

## Action paper NDTECH/24/13/7

## GBAS STATUS

**PROGRESS SINCE THE NDTECH/12 "MATTERS ARISING" REPORT**

Submitted by the Network Manager

EU Regulation: *Network Functions Implementing Rule, Article 7*

**EXECUTIVE SUMMARY**

At NDTECH/12, the "Matters Arising" report noted that no tender relating to GBAS CAT III implementation had been submitted in the case of two successive EU funding opportunities. In the discussion that followed, a number of arguments were presented and it was noted that the non-implementation of GBAS, as part of the long-term strategy to maintain and improve low visibility operations (LVOs), might have adverse effects on the long-term viability of LVOs. On the other hand, a significant increase in GNSS jamming and spoofing raised questions on the use of GNSS-based systems for such critical operations. NDTECH thus considered it necessary to request feedback from expert-level groups to maintain the long-term viability of CAT III landing operations, either through GBAS GAST D or investment in other CAT III technologies.

Two of the expert groups have already started addressing the issue, with others set to follow. Discussions to date have indicated that the issue cannot, however, be solved by technology discussions but is embedded in a greater context, notably as regards the future reliance on GNSS. Policy decisions, such as those relating to the PBN IR, the RP4 requirements and the funding arrangement of certification authorities, have an impact on business case feasibility for all of the parties involved.

These hurdles can only be overcome with a coordinated strategy. The members of NDTECH are asked to support contributions to ongoing activities at expert level and to consider the development of an investment strategy in order to be able to overcome the current certification challenges (which will exist for GBAS or any other precision approach system and may also apply to any future upgrades of ILS).

**RECOMMENDATIONS**

The Network Directors of Technology Working Group is invited to:

- a. **continue** supporting the discussions at technical level;
- b. **consider** how long-term investments in maintaining future precision- and low-visibility approach capabilities can be justified;
- c. **consider** adding a related work item to the CNS Programme Manager's long-term work programme.



2.3. During the discussion, the following points of importance were raised:

- GBAS implementation is not faltering because there is no need for GBAS capability but because of the inability to reconcile short-term business case needs with the strategic dimension of such a decision.
- It was emphasised that there is an operational need for GBAS in order to support Category III LVOs.
- The issue is compounded by the dramatic increase in GNSS interference, which refocuses ANSP and airport attention on non-GNSS nav aids.
- None of the discussion participants suggested that pure reliance on ILS would suffice to cover long-term LVO needs. All of the participants advocated for the availability of ILS and GBAS; alternative systems were not suggested. It was made clear that the MLS option is not feasible anymore since the remaining frequencies will no longer support widespread deployment.
- One crucial point is the cost of ground system certification, traditionally covered in part by the certification authority and in part by the industrial applicant but recently transferred principally to the applicant. This creates a significant investment risk for systems targeting a small market.
- It was suggested that coordinated implementation and financial support to overcome the initial business case challenges, especially with regard to the certification process, would be one way forward.
- Even if the challenges associated with GBAS are overcome and GBAS is implemented on a wider scale, it will likely not be possible to completely phase out ILS. Therefore, it will be necessary to revise any strategies considered in the past which aimed for a complete transition. An appropriate balance would need to be found between widespread CAT III capable GBAS implementation, supported by a complementary network of ILS. This balance also implies a new working environment for ATC, with mixed-mode operations (RNP/GLS/ILS) becoming the norm rather than the exception.

### **3. DISCUSSIONS AT THE EASPG RWGAO/04 MEETING (23-24 APRIL 2024)**

- 3.1. The Regional Working Group on Aerodrome Operations (RWGAO) addressed the implementation status of GBAS in two information papers (IPs) and the issues related to maintaining CAT III capability in a working paper (WP).
- 3.2. The EUROCONTROL IP and WP provided the same information as listed in Attachment 1; with more additional background information, as the topic had not been discussed in similar depth before.
- 3.3. ENAIRE provided an IP with strong support for GBAS implementation, noting especially its complementary functions to ILS, its operational advantages and the growing need among airlines to maintain schedule resilience. These arguments were also provided to the NSG post-meeting.

- 3.4. The discussion addressed topics similar to those addressed by the NSG, with the additional concern that the start of the fourth EU-wide reference period 4 (RP4) would place additional financial constraints on ANSPs, requiring a focus on a short-term efficiency increase rather than long-term investment decisions, thus complicating GBAS investment.
- 3.5. The RWGAO decided to create a task force to address this topic, with the additional objective of addressing whether the increasing amount of GNSS interference would require a review of the policy for regional air navigation plans to transition to GNSS-based operations. This task force will report to the EASPG at the end of 2024.

#### **4. CONCLUSIONS AND RECOMMENDATIONS**

- 4.1. Two of the expert groups have already started addressing the issue, with others set to follow. The issue cannot, however, be solved by technology discussions but is embedded in a greater context, notably as regards the future reliance on GNSS. Policy decisions, such as those relating to the PBN IR, the RP4 requirements and the funding arrangement of certification authorities, have an impact on business case feasibility for all of the parties involved.
- 4.2. These hurdles can only be overcome with a coordinated strategy.
- 4.3. Members of NDTECH are asked to:
  - note the information provided and to continue contributing to ongoing activities at expert level, with results expected towards the end of 2024;
  - consider the development of an investment strategy in order to be able to overcome the current certification challenges (which will exist for GBAS or any other precision approach system and may also apply to any future upgrades of ILS).

Slides presented at the NSG/37 meeting:

Supporting European Aviation

# LATO and GBAS Status for NSG 37 Strategy and Way Forward?

Andreas Lipp  
GBAS and [All Weather Operations](#)  
05/04/2024



## GBAS Implementation Dashboard



### GAST C

- Ground stations (3 operational installations in Europe - 0,6% of PA airports)
  - Operational: Minneapolis, JFK + LGA progressing, Bremen withdrawn
  - Research: no change
  - Plans/Projects: no change
- Aircraft: (Europe: 13% of flights, 11% of aircraft, at some airports >70% of arrivals capable)
  - Boeing – about 75% of orders where GBAS optional, 100% on others
  - Airbus – about 25% of orders activated, all new aircraft pre-equipped

### GAST D

- Ground stations: none, Plans/Projects: none
- Aircraft: B777-9 by entry into service

### DFMC GBAS (GAST E)

- GAST D+ (MC) -> DFMC (E) prototype at LFPY (EUROCONTROL)
- Data collection in [Tenerife Norte](#)
- Other prototypes in Barcelona, Japan, Russia, China

## LATO and I-GWG Meetings in 2024



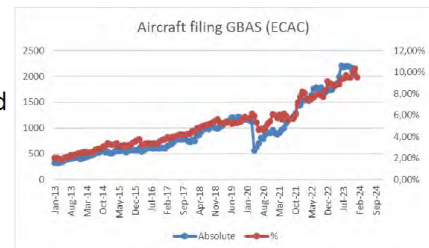
- I-GWG/23 as in-person meeting at Frankfurt Airport Conference centre **4-7 June 2024** on invitation from Fraport and DFS
  - 4 days, for the moment <20 registrations, no current Agenda contributions outside organisers
- LATO/38 (Fall 2024) - to be discussed
  - Is there a need? (GBAS discussed at EDGAR and EUROCAE WG28)
  - What PA/TO topics are requested from stakeholders?
  - What should LATO be concentrating on?
- GBAS Training course
  - ALC (ex- IANS); Next on-site course 24-28 June 2024

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## Current status of GBAS implementation in Europe



- Approximately **11%** of aircraft equipped and operational
- These aircraft perform >13% of all ECAC arrivals
- Approximately **0.6%** of precision approach airports equipped and operational (3 of 484 PA airports)



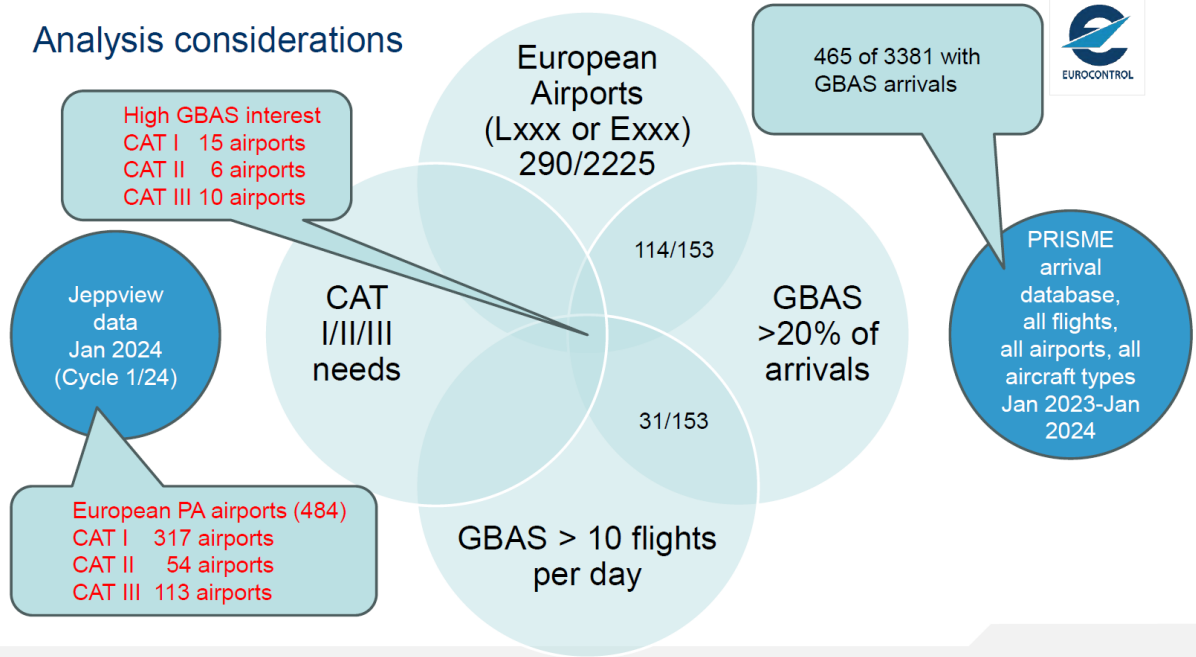
### Why the difference?

- LSSIP+ process, NAV 11.1 objective: "Implementation of GBAS CAT II based on GAST C":
  - XXX reviewed the objective, but since there is no intention to implement GBAS, no action is required on behalf of XXX.
  - XXX has reviewed the implementation objective but there is no intention to implement it because it is not justified in terms of operational needs.
  - Currently no plans to install GBAS GAST C CATII ground equipment on existing airports.
  - No local needs. Not Applicable
  - No environmental or procedural needs for such a system at any XXX airport.
  - The objective is not applicable for XXX as there are no CAT II approaches in XXX airports. ...

=> ANSP's uninterested, why? - Analysis needed!

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### Analysis considerations



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### Will the PBN IR change the situation?

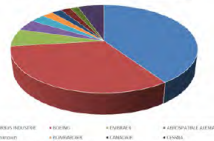
Airport Code	Airport Name	GBAS /day	LPV/day	# GBAS	# LPV	Total # Flights	% GBAS	LPV%	CAT
LTFM	iGA Istanbul	242	7	95733	2938	271336	35,28%	1,08%	III
LPPT	Lisbon	90	7	35462	2762	121633	29,15%	2,27%	III
LIME	Bergamo	72	1	28407	461	55042	51,61%	0,84%	III
EGSS	London Stansted	60	8	23584	3185	104618	22,54%	3,04%	III
LIPE	Bologna	35	12	13837	4584	41830	33,08%	10,96%	III
EPKK	Krakow	31	2	12258	877	35450	34,58%	2,47%	I
LICC	Catania	31	4	12234	1568	39498	30,97%	3,97%	I
LHBP	Budapest	30	9	12023	3591	57980	20,74%	6,19%	III
LICJ	Palermo	30	4	11931	1601	31500	37,88%	5,08%	I
LIRN	Naples	26	10	10124	4069	47743	21,21%	8,52%	I
LIBD	Bari	25	4	9768	1731	24693	39,56%	7,01%	I
LMML	Malta	23	6	9145	2412	31643	28,90%	7,62%	I
EPMO	Warsaw Modlin	22	1	8580	548	11438	75,01%	4,79%	II
LIRP	Pisa	21	5	8176	2103	21677	37,72%	9,70%	II
LFOB	Beauvais	19	1	7657	336	18736	40,87%	1,79%	III
ENBO	Bodo	19	6	7521	2369	20369	36,92%	11,63%	I
LIEE	Cagliari	18	2	7142	737	18968	37,65%	3,89%	I
LIRA	Rome Ciampino	18	13	7059	5116	22340	31,60%	22,90%	I
EBCI	Charleroi	18	6	6940	2184	32575	21,30%	6,70%	III
EPGD	Gdansk	17	3	6628	1093	24388	27,18%	4,48%	III
ENTC	Tromso	14	10	5392	3816	21198	25,44%	18,00%	I
EPWR	Wroclaw	14	2	5354	861	16772	31,92%	5,13%	II
LIMF	Turin	13	6	5334	2353	20477	26,05%	11,49%	III
LIBR	Brindisi	13	4	5255	1521	12350	42,55%	12,32%	I
EPKT	Katowice	13	2	4986	707	21992	22,67%	3,21%	II
LIPH	Treviso	12	1	4886	550	10783	45,31%	5,10%	II
EHEH	Eindhoven	12	2	4679	738	23042	20,31%	3,20%	I
EPPO	Poznan Lawica	11	3	4261	1282	13473	31,63%	9,52%	II
LTAf	Adana	10	1	4116	240	16589	24,81%	1,45%	I
LPMA	Madeira	10	1	3988	457	16883	23,62%	2,71%	I
LICA	Lamezia Terme	10	1	3986	430	11120	35,85%	3,87%	I

- Unlikely, as both GBAS and LPV are principally forward-fit (< 3% increase/year)



- They are both subject to the same GNSS interference issues
- Airbus and Boeing have the greatest share of traffic – they offer both as package

Arrivals by Manufacturer (above 25) - October 2023



[Three more detailed slides omitted here – main content is in the above slide]



## Analysis conclusions

- At some airports in Europe, GBAS CAT I/II - capable aircraft provide over 50% and up to 70% of traffic today. This trend will continue with about 2%/year increase.
- At least 31 airports in Europe have over 20% of GBAS-capable traffic today, several of these risk increased minima for a significant part of the current traffic from 2030 due to PBN IR (in about 6 years – a GBAS investment decision takes about 4-5 years until full operational state)
- The LSSIP+ process seems unable to raise suitable awareness or incite ANSP interest
- GBAS CAT III is ready for implementation, but lacks funding for initial installations and subventions are unlikely after two failed calls for proposals

### Question:

Aviation has spent 25 years developing GBAS, with a number of capabilities not available for other systems:

- SBAS (CAT II/III, Autoland, guided T/O, availability/continuity for high density operations, local monitoring, implementation in island locations, FAS flexibility outside AIRAC cycle),
- ILS (technical integrity guarantees, runway independent protection areas, multiple, noise efficient approach paths even in LVO, increased capture window, increased coverage area, less manual ATC intervention).
- **Why are these not embraced by ANSP's, even if aircraft are equipped?**

=> strong risk of GBAS following MLS fate

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## Initial arguments provided against GBAS implementation:

- **GNSS interference is a growing concern**
  - How much of the interference is observed below FL100 (GBAS coverage area) and would a (GBAS) ground monitor improve awareness?
- **Civil-military joint airports cannot be asked for investments**
  - GBAS is used on A400M and a growing number of military UAS, cited in NATO groups, proven for more rapid deployment than ILS, Marine JPALS is deployed
- **Effort is concentrated on PBN-IR compliance**
  - If PA updates are postponed relative to PBN approaches, what PA options are still available to ANSPs beyond 2030? Do they fulfil ANSP' needs?
- **ILS is required to be maintained due to GNSS vulnerability**
  - Does this reduce the need for safer and more noise/fuel efficient approaches in LVO?
  - Is LVO capacity still an issue (ICAO EUR DOC 013 section 8, DOC 040) ?
- **ILS is required due to lack of GBAS equipage**
  - An unavoidable problem in all transition phases – but a decreasing one as shown
- **Others?**

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## NSG Discussion

In a time horizon of 15-20 years (2040+) are NSG members satisfied with the existing ILS and SBAS (PBN-IR) combination for all precision approach and guided take-off purposes at all European aerodromes?

- If yes, what should LATO TF cover to ensure ILS operations and/or further development (PBN being covered in NSG directly)?
  - NSG working group to adjust LATO ToR's or integrate in infrastructure day?
  - Definition of ILS R+D, training, implementation support needs for continued viability ?
- If no, should LATO:
  1. Continue with (non-financial) GBAS support and which areas?
  2. Investigate other PA systems? Which?
- If no agreement, create NSG task to provide:
  - What is missing for ANSP's to develop and implement a future CAT II/III capability, allowing improved airport access and landside development, including robustness and cybersecurity?
  - What concrete work programme will achieve this task cooperatively between all aviation stakeholder?