



中國政法大學
CHINA UNIVERSITY OF POLITICAL SCIENCE AND LAW

Commercialization & Corporatization of GNSS Service Providers

Dejian Kong, China University of Political Science and Law

Miami, Florida, 16 September 2019





KONG Dejian

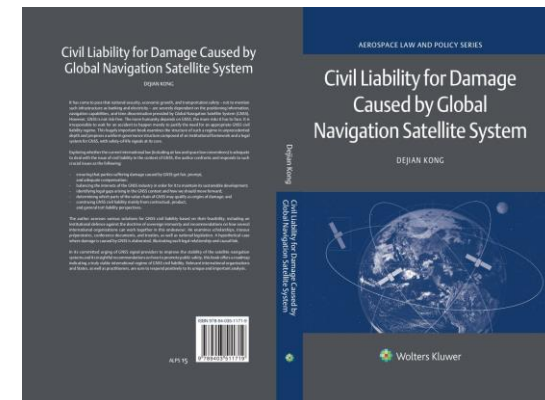
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PhD Thesis: Civil Liability for Damage Caused by Global Navigation Satellite System



Commercialization

introducing GNSS Service into the commercial Market

Service Access

- unpaid → paid
- sustainable development
- profitable or non-profitable but with a cost recovery mechanism

Corporatization

turning an organization from an authority to a company

Operation Structure

- independent legal entity
- efficiency & liability
- private or State-owned company

Privitization

transferring an entity from public sector to private sector

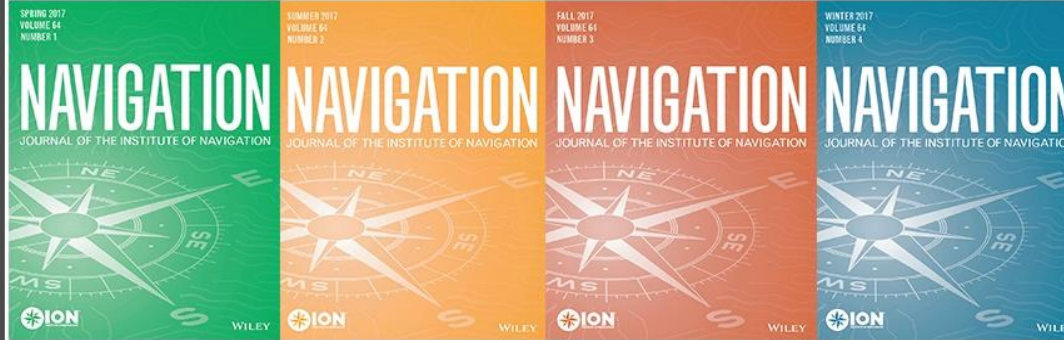
Ownership

- private stakeholders
- decrease burden of government

I. Background



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Privatization and Commercialization of GPS

Aron Pinker and Jim Hasik

Abstract: The DOD is considering the potential for privatization of various sectors of its activity. It has been estimated that savings from 20 to 27 percent can accrue from privatization; primarily from cuts in personnel. The purpose of this paper is to analyze the concept "privatization" (with respect to GPS), analyze the pros and cons for the privatization of the GPS, and make a recommendation on the future status of the GPS. Our approach is to analyze the meaning and implication of various levels of privatization of GPS. We use the working hypothesis that privatizing a DOD activity would mean availing the government with the standard services or items offered to any customer. Privatizing a DOD enterprise would mean selling it to private owners, or fully disposing of it and its obligations, and becoming a regular customer of this privatized enterprise. The US government has made a substantial investment in the GPS. Naturally, any thought of privatization would have to address the recouping of the investment, of the maintenance costs, or making some substantial contribution towards these costs. Our analysis, therefore, deals with three levels of privatization or ceding of control: complete, partial, and commercialization.. We consider the the advantages and disadvantages for each case.

Published in: Proceedings of the 9th International Technical Meeting of the Satellite Division of The Institute of Navigation (ION GPS 1996)
September 17 - 20, 1996
Kansas City, MO

Pages: 1501 - 1509

Cite this article: Pinker, Aron, Hasik, Jim, "Privatization and Commercialization of GPS," *Proceedings of the 9th International Technical Meeting of the Satellite Division of The Institute of Navigation (ION GPS 1996)*, Kansas City, MO, September 1996, pp. 1501-1509.

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GPS Case

Home » Governance » Program Funding

GOVERNANCE:

- Policy & Law
- Organization
- Program Funding**

- FY 2020
- FY 2019
- FY 2018
- FY 2017
- FY 2016
- FY 2015
- FY 2014
- FY 2013
- FY 2012
- FY 2011
- FY 2010
- FY 2009

- Congress
- International

Program Funding

Who Pays for GPS?



The American taxpayer pays for the GPS service enjoyed throughout the world. All GPS program funding comes from general U.S. tax revenues.

The bulk of the program is budgeted through the Department of Defense, which has primary responsibility for developing, acquiring, operating, sustaining, and modernizing GPS.

[LEARN ABOUT GPS MODERNIZATION](#) ➔

GPS Budget Request for FY 2020 ➔

- Defense Appropriations
- DOT Appropriations

Past Fiscal Years

- FY 2019
- FY 2018
- FY 2017
- FY 2016
- FY 2015
- FY 2014

Civil GPS Funding

U.S. policy assigns the Department of Transportation responsibility for funding the extra costs associated with new, civilian GPS users beyond the second and third civil-grade. America with

Has the U.S. Government Thought About Privatizing GPS?

There are **no plans** to privatize GPS. **U.S. law and policy require the civil GPS service to be provided free of direct user fees.**

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Augmentation Systems

Beyond the core GPS program, several federal agencies fund and manage augmentation systems that improve GPS performance in support of their particular needs.

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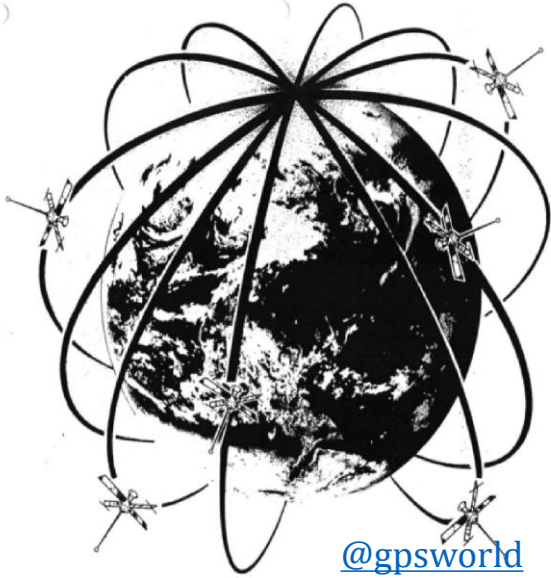
Budget details for federal augmentations are available via the links on the right.

Has the U.S. Government Thought About Privatizing GPS?

There are no plans to privatize GPS. U.S. law and policy require the civil GPS service to be provided free of direct user fees.

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Military Needs
≈1960s



Civil Use
After 1983

DUAL USE

II. Demand



1

Operation Structure

Military Roles



Department of Defence

world's largest **military** satellite constellation

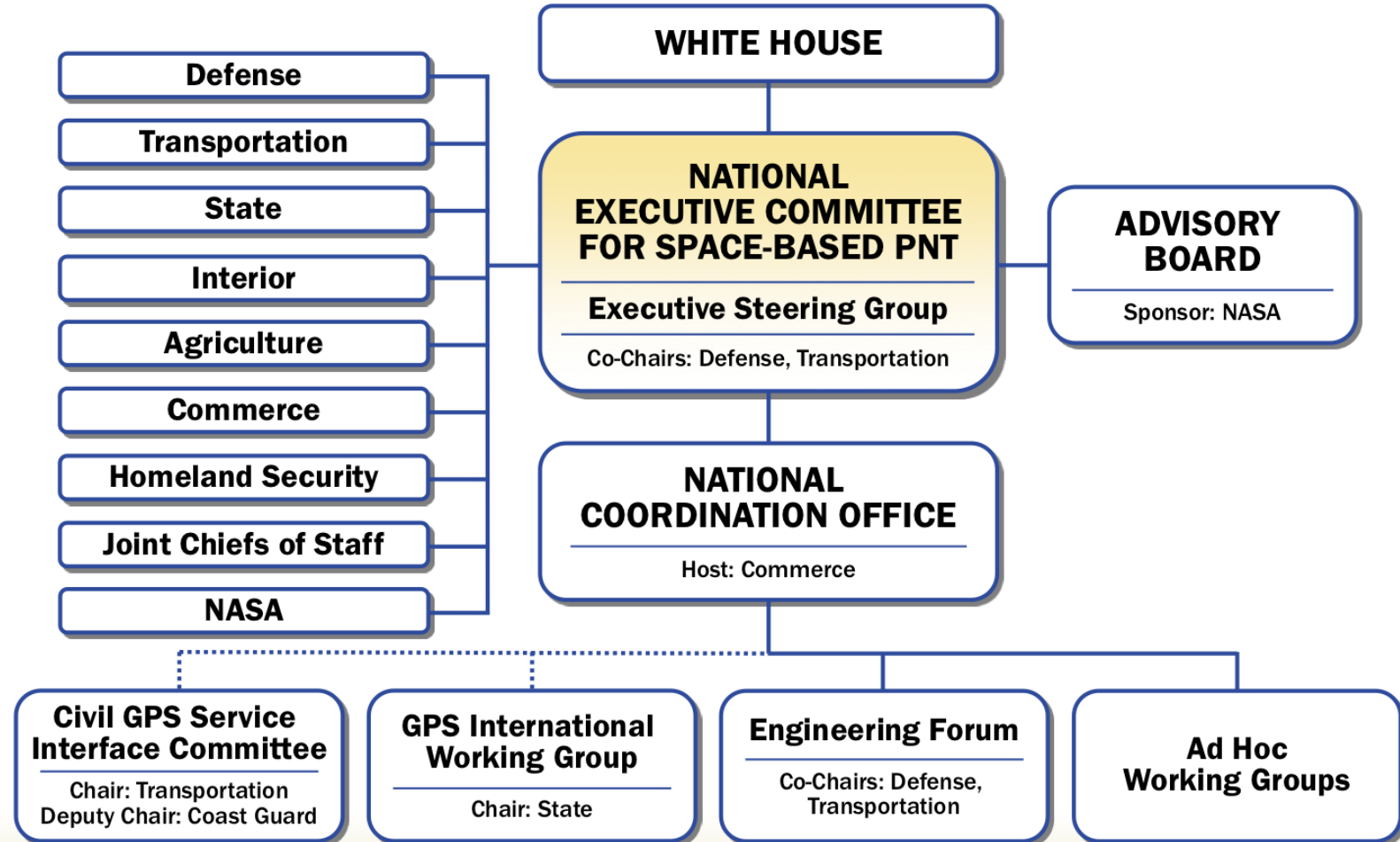
National Security First



GPS development & Operation



U.S. Organizational Structure for GPS Governance



1



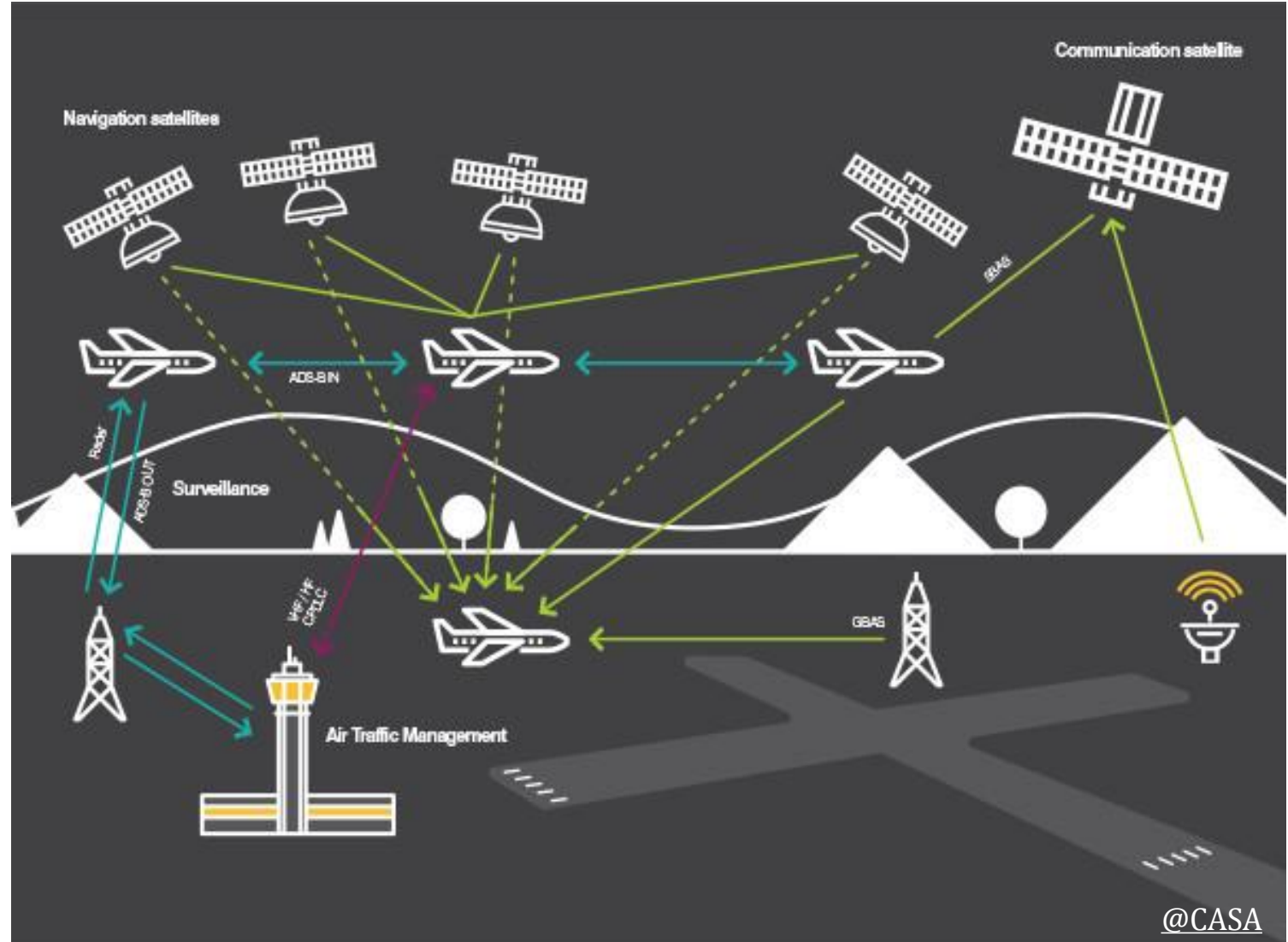
Communication, Navigation and Surveillance/Air Traffic Management (1980s - Present)

initial expectation

- **civil & international** GNSS
- failed due to high cost

negative factor:

- high cost for the infrastructure update
- **military** nature of main GNSS, **without control**



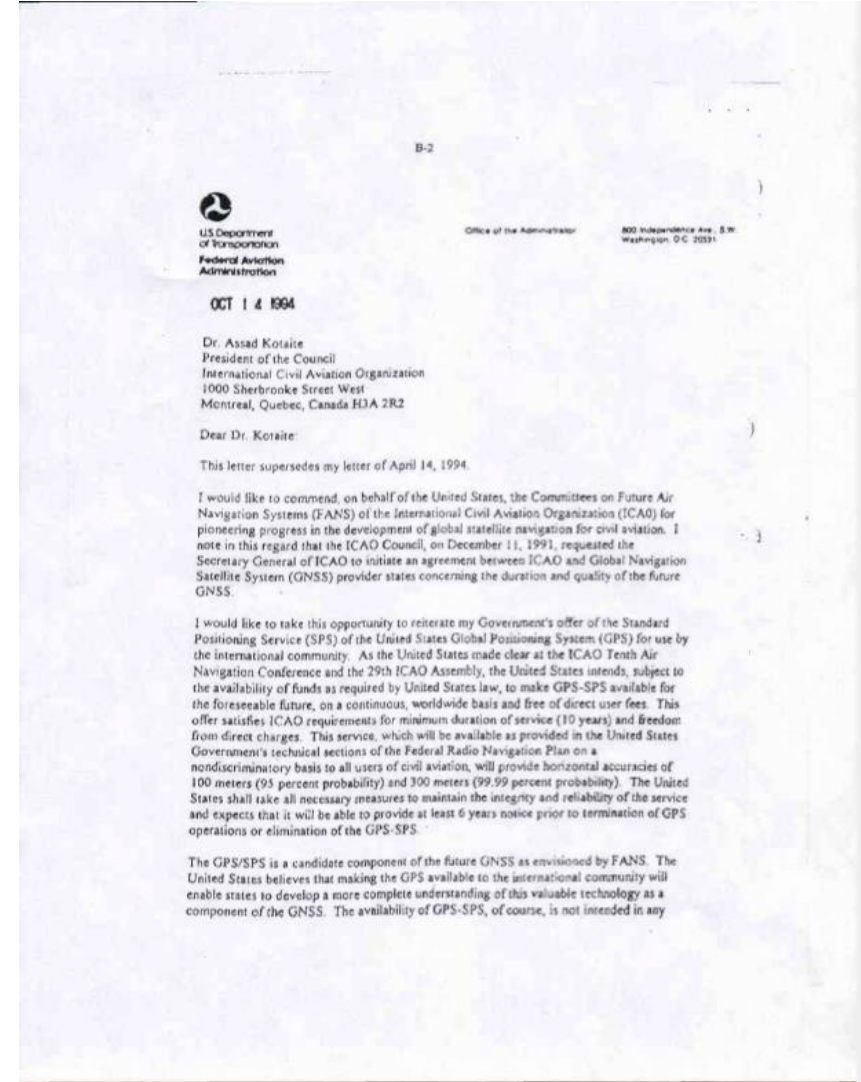


Political Commitment on the availability of GPS service 1994+2007

- concern & untrusty remains
- decrease military factors in the provision of civil service

corporatization of GNSS service providers

provision of GNSS civil signals



Financial Pressure

Reasons:

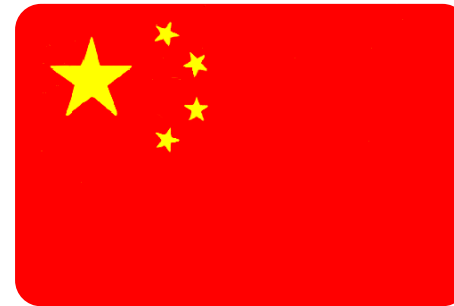
- **High cost** for the development, maintenance & operation
- **Free-of-charge policy** vs satellite communication market

Examples:

- failure of Galileo PPP model
- maintenance of GLONASS around 2000s
- the cost of GPS Modernization (civil signals)
 - from DoD to DOT

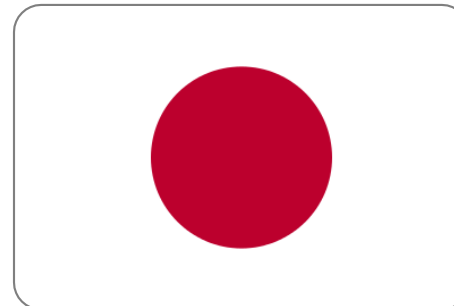
Commercialization of GNSS service

Cost recovery mechanism



Global Core Systems

Regional Core Systems



Augmentation Systems



ICAO ECONOMIC DEVELOPMENT

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Highlights

State Ranking by Revenue Tonne Kilometres

Connectivity

Competition /

GNSS - Cost Allocation

Introduction

The [Worldwide CNS/ATM Systems Implementation Conference](#) (Rio de Janeiro, **1998**) called on ICAO to address the issue of cost allocation amongst all users of Global Navigation Satellite System (GNSS), including its allocation between civil aviation and other user categories. Since then, a Secretariat study on the matter has been considered by various forums.

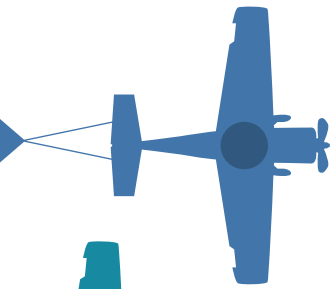
Provisional Policy Guidance

In February **2007** the following five conclusions of the study were accepted by the Council as “provisional” policy guidance on the allocation of the incremental costs of more advanced GNSS services:

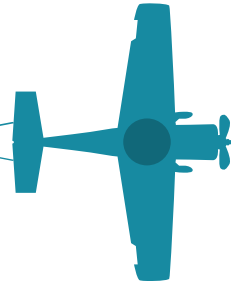
II. Demand

2

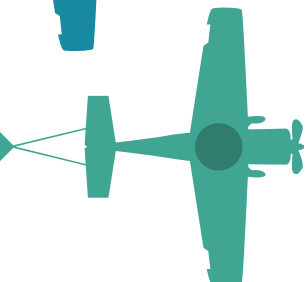
- Basic GNSS services will be free as a common good
- Advanced GNSS services, requiring higher quality with higher cost, will have to be paid



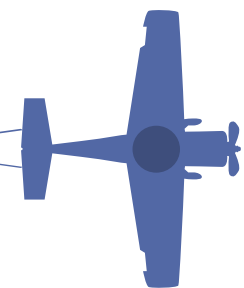
cost for more advanced GNSS services shall be allocated amongst all users categories



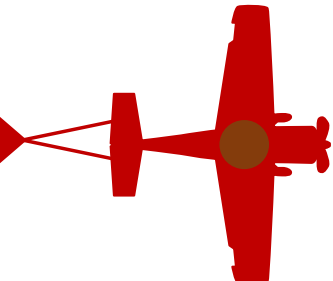
cost allocation policy should be consistent with ICAO's policies on air navigation services charges



cost recovery mechanism in civil aviation shall be through transparent negotiations between a GNSS service provider and aviation representatives as well as other users



- Allocate cost among ANSP and on different phases of flight
- ANSP may recover the cost from the airspace users within their existing charging systems



GNSS Cost Allocation Provisional Policy



ICAO

NO REJECTION
on GNSS cost allocation

Finance

ICAO

The screenshot shows the ICAO Economic Development website. The main heading is "ICAO ECONOMIC DEVELOPMENT". Below the navigation bar, the page title is "ICAO / Economic Development of Air Transport / GNSS - Cost Allocation". The main content area is titled "GNSS - Cost Allocation" and includes an "Introduction" section. A red text box highlights the following text: "Once a consensus has been reached on the definition of basic services and liabilities of GNSS service providers, this provisional guidance is to be redrafted with appropriate wording for inclusion in ICAO's Policies on Charges for Airports and Air Navigation Services (Doc 9082)." Below this, the text states: "In February 2007, the following five conclusions of the study were accepted by the Council as 'provisional' policy guidance on the allocation of the incremental costs of more advanced GNSS services:" followed by a "Further Work" section which repeats the highlighted text.

Once a consensus has been reached on the definition of basic services and liabilities of GNSS service providers, this provisional guidance is to be redrafted with appropriate wording for inclusion in ICAO's Policies on Charges for Airports and Air Navigation Services (Doc 9082).

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Further Work

ICAO continues to monitor developments and to collect relevant information to make an inventory of GNSS applications. The organization will also further coordinate technical, legal and economic aspects associated with GNSS cost allocation. Once a consensus has been reached on the definition of basic services and liabilities of GNSS service providers, this provisional guidance is to be redrafted with appropriate wording for inclusion in ICAO's Policies on Charges for Airports and Air Navigation Services (Doc 9082).

II. Demand



3

The technical, institutional and legal evolution of CNS/ATM systems under the ICAO Regime

Year	Events
1983	The ICAO Council established the FANS Committee.
1988	<ol style="list-style-type: none"> The FANS Committee developed the concept of CNS/ATM systems. The ICAO Legal Committee started to work on the legal aspects of CNS/ATM systems, with a focus on GNSS. The priority of legal aspects of CNS/ATM systems became Item 4.
1989	The FANS Phase II was established.
1991	<ol style="list-style-type: none"> The concept of CNS/ATM systems gained universal approval at the 10th Air Navigation Conference. The 10th Air Navigation Conference requested the initiation of an agreement between the ICAO and GNSS-provider States concerning quality and duration of GNSS.
1992	<ol style="list-style-type: none"> The concept of CNS/ATM systems was endorsed at the 29th Session of the ICAO Assembly. The priority of legal aspects of CNS/ATM systems moved to Item 5 and further to Item 1. The 28th Session of the ICAO Legal Committee made preliminary conclusions on no inconsistency between the Chicago Convention and the implementation of the concept of CNS/ATM systems.
1993	The ICAO Air Navigation Commission established the Global Navigation Satellite System Panel (GNSSP, subsequently renamed NSP) to amend certain ICAO SARPs.
1994	<ol style="list-style-type: none"> The ICAO Council released the 'Statement of Policy on CNS/ATM Systems implementation and operation' for the implementation of CNS/ATM systems including GNSS. The 29th Session of the ICAO Legal Committee: <ol style="list-style-type: none"> prepared the Draft Agreement Between the International Civil Aviation Organization (ICAO) and GNSS Signal Provider Regarding the Provision of Signals for GNSS Services; recommended establishing the LTEP, using a two-stage approach, namely, identifying a suitable solution for the immediate future, and a legal framework for the long-term future. The US government and ICAO exchanged letters on the use of GPS in civil aviation.
1995	<ol style="list-style-type: none"> The 31st ICAO Assembly adopted Resolution A31-7 which requests the Council to establish the LTEP. The LTEP was established by the ICAO Council.
1996	The Russian Federation and ICAO exchanged letters on the use of GLONASS in civil aviation.
1998	<ol style="list-style-type: none"> The first edition of the Global Air Navigation Plan for CNS/ATM Systems was released; The World-wide CNS/ATM Systems Implementation Conference ((Rio de Janeiro) gave recommendations to legal action for CNS/ATM systems. The 32nd ICAO Assembly: <ol style="list-style-type: none"> adopted Resolution A32-19 'Charter on the Rights and Obligations of States Relating to GNSS Service', which was followed by a number of Recommendations offered by the LTEP on those subjects which need to be further studied before a consensus was reached; adopted Resolution A32-20 'Development and elaboration of an appropriate long-term legal framework to govern the implementation of GNSS', which instructed the ICAO Council to establish a Secretariat Study Group on Legal Aspects of CNS/ATM Systems. The ICAO Council established the Secretariat Study Group 'Development and Elaboration of an appropriate

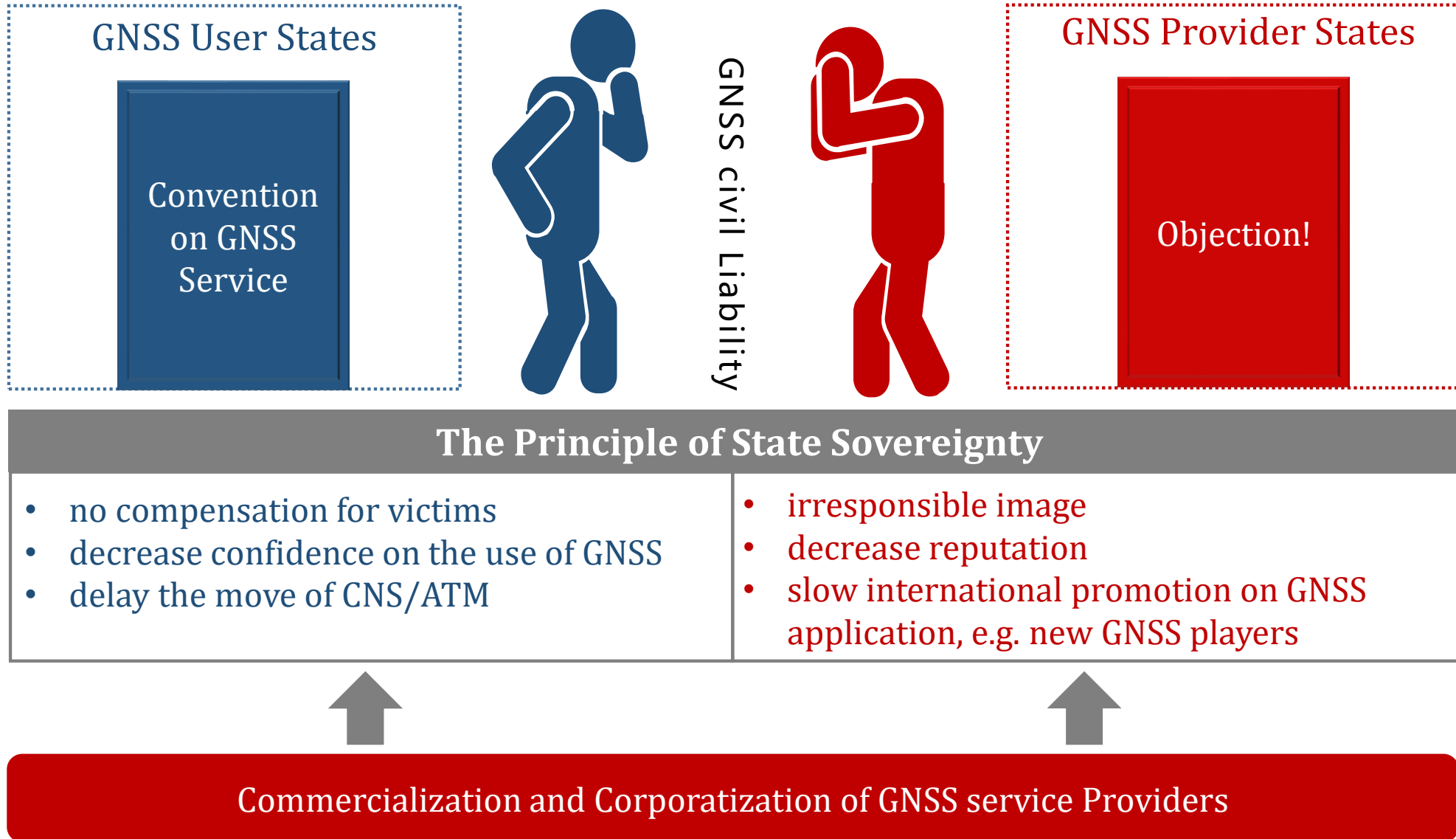


ICAO

	long- term legal framework to govern the implementation of GNSS'
2001	The first package of SARPs was introduced in Volume I (Radio Navigation Aids) of Annex 10 (Aeronautical Telecommunications) to the Chicago Convention.
2002	The second edition of the Global Air Navigation Plan for CNS/ATM Systems was released.
2003	The 11 th Air Navigation Conference recommended a worldwide transition to CNS/ATM systems.
2004	The Secretariat Study Group submitted its report, and the Group received approval on its accomplishing its mission at the 35 th ICAO Assembly.
2005	<ol style="list-style-type: none"> The priority of legal aspects of CNS/ATM systems moved to Item 3. The first edition of the GNSS Manual was released.
2007	<ol style="list-style-type: none"> The third edition of the Global Air Navigation Plan was released. The US government and ICAO updated their exchanges of letters on the use of GPS in civil aviation.
2012	The 12 th Air Navigation Conference addressed issues of use of multiple constellations and GNSS vulnerabilities.
2013	<ol style="list-style-type: none"> The fourth edition of the Global Air Navigation Plan was released. The second edition of the GNSS Manual was released. The priority of legal aspects of CNS/ATM systems moved to Item 3.
2014	The priority of legal aspects of CNS/ATM systems moved to Item 5.
2015	The priority of legal aspects of CNS/ATM systems moved to Item 4.
2016	The fifth edition of the Global Air Navigation Plan was released.
2017	The third edition of the GNSS Manual was released.
2018	The 13 th Air Navigation Conference will pave the way forward to a more cost-efficient manner on the use of GNSS in civil aviation.

Legal Framework


ICAO Efforts

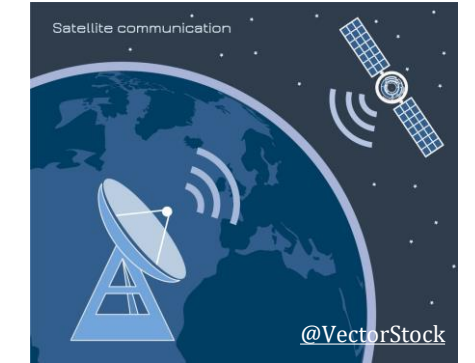
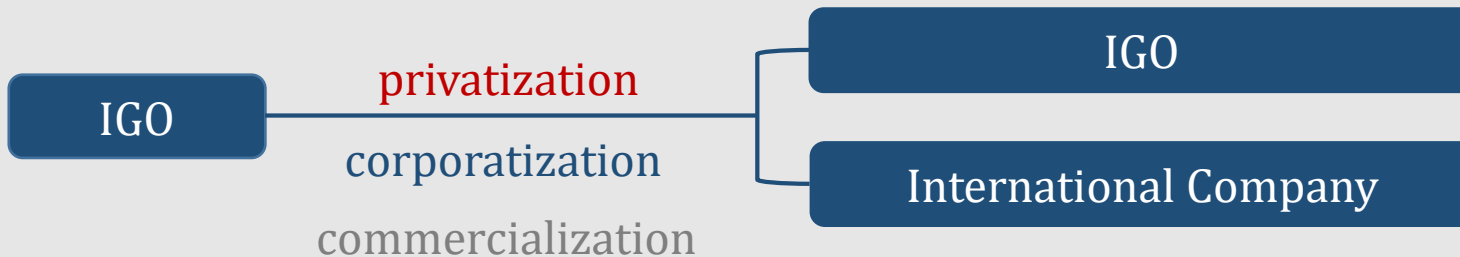


III. Experience & Practices

1

Satellite Communication

2001	Intelsat	ITSO	
		Intelsat S.A.	
2001	Eutelsat	Eutelsat S.A.	
		EUTELSAT IGO	
1999	INMARSAT	IMSO	
		Inmarsat Ltd	



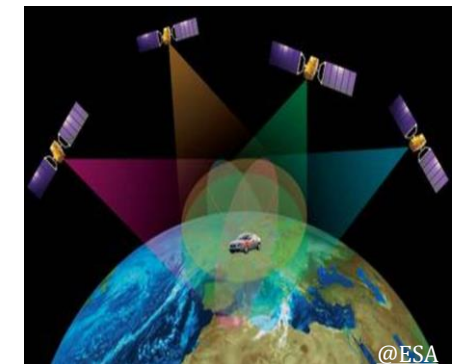
Satellite Communication

Paid Policy

V S

Free Access

Satellite Navigation



Limited Experience

2



Separation between ATC Governance and ATC Service

State-owned or State-controlled company

Similarities

- **basic infrastructure** relative with public safety
- State controlled system, **not international** control
- **public service** vs profit-seeking business

partial reference

Differences

- civil ATC system + military national defense system
 - interest of civil users
- most of GNSS = civil system + military system
 - interest of national security first
- **charging** system vs unpaid policy

ATC

High
Similarities

Home > European GNSS > Galileo > Services

Galileo Services

The Galileo system, once fully operational, will offer four high-performance services worldwide:

- > **Open Service (OS):** Galileo open and free of charge service set up for positioning and timing services.
- > **High Accuracy Service (HAS):** A service complementing the OS by providing an additional navigation signal and added-value services in a different frequency band. The HAS signal can be encrypted in order to control the access to the Galileo HAS services.
- > **Public Regulated Service (PRS):** Service restricted to government-authorized users, for sensitive applications that require a high level of service continuity.
- > **Search and Rescue Service (SAR):** Europe's contribution to COSPAS-SARSAT, an international satellite-based search and rescue distress alert detection system.

Updated: Sep 25, 2018

unknown service provider

? commercialization ?

Commercial Authentication

- transferred Safety of Life Service to EGNOS
- reconstructed ~~Commercial Service~~ to High Accuracy Service
 - additional navigation signal with high accuracy: free of charge
 - value-added service (authentication): fees-based
 - encrypted signal with controlled access: lie down possibility for charging system



3

Practices

EGNOS

Home > European GNSS > EGNOS > Services

- What is GNSS? >
- Galileo >
- EGNOS >**
 - What is EGNOS?
 - Programme >
 - System
 - Applications
 - Services >**
 - Performance overview
 - Service access
 - EGNOS User Survey
 - EDAS >
 - Benefits
 - FAQ

Services

corporatization

? commercialization ?

The European Geostationary Navigation Overlay Service (**EGNOS**) consists of three core services:

free of charge

- > **Open Service**: free and open to the public, the Open Service is used by mass-market receivers and common user applications;
- > **EGNOS Data Access Service (EDAS)**: offered on a controlled access basis (i.e. via the internet and mobile phones) for customers requiring enhanced performance for professional use;
- > **Safety of Life Service (SoL)**: for safety-critical transport applications, including civil aviation, which require enhanced and guaranteed performance and an integrity warning system.

The EGNOS service area includes all European Member States.





Our shareholders are 7 key European Air Navigation Service Providers ANSPs.



THE ESSP IN BRIEF

We are an experienced and dynamic **company** specialized in the operations and provision of satellite-based services for aviation

Our core activities are the operation of the Navigation Overlay Service.

Operation & Service Provision

EGNOS is a satellite based augmentation system which delivers precise satellite positioning on top of GPS to make it suitable for safety critical applications such as landing aircrafts or navigating ships through narrow channels.

The EGNOS Service Provision contract is funded by the European Union and managed through the European Global Navigation Satellite Systems (GNSS) Agency (GSA), with a clear mandate to help foster the use of satellite navigation within Europe and particularly in the domain of aviation. As such, we manage the second largest **contract** in space by the European Commission.

In addition to the provision of EGNOS Services, ESSP expertise allows us to deliver new activities and projects in the fields of:

- Consultancy Services for aviation (PBN implementation; SBAS operations, certification and service provision)
- Provision of pan-European certified services for aviation
- Provision of global, satellite-based Communication, Navigation and Surveillance (CNS) services for aviation

III. Experience & Practices

3

Practices

EGNOS



We certify you're there.



BULATSA
BULGARIAN AIR TRAFFIC SERVICES AUTHORITY



1



corporatization

Owner-EU

Supervisor-EC-GSA

Service Provider-ESSP

Operator-ESSP

Contractor: GSA & ESSP

Main User-ANSP

civil augmented system

V S

dual-use basic system

Most of core GNSS

Operator-DOD

Service Provider-DOD

partial reference

Experience

EGNOS

IV. Proposals



2

Corporatization of GNSS Service Providers

interest of national security

- only civil service
- **no change on military service**, no privatization

key role of public authority

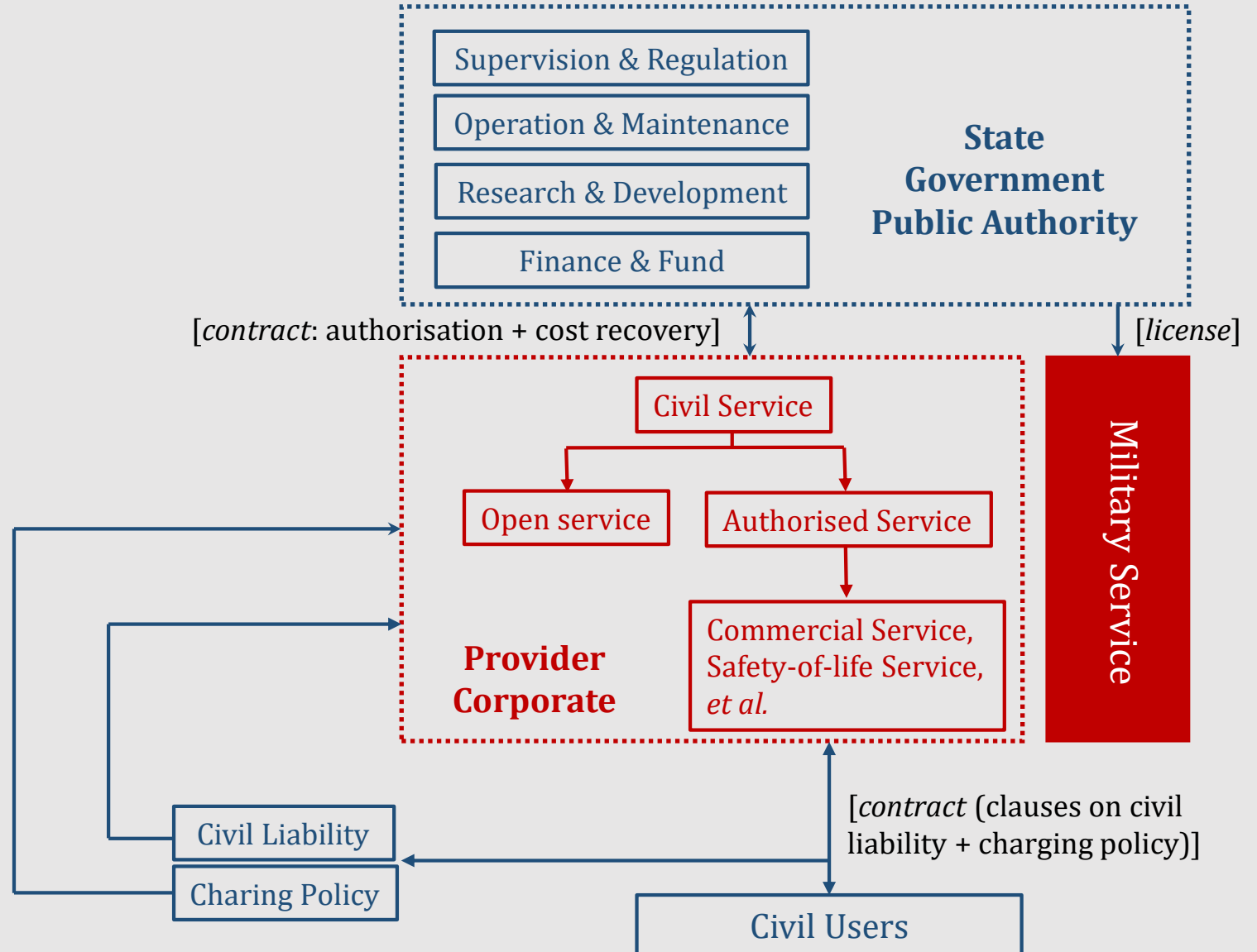
- public nature, **public funds**
- high cost of development and operation, EGNOS fund from the EU
- **only corporatization**, as not profitable, no privatization

model contract

- instead of license
- contractual chain
- **liability terms**
- **charging policy**

Corporatization

Structure



2

Commercialization

Case by Case



ICAO does **NOT** object
GNSS Cost Allocation & Recovery Mechanisms

Basic GNSS services will be provided free of charge as a common good to a multiple number of user categories, while more advanced GNSS services (including augmentation services) requiring a higher quality of service and hence higher costs will have to be paid for by all their users in most cases.

higher fees means higher responsibility

free of charge does **NOT** free civil liability

IV. Proposals

3

Lets Work Together!



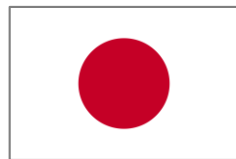
WG1

WG2

WG3

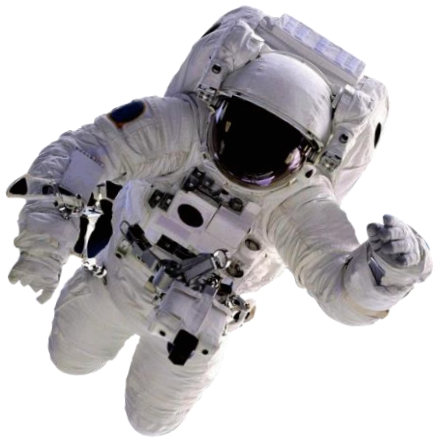
WG4

WG5 Policy & Law ?



Way Forward

Joint Efforts



THANKS!



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孔得建