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Panel Session I - The Chinese Space Program: Space Wei Qi

Joan Johnson-Freese

Chinese Space Initiative Expert and Chair, National Security Decision Making Department, Naval War College

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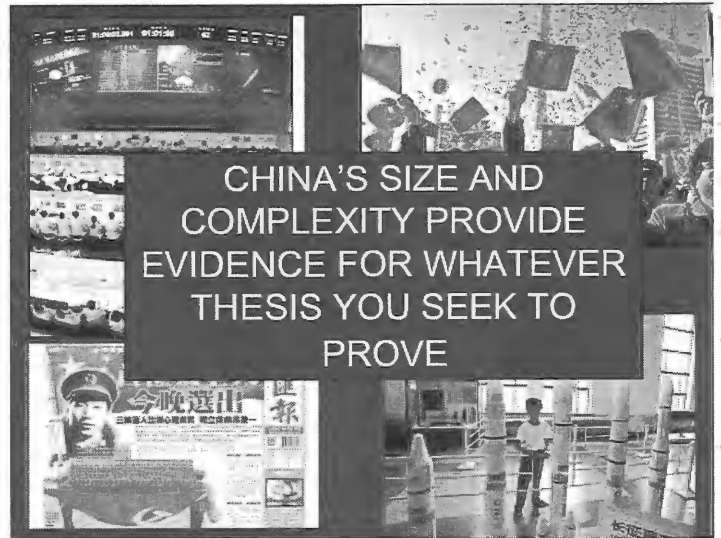
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THE CHINESE SPACE PROGRAM: Space Wei Qi

Joan Johnson-Freese
 Naval War College
 Johnsonj@nwc.navy.mil



CHINA'S SIZE AND COMPLEXITY PROVIDE EVIDENCE FOR WHATEVER THESIS YOU SEEK TO PROVE

DILEMMA OF DUAL-USE TECHNOLOGY

PlayStation

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    graph TD
      Packages --> Incomplete[Incomplete address]
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      Warehouse --> NoInventory[no inventory system]
      Warehouse --> Diverging[diverging]
      Warehouse --> Place[Place]
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      People --> Understaffed[understaffed]
      People --> Extrained[extrained]
      Staff[Staff] --> Understaffed
      Staff --> Extrained
      Rekeyers[rekeyers] --> MostSign[most sign for pigs]
      Rekeyers --> HardToReach[hard to reach]
      Packages --> DeliveredLate[DELIVERED LATE]
      Packages --> TooMuchPaper[Too much paperwork]
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      Printers --> OnlyOneADay[only will use a day]
  
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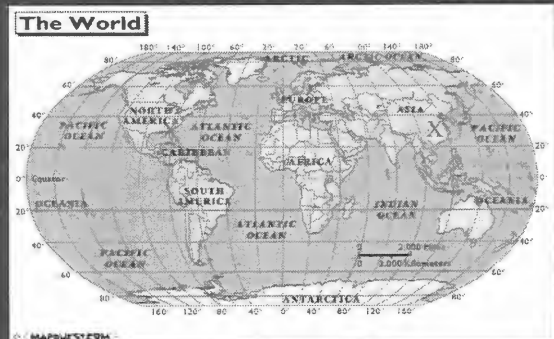
CHINA'S AMBITIOUS SPACE ACTIVITIES

- November 2000 White Paper
- "The Chinese government attaches great importance to the significant role of space activities in implementing the strategy of **revitalizing the country** with science and education and that of **sustainable development**, as well as in **economic construction, national security, science & technology development** and social progress. The development of space activities is encouraged and supported by the government as an **integral part of the state's comprehensive development strategy**."

FAST APPROACH OR PRUDENT APPROACH?

- US precursor missions = about 21 / Chinese 4
- China started much further up the learning curve / learn from others
- China bought hardware from Russia (life-support, reentry)
- Alarm system for debris, automatic fault detection & escape system...

LEARNING FROM OTHERS...OR NOT REINVENTING THE WHEEL



Xichang Launch Site = 28 degrees N latitude

KSC = 28.5 degrees N latitude

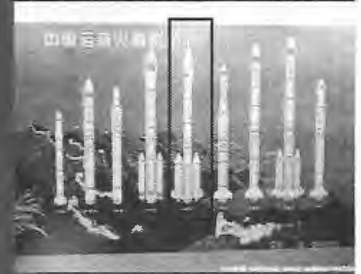
SUCCESS IN SPACE IS SPECTACULAR...SO TOO IS FAILURE



Florida Today

WHAT: LAUNCHERS

- Long March family of launchers – derived from *Dong Feng* missile
 - Analogy with development of workhorses of U.S. commercial launch fleet: Atlas, Delta and Titan
- Manned Launches – LM/CZ-2F
- 9/24/03 test-fire of first 4 stage solid-fuel launch vehicle (100-kg satellites)



LAUNCH SITES

- Jiuquan Satellite Launch Center Gobi Desert in Gansu Province, NW China, launches all recoverable satellites (Inner Mongolia recovery site)
- Xichang Satellite Launch Center Sichuan Province. GEO satellites (only center which can accommodate cryogenic upper stage)
- Taiyuan Satellite Launch Center. Shanxi Province. Polar orbits.



Space Imaging – 10/4/03

COMMERCIAL LAUNCH INDUSTRY

- Long March (Great Wall Industry Corporation)
- Hard Currency (mid 1980's)
- Series of launch accidents in the 1990's
 - Cox Committee
 - U.S. export laws
- Launch Insurance
- 30+ consecutive successful launches since 1996

SATELLITES

- Mao 1/China 1 – April 24, 1970, “The East is Red”
- Over 50 satellites with > 90% success rate
 - Multiple launch capability since 1981
- Military
 - Communications – January 2000
 - Fanshui Shi Weixing (FSW) recoverable photo-reconnaissance
- Remote Sensing – Ziyuan (ZY), “resource”
 - CBERS-1 or ZY-: China-Brazil
 - **ZY-2 (2002/3) High-resolution electro-optical imaging satellites (resolution about 3 meters)**
 - Jianbing-3 “Pathfinder”
 - Radar remote sensing satellite development

SATELLITES

- Weather – Fengyun (FY)/ “Wind and Cloud” >6 for Olympics
- Communications – Dongfanghong (DFH)/ “East is Red”
 - Moving to C, Ku, KA, And L band transponders
- Oceanography – Haiyang (HY) “Ocean”
- Microgravity – Shijian (SJ) “Practice”
- Science/Astronomy
 - Double Star – 2003 with ESA –effects of the Sun on the Earth’s environment (5 ESA sensors)
- Navigation – Beidou “Twin Star”
 - 4 total/2 launched in 2000/3rd in 2003
 - EU Galileo program

PROJECT 921: MANNED PROGRAM

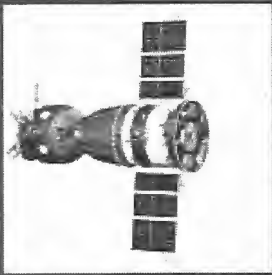
- Second (third) attempt
- Money determines timetable as much as technology
- 14 *Taikonauts* (2 trainers)
 - (*Yuhangyuans* in Chinese)
 - Women to be recruited in 2005



SHENZHOU MISSIONS

- 1996 announcement of 1999 manned launch (commemorate 50th anniversary of founding of Communist State)
- Nov 1999 Shenzhou I (unmanned)
- January 2001 Shenzhou II (unmanned)
- March 2002 Shenzhou III (unmanned)
- January 2003 Shenzhou IV (unmanned)

SOYUZ/SHENZHOU



Soyuz A



Shenzhou

SHENZHOU



- Differences
 - Second set of solar panels
 - Larger
 - Propulsion, control & guidance improvements
- Design
 - Forward module holds experiments/docking crew transfer module
 - Potential Space Station piece
 - Manned Module
 - Rear Service Propulsion system

TAIKONAUT TRAINING

- Star City , Russia
 - Li Qinlong & Wu Zi
 - EVA training
- Chinese Center North of Beijing
 - Secrecy
 - Families employed

YANG LIWEI



HOW: ORGANIZATION

- General Cao Gangchuan: Was head of the General Armaments Department of the PLA, member of the Central Military Commission (CMC) & Director of the Manned Spacecraft Program – Now the Chinese Defense Minister
- General Li Jinai: Chief Commander of China's Space Program



ORGANIZATION

- Civilian & military programs often intertwined (*Mystery Within a Maze*)
 - China Aerospace & Technology Corporation (CASC) & Chinese National Space Administration (CNSA) = same group
 - CASC Employs over 150,000 people + 130 subordinate organizations
 - "...45th anniversary of the founding of the No. 11 Group of the No. 6 Institute (designs liquid – propellant rock engine for large spacecraft)..."
- Recognition that commercial/civil aspects must be separated, for political & "image" reasons

REORGANIZATION

- Aerospace: From pure, central-economy run program to internationally competitive enterprise
 - Balance
 - Jobs
 - Efficiency
 - Competition/Cooperation
 - Politics
 - Military Control/Civilian Control as International Requisite

WHY: APOLLO ANALOGY

- Goals of the Apollo Program
 - Beat the Russians/Cold War "Battle"
 - Prestige
 - » *Sputnik shock*
 - » Domestic & Foreign (Regional) Benefits
 - Technology Gap
 - Economics
 - Jobs (political and economic benefits)
 - Military

PRESTIGE

- Domestic
 - Positive public "rallying" factor
 - Governmental legitimacy (ala Olympics)
- Regional/International
 - Prestige/influence – Pakistan & Iran
 - Third country with manned space capabilities



President Jiang Zemin's visit to JSC October 2002/Launch of Shenzhou III, March 2002

TECHNOLOGY GAP/ECONOMICS, EDUCATION...AND POLITICS

- Educational Programs
- Labor force skilled in technology jobs
- Government spending creating technical jobs
- Communication to Western China

TECHNOLOGY GAP/ MILITARY

- Developing military space technology through a manned program is the most expensive, least efficient way to do so
- However, there is no doubt that benefits accrue
 - *Shenzhou* a reconnaissance platform?
 - *Zi Yuan* (ZY) 2 photo reconnaissance satellite launched 10/02 “military” version of ZY 1, developed as China-Brazil Earth Resource Satellite (also called Jianbing 3)
 - Intl Cooperation Example
 - Japanese Information Gathering System (IGS)

TECHNOLOGY GAP/MILITARY

- U.S. Space Dominance – Technology
 - Gulf War, Kosovo, Afghanistan, Iraq
- 1998 “Turning Point” – Blue Team
- 1999 Cox Commission
- 2001 U.S. Space Commission Report
 - Inevitability that space will become a battleground...so the U.S. would be remiss not to prepare
- 2001 First US Space War Game – pitted US forces against an opponent threatening a small neighbor
- Chinese view that they would be remiss not to prepare for the inevitability of U.S. development of space weapons
 - “For countries that can never win a war with the US by using the method of tanks and planes, attacking a US space system may be an irresistible and most tempting choice.” 2001, Xinhua Hong Kong Service

MANNED TO

- Tracking
 - TT&C = 8 domestic tracking sites, one in Kiribati, 1 in Namibia, & 4 Yuanwang class tracking ships
 - S-band expansion/improvements (tracking GEO sats)
- On-orbit maneuvering
- Mission management
- Launch-on-demand
- Miniaturization (less weight)
- Computational analysis

FUTURE SPACE RACE?

- Seeking parity with US? NO
 - May 2003, Council on Foreign Relations: China is at least two decades behind the US in military technology and ability
- U.S.-China action-reaction YES
 - Both countries see space as so vital to their futures, that actions by one seen as zero-sum to the other



SPACE SPENDING: NASA COMPARISON

- Apollo @ \$25 Billion
- NASA/\$15 Billion
- China @ between \$1.4 and \$2.2 Billion
- Apples & Oranges Comparison
 - Currency Conversion
 - Command Economy
 - Deliberate Over-Employment

PROGRAMMATIC SPENDING

- Galileo
 - \$259 Million, to cooperate with technical, manufacturing and market development
- *Chang'e*
 - First phase = Moon rover @ \$170 M

FUTURE PLANS

- Phased, incremental, cautious, ambitious
- 20 – 70 ton life capability
- Liquid oxygen/kerosene engines to replace the UDMH (Unsymmetrical DiMethyl Hydrazine) currently used
 - Poisonous and highly volatile



FUTURE PLANS

- *Taikonaut*
 - 2ND Launch in 2005 – 2 taikonauts for 5-7 days
- Space Laboratory (2 modules)
- Lunar program – Chang'e
 - Moon landing in 2010, then polar-like base
 - Vehicle program by 2020
 - Sustained program vice Apollo
 - Energy Resources
- Manned Lunar Program – expected (2020?)
- Mars 2040

FUTURE PLANS

- Militarization
- Weapons
 - With Russia, calls for treaty banning weapons from space
 - ASAT Technology
 - Clearly developing military space technology
 - Generally, same feelings as U.S. in terms of 'would be remiss not to prepare' for what it sees as inevitable U.S. development of space weapons

SPACE WEI QI

- ISS
 - Docking Ring
 - State Space Robot Project Research Center/ space robot "Mister E"
 - Harbin Industrial University/ "Space Hand"
- New US Space Vision
 - Inclusion of China politically improbable
- Cooperative Programs without the US

CHINA'S SPACE PROGRAM

- China's determination to regain what it considers as its deserved place in global, and by default, regional politics
- Win-Win investment as long as there are no catastrophic failures
- Minimize the Technology Gap with US

- The Chinese Space Program: Sun Tzu or Apollo Redux (Summer 2003)
- Space *Wei Qi*: The Launch of *Shenzhou V* (Spring 2004)
- "Becoming Chinese: Or, How the U.S. Satellite Export Licensing Process Hurts National Security"
- "Houston, We Have A Problem:" China and the Race to Space
- 10/1/03