IEC 61108-7
The standard for SBAS L1 shipborne receivers

EGNOS workshop

Written by: G. Fernández (ESSP), Elisabet Lacarra (ESSP)

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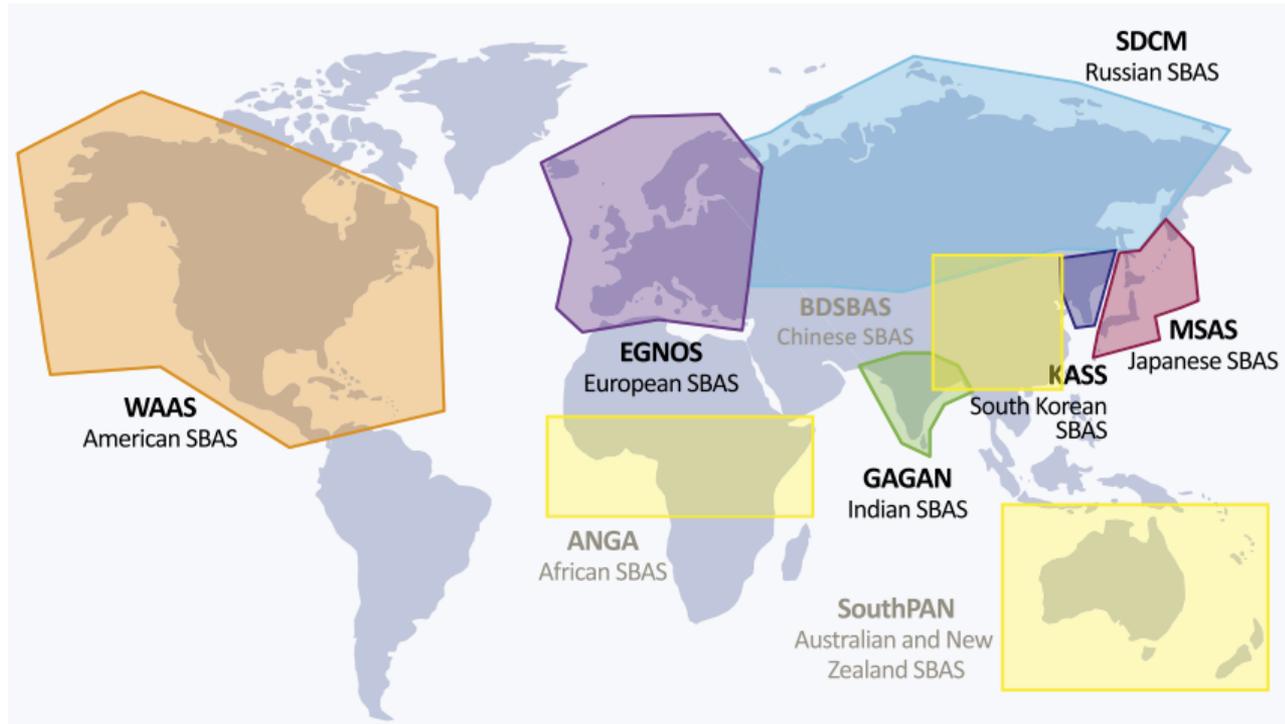
❑ BACKGROUND

❑ PURPOSE

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❑ SUMMARY

SBAS around the world

*Planned SBAS systems

Background

❑ GNSS systems are not compliant with operational navigation specifications for harbour entrances/approaches and coastal waters without augmentation

- ➢ Recognised by IMO as components of the World Wide Radio Navigation System.
- ➢ Differential services, like DGPS/DGLONASS, used to broadcast augmentation data to fulfil the performance level required by *IMO Res A.1046(27)*.

❑ **EGNOS performance is compliant with IMO Res A.1046(27)** operational requirements for ocean/coastal waters and harbour entrances/approaches:

- ➢ EGNOS provides instantaneous integrity warnings of system malfunction.
- ➢ EGNOS enhances horizontal accuracy to meet 10 m at 95% percentile.
- ➢ Capable of multiple satellite failure detection, of constellation failure detection and of local ionospheric effect detection.
- ➢ Better error estimation

Background

❑ **SBAS is seen as a suitable augmentation system for maritime navigation** considering:

  ➢ DGNSS services do not cover wide areas.
  ➢ Some maritime authorities are discontinuing the DGNSS services for maritime operations.
  ➢ SBAS maritime service is complementary to DGNSS and allow DGNSS infrastructure rationalization

❑ IMO MSC.401(95), MSC.432 (98) and IEC 61108-4 allow the use of different augmentation signals in shipborne receivers.

  ➢ Not IMO or IEC standard on how to process and implement SBAS signals in shipborne receivers.

❑ **Most of maritime GNSS receiver models are SBAS compatible but present important differences** in their performance since they are not certified according to any specific test standard.
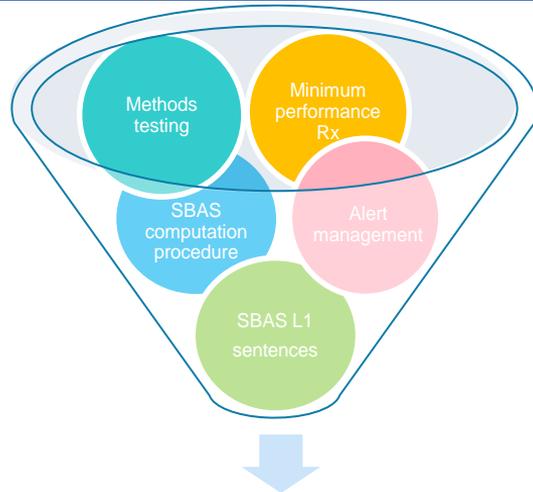
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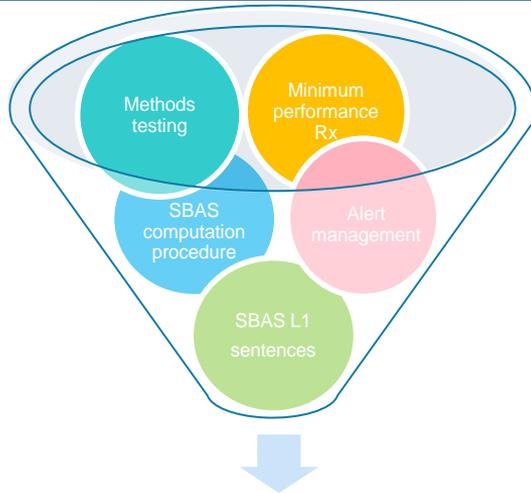
IEC 61108-7 standard

MARITIME NAVIGATION AND RADIOCOMMUNICATION EQUIPMENT AND SYSTEMS – GLOBAL NAVIGATION SATELLITE SYSTEMS (GNSS) –

Part 7: Satellite Based Augmentation System (SBAS) L1 – Receiver equipment – Performance standards, methods of testing and required test results

❑ In order to ensure a safe and harmonised use of SBAS by all shipborne receivers worldwide for harbour entrances/approaches & ocean/coastal waters, a new standard is about to be published by IEC Technical Committee 80 for the implementation of SBAS L1 in shipborne receivers.

IEC 61108-7 content

IEC 61108-7 standard

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❑ IEC 61108-7 includes for **SBAS L1 maritime receivers** :

➢ **Minimum performance** to be obtained by the equipment under SBAS coverage to be compliant with the IMO Res A.1046(27) for harbour entrances/approaches and ocean/coastal waters.

- *General*
- *Equipment output*
- *Accuracy*
- *Acquisition*
- *Availability*
- *Dynamic range*
- *Effects of specific interfering signals*

- *Position update*
- *SBAS input and processing*
- *Navigational status indications*
- *Operation under typical interference conditions*
- *Output of COG, SOG and UTC*
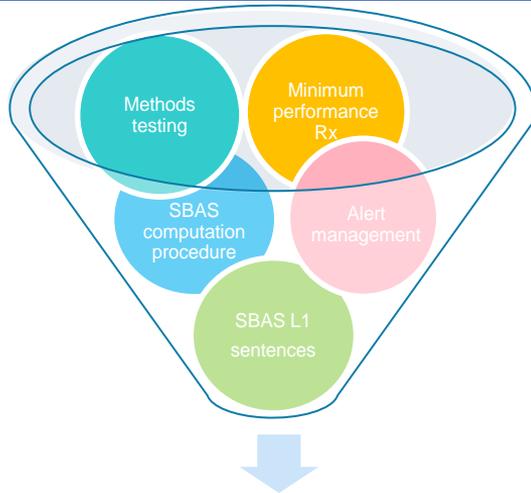
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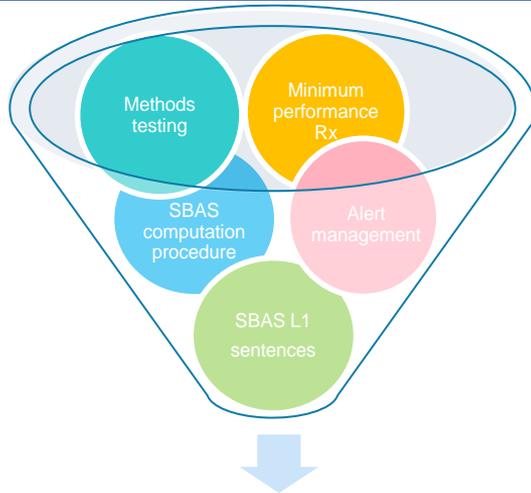
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required test results

❑ IEC 61108-7 navigational status indication:

Navigational status indication	Conditions
SAFE	- Estimated error (95% confidence) less than selected accuracy level (10m or 100m), and - Integrity available and HPL ≤ HAL, and - Position calculated within the required update rate.
CAUTION	- Integrity not available for 3 seconds, and/or - HDOP > 4, and/or - SBAS corrections not applied.
UNSAFE	- Estimated error (95% confidence) bigger than selected accuracy level (10m or 100m), and/or - Integrity available and HPL > HAL, and/or - No position calculated within the required update rate.

IEC 61108-7 content
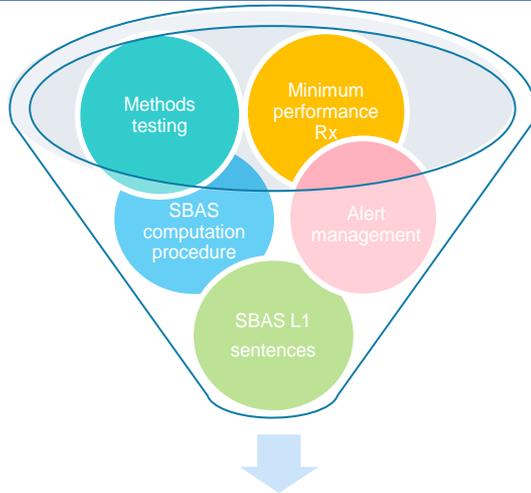

IEC 61108-7 standard

MARITIME NAVIGATION AND RADIOCOMMUNICATION EQUIPMENT AND SYSTEMS – GLOBAL NAVIGATION SATELLITE SYSTEMS (GNSS) –

Part 7: Satellite Based Augmentation System (SBAS) L1 – Receiver equipment – Performance standards, methods of testing and required test results

❑ IEC 61108-7 includes for SBAS L1 maritime receivers :

➢ **High level procedure** for SBAS navigation computation

- *GPS & SBAS L1 signal processing*
- *Application of SBAS messages*
- *SBAS position computation.*

➢ **Receiver output sentences** to support SBAS L1 operation

- *GBS, GFA, GNS, GRS, GSA, GSV, RMC & VTG.*
- *New message: GSN – GNSS SBAS navigation message*

➢ **Bridge alert management** compliant with IEC 62923-1 and IEC 62923-2.

- *Required alerts and classification: HDOP exceeded, loss of pos., SBAS not applied, unsafe status & Integrity not available.*

IEC 61108-7 content

IEC 61108-7 standard

MARITIME NAVIGATION AND RADIOCOMMUNICATION EQUIPMENT AND SYSTEMS – GLOBAL NAVIGATION SATELLITE SYSTEMS (GNSS) –

Part 7: Satellite Based Augmentation System (SBAS) L1 – Receiver equipment – Performance standards, methods of testing and required test results

❑ IEC 61108-7 includes for SBAS L1 maritime receivers :

➢ **Methods of testing** and required test results

- *SBAS L1 receiver equipment*
- *Configuration*
- *Position output*
- *Equipment output*
- *Static accuracy and availability*
- *Static accuracy with angular movement of the antenna*
- *Dynamic accuracy*
- *Acquisition*
- *Sensitivity and dynamic range*
- *Effects on specific interfering signals*
- *Position update*
- *SBAS input and processing*

- *SBAS message processing*
- *SBAS GEO satellite selection and switching*
- *Navigational status indications*
- *Test for typical interference conditions*
- *Accuracy of COG and SOG*
- *Validity of COG and SOG information*
- *Output of UTC*
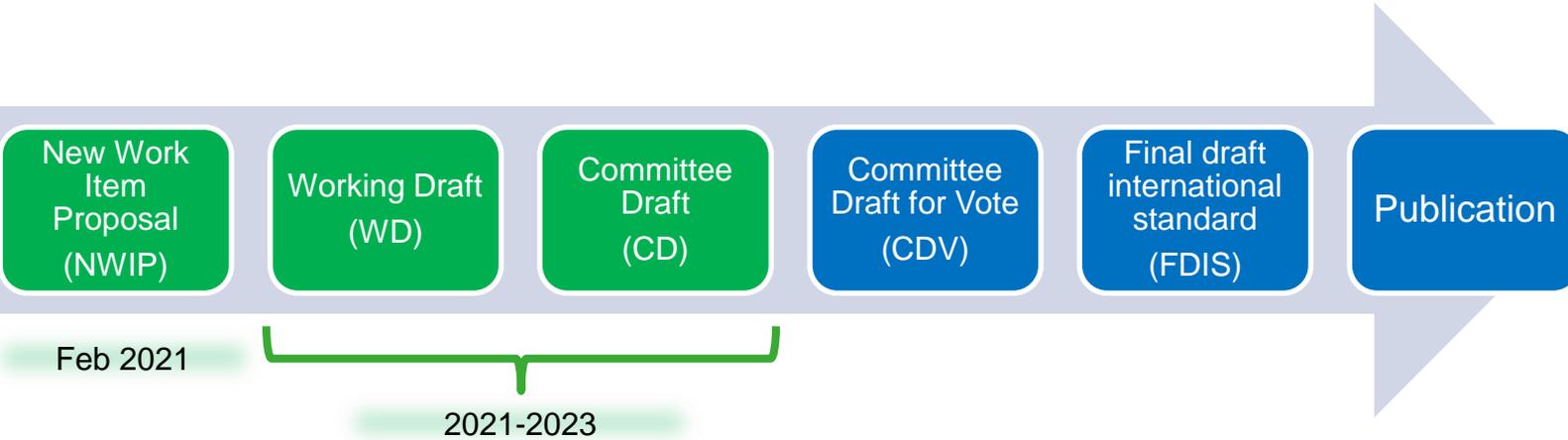- *Validation material for tropospheric model*

#EUSpace

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Schedule

New Work Item Proposal (NWIP) → Working Draft (WD) → Committee Draft (CD) → Committee Draft for Vote (CDV) → Final draft international standard (FDIS) → Publication

Schedule

New Work Item Proposal (NWIP)

Working Draft (WD)

Committee Draft (CD)

Committee Draft for Vote (CDV)

Final draft international standard (FDIS)

Publication

Feb 2021

Schedule

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New Work Item Proposal (NWIP) — Feb 2021

Working Draft (WD)

Committee Draft (CD) — 2021-2023

Committee Draft for Vote (CDV) — CDV Ballot 7th July – 29th Sept

Final draft international standard (FDIS) — FDIS Ballot 15th Dec – 26th Jan 100% positive votes!!

Publication

IEC 61108-7 published by **March 2024**

IEC 61108-7 FDIS APPROVED
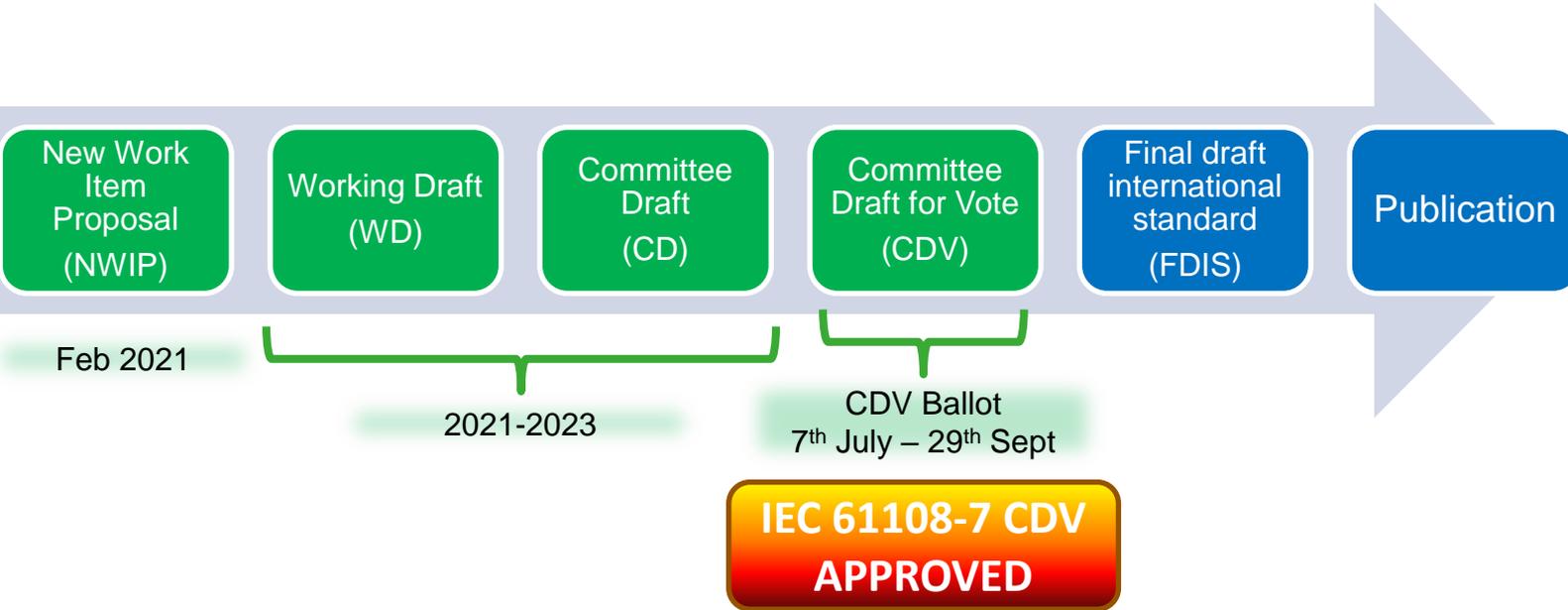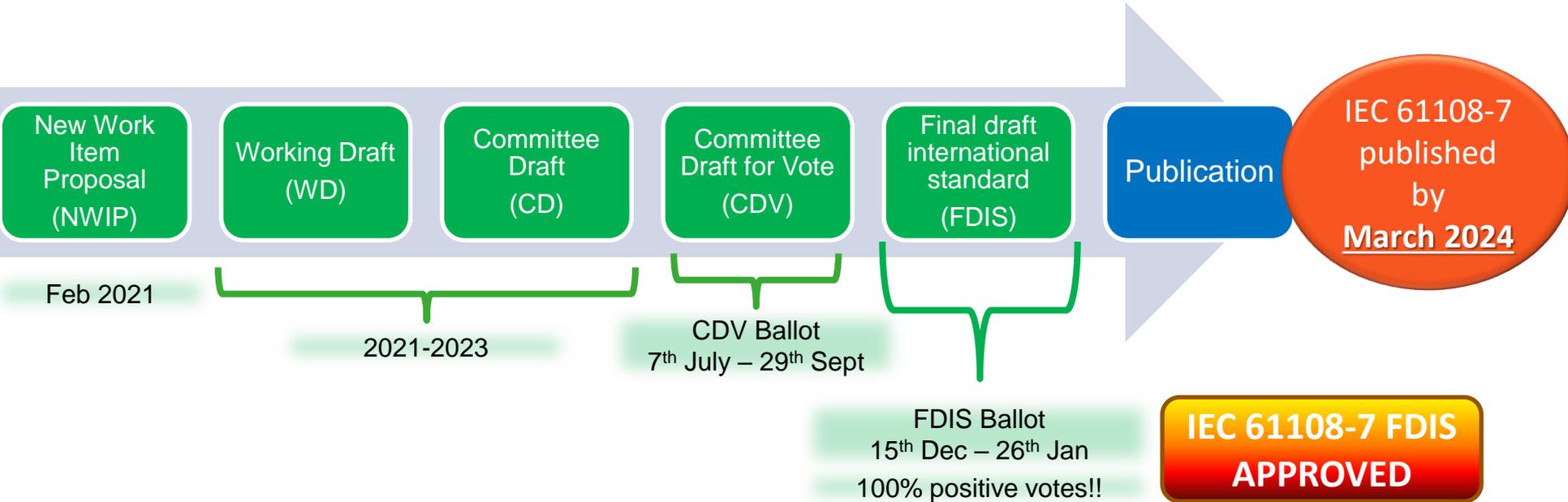
Future work

❑ **Updates / amendment of IEC61108-7 standard**

  – Current IEC 61108-7 covers GPS L1 augmented by SBAS L1 and it is in line with the EGNOS maritime service.

  – Updates may be proposed to further detail the SBAS algorithms.

❑ **SBAS DFMC and Advanced-RAIM in shipborne radio-navigation receivers**.

  – IMO will develop a standard for the minimum performance standards for Dual-Frequency Multi-constellation SBAS and Advanced-RAIM in shipborne radionavigation receivers:

    • IMO has approved the performance standards working point, but these are scheduled for the post biennia agenda.

  – After that, IEC will be approached to develop the standard to define the receiver requirements and the methods of testing for SBAS DFMC and ARAIM, as it has been done on the IEC-61108-7 for SBAS L1.

Summary

- ❑ SBAS L1 receiver standard **IEC 61108-7 is expected to be published by March 2024.**

- ❑ This standard will ensure a safe and harmonised use of SBAS by all shipborne receivers worldwide for harbour entrances/approaches & ocean/coastal waters.

- ❑ **Vessels should be equipped with type approval receivers in order to navigate using the EGNOS maritime service over Europe**.

- ❑ **Recommendation:**
  - – Receivers manufactures are invited to upgrade their receivers according to the SBAS L1 receiver equipment standard (IEC 61108-7). They are welcome to contact ESSP and EUSPA in order to find free-of-charge technical support for this potential update.

Guillermo.Fernandez@essp-sas.eu
Elisabet.Lacarra@essp-sas.eu

http://egnos-user-support.essp-sas.eu

egnos-helpdesk@essp-sas.eu

+34 911 236 555 (H24/7)

Corporate Video

Thank you!