



NATIONAL GNSS RFI MITIGATION PLAN

- STATUS
- WAY AHEAD

NORDIC INSTITUTE OF NAVIGATION - AVIATION WORKSHOP
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Checklists from ICAO GNSS RFI Mitigation Plan

Preventive Measure Checklist

1. Possession of a jamming device is illegal
2. Personal location privacy provisions are acceptable for citizens
3. Market survey and control mechanisms are in place
4. Devices with associated RFI risks are carefully controlled (outdoor pseudolites, repeaters or boosters). Installations are independently verified for compliance to international standards.
5. Agreements for reactive mitigation actions are in place and tested
6. Contact points for RFI between ANSP, airports, telecom regulator, as necessary, are established
7. Mitigation plans are in place

Reactive Measure Checklist

1. Measurement capabilities exist for all potentially required monitoring tasks
2. Airports monitor for RFI at critical points within or near airport perimeter
3. Capabilities to locate and identify RFI sources are in place
4. Capabilities to stop RFI (law enforcement) are in place
5. Alternate navigation capabilities and operational procedures are available to safely deal with GNSS area outages
6. Mechanisms to generate a NOTAM, if necessary, are clear for all relevant actors
7. All involved personnel are trained to recognize and/or deal with RFI events if appropriate

Preventive Measure Checklist - Status

1. Possession of a jamming device is illegal

YES: According to the Ecom Act §8-1 importation, possession, sale and use of jamming devices is illegal in Norway

Preventive Measure Checklist - Status

2. Personal location privacy provisions are acceptable for citizens

Responsible authorities:

- Norwegian Data Protection Authority (Datatilsynet)
- Privacy Appeals Board (Personvernemnda)

Relevant legislation:

- The Working Environment Act (Arbeidsmiljøloven) Chapter 9 on Control measures in the undertaking.
- The Personal Data Act (personopplysningsloven)

Preventive Measure Checklist - Status

3. Market survey and control mechanisms are in place

Market survey:

Market survey refers to analysis and overview of mechanisms in society that facilitate or motivate GNSS RFI and jamming, how widespread this is and future trends, and on the other hand what control mechanisms could be effective.

Examples:

- The Data Protection Authority has identified two main objectives for GPS monitoring of company vehicles/drivers, and comprehensive privacy provisions guidance material is posted on their homepage:

Electronic travel log –for a convenient (but not required) way of achieving documentation for payroll tax.

Fleet tracking –for logistics ,rationalization, safety etc

- I have found no facts on applications like road tolling systems based on GNSS, insurance companies charging fees by the distance driven, etc.

- In an article from 2014 the Police had no information about GPS jamming to avoid tracking of the theft, or of criminals on parole subject to geo-fencing, wearing a GPS-enabled ankle bracelet.

Control mechanisms:

Ecom Act §6.2: Authorization to transmit within a frequency band. Individual decision (mostly authorities, concrete evaluation of each case).

Other built-in control mechanisms in society – To be assessed at state level

Preventive Measure Checklist - Status

4. Devices with associated RFI risks are carefully controlled (outdoor pseudolites, repeaters or boosters). Installations are independently verified for compliance to international standards.

Pseudolites: Authorization from Nkom is required for use of this equipment.

Repeaters or boosters: An individual authorization to transmit within the frequency band is required.

Installations are independently verified by random controls and in case of RFI complaints or errors being reported.

Preventive Measure Checklist - Status

5. Agreements for reactive mitigation actions are in place and tested

This concerns different interfaces between Airspace users, ANSP, Airports and Nkom.

Some reactive mitigation actions are in place.

Avinor may for instance notify Nkom in case of RFI, and Nkom will arrive to locate and identify RFI sources

However the need of formal agreements must be assessed. This will be a part of the work with the National RFI Mitigation Plan for Air Navigation Services.

Preventive Measure Checklist - Status

6. Contact points for RFI between ANSP, airports, telecom regulator, as necessary, are established

No - formal Contact points for RFI are not yet established, but will be a part of the National RFI Mitigation Plan for Air Navigation Services.

However contact points for working with the RFI Mitigation Plan itself are indeed established

Preventive Measure Checklist - Status

7. Mitigation plans are in place

Avinor representing both Airports and ANSP has decided to produce a local GNSS RFI Mitigation Plan for the Air Navigation Services in line with the ICAO GNSS RFI Mitigation Plan

The telecom regulator Nkom sees this as a common interest and will contribute.

Preventive Measure Checklist - Status

Possession of a jamming device is illegal	Yes
Personal location privacy provisions are acceptable for citizens	Quite
Market survey and control mechanisms are in place	May be improved
Devices with associated RFI risks are carefully controlled (outdoor pseudolites, repeaters or boosters). Installations are independently verified for compliance to international standards.	Could be even more strict
Agreements for reactive mitigation actions are in place and tested	Planned
Contact points for RFI between ANSP, airports, telecom regulator, as necessary, are established	Planned
Mitigation plans are in place	Planned

Reactive Measure Checklist - Status

1. Measurement capabilities exist for all potentially required monitoring tasks

Some clarifications remains to be done. In general:

Avinor monitors the airports and the Air Navigation Services

Nkom has the equipment and the law enforcement to detect, localise, identify and stop RFI sources

Reactive Measure Checklist - Status

2. Airports monitor for RFI at critical points within or near airport perimeter

Avinor is preparing for monitoring and logging of RFI at airports and will identify critical points based on risk assessments.

Reactive Measure Checklist - Status

3. Capabilities to locate and identify RFI sources are in place

Nkom has the capability to locate and identify RFI sources.

Avinor plan to assess the local preparedness at each local airport based on a risk assessment.

Reactive Measure Checklist - Status

4. Capabilities to stop RFI (law enforcement) are in place

Yes.

Nkom has the legal authority to stop RFI under the provisions of the Ecom Act.

Under inspection Nkom may also be assisted by other authorities like the Police.

Reactive Measure Checklist - Status

5. Alternate navigation capabilities and operational procedures are available to safely deal with GNSS area outages

Today alternative navigation capabilities are still available at all approaches and routes - except for the approach to Namsos where an alternate airport is used in case of a GNSS outage.

Reactive Measure Checklist - Status

6. Mechanisms to generate a NOTAM, if necessary, are clear for all relevant actors

The general mechanisms to generate a NOTAM are clear.

Avinor will further assess the existing routines for RFI warning.

This will be a part of the work with the National RFI Mitigation Plan for Air Navigation Services.

Reactive Measure Checklist - Status

7. All involved personnel are trained to recognize and/or deal with RFI events if appropriate

This concerns internal Avinor routines, as well as different interfaces between Airspace users, ANSP, Airports and Nkom.

The implementation and training issue will be further assessed as part of the work with the National RFI Mitigation Plan for Air Navigation Services.

Reactive Measure Checklist - Status

Measurement capabilities exist for all potentially required monitoring tasks	Yes / To be assessed
Airports monitor for RFI at critical points within or near airport perimeter	Planned
Capabilities to locate and identify RFI sources are in place	Yes / To be assessed
Capabilities to stop RFI (law enforcement) are in place	Yes
Alternate navigation capabilities and operational procedures are available to safely deal with GNSS area outages	Yes
Mechanisms to generate a NOTAM, if necessary, are clear for all relevant actors	Yes / To be assessed
All involved personnel are trained to recognize and/or deal with RFI events if appropriate	To be improved

The way ahead

– local GNSS RFI Mitigation Plan for Air Navigation Services

Avinor representing both Airports and ANSP has decided to produce a local GNSS RFI Mitigation Plan in line with the ICAO GNSS RFI Mitigation Plan

The telecom regulator Nkom sees this as a common interest and will contribute

First steps - Avinor:

1. Assess the level of mitigation actions like *required monitoring tasks* and identify *critical points within or near airport perimeter* by local risk assessments (RFI threat and impact)
2. Establish equipment and organization for GNSS RFI monitoring (statistics logging and alerts) at airports
3. Develop procedures for handling RFI events in coordination with Nkom and Airspace Users
4. Develop procedures for defining no-fly zones in case of Military Testing

The way ahead

– GNSS as a national critical infrastructure to benefit all users

Some of the actions on the ICAO Checklists are state level tasks and beyond the influence of the aviation community alone.

A Task Force representing a range of relevant Norwegian authorities and user segments could be suitable for addressing the more coordinated protection actions that benefit all users

First steps :

1. Designate GNSS as a national critical infrastructure
2. State level assessment of personal location privacy provisions and legislation, anti jamming legislation, market survey and trend forecasts, society mechanisms controlling motivation and opportunity to GNSS jamming, law enforcement, etc
3. A working group is being established by the Norwegian Space Centre that potentially could attend to these state level issues.