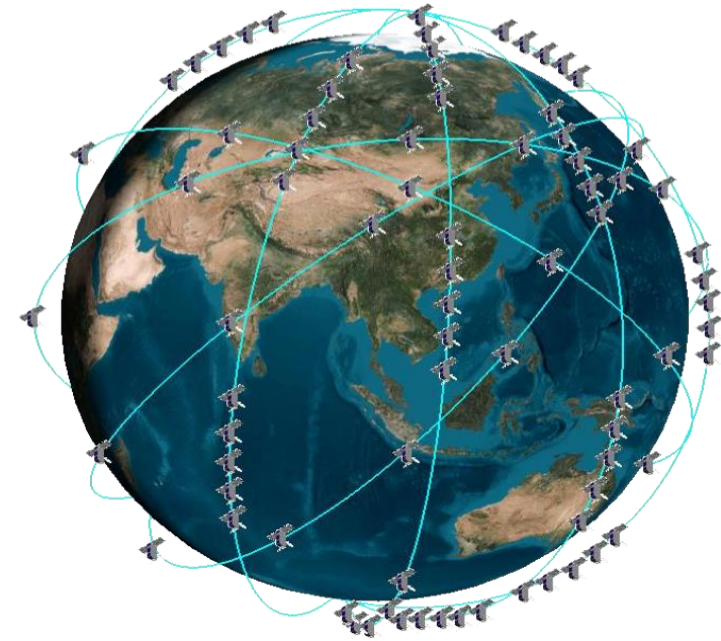
Technical scheme of commercial-grade small satellite production line

03 香港衛星製造2階段發展計劃

金紫荊星座服務大灣區

“金紫荊”星座是以服務粵港澳大灣區十一座城市群為基礎，構建區域完整覆蓋的主被動混合式低軌高頻衛星星座，成為粵港澳大灣區航天智慧城市主數據運營商。

- 24小時全天候覆蓋粵港澳大灣區
- 30分鐘重訪週期
- 0.3m - 1.0m 空間分辨率
- 提供航天大數據、圖像、視頻及智慧城市服務



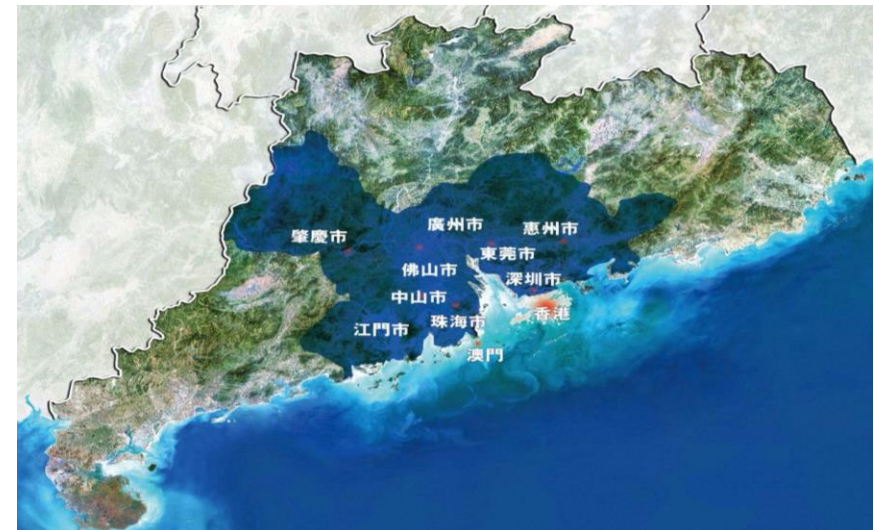
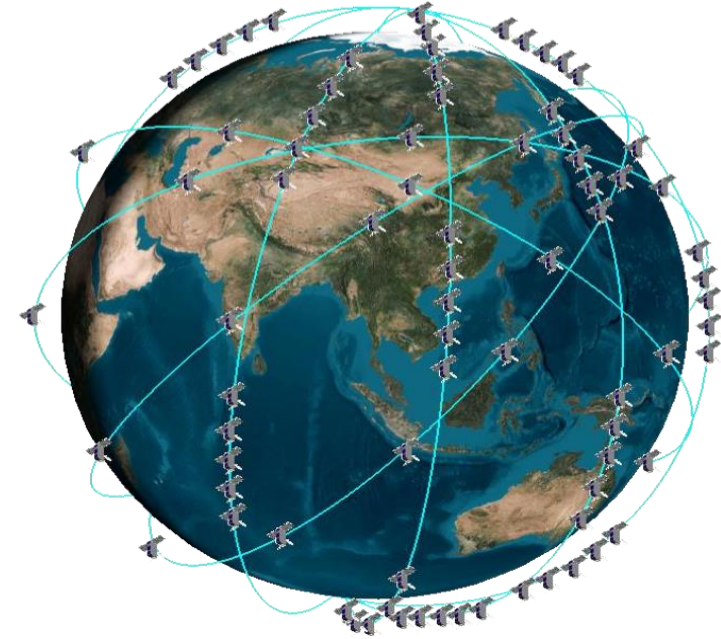
03 Hong Kong Satellite Manufacturing: Two-Stage Development Plan



Golden Bauhinia Constellation serves the Greater Bay Area

The “Golden Bauhinia” constellation constructs an active and passive hybrid low-orbit high-frequency satellite constellation with complete regional coverage. Based on serving 11 urban agglomerations in the Guangdong-Hong Kong-Macao Greater Bay Area, it aims to become the main data operator of aerospace smart cities in the Area.

- 24-hour coverage in the Guangdong-Hong Kong-Macao Greater Bay Area
- 30 minutes revisit cycle
- 0.3m -1.0m spatial resolution
- Provide aerospace big data, image, video and smart city services



03 香港衛星製造2階段發展計劃

衛星製造第二階段

- 香港衛星製造有限公司二期工程將於2022~2026年分期建設2,500,000平方呎的全球大型衛星總裝集成與超精密製造中心;
- 設計年產製造10噸以下航天器及1500顆衛星;
- 設計年產200種超精密衛星零部件生態鏈。



03 Hong Kong Satellite Manufacturing: Two-Stage Development Plan

Stage II

- A 2,500,000 square-foot global large satellite assembly and ultra-precision manufacturing center will be constructed from 2022 to 2026;
- Annual production of spacecraft under 10 tons and 1,500 satellites;
- Design an ecological chain with an annual output of 200 kinds of ultra-precision satellite components.



01 **發展背景**
Background

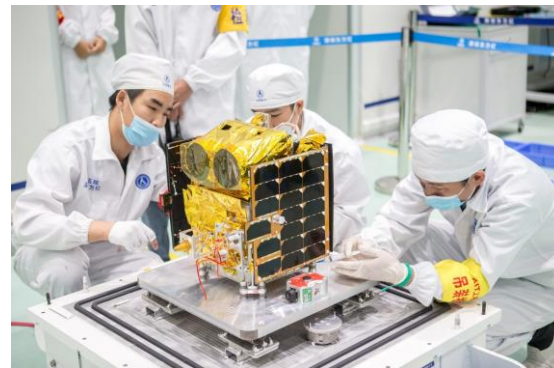
02 **香港造衛星的優勢**
Advantages of Hong Kong Satellite Manufacturing

03 **香港衛星製造方案與進展**
Progress of Hong Kong Satellite Manufacturing

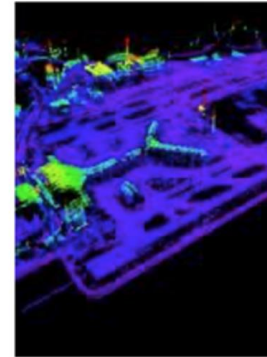
04 **發展目標**
Development Vision

04 發展目標 Development Vision

- 推動香港航天產業
- To promote Aerospace Industry In HK
- 發展香港精密製造
- To develop Precision Manufacturing in HK
- 賦能香港再工業化
- To empower Reindustrialization of HK

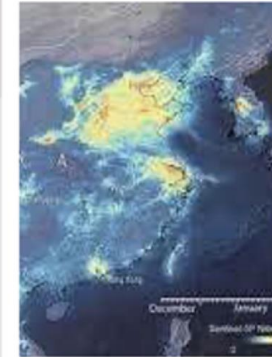


Management of
Emergency Condition



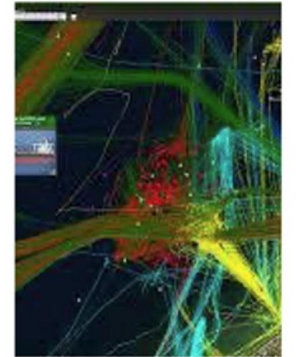
應急管理

Disaster
Recovery



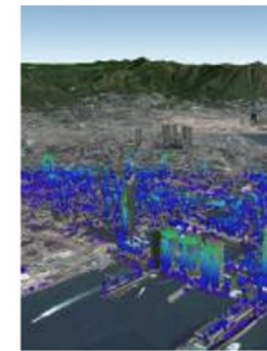
防災減災

Environmental
Control



生態環境

Urban
Management



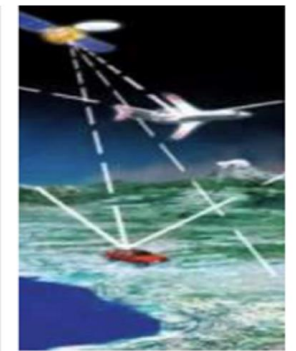
城市管理

Construction
Management



工程建設

Isometric
Traffic Control



交通運輸

04 “香港造” 衛星

- 向國際社會展示香港衛星製造能力
 - 先期開展1000公斤重以下的微小衛星製造，中期開展1000公斤~5噸中型-大型衛星製造
 - 具備8~40顆以上商業小衛星並行總裝綜測能力
 - 具備擴展性，通過擴展建設，可直接轉化為脈動式智能AIT生產線，年產衛星目標600-1500顆
- 直接帶動香港再工業化快速發展
 - 引進全球精密設備製造衛星
 - 恢復香港精密工業
- 帶動香港精密製造業二次騰飛
 - 能夠引進高端人才並增加本地就業
 - 有望帶動本地GDP增值





04 "Hong Kong-made" satellite

- **Demonstrating Hong Kong's satellite manufacturing capabilities to the international community**
 - **Develop small satellites under 1000 kg in the initial period, and develop medium-sized and large-sized satellites ranging to 5 tons in the medium-term period**
 - **Possess the ability of parallel assembly and comprehensive test of 8 - 40 commercial small satellites**
 - **Expansible. It can be directly transformed into a pulsating intelligent AIT production line through expansion and construction. The annual production target is 600-1500 satellites**
- **Directly drive the rapid development of Hong Kong's reindustrialization**
 - **Introducing global precision equipment manufacturing satellites**
 - **Restore Hong Kong's precision Industry**
- **Promoting the second take-off of Hong Kong's precision manufacturing industry**
 - **Bring in high-end talents and increase local employment, especially for young graduates**
 - **Increase GDP and facilitate economic and social development**





THANKS!