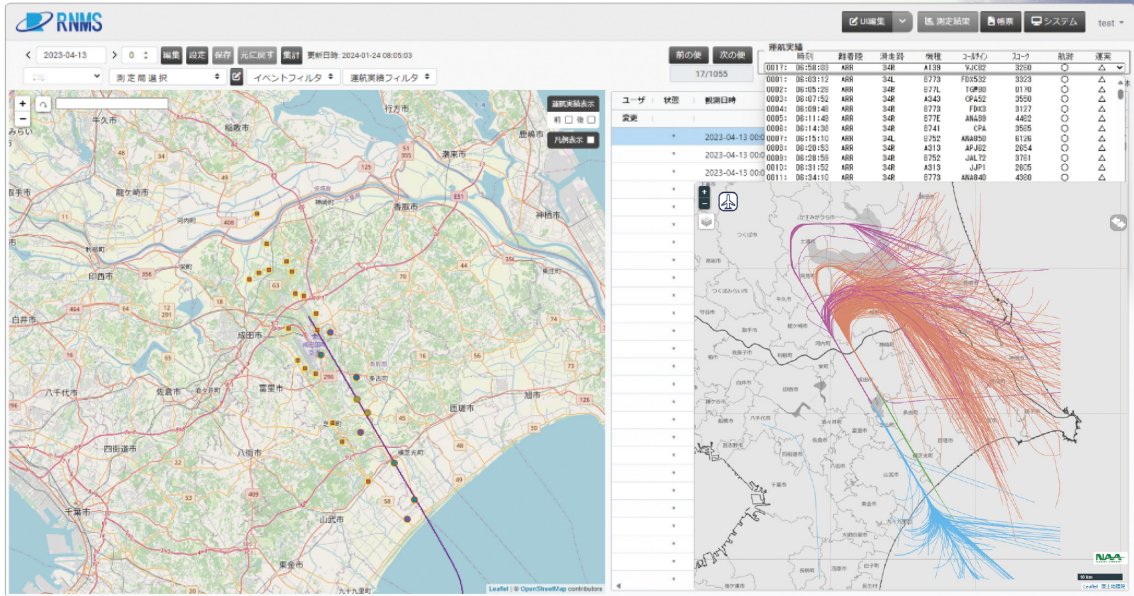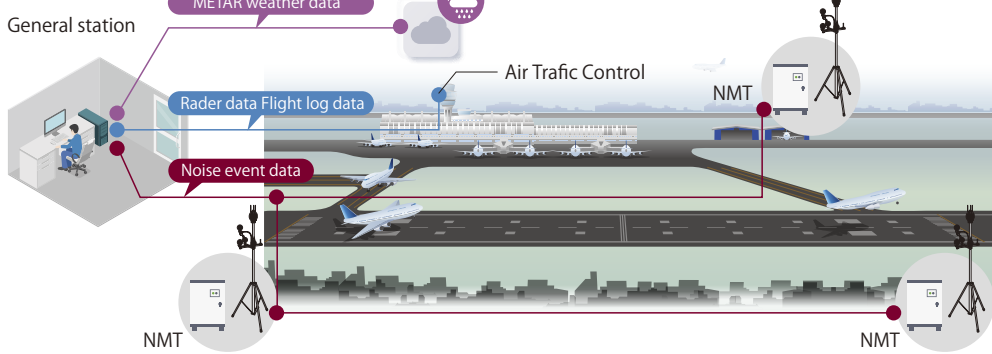# Acoustics

Comprehensive solution for aircraft noise management supporting noise and flight track data together.

## R-EMS (RION-Environmental Managing System)

▐ Acquire aircraft noise report with detailed aircraft information.
▐ Observe flight tracking data using ADS-B and PSSR ＊ even in situations where radar data from airport cannot be provided.
＊PSSR (Passive Secondary Surveyrance Rader) is RION's unique technology, which can observe flight-tracking information for all aircraft including one without ADS-B.
▐ Sound Arrival Direction information can identify the noise events even when there are large noise sources other than aircraft nearby, or when it is difficult to identify noise events by flight tracks.
▐ Special microphone with excellent weather resistance, allowing accurate measurements even in the rainy and humid climate.



## Overview



General station
METAR weather data
Air Trafic Control
Rader data Flight log data
Noise event data
NMT

▐ The NMTs, noise monitoring terminals are installed around an airport. The monitoring must be continued with stable operation for long time and will be unattended. The durable NMT have communication function for concentlizing all data onto data server. The data is controled on central station and will be used for several purpose.

## Noise Monitoring Terminal

### Sound Level Meter NA-39A
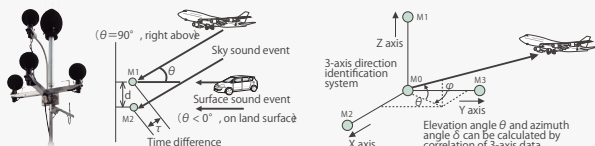
▐ Designed for long-term monitoring.

### Outdoor Microphone MS-11A

▐ Built-in sound source for automatically checking the microphone sensitivity.
▐ Built-in Heater for preventing condensation on microphone membrane.
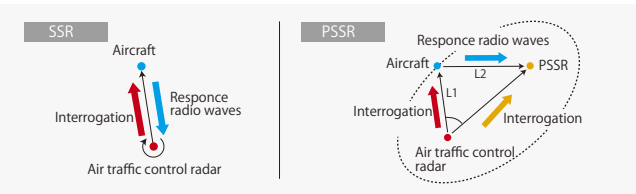
Sound Source — Heater

### Sound Arrival Direction Sensor NA-39D

The sensor structured by 4 microphones detects vertical/horizontal sound arrival direction to identify whether the sound source is aircraft.
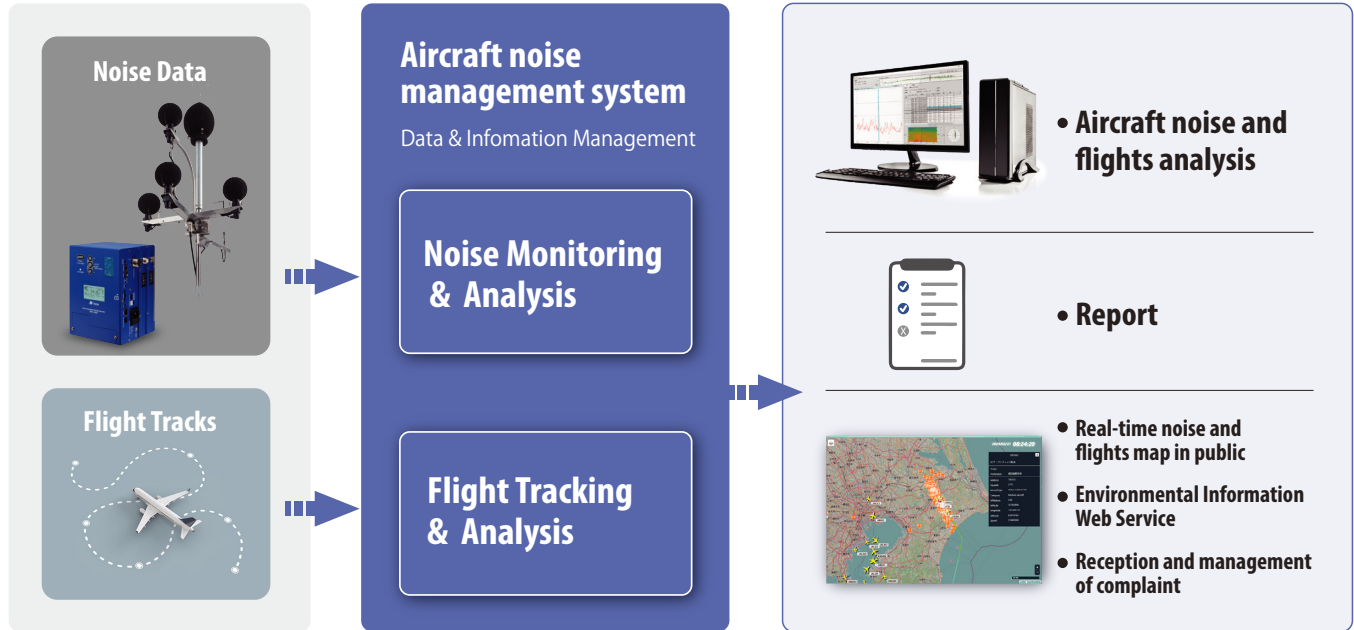
$(\theta=90°$, right above)
Sky sound event
Surface sound event
$(\theta < 0°$, on land surface)
Time difference

3-axis direction identification system
Z axis
Y axis
X axis
Elevation angle $\theta$ and azimuth angle $\delta$ can be calculated by correlation of 3-axis data.

## PSSR (Passive Secondary Surveillance Radar)

▐ Observe the positioning information of an aircraft by receiving interrogation radio waves from the air traffic control radar and response radio waves from the transponder installed on the aircraft.
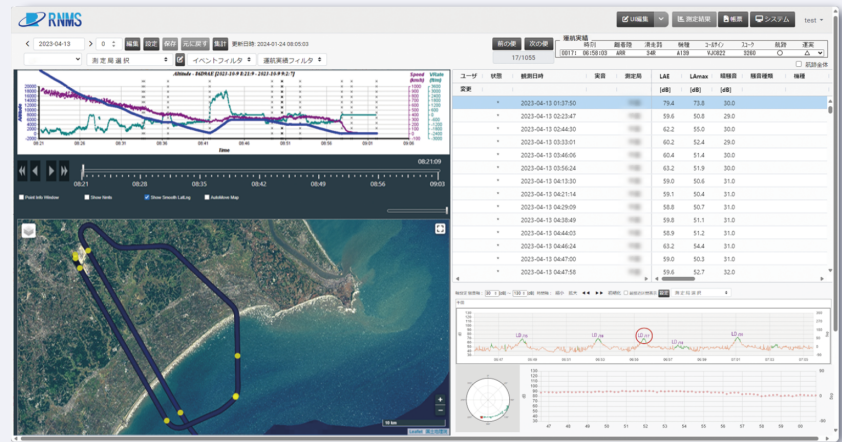
SSR
Aircraft
Responce radio waves
Interrogation
Air traffic control radar

PSSR
Responce radio waves
Aircraft
PSSR
L2
L1
Interrogation
Interrogation
Air traffic control radar

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## R-EMS supports...



Noise Data

Flight Tracks

### Aircraft noise management system
Data & Infomation Management

Noise Monitoring & Analysis

Flight Tracking & Analysis

● Aircraft noise and flights analysis

● Report

● Real-time noise and flights map in public
● Environmental Information Web Service
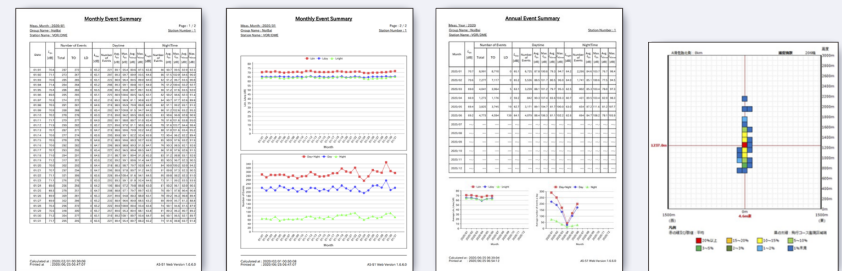● Reception and management of complaint

## Aircraft noise and flights analysis

▐ Automatically identifies which aircraft generated the observed noise data. Calculates noise evaluation values ($L_{dn}$, $L_{den}$, etc.) and analyzes noise generation status by time of the day.
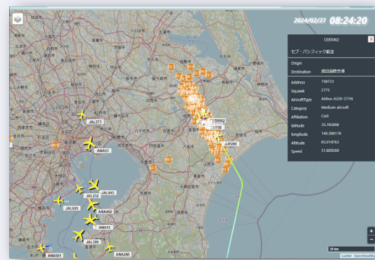


## Report

▐ Creates an annual noise report for environmental impact.
▐ Creates period summary report for publishing breaking news for surrounding residents.



## Real-time noise and flights map in public

▐ Flight track information and preliminary noise data can be published on the Internet in real-time.



## Environmental Information Web Service

▐ Provides easy-to-customize web platform where you can introduce your environmental policy, noise monitoring network, noise measures and other initiatives being implemented.

## Reception and management of complaint

▐ Residents can post noise complaints with necessary information through dedicated contact form.
▐ The complaint information is associated with flight track information and noise data so that an operator can understand the relevance between complaint and flights.