Laser Safety in Ny-Ålesund: Aircraft Avoidance System (AAS)

Norwegian Mapping Authority

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Ny-Ålesund is a very small research community located on the Spitsbergen island on Svalbard. By law the whole city shall have complete radio silence. This makes it impossible for NMA to use a radar for aircraft identification as the other SGSLR stations will do. NMA must therefore develop a system for aircraft detection and avoidance which meets the requirements of NASA, The Norwegian Civil Aviation Authority, The Governor of Svalbard and NMA.
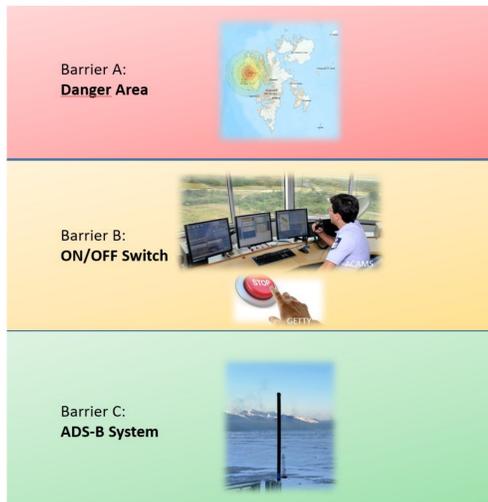
System Overview

Figure 1: AAS Barrier Overview.

The AAS consists of three barriers:

Barrier A: A danger area including the whole operation area of the laser (10 to 90 deg) from altitudes 0 to 66 000 ft.

Barrier B: A manual switch system.

Barrier C: An automatic, ADS-B based switch system.

Barrier A: Danger Area
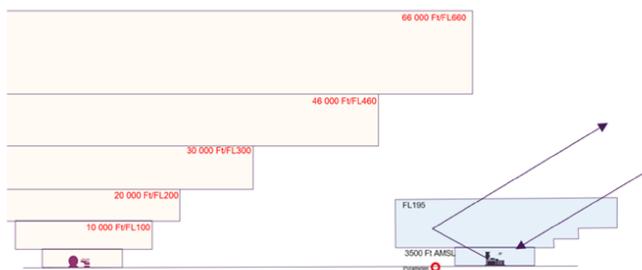
Figure 2: Danger area side view. Source: Norwgian Civil Aviation Authority

The first barrier of the AAS is a danger area that will be published by the Norwegian Civil Aviation Authority. Planes may still fly into this area, but it will be at their own risk. Figure 2 shows how the danger area is built up of layers. The layers are made to match the 10 degree minimum elevation of the SGSLR so that the whole operation area of the laser is covered by a published danger area all the way from 0 to 66 000 ft altitude. The map of Svalbard in figure 3 shows the same layers as figure 2.
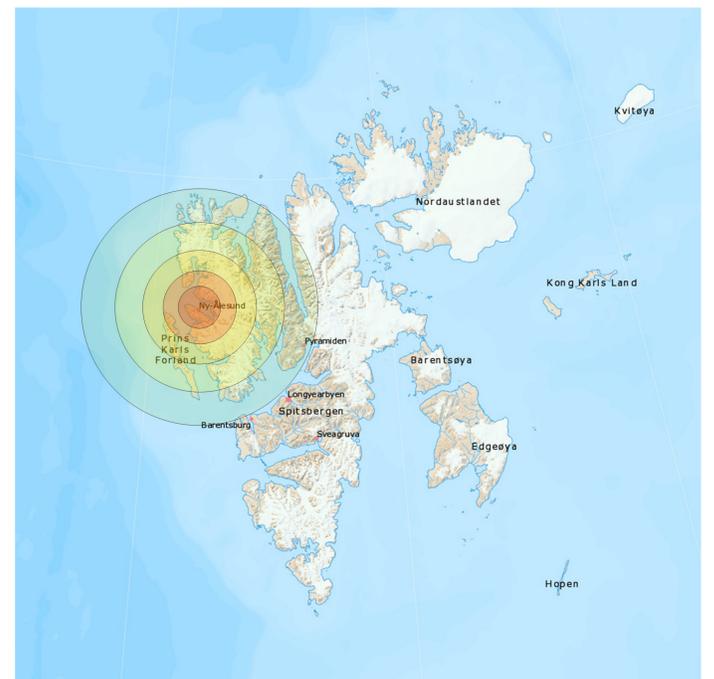

Figure 3: Map showing the danger area. Source: NMA and NPI

Barrier B: Switch System
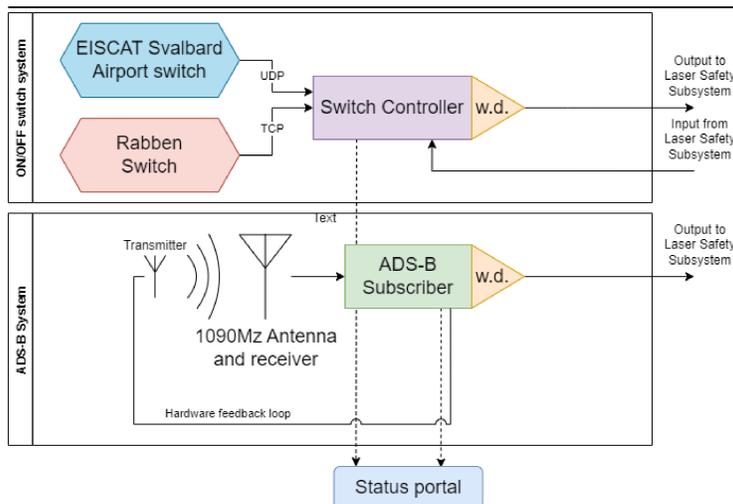
Figure 4: System overview.

- On/off switch in the Svalbard Airport Tower in Longyearbyen. Encrypted UDP communication to Ny-Ålesund.
- Portable on/off switch in Ny-Ålesund. This button cannot communicate wireless because of the radio silence, and must be physically connected to the NMA network.
- Switch controller located at the SLR site which receives UDP and TCP messages from the switches, sends commands to the SGSLR Laser Safety Subsystem and reports status to the NMA Status Portal
- All switching is logged.
- Watchdog ensures that the laser will be blocked if the system fails.
- 5/0 volt interface to SGSLR Laser Safety Subsystem using an RJ45 connector.

Barrier C: ADS-B System

- Automatic system that uses a passive antenna to receive aircraft identification and position data.
- Receiver hardware from Jetvision (Radarcape with antenna duality).
- Raspberry PI (single board computer) receives data from the Radarcape and uses NMA software to determine if the laser needs to be blocked.
- All flights that trigger the laser to be blocked is logged.
- 1090 MHz transmitter sends a pulse or dummy signal to regularly test that the antenna and receiver is working.
- Watchdog ensures that the laser will be blocked if the system fails.
- 5/0 volt interface to SGSLR Laser Safety Subsystem using an RJ45 connector.
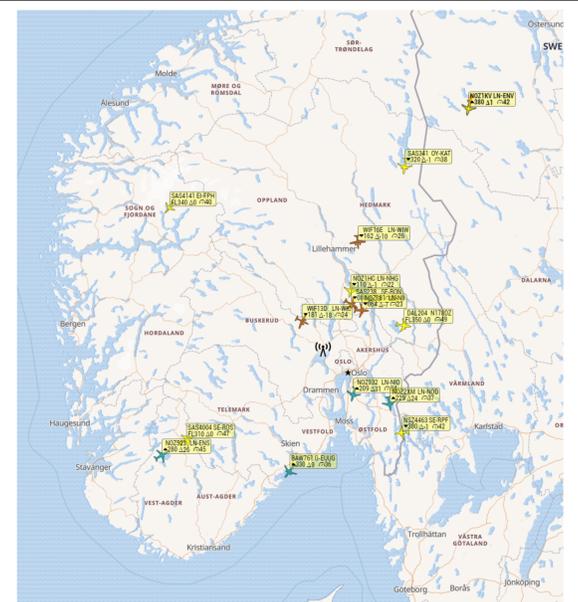
Figure 5: ADS-B coverage from NMA office in Hønefoss.