



United Nations/Zambia/ESA Workshop on Applications of
Global Navigation Satellite System Technologies for Sub-Saharan Africa
Lusaka, Zambia, 26 - 30 June 2006

***EUPOS*[®] - Developing a Full Scale Accuracy Ground Based Regional GNSS Infrastructure**

Gerd Rosenthal (DE), István Fejes (HU)
International *EUPOS*[®] Steering Committee

Contact:

Office of the International *EUPOS* Steering Committee
c/o Senate Department for Urban Development of Berlin
III B - Geodetic Survey, Three-dimensional Geodesy
Fehrbelliner Platz 1, 10707 Berlin, Germany
telephone +49 30 90 12 - 56 15
fax +49 30 90 12 - 37 09

e-mail: eupos.isco@senstadt.verwalt-berlin.de
e-mail: gerd.rosenthal@senstadt.verwalt-berlin.de
www.eupos.de



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- The *EUPOS* Initiative
- The organizational structure of *EUPOS*
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The *EUPOS* initiative

The International *EUPOS*[®] Steering Committee was founded with the aim to establish a uniform compatible, multifunctional DGNSS basis infrastructure for position determination, navigation and locating in interested countries of Central and Eastern Europe.

Berlin, March 5th, 2002

Workshop
Multifunctional GNSS Reference
Station Systems for Europe
4 - 5 March 2002
Berlin

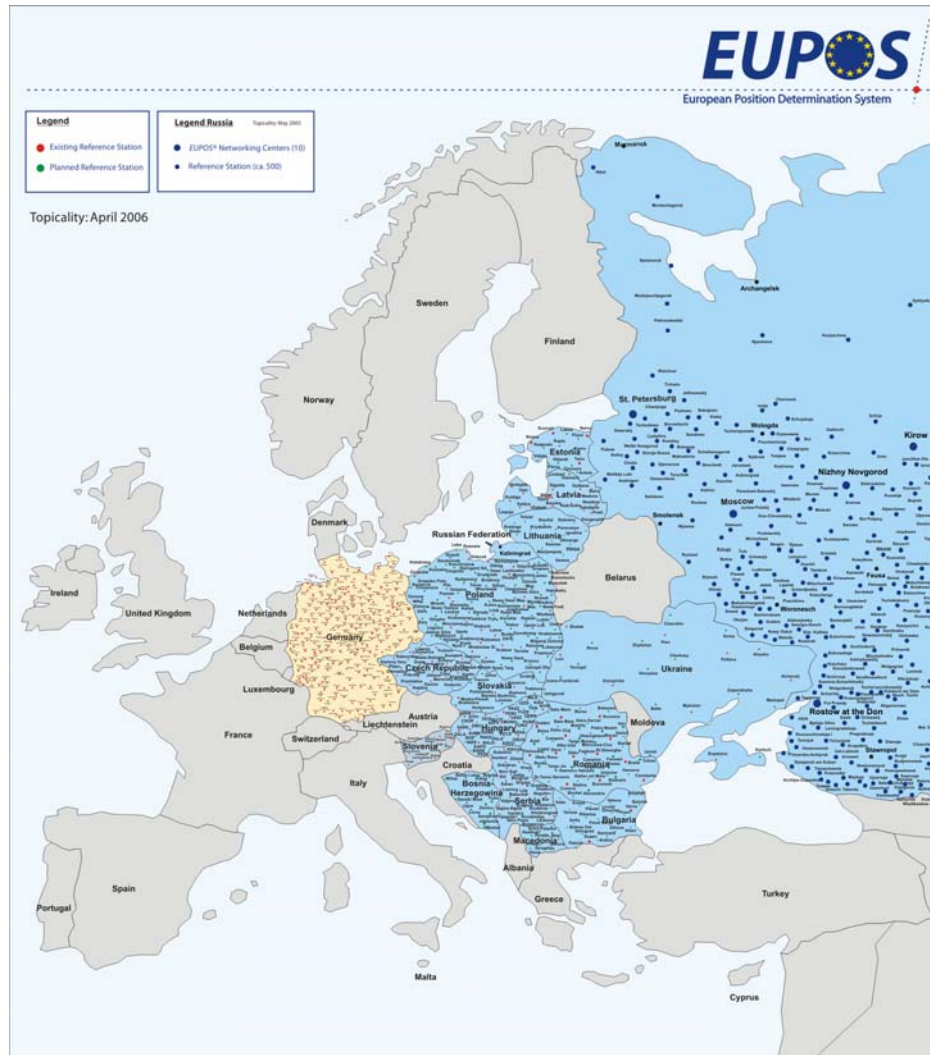
SAPOS[®]
German National Survey
Satellite Positioning Service

European Academy
of the Urban Environment Berlin

Berlin Geodesy
Senate Department
for Urban Development



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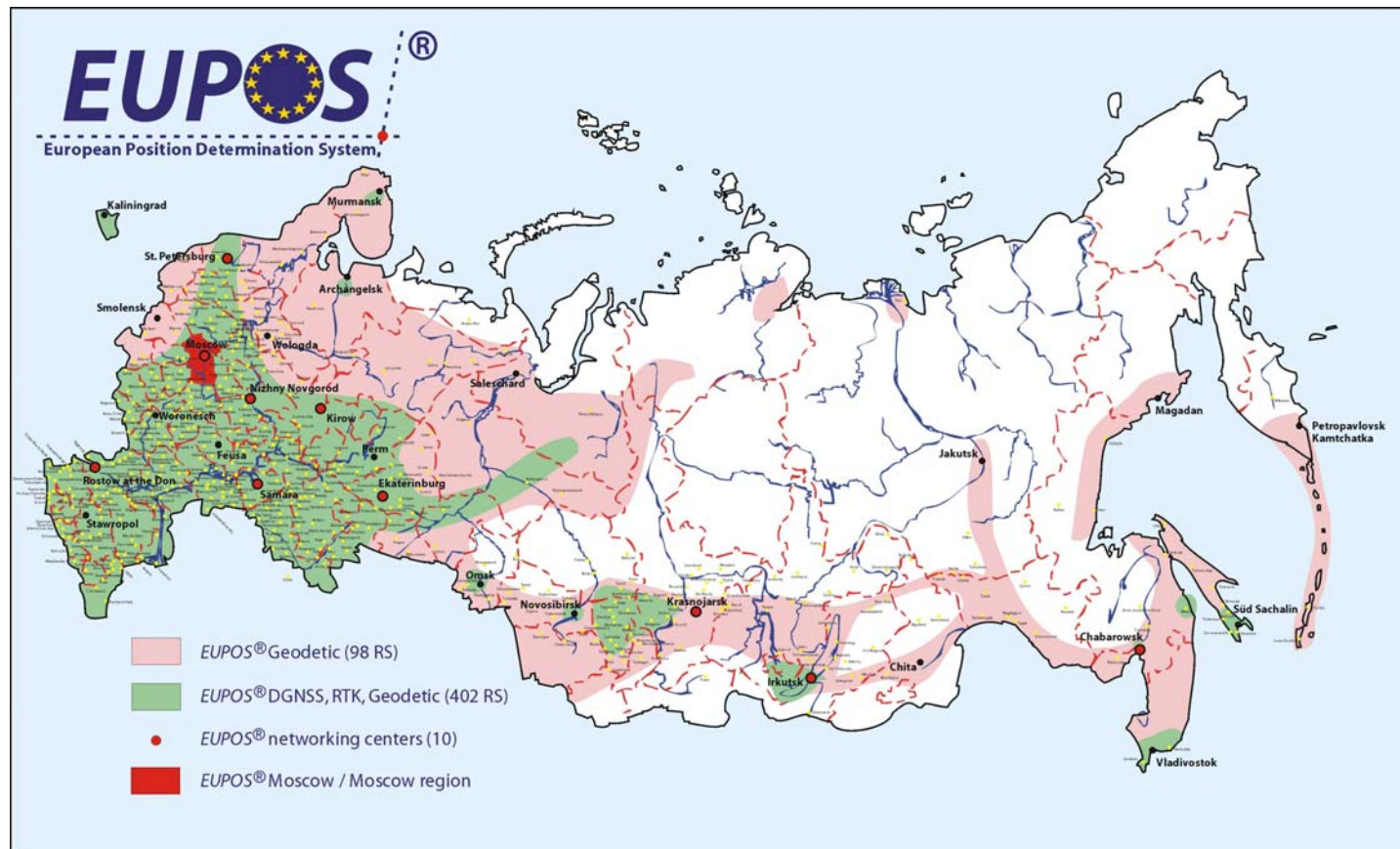


Bosnia and Herzegovina
Bulgaria
Czech Republic
Estonia
Hungary
Latvia
Lithuania
The Former Yugoslav Republic
of Macedonia
Poland
Romania
Russian Federation
Serbia and Montenegro
Slovakia
Slovenia (observer status)
Ukraine
Berlin, Hamburg (consultative)



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EUPOS[®] planning in Russia (partially realized)





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EUPOS[®] planned and realized reference stations

Country (ISO Country Code)	Area [km ²]	Number of planned <i>EUPOS</i> [®] reference stations	Number of realized <i>EUPOS</i> [®] reference stations	Country (ISO Country Code)	Area [km ²]	Number of planned <i>EUPOS</i> [®] reference stations	Number of realized <i>EUPOS</i> [®] reference stations
EU member countries				EU candidate countries			
Czech Republic (CZ)	78.870	22	22	Bulgaria (BG)	110.950	23	5
Estonia (EE)	45.220	13	4 ²⁾	Romania (RO)	237.500	48	13
Hungary (HU)	93.030	36	17	Country (ISO Country Code)	Area [km²]	Number of planned <i>EUPOS</i>[®] reference stations	Number of realized <i>EUPOS</i>[®] reference stations
Latvia (LV)	64.600	24	24 ⁴⁾				
Lithuania (LT)	65.300	13	1 ⁵⁾	West Balkan States			
Poland (PL)	323.520	86	20 [86] ⁵⁾	Bosnia and Herzegovina (BA)	51.000	30	30 ²⁾
Slovak Republic (SK)	49.035	21	2 ³⁾ [21] ⁵⁾	Macedonia FYROM (MK)	25.330	15	1 ²⁾
(observer) Slovenia (SI)	20.270	15	15 ⁵⁾	Serbia and Montenegro (YU)	88.360	32	32
				Russian Federation			
				Russian Federation (RU)	17.075.000	500 stations at all ¹⁾	31
				Ukraine			
				Ukraine (UA)	603.700	n/a ²⁾	13

¹⁾ In seven federal districts, will cover not the whole territory of the Russian Federation (cf. fig. 3)

²⁾ The design of the Ukraine *EUPOS* is not yet completed

³⁾ Number of reference stations which exist and shall be updated to *EUPOS* stations

⁴⁾ Including the national State Land Service (19) and the Riga City (5) *EUPOS* reference stations

⁵⁾ The complete System will be established in 2006

⁶⁾ The system is complete *EUPOS* compatible

Topicality April 2006



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The organizational structure of *EUPOS*

International *EUPOS*[®] Steering Committee (ISC)
Representatives of all *EUPOS*[®] member countries | Office (ISCO)

National *EUPOS*[®] Service Centers (NSCs)
EUPOS[®] providers, if not the same

Working Groups
TCI¹⁾ | SQI²⁾

Authorized *EUPOS*[®] resellers

***EUPOS*[®] users**

Manufacturers of *EUPOS*[®] compatible hardware/software

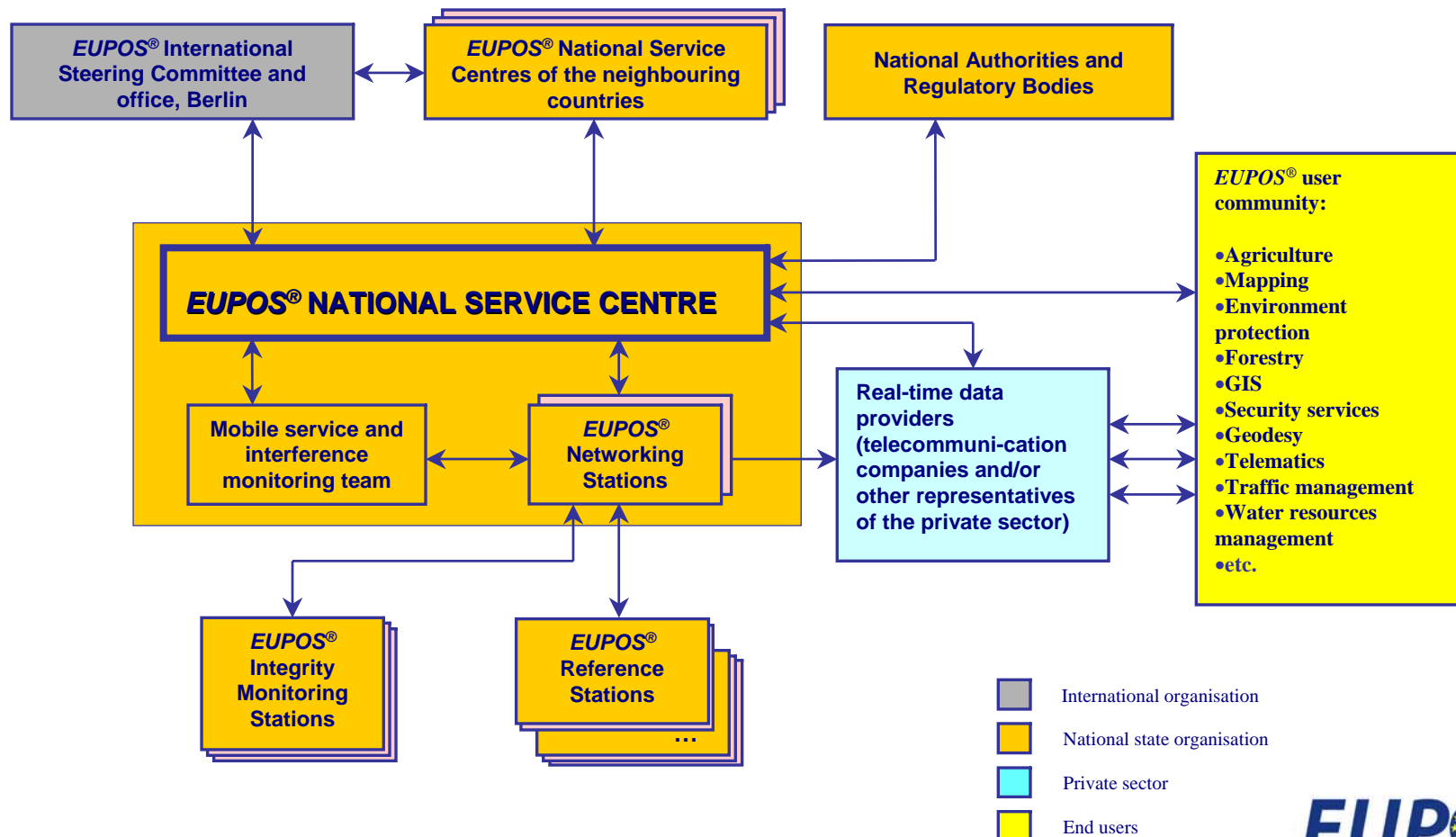
Resellers of *EUPOS*[®] compatible hardware/software

¹⁾ Working Group on Technical Cooperation with the Industry;

²⁾ Working Group on System Quality, Integrity and Interference Monitoring



The National Service Centre (NSC) organisational structure





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***EUPOS* cooperation and coordination with other international organizations**

Cooperation with the UN Office for Outer Space Affairs, UN OOSA supports *EUPOS*

GALILEO Joint Undertaking accepted the necessity of reference station systems and welcomes *EUPOS*, an information exchange is agreed

The promotion of the operation *EUPOS*-IRC in 2006 et sqq. by EU INTERREG III C East/INTERREG IV programmes is expected

Official participation of representatives of both EUREF TWG and *EUPOS* ISC respectively in the other organization conferences

EUPOS is member of the International Committee on GNSS (ICG)

EUPOS is member of the US Radio Technical Commission for Maritime Services (RTCM)



North EAST South West
INTERREG IIIC



ICG



EUPOS
European Position Determination System



Some Technical Characteristics of *EUPOS*

- Unified world-wide unlimited and gratis usable Standards, guaranteed downward-compatibility in the case of further development
- Equal opportunities for companies, investment safety for all economy enterprises, *EUPOS* providers and *EUPOS* users
- Use of GALILEO (duty if completely available), NAVSTAR-GPS (optional), GLONASS (optional)
- Guaranteed *EUPOS* availability of 99% at minimum (99.8%)
- Standard medium Internet for all Services
- Optional additional media radio, public broadcast, TV broadcast etc. for the *EUPOS* real-time sub-services



***EUPOS* - Sub-Services**

- *EUPOS* DGNSS – real-time service,
reachable precision dependent on the user equipment
0,5 m - 2 m for moved objects,
0,2 m - 1 m for stationary positioning
- *EUPOS* Network RTK – real-time service,
2 cm accuracy
- *EUPOS* Geodetic, post processing service,
ca. 1 cm precision by short observations and
using near real-time procedures
sub-centimeter precision with long lasting observations,
using precise ephemerides etc.



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Examples of **EUPOS[®]/SAPOS[®]** applications





Vehicle Scheduling and Control System of the Berliner Verkehrsbetriebe (BVG)

- punctuality, connection quality
- dynamic passenger information
- influence of traffic lights
- acceleration measurements
- flexible change of routes
- safety for passengers, drivers
- reduced costs



Linie	Ziel	Abfahrt in
3		
5	Zingster Str.	3 min
4	Falkenberg	4 min
6	Riesaeer Str.	6 min
etrieb***Testbetrieb*** *** Testbe		
S+U-Bahnhof Alexanderplatz		





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Central Police Traffic Service of Berlin (ZVkd)

State visitors, demonstrations, parades etc.

- Escorting of important state visitors
- flexible changes of routes
- precise traffic steering in time
- security measurements



photo: Berliner Polizei



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Autonomous fleet management and guiding system



MOFIS

Hamburg Fire Service



EUROPEAN POSITION DETERMINATION SYSTEM



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Management of freight vehicles on large building sites

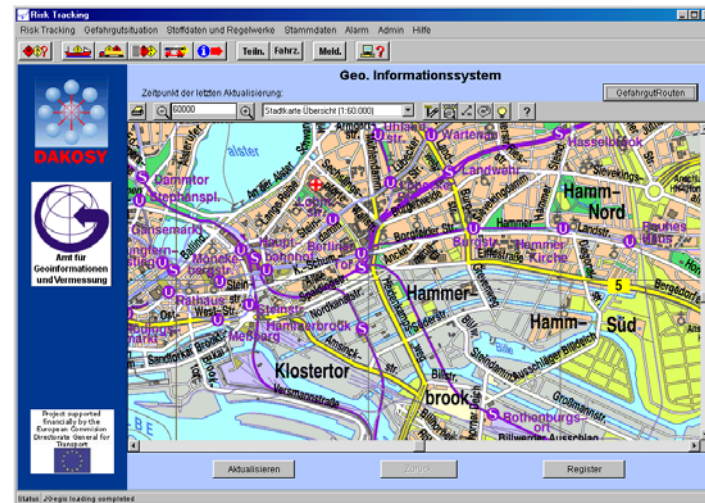


Rhenus Baulogistik GmbH
www.rhenus.de



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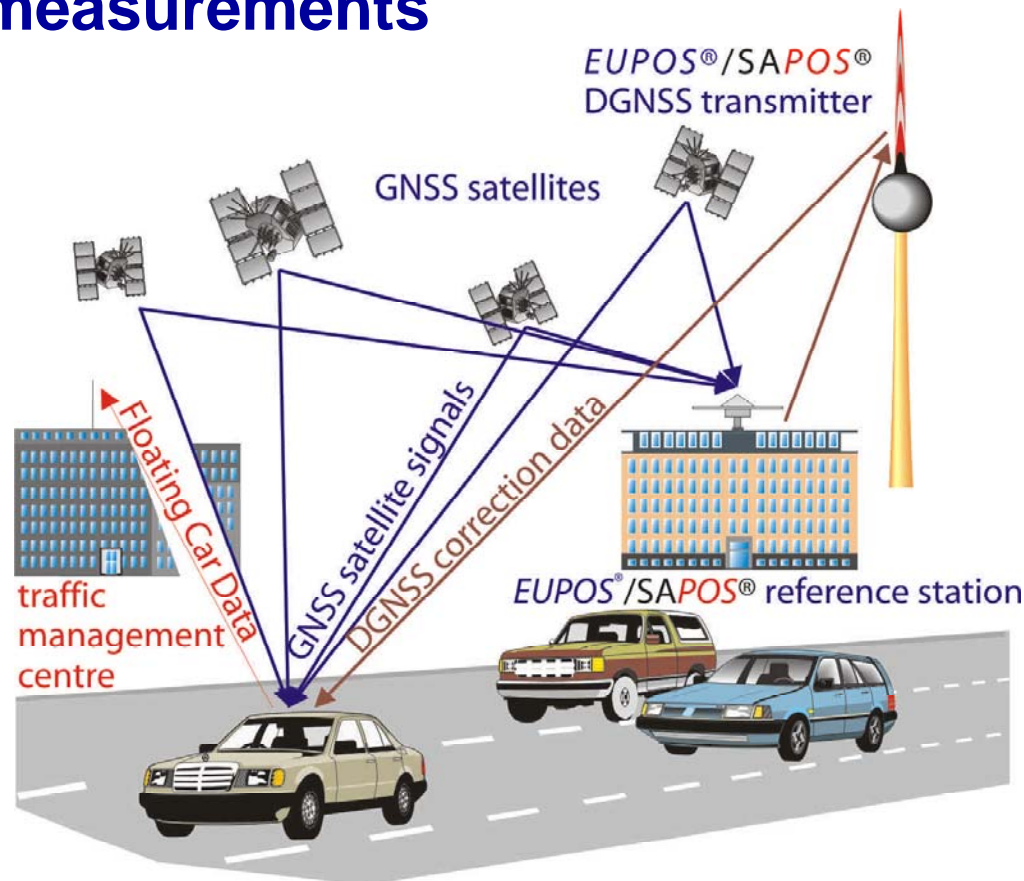
Risk tracking – EU project VIKING





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Lane-precise Floating Car Data in real time for traffic steering measurements





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EU project Mobility for Blind and Elder People interaction with Computer

MoBIC



F.H. PAPPENMEIER

EUPOS

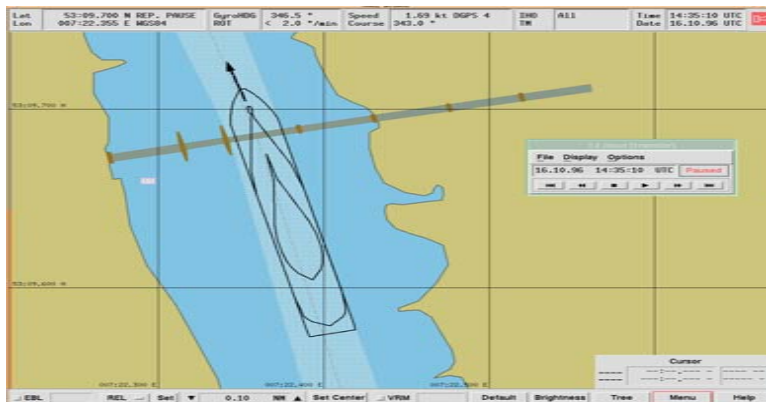
EUROPEAN POSITION DETERMINATION SYSTEM



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Meyer Werft Papenburg

Transfer of ocean liners after production at the river Ems into the deep fair-way of the North Sea





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Dynamic passenger information system and precise positioning and navigation



HADAG

Hafen-Dampfschiffahrt-
Aktiengesellschaft
Hamburg



EUROPEAN POSITION DETERMINATION SYSTEM



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Dynamic passenger information system and precise positioning and navigation



Special missions, e. g.

- rescue helicopters (tested)
- safeguarding tasks (tested)
- measurements for radio/TV broadcast supply (field strength)



Precise starting and landing (tested)

photo: www.kreuzfahrt-reisen.de



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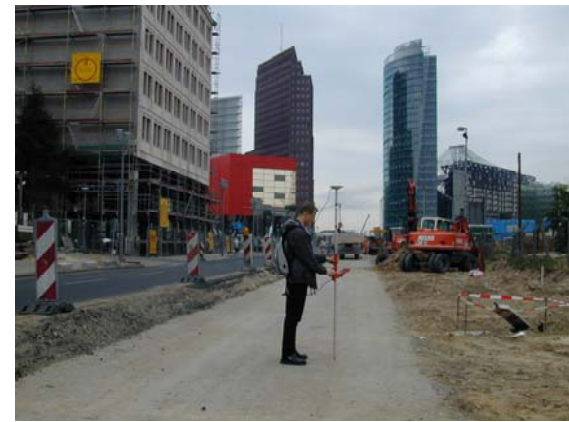
Dynamic surveying of roadway – inclusion of traffic relevant data (e. g. road signs, possibilities to turn)





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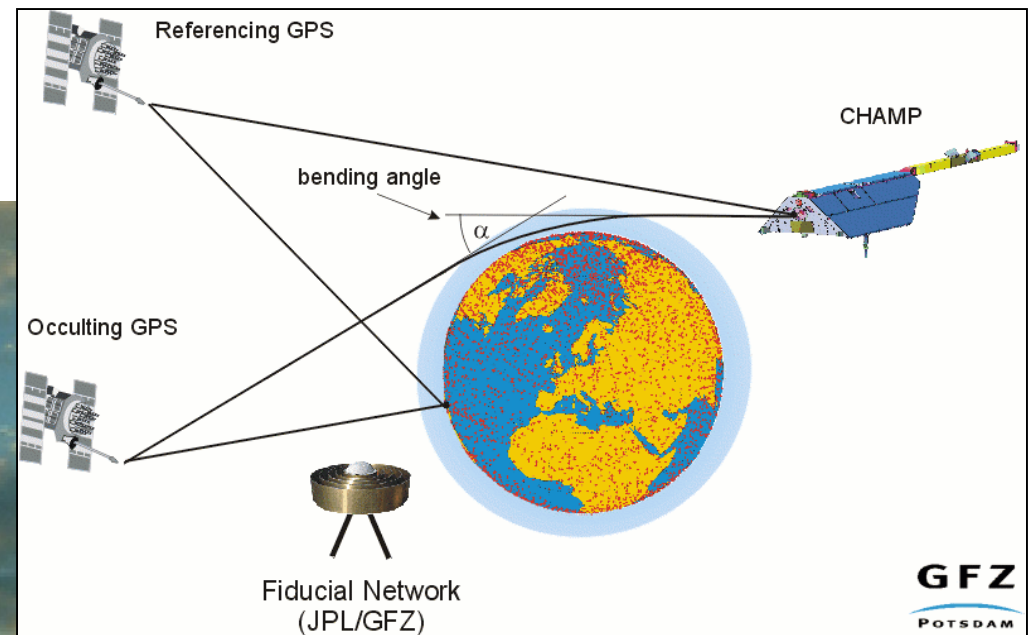
Geo-information, surveying, geodesy





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Weather-forecast and climate research





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Agriculture

area determination,
yield cartography,
specific partial acre farming management



Environmental protection and
reduced costs by

- reduction of sprinkled herbicide,
- specific deploying of agriculture operating supplies



Conclusion

GNSS and DGNSS technology and applications move forward as well as the establishment of space- and ground-based GNSS augmentation systems

Fundamental GNSS-based reference frameworks approach at real-time data provisions

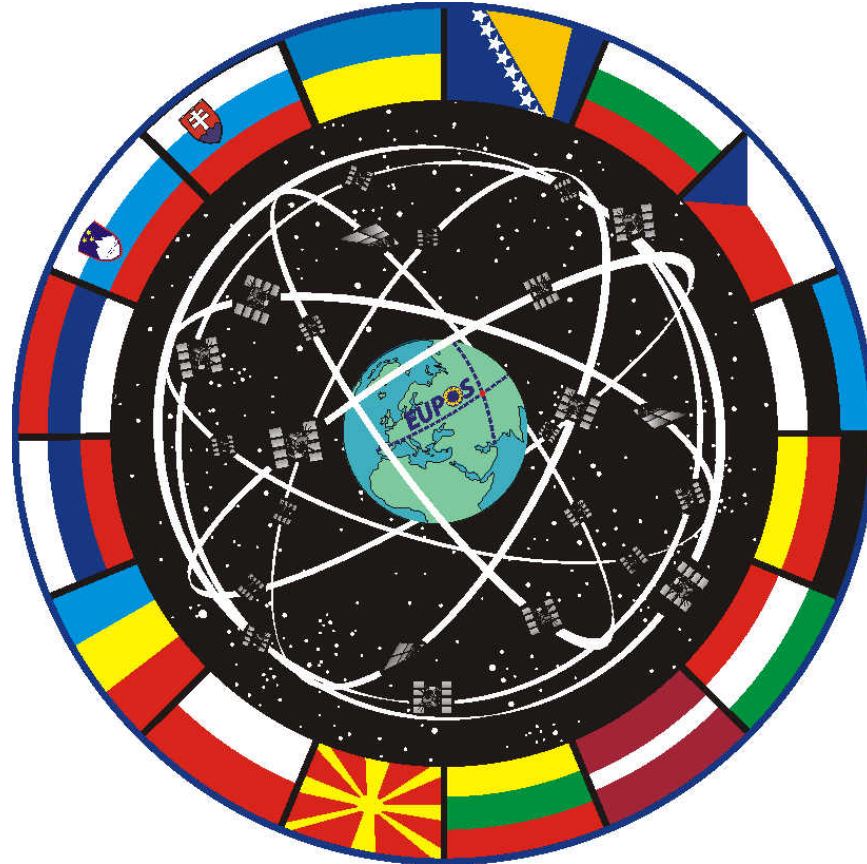
Compatibility and interoperability are highly important for economic reasons and to strengthen the benefits

Both AFREF and *EUPOS* are international initiatives which were identified priority projects for support by the UN OOSA

If AFREF (e.g. partly) think about the provision of DGNSS real-time data in the future a cooperation with *EUPOS* for interoperability and compatibility offers a great chance to increase lasting the benefits of both systems



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Thank you very much for your attention!