

# Chinese Space Capabilities

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# History of Chinese Space Program

- Fifth Academy was initial center
  - Nie Rongzhen
  - Qian Xuesen
- Major priority for Mao Zedong
- Downgraded by Deng Xiaoping
  - Until advent of Project 863
- Chinese civil and military space programs separated in 1998
  - As part of reorganization of State Commission for Science, Technology, and Industry for National Defense (COSTIND)

# Is China a Space Power?

- Space power is ability to use space in pursuit of national goals
- Space power comprised of three elements
  - National will
  - National resources
    - Financial
    - Technological
    - Human
  - Mission support capacity

# Is China a Space Power?

- Mission support capacity in turn has three components
  - Launchers
  - Mission facilities
    - Launch sites
    - Control centers
    - Telemetry, tracking & control (TT&C) capability
  - Satellites or other payloads

# PRC Space Program Objectives

- China Space White Paper (November 2000), issued by the State Council indicated three main objectives
  - Creating an earth observation system that would have long-term operational parameters.
  - Creating an independent satellite broadcasting and telecommunications system.
  - Establishing an independent satellite navigation and positioning system.
- In addition, PRC is clearly interested in a manned space program

# Chinese Space Spending

- Most estimates of China's space program is ~\$1.5-2 billion
  - PRC official figures indicate a \$100 million space program
  - By comparison, US civilian space program is \$13.5 billion

# PRC Mission Support Facilities

- PRC is one of few states with multiple launch sites.
- Main sites include:
  - Jiuquan Satellite Launch Center (Base 20)
    - LEO and medium-orbit
  - Tiyyuan Space Launch Center (Base 25)
    - Polar orbit
  - Xichang Space Launch Center (Base 27)
    - Geosynchronous orbit
  - Hainan facilities reportedly under construction

# PRC Mission Support Facilities

- Mission control undertaken from China Satellite Launch and Tracking Control Center
  - Near Xi'an
  - Includes both Command and Control Center and Tracking, Telemetry & Control
- Supported by tracking stations
  - Domestic sites
  - Overseas facilities
  - Fleet of tracking ships

# PRC Satellites

- First Chinese satellite orbited in 1970
  - Dongfanghong-1
- PRC has since developed several satellite programs
- Main programs include:
  - Communications
  - Meteorology
  - Remote Sensing
  - Navigation

# PRC Satellite Programs: Communications

- Dongfanghong (DFH) series of communications satellites
- Slow development
  - DFH-2 was deployed decade after DFH-1
  - DFH-2 series had seven satellites

# PRC Satellite Programs: Communications

- DFH-3 series
  - Most sophisticated Chinese satellite yet produced
  - Three-axis stabilized
  - Voice and TV capable
- Feng Huo-1 series
  - Believed to be dedicated military communications satellite

# PRC Satellite Programs: Meteorology

- Fengyun (FY) series of meteorology satellites
  - Six satellites launched
- FY-1 first launched in 1988
  - Exhibiting capacity for polar (sun-synchronous) launch and orbit
- FY-2
  - PRC's first geosynchronous satellite
  - Images in both visible and infra-red spectra

# PRC Satellite Programs: Remote Sensing

- Fanhui Shi Weixing (FSW) series
  - Largest series of PRC satellites, with seventeen thus far launched
  - Fifth country to retrieve photographs from space
- FSW first launched in 1975
- Variety of payloads
  - Photoreconnaissance
  - Microgravity experiments

# PRC Satellite Programs: Remote Sensing

- Ziyuan (ZY) series
  - Developed in conjunction with Brazil
- Significant advance over FSW series
  - Data downlinked, rather than dropped
- Key sensors include:
  - CCD Camera
    - 19.5m resolution/113 km swath-width
  - Wide-Field Imager
    - 258m resolution/890 km swath-width
  - Multispectral Infra-red Scanner (IR)
    - 78-156m resolution/119.5 km swath-width

# PRC Satellite Programs: Navigation

- Only third state to deploy navigation satellites
  - US: GPS
  - FSU/Russia: GLONASS
- Beidou Navigation System
  - Comprised of two satellites (plus one spare)
  - Providing geolocating and timing capability
- Launched in 2000 and 2001

# PRC Satellite Programs: Other Programs

- Oceanographic Satellites
- Small satellites
  - Early co-development effort with foreign parties
  - Including search-and-rescue, disaster monitoring, environmental monitoring missions
- Co-development with foreign states
  - Double Star
  - Galileo

# PRC Manned Space

- PRC is also engaged in a manned space program
  - Project 921
  - First proposed in 1993 by Shanghai Astronautic Bureau
- Facilitated by Russian transfer of Soyuz-related technologies
  - Agreement signed in 1995
- Four test flights, prior to first manned launch

# Shenzhou Spacecraft

- Similar to Soyuz capsule
  - Comprised of three modules
    - Descent module (contains crew)
    - Orbital module (contains payload)
    - Service module (contains main engines)
  - Longer, wider, heavier than Soyuz
  - Includes two sets of solar panels
    - Second set attached to orbital module
- Launcher: Long March-2F
  - Modified Long March-2E

# PRC Manned Space Infrastructure

- Dedicated Launch and Mission Control Center
  - Beijing Aerospace Directing and Controlling Center (BADCC)
- Additional facilities
  - Telemetry station in Namibia
  - Telemetry station in Kiribati
  - Access to foreign space-tracking facilities
    - France
    - Sweden
    - Brazil