

# Sistemas de Aumentação



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# **Descrição das tecnologias: Posicionamento por aumentação**

**DGPS**

**WAAS**

**EGNOS**

**GAGAN**

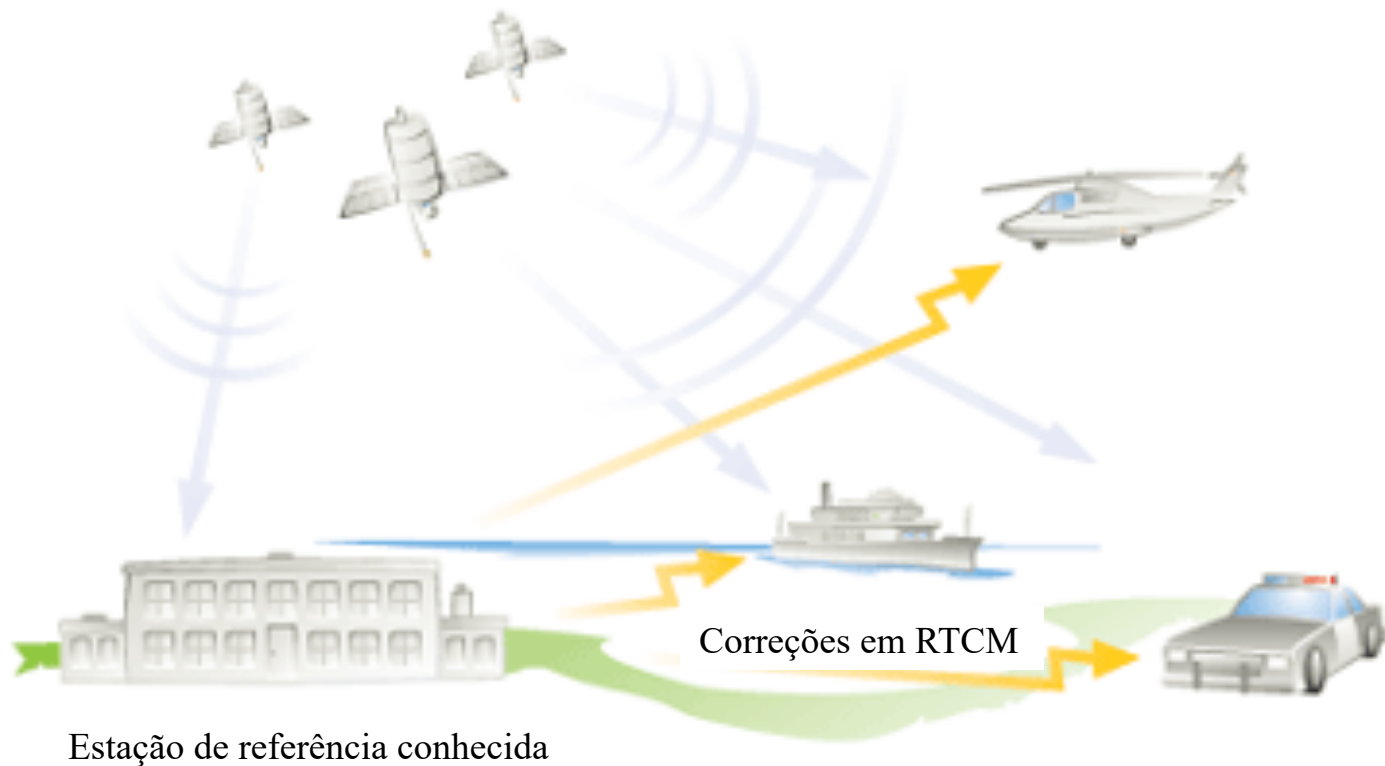
**MSAS**

**LAAS**

**Etc...**

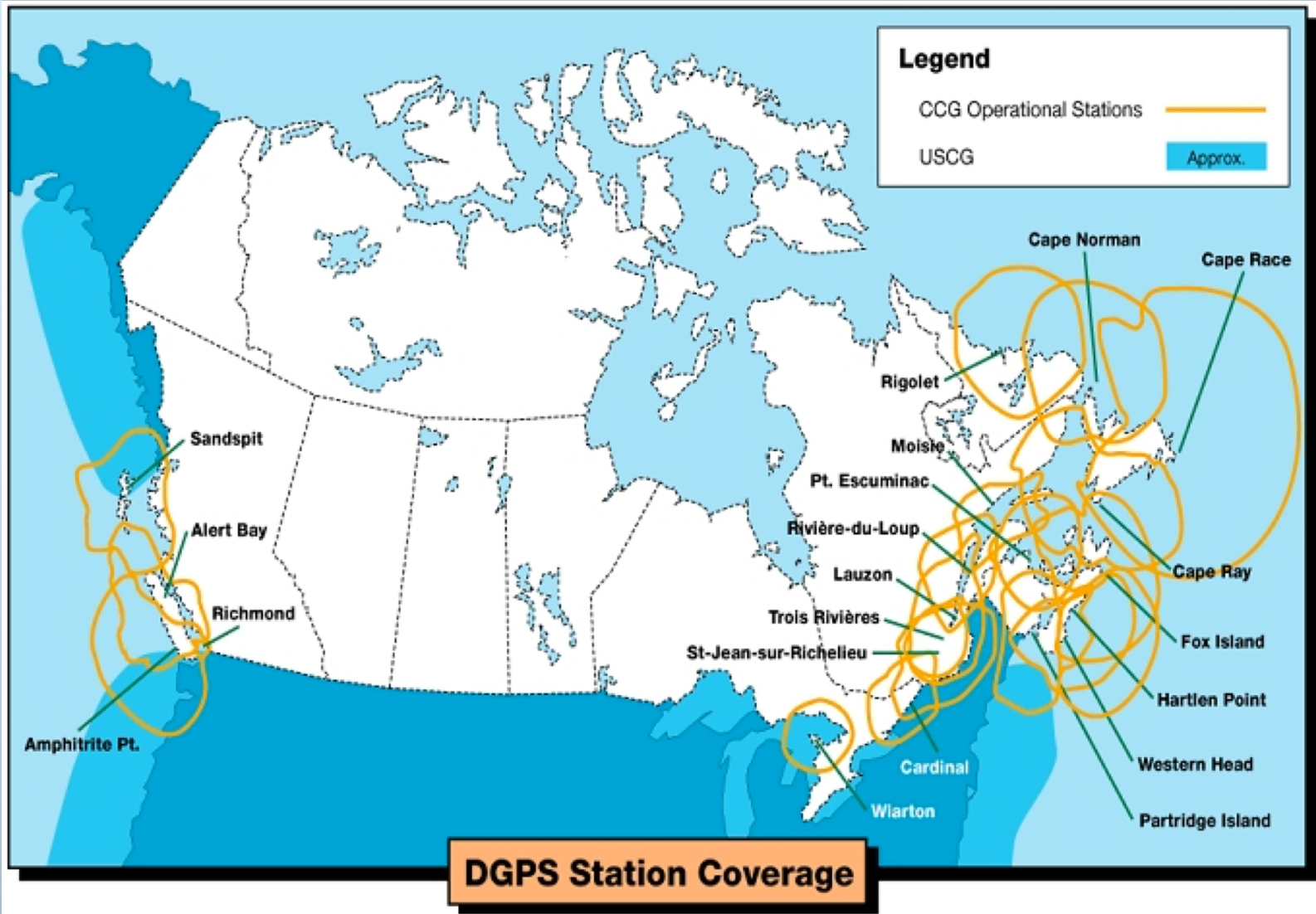
# Esquema de rede para DGPS

## Posicionamento DGPS em Tempo Real



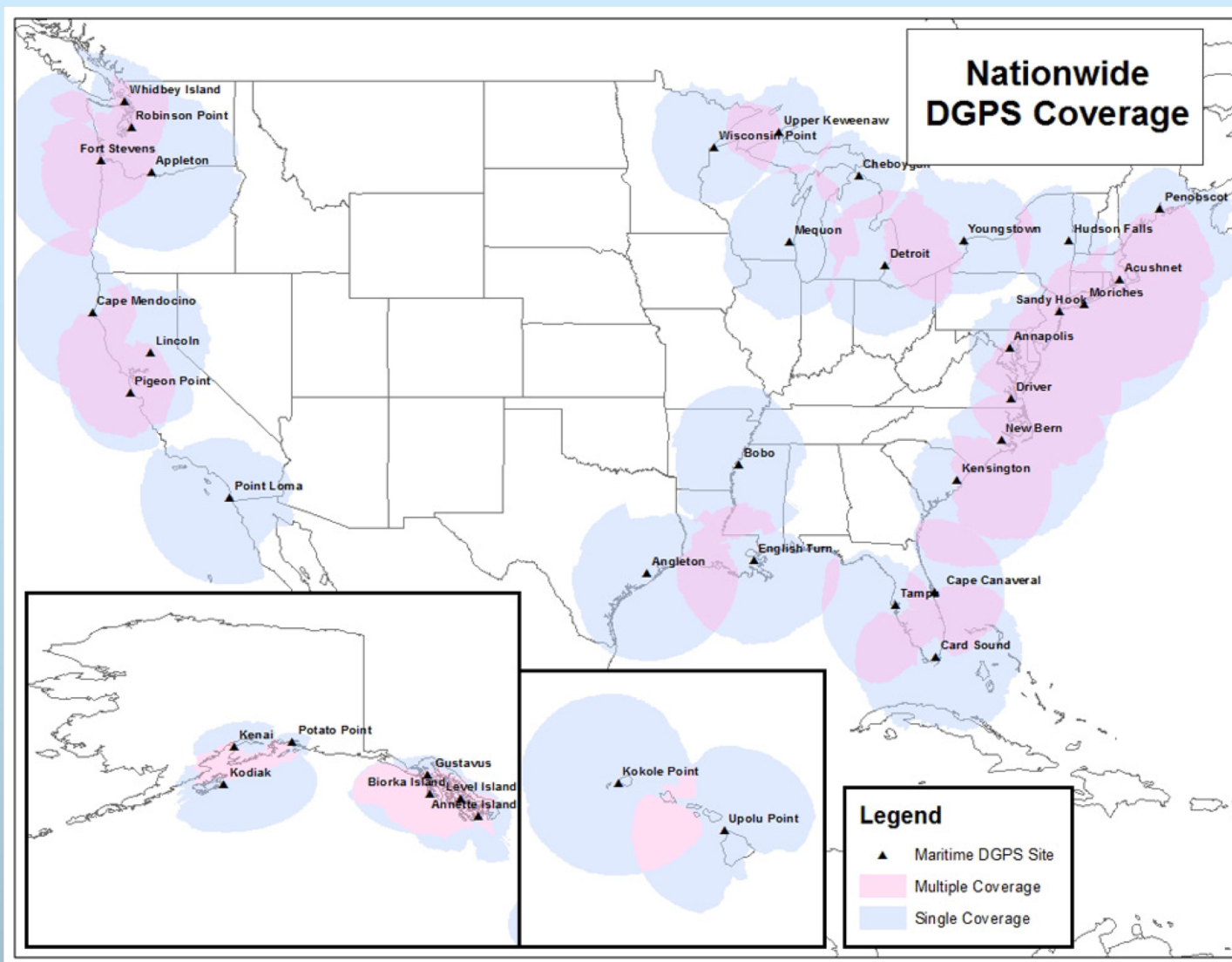
# CDGPS – Canada-wide DGPS Service

OBS: este serviço foi desativado em 31 de março de 2011

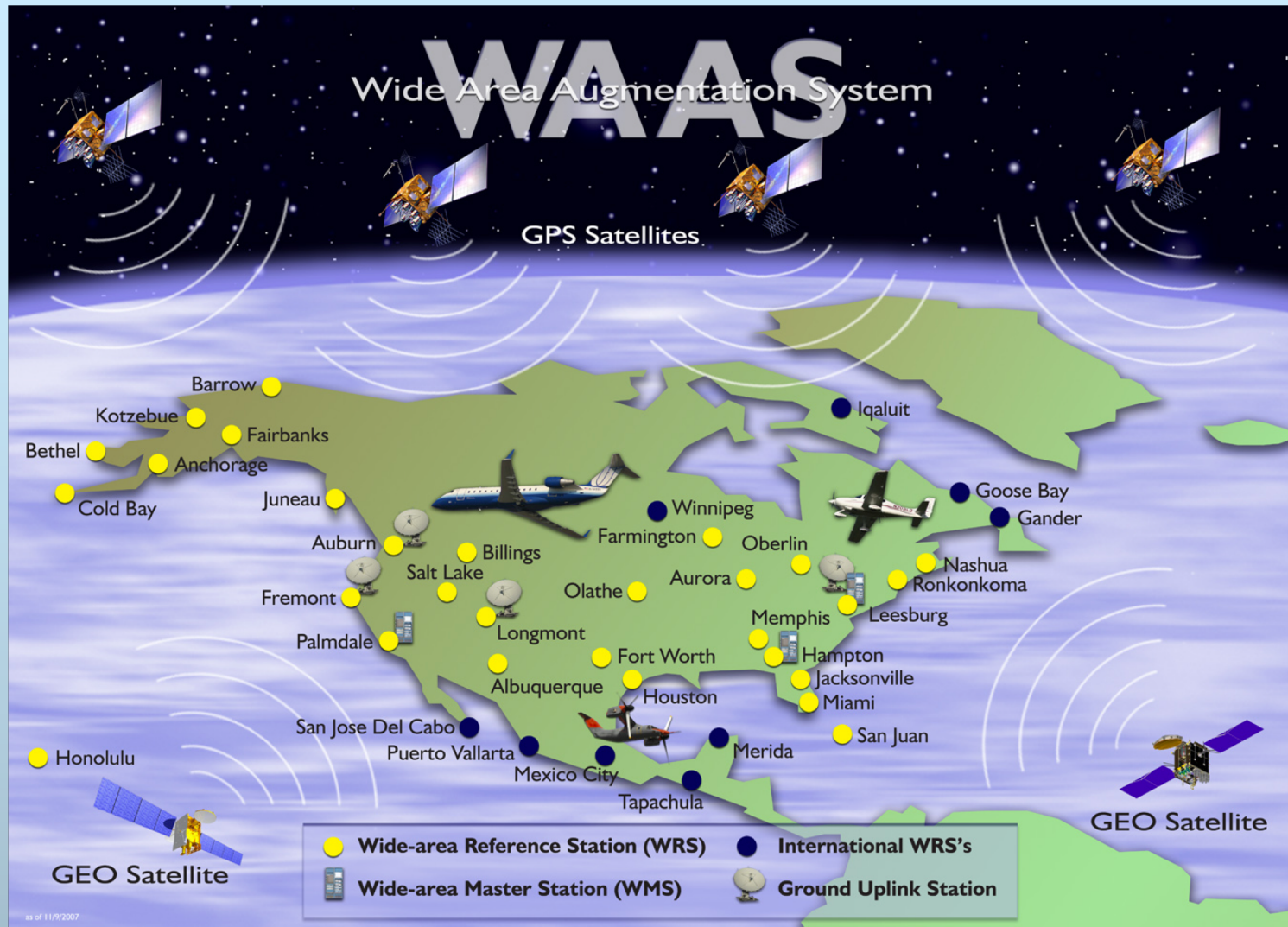


# NDGPS - Nationwide Differential GPS Service

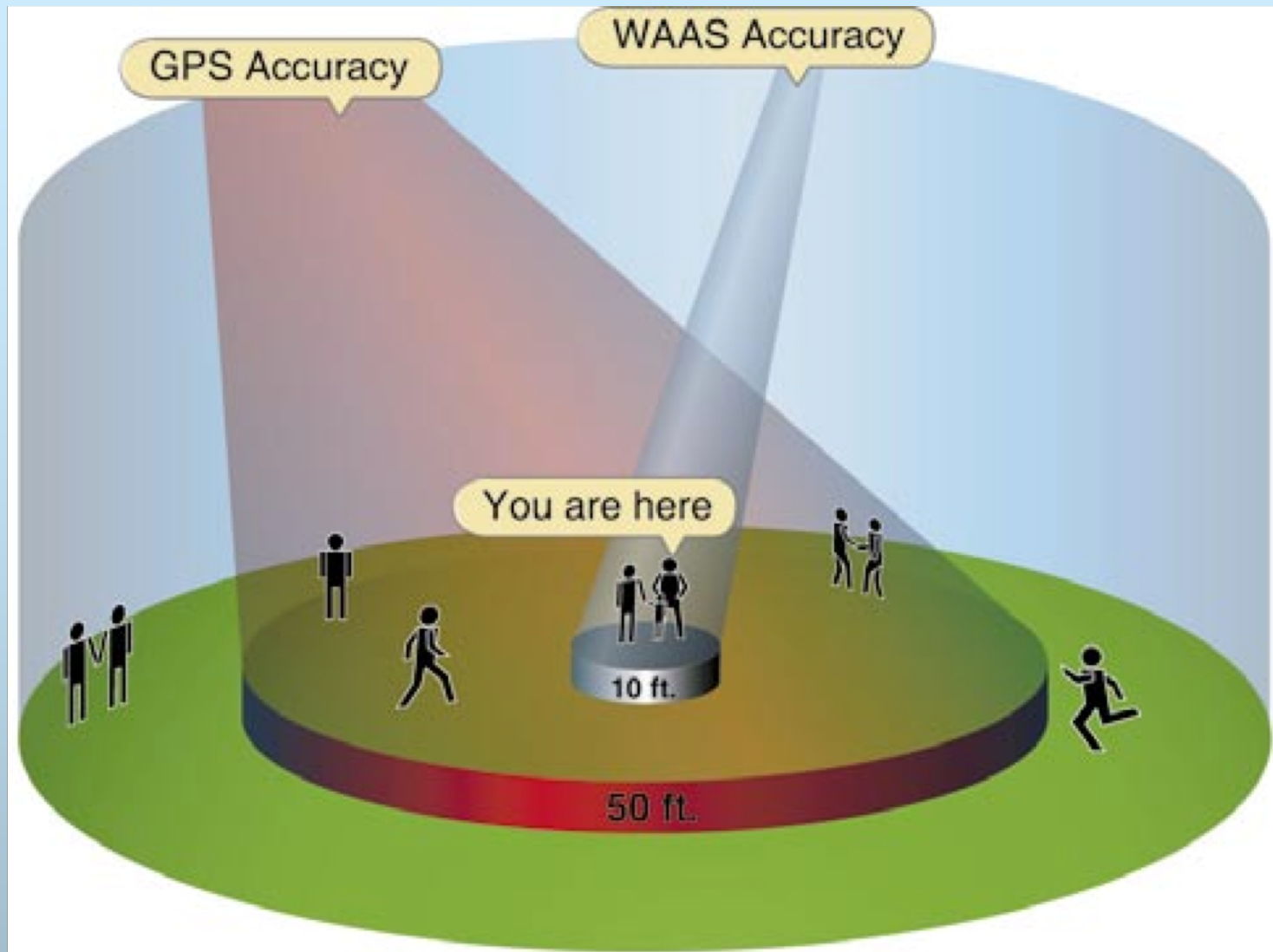
OBS: este serviço deverá ser encerrado até 2020



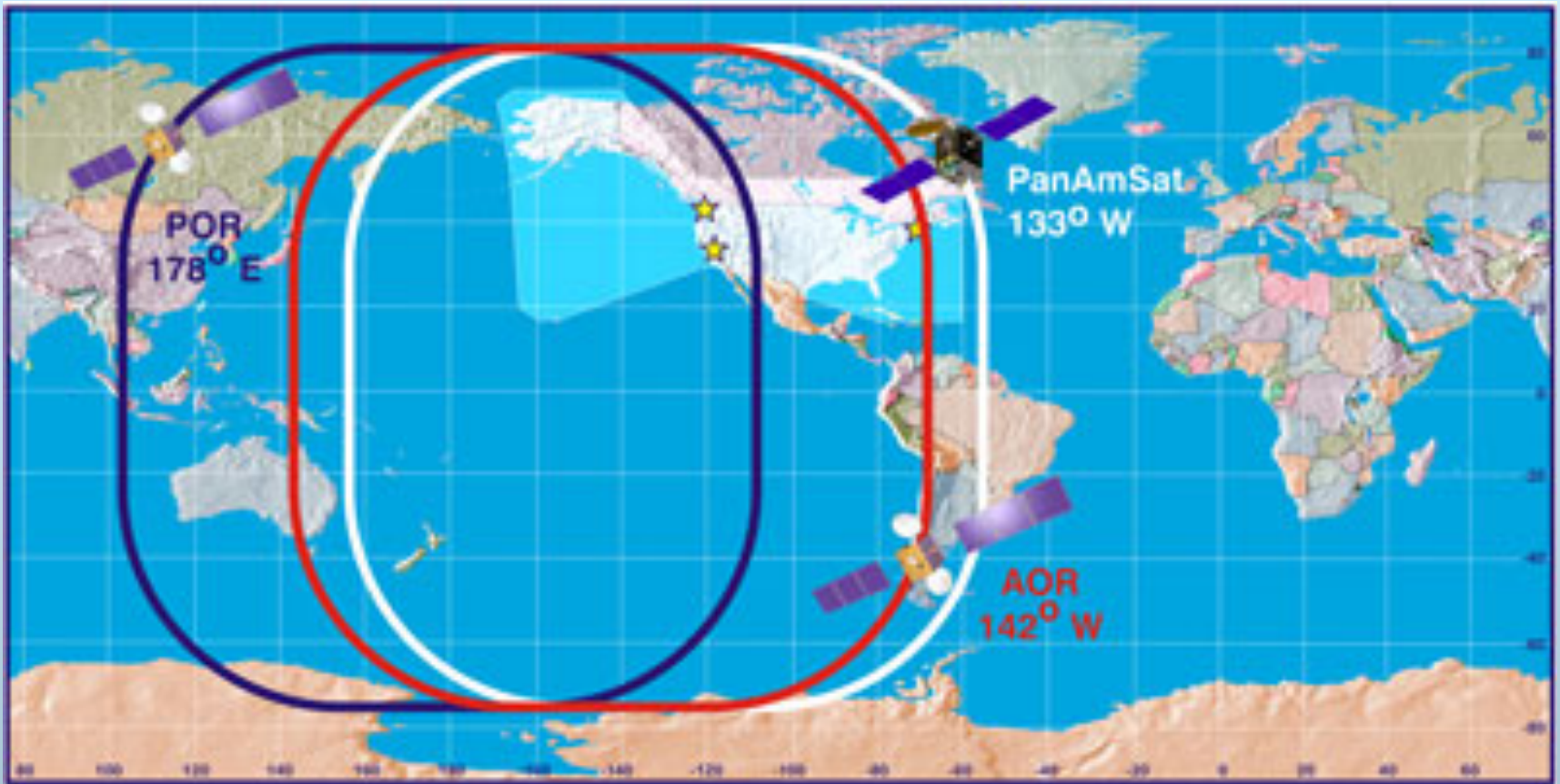
# WAAS - Sistema de aumento GPS – Estados Unidos configuração



# WAAS – Melhoria da acurácia



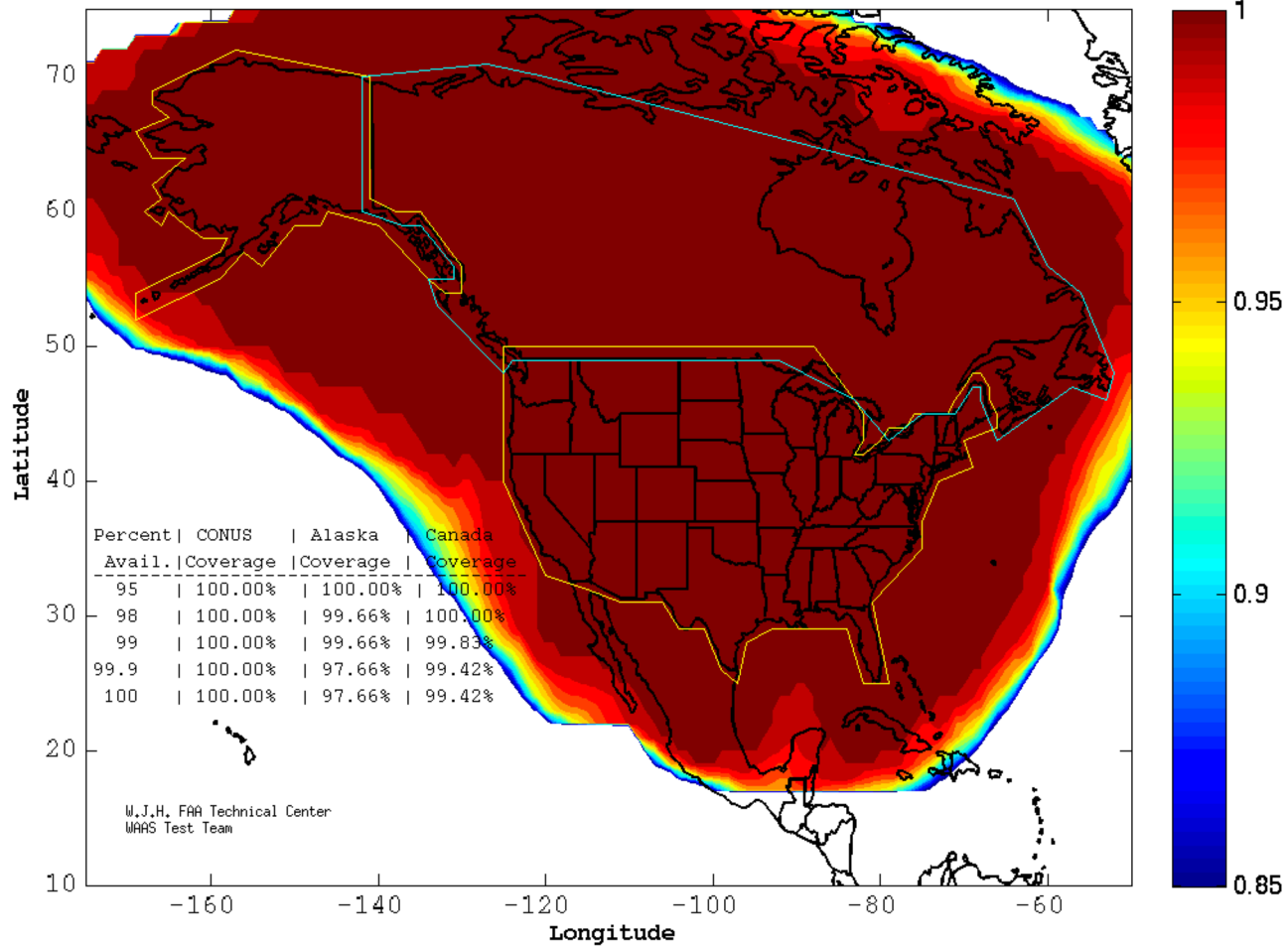
# Cobertura WAAS



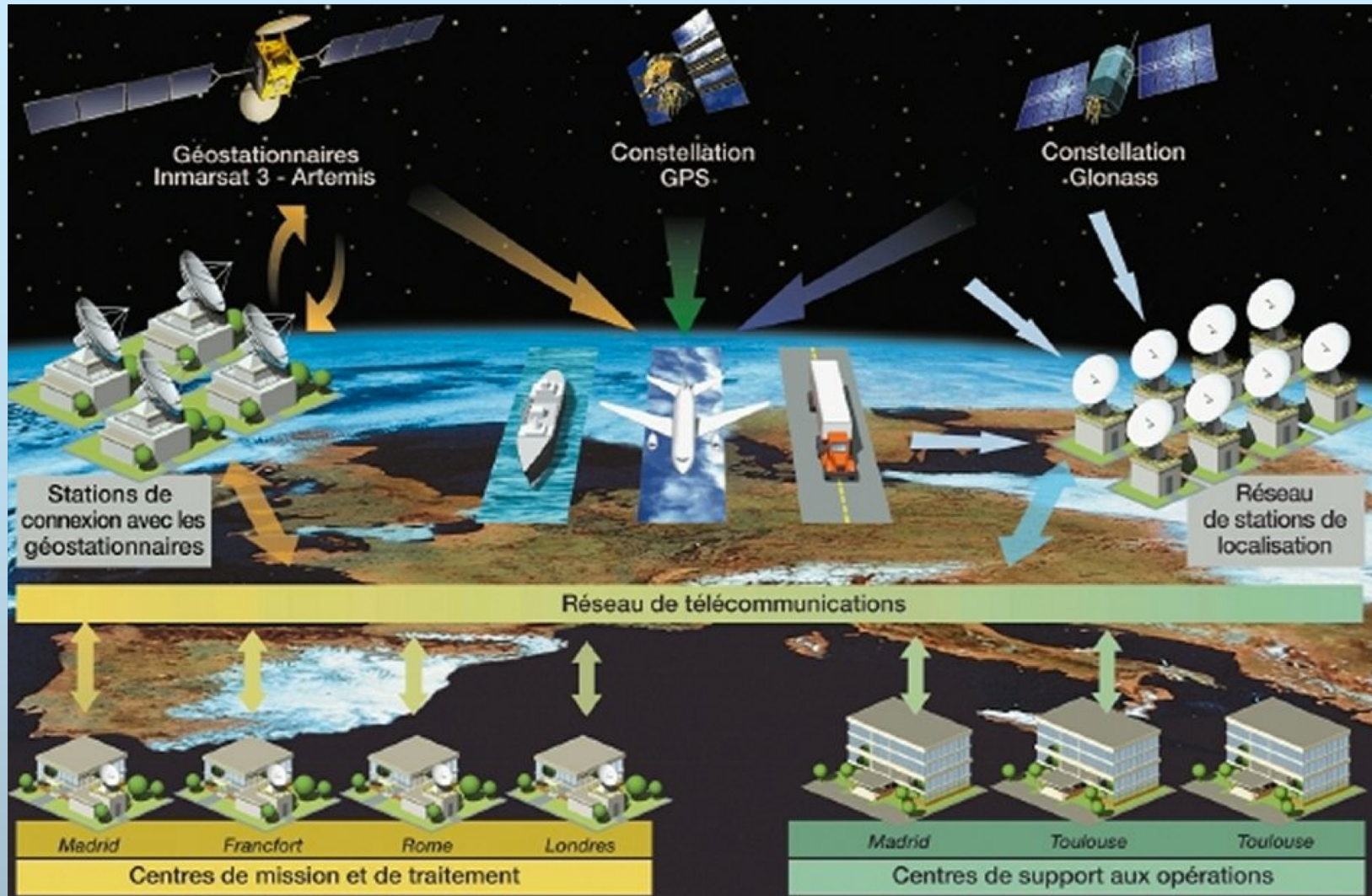


# Estimativa de cobertura (1= 100% e 0,05 = 85%)

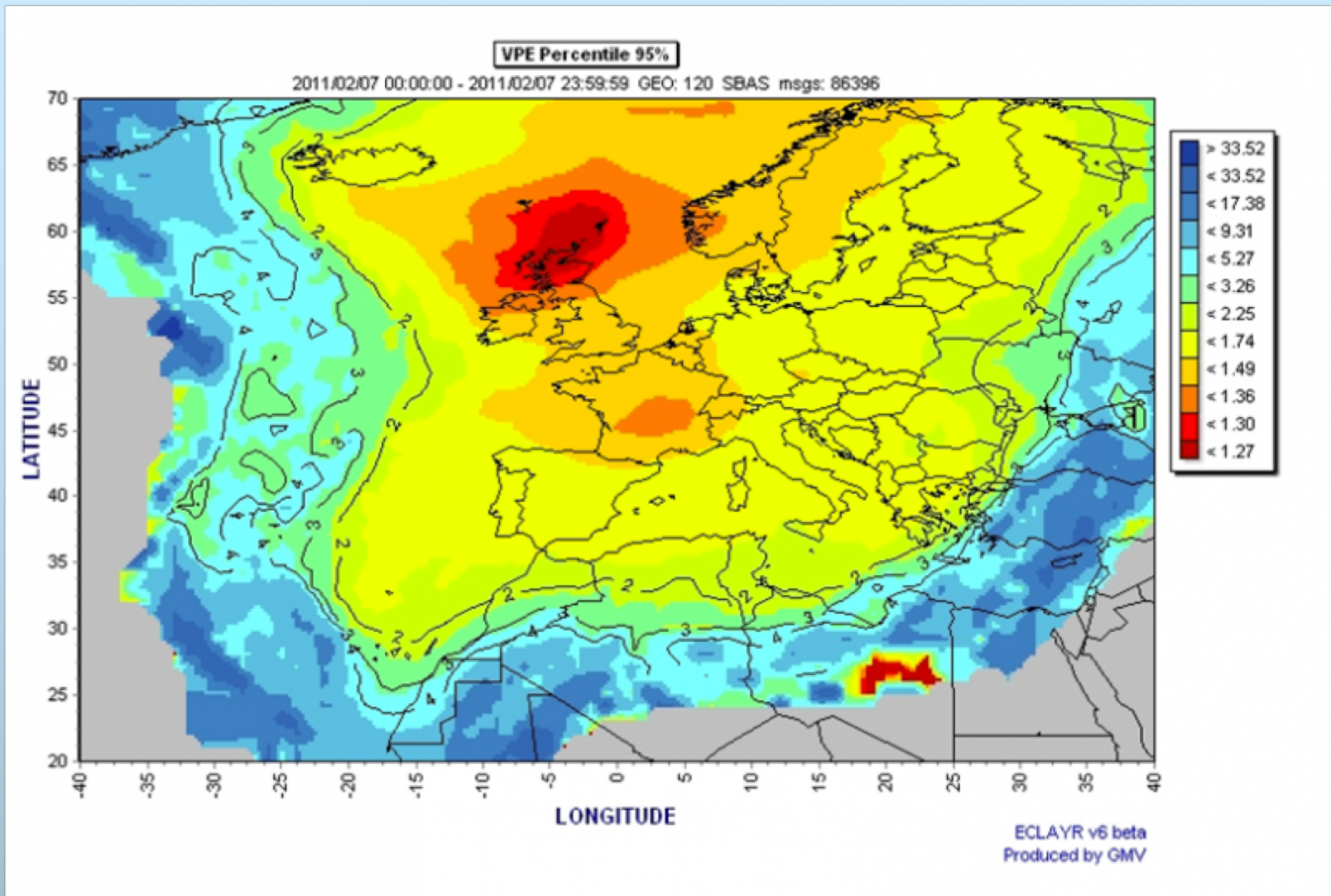
WAAS LPV Coverage Contours  
 04/01/18  
 Week 1995 Day 0



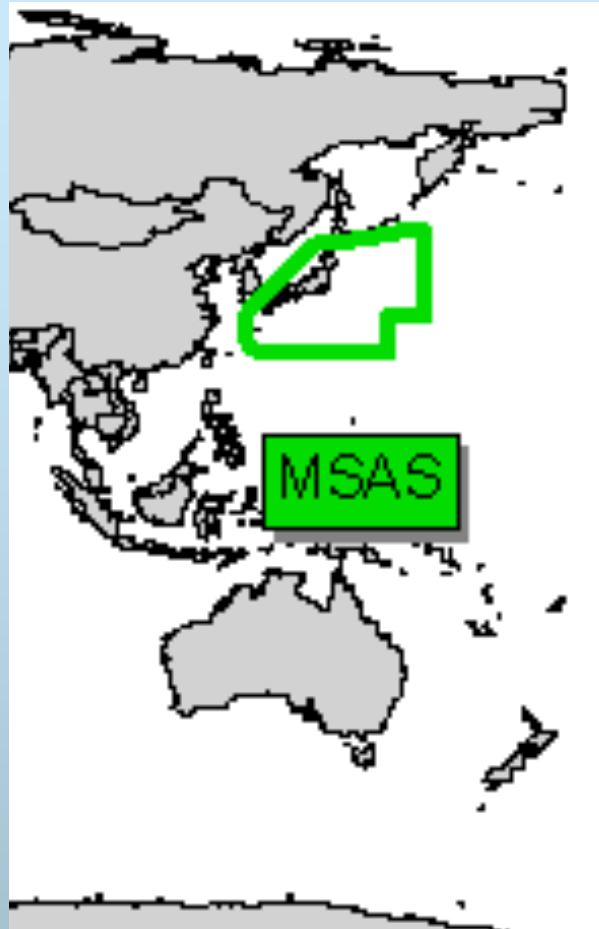
# EGNOS – European Geostationary Navigation Overlay Service – Europa configuração



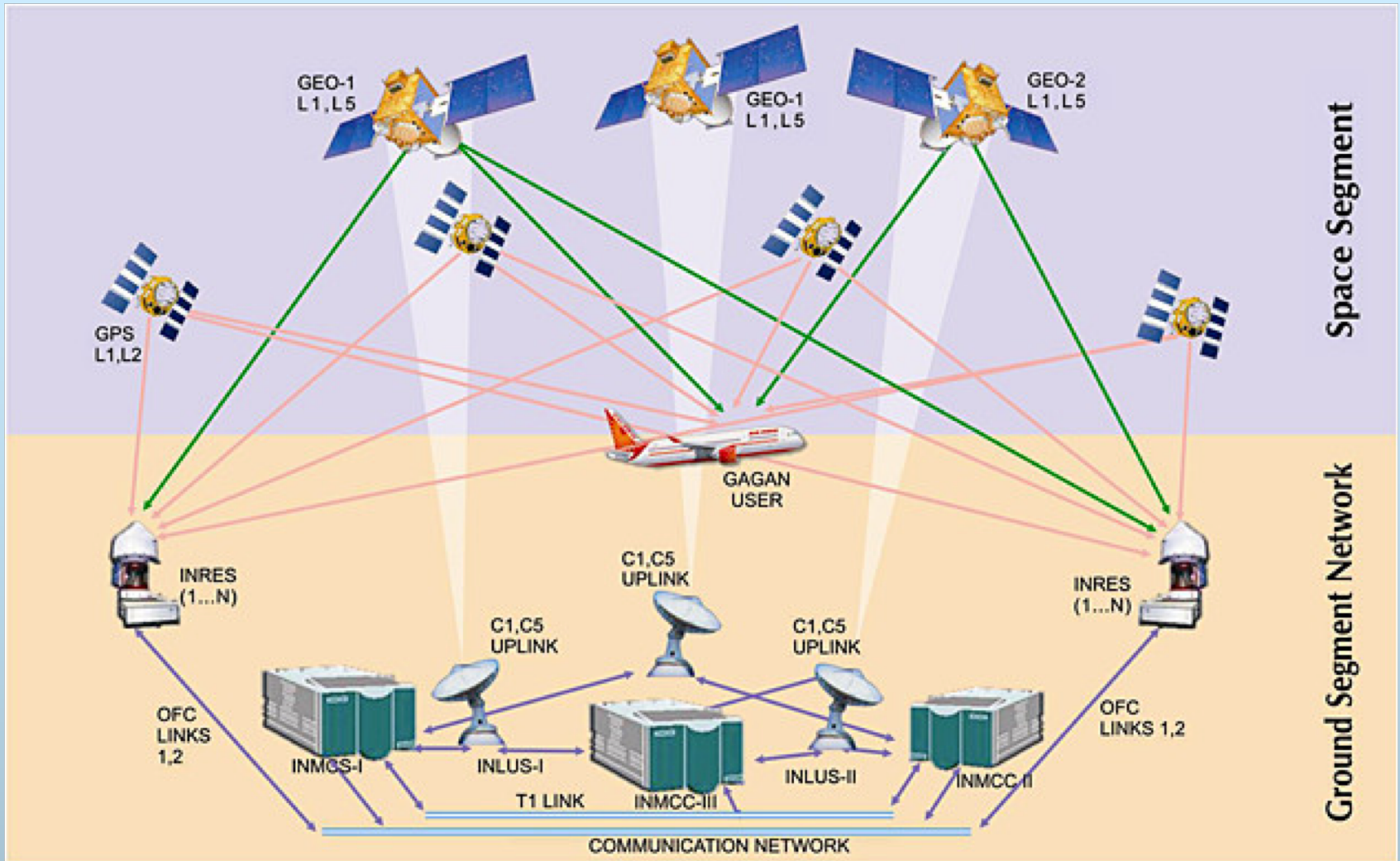
# Acurácia do EGNOS



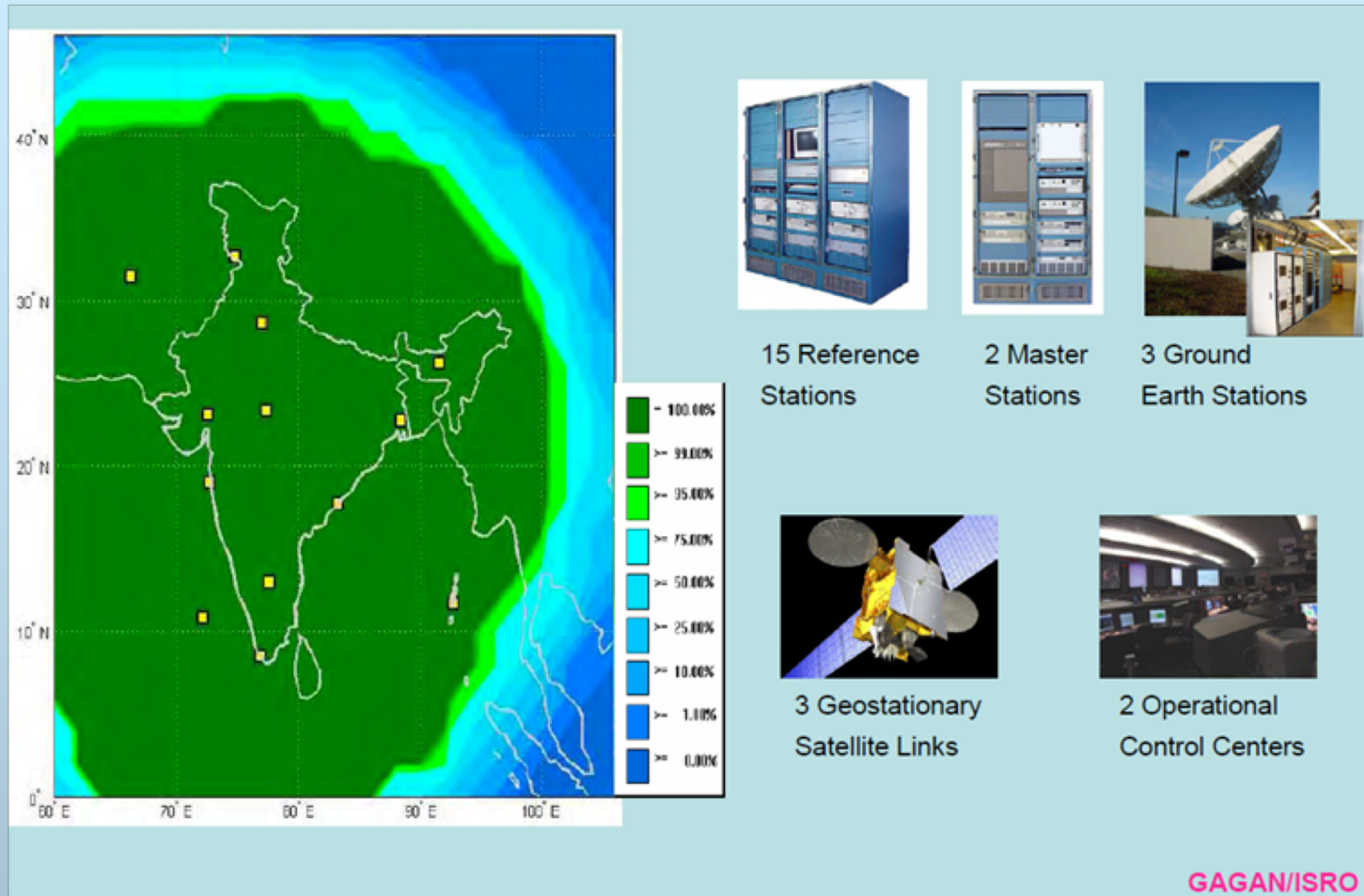
# MSAS – Multi-functional Satellite Augmentation System – Japão



# GAGAN - Configuração



# GAGAN - GPS Aided Geo Augmented – Índia cobertura



# SDCM - System for Differential Corrections and Monitoring - Rússia

## ➤ Reference stations (2008):

1. Moscow (Mendeleevo)
2. Pulkovo
3. Kislovodsk
4. Norilsk
5. Irkutsk
6. Petropavlovsk-Kamchatka
7. Khabarovsk
8. Novosibirsk
9. Gelnzhik

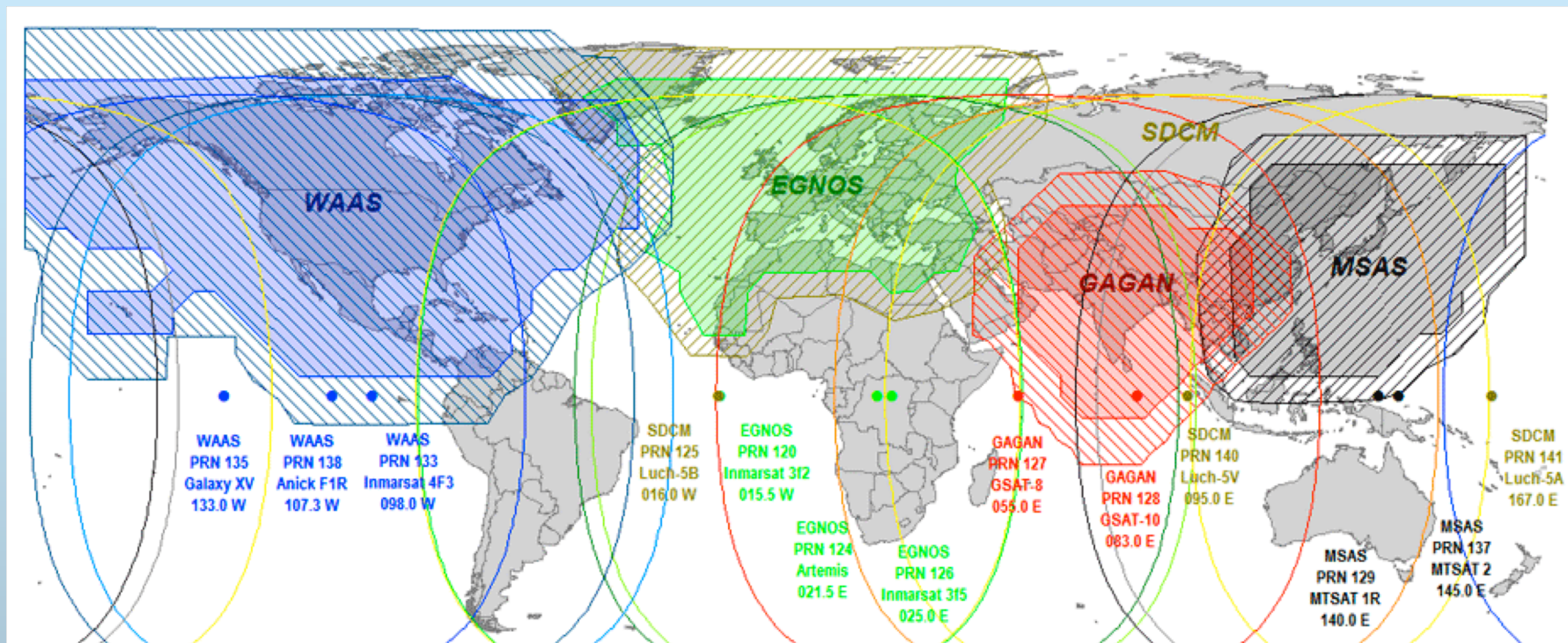
## ➤ Reference stations (further development):

10. Tiksi
11. Bilibino
12. Magadan
13. Yuzhno-Sakhalinsk
14. Yakutsk
15. Vladivostok
16. Sverdlovsk
17. Lovozero
18. Voronezh
19. Pechery

**First part of SDCM  
reference stations network  
was put into the test  
operation in 2007**

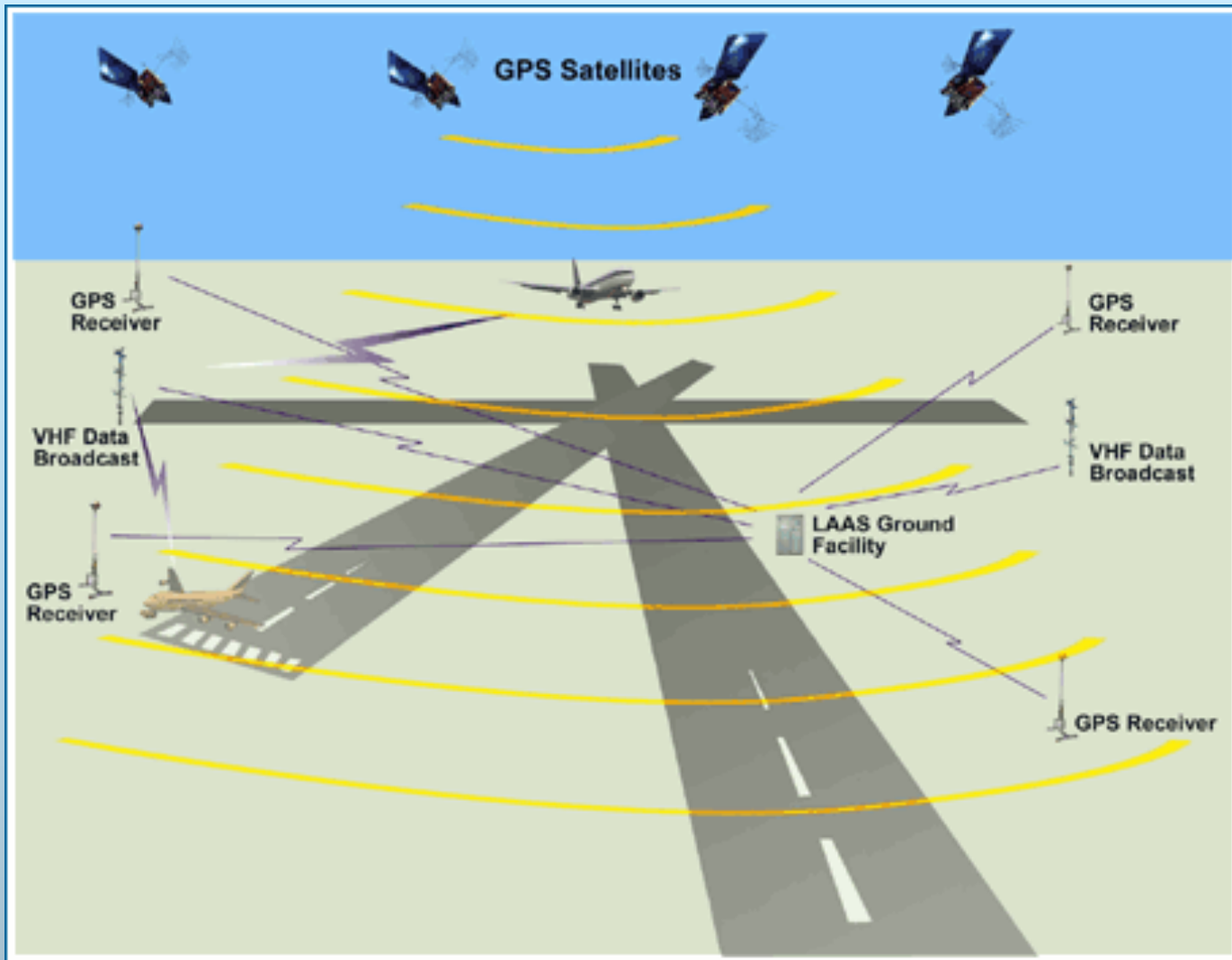


# Cobertura global dos sistemas de augmentação

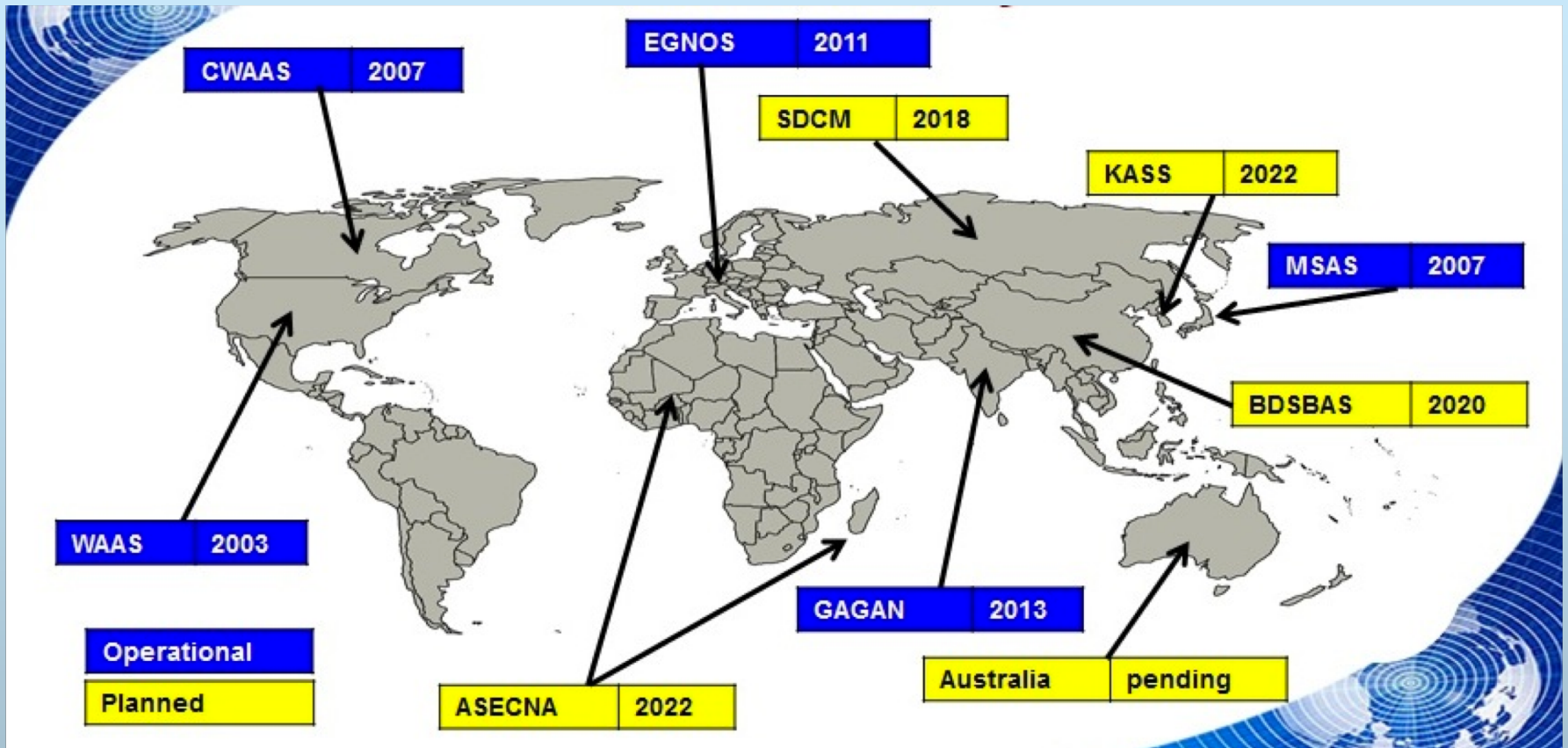




# LAAS - Local Area Augmentation System



# Sistemas de aumento em funcionamento e previsão de implantação de novos sistemas



## Comparação de vários sistemas de radio navegação: acurácia

sistema	95% Acurácia (Lateral / Vertical)	Detalhes
<b>LORAN-C Specification</b>	<b>460 meters / 460 meters</b>	<b>The specified absolute accuracy of the LORAN-C system.</b>
<b>Distance Measuring Equipment (DME) Specification</b>	<b>185 meters / 185 meters</b>	<b>DME is a radionavigation aid that can calculate the distance from an aircraft to ground equipment.</b>
<b>GPS Specification</b>	<b>100 meters / 150 meters</b>	<b>The specified accuracy of the GPS system with the <a href="#">Selective Availability (SA)</a> option turned on. SA was employed by the U.S. Government until May 1, 2000.</b>
<b>LORAN-C Measured Repeatability</b>	<b>50 meters / 50 meters</b>	<b>The U.S. Coast Guard reports "return to position" accuracies of 50 meters in time difference mode.</b>
<b>loran Repeatability</b>	<b>10 meters / 10 meters</b>	<b>Modern LORAN-C receivers, which use all the available signals simultaneously and H-field antennas.</b>

## Comparação de vários sistemas de radio navegação: acurácia

sistema	95% Acurácia (Lateral / Vertical)	Detalhes
<b>Differential GPS (DGPS)</b>	<b>10 meters / 10 meters</b>	<b>This is the <a href="#">Differential GPS (DGPS)</a> worst-case accuracy. According to the 2001 Federal Radionavigation Systems (FRS) report published jointly by the U.S. DOT and <a href="#">Department of Defense (DoD)</a>, accuracy degrades with distance from the facility; it can be &lt; 1 m but will normally be &lt; 10 m.</b>
<b>Wide Area Augmentation System (WAAS) Specification</b>	<b>7.6 meters / 7.6 meters</b>	<b>The worst-case accuracy that the WAAS must provide to be used in precision approaches.</b>
<b>GPS Measured</b>	<b>2.5 meters / 4.7 meters</b>	<b>The actual measured accuracy of the system (excluding receiver errors), with SA turned off, based on the NTSB's findings.</b>
<b>WAAS Measured</b>	<b>0.9 meters / 1.3 meters</b>	<b>The actual measured accuracy of the system (excluding receiver errors), based on the NTSB's findings.</b>
<b>Local Area Augmentation System (LAAS) Specification</b>	<b>1.0 meter / 1.0 meter</b>	<b>The goal of the LAAS program is to provide Category III ILS capability. This allows aircraft to land with zero visibility utilizing 'autoland' systems and indicates a very high accuracy of &lt; 1 m.</b>



Dúvidas ?

Perguntas ?



# Obrigado!

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