Space Innovation and Its Governance in Japan

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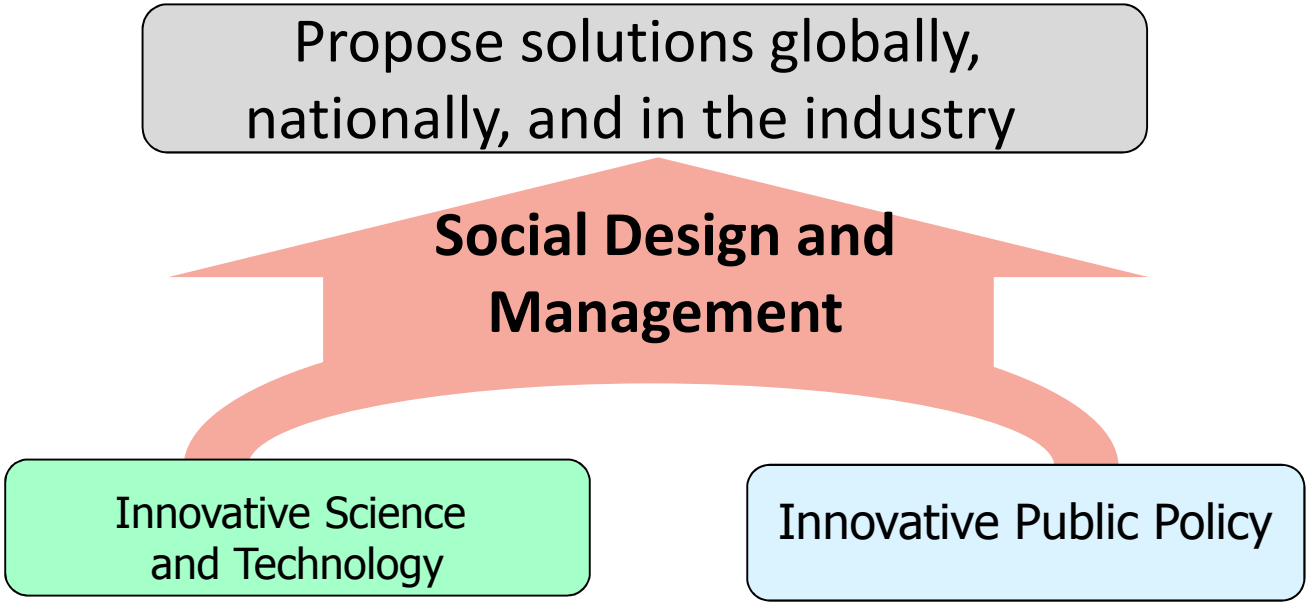
Social Design and Management

- Technology alone cannot solve problems in our society
  - Social context needs to be appreciated
- Policy or systems alone cannot solve problems
  - Advanced technology to be managed, to design and plan policies/systems
- Identify problems in the society through global perspective with comprehensive knowledge and expertise, to design and propose integrative solutions by harmonizing innovative technology and public policy collaborating with diverse stakeholders



Functions of Science and Technology Governance

- Assessment of multiple social implications (risks and benefits)
- Risk management for safety, security, ethics by government/ private self-governing body
- Promotion

Upstream: Research & Development（←freedom of research, Intellectual property rights）

⇒Downstream: Implementation in society

Transition management

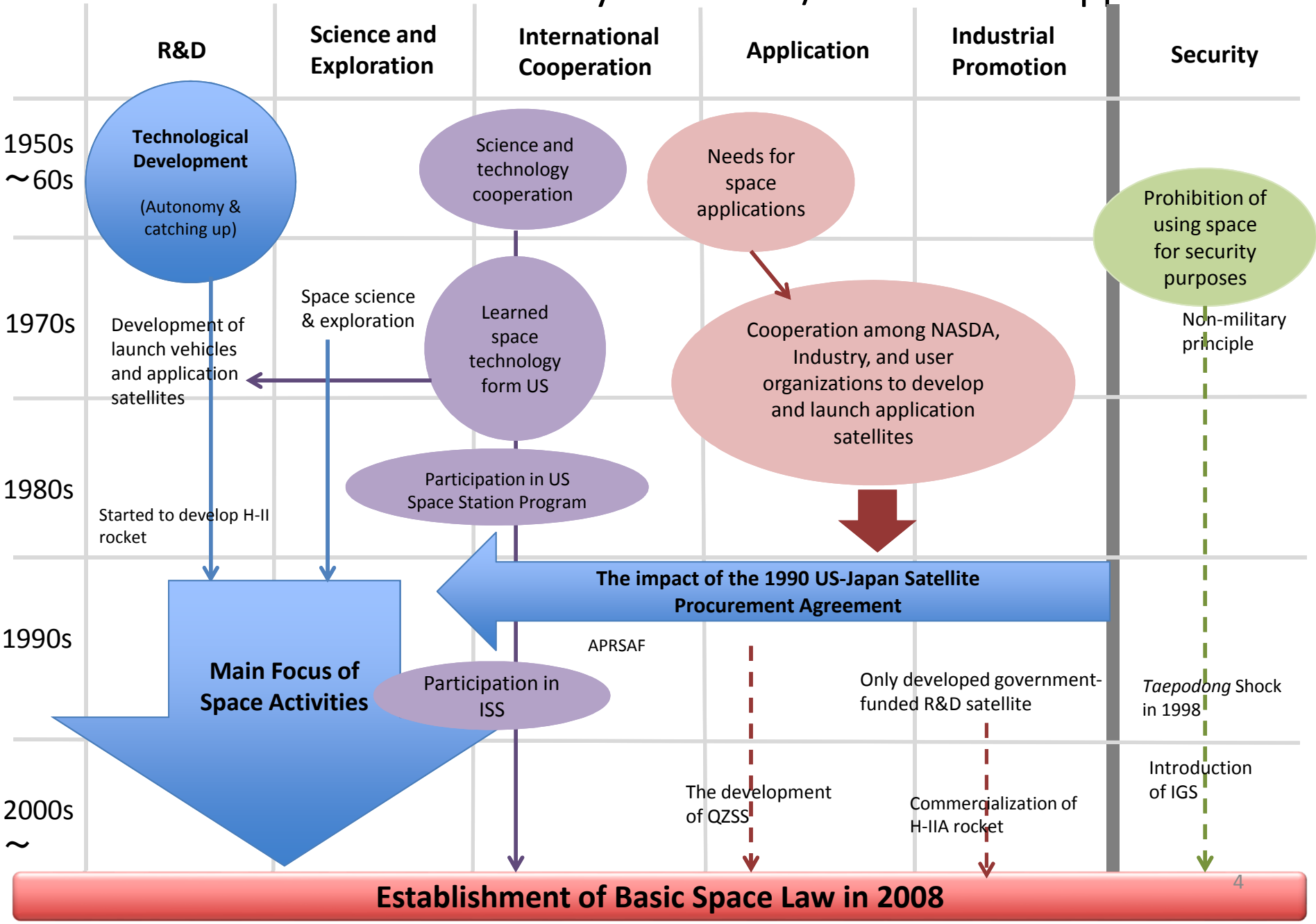
cf. importance of cross sectoral/ interdisciplinary interactions

- Compensation

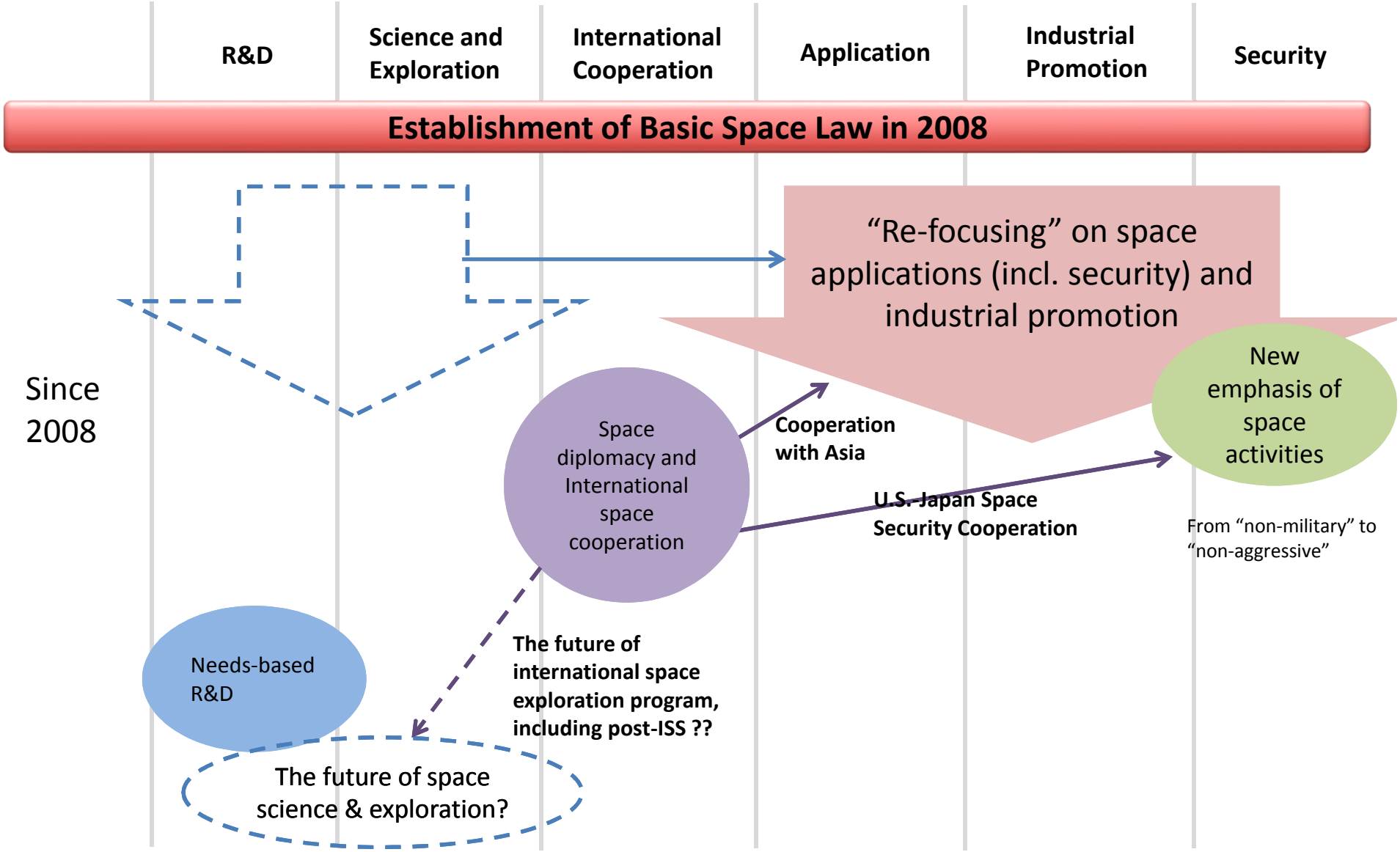
Last year：Health innovation/ global health⇒This year：Space innovation

Cross cutting issue: the role of university

Historical Overview - 1st Cycle of R&D/ Science and Applications

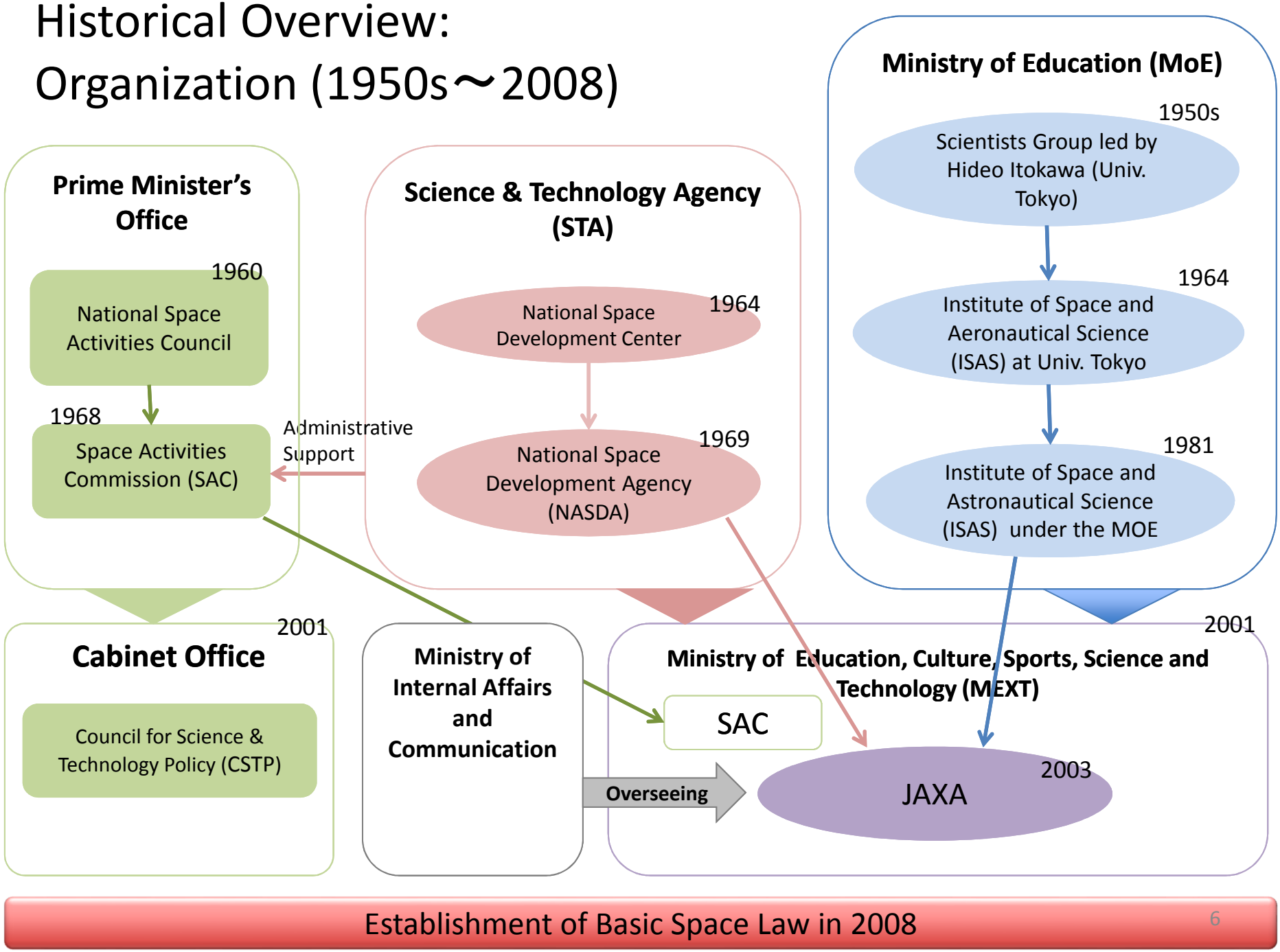


Historical Overview - 2nd Cycle of R&D/ Science and Applications



Space programs (including R&D) are justified by how much contribute to realizing social values and industrial development

Historical Overview: Organization (1950s～2008)

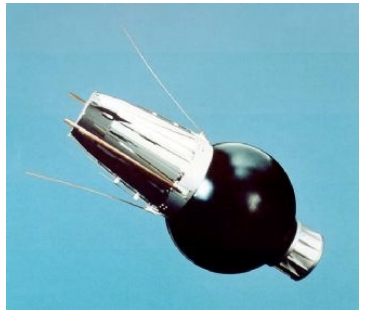


Brief History of Space Policy in Japan: 1970-80s

ISAS: autonomous space technology, science, and exploration

- **Successfully launched the Japan's first satellite *Osumi* with L-4S rocket developed by ISAS (1970)**
  - Japan became the forth nation to launch a satellite by its own
- **Carried our various space scientific missions since 1970s**
  - X-ray astrophysics, Solar physics, Halley's comet's exploration, planetary exploration (1990s-), . . .
  - Contribution to international space science missions

Ohsumi



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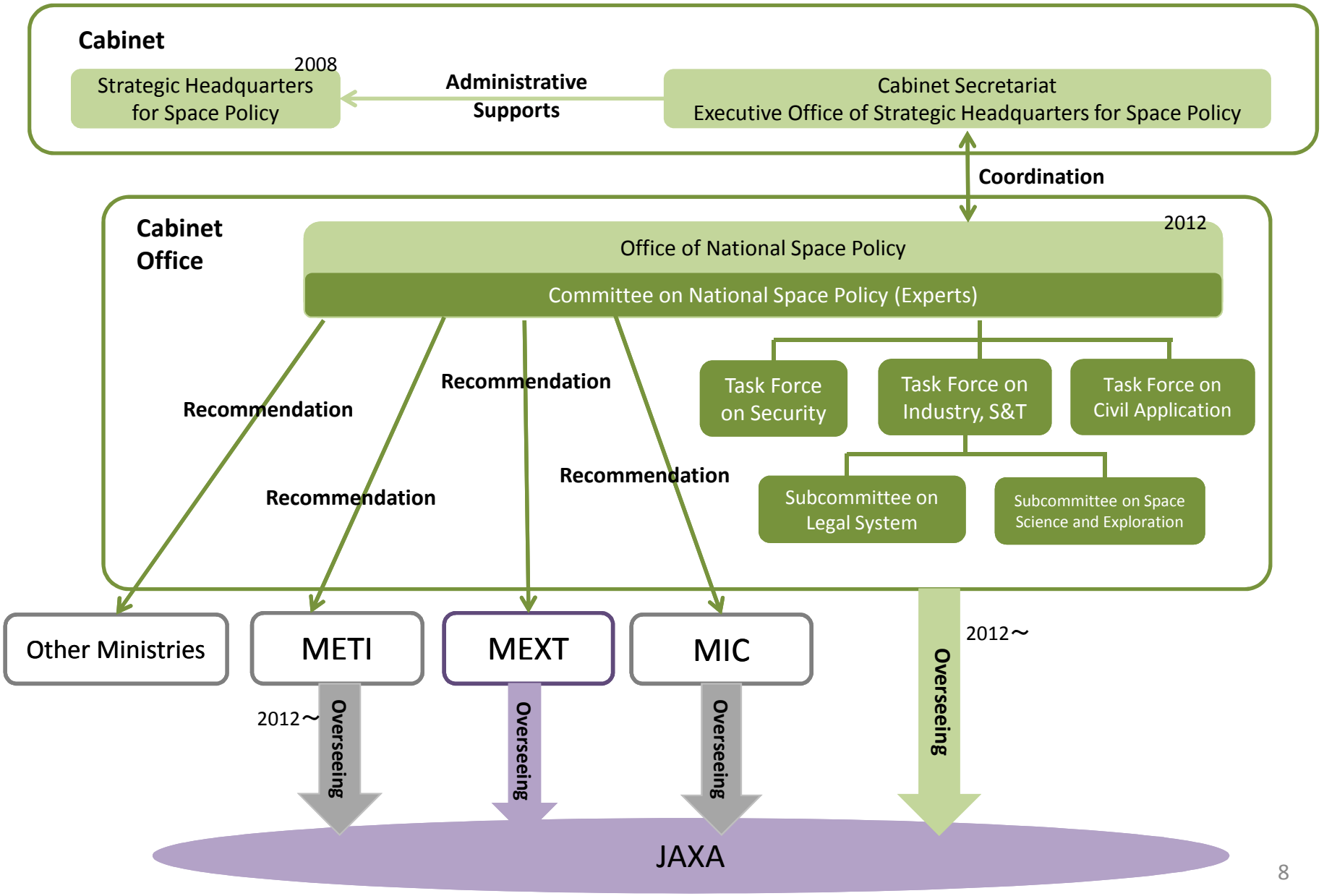
NASDA: Introduction of technology from US (rocket and application satellite), social needs

- **Started to develop liquid fueled space transportation systems with technological assistance from US**
  - Catching up with advanced spacefaring nations
  - Development of N-I (1975), N-II (1981), and H-I rockets (1986) :NASDA and Mitsubishi Heavy Industry
  - In 1977, successfully launched the Japan's first geostationary satellite, *Kiku*-2 (satellite communication engineering satellite), by N-I rocket
- **Decided to develop H-II rocket without US technological assistance in 1984**
  - 100% domestically-developed space launch vehicle ⇒ independent space capabilities
- **Started to develop space application satellites by close cooperation among NASDA, User, and Industry**
  - **Communication**: NASDA, Nippon Telegraph and Telephone Public Corporation, and Mitsubishi Electronic (*Sakura* in 1977)
  - **Broadcasting**: NASDA, NHK(Japan Broadcasting Corporation), and Toshiba (*Yuri* in 1978)
  - **Meteorological**: NASDA, Meteorological Agency, and NEC (*Himawari-1* in 1977)

Japan decided to participate in U.S. Space Station Program in 1984

Historical Overview: Organization (2008～)



Basic Space Law (2008) and Basic Plan on Space Policy

Basic objectives of space activities

- Improving the daily lives of Japanese citizens
- Strengthening national security
- Ensuring international peace
- Encouraging Japan's space industry
- Fostering socioeconomic development
- Promoting international cooperation and space diplomacy
- Advancing scientific research and technological capabilities

"Refocusing" on the promotion of space application, including security, and industrial development

Historical Overview of the Basic Plan on Space Policy in Japan

- 1st Plan, June 2009 (2009-2013)
- 2nd Plan, January 2013 (2013-2018)
- 3rd Plan, January 2015 (2015-2024)
  - Promoting space applications and industry
  - In particular, 3rd Plan places more emphasis on security than previous plans

Space Policy and Security in Japan

- Contributing national and international security, including disaster management, is a new objective of Japan's space policy
- Basic Plan on Space Policy (2013) identified security as one of three priority areas of Japan' space activities

Basic Space Law, Article 3

"Space use and exploitation shall be carried out in order to improve our citizen's living standards; to form a safe and secured society; to remove any kind of threats to our lives, such as natural disasters and poverty; to maintain peace and security in international community; and to contribute to national security " (unofficial translation)

National Security Strategy of Japan, December 2013

- **Space system as a important tool of security**
- **Various threats and risks in outer space**
  - Congested space (the growing number of space debris and space actors)
  - Counter-space capability (ASAT etc.)
- **Importance of space security**
  - Enhancing the capability of Space Situational Awareness
  - Strengthening International cooperation for space security, especially with the United States

Strengthening Industrial Base

- Importance of robust space industry as **a foundation of independent space capabilities**

But . . .

- Insufficient international competitiveness of Japan's space industry
- Unclear predictability of space business
- No clear rules for space activities by private sectors

- **Improving predictability of business so that private sector can invent in space**
  - Clarifying governmental needs for space products and services for longer term
    - ⇒Current Basic Plan on Space Policy is 10 years plan during 2015-2024
  - Establishing clear rules and regulation for space activities by private sector
- **Active efforts by private sector**
  - Expanding business size of space manufacturing industry for next 10 yeas
    - Goal: 5000 B yen (both governmental and private sector's needs) for next 10 years
    - Current business size: about 2600 B yen for a year (90% of demands come from government)
    - Need to expand markets for space systems and launch services in private sector and foreign countries
    - Private sector has to make its own active efforts to this end
      - Developing new markets at home and abroad, increasing acceptance of orders, . . .
- **Launching government satellites by Japanese space launch vehicles**
  - H-IIA and Epsilon
  - The development of next generation of launch vehicle, H-3 (cost effectiveness)
- **Providing private sector, as well as universities, with space launch opportunities by means of "piggyback" launch**
- **Creating new markets for space products and services at home and overseas**
  - Diplomatic efforts to create new markets abroad: ODA and APRSAF
- **Collaborating with innovation policy and IT policy to create new technologies and values**

International Comparison of Space Policy and Governance

France		Germany
• Solidifying sovereignty	**Orientation**	• A tool for solution to global challenges • Emphasis on industrialization of space
• Priority on national security • Perusing leadership in Europe • Maintaining technological independence and autonomous access to space	**Characteristic**	• Priority on benefit and needs • Space as social infrastructure • Space activity as high-tech strategy and innovation strategy
• President and Prime minister • CNES as space policy making and implementing • CNES controlled by Ministry of Education and Ministry of Defense • CNES' close cooperation with Ministry of Defense	**Governance**	• Cabinet space committee as coordinating body • Transition of control over DLR to Ministry of Economy and Technology • DLR as space policy planning and implementing body • DLR in charge of R&D in various fields (transportation, energy, aeronautics and so on,) • DLR space committee for horizontal coordination and cooperation among ministries
• Indispensability for autonomous diplomatic and security policy • Autonomous capabilities for military space activities • Multiple satellites for military and dual-use purposes	**Relationship to security**	• Meeting various global threats • Effective use of dual-use technology for national security
• Maintaining industrial base for autonomy	**Industry**	• Spring of innovation for industrial bases in various fields • Focusing on dual-use technology and PPP for effectively promoting space industry

Issues from S&T Governance Perspective

- Assessment of multiple social implications
  - Security, diplomacy, environment, economic growth
- Current focus: S&T for solving social issues - 4th to 5th S&T Development Plan
- Importance of platform for various stakeholders
  - Need for opening up policy space
- Inter-organizational relations
  - CSTI (Conference for Science, Technology and Innovation) and various Headquarters in Cabinet Office/ Secretariat (Ocean, Space, Nuclear, IT/ Cyber security, Intellectual Property Rights)
- Inter-sectoral Collaboration
  - Space and ocean: MDA
  - DLR in Germany, including rail and energy
- Security as an another crosscutting issue - parallel with S&T
- Role of ventures for small satellites and privatization