As a landed airport, Narita International Airport has implemented a unique landing charge system for international flights that offers preferential charge to quieter aircraft, which has encouraged airlines to introduce such aircraft. As a result, the number of quieter aircraft has increased each year since then. In April 2015, landing charges for international flights were reduced even further. The Eco-Airport Master Plan (FY 2011–2015) set a target for fiscal 2015 of improving the introduction rate of low-noise aircraft under the Narita Aircraft Noise Index to 90%.

As an aircraft noise countermeasure. The rate in fiscal 2015 was 90.7%, fulfilling this target.

### Noise Mitigation Measures

#### Target and Performances

<table>
<thead>
<tr>
<th>Year</th>
<th>80</th>
<th>85</th>
<th>90</th>
<th>90.7</th>
<th>90.7 Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>81.5</td>
<td>84.3</td>
<td>85.4</td>
<td>87.6</td>
<td>90%</td>
</tr>
<tr>
<td>2011</td>
<td>84.3</td>
<td>86.4</td>
<td>87.6</td>
<td>90.7</td>
<td>90%</td>
</tr>
<tr>
<td>2012</td>
<td>85</td>
<td>86.4</td>
<td>87.6</td>
<td>90.7</td>
<td>90%</td>
</tr>
<tr>
<td>2013</td>
<td>86.4</td>
<td>86.4</td>
<td>87.6</td>
<td>90.7</td>
<td>90%</td>
</tr>
<tr>
<td>2014</td>
<td>87.6</td>
<td>87.6</td>
<td>87.6</td>
<td>90.7</td>
<td>90%</td>
</tr>
<tr>
<td>2015</td>
<td>90.7</td>
<td>90.7</td>
<td>90.7</td>
<td>90.7</td>
<td>90%</td>
</tr>
</tbody>
</table>

As a landed airport, Narita International Airport has implemented a unique landing charge system for international flights that offers preferential charge to quieter aircraft, which has encouraged airlines to introduce such aircraft. As a result, the number of quieter aircraft has increased each year since then. In April 2015, landing charges for international flights were reduced even further. The Eco-Airport Master Plan (FY 2011–2015) set a target for fiscal 2015 of improving the introduction rate of low-noise aircraft under the Narita Aircraft Noise Index to 90%.

As an aircraft noise countermeasure. The rate in fiscal 2015 was 90.7%, fulfilling this target.

### Reducing Noise Source

#### Introducing Quieter Aircraft

As part of the global movement towards quieter aircraft, in fiscal 2002 Japan prohibited the operation of aircraft which do not meet the provisions for noise standards set out in Chapter 43 noise standard by the International Civil Aviation Organization (ICAO).

In order to encourage the use of Chapter 4 aircraft which come under more stringent noise standards, we have introduced landing charge system for international flights that provides preferential treatment for quieter aircraft since fiscal 2005. The system offers lower landing charges for international flights based on the noise level (Class A to F) of the aircraft according to the Narita Aircraft Noise Index. The quietest Class A aircraft are charged at least 20% less than Class F aircraft. As the graph on the right shows, Class A to C aircraft which satisfy Chapter 4 standards have gradually increased since fiscal 2002 when Chapter 2 aircraft were prohibited. The ratio increased significantly after fiscal 2005 when new charge system was introduced.

Recently, airlines have been promoting the introduction of new aircraft with state-of-art technology on their fleets’ renewal. These aircraft make substantial contributions to reducing environmental impacts such as noise and greenhouse gases.

#### Night Flight Restrictions (Airport Curfew)

Since opening in 1978, takeoffs and landings at Narita International Airport have been restricted in principle between 11:00 p.m. and 6:00 a.m., except emergency conditions or unavoidable circumstances, such as due to typhoon, heavy snowfall or other unusual weather conditions, or conditions that affect safety of flight operation and sudden serious medical cases.

As of March 31, 2013, night-time operating restrictions were also relaxed. In addition to the above circumstances, permitting flights from 11:00 p.m. to midnight for situations that are beyond airlines’ control, such as unusual weather conditions at the departure airport. In fiscal 2015, night-time operating restrictions were relaxed 65 times.

Information on flights operated after airport curfew is released the following day on the NAA website, “Information on Flights After Curfew” (http://www.naa.jp/jp/csr/curfew/).
To minimize the impact from aircraft noise, flight corridors (monitoring zones) for direct ascent and descent have been established from the Tonegawa River to the Kujukuri coastline. They are monitored to ensure that aircraft do not deviate from the corridors.

In the case of deviation from the corridors without a valid reason was seven (0.003%).

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To measure noise of take-off and landing aircraft, we have been monitoring aircraft noise since opening in 1978, presently with 33

Aircraft in Violation

<table>
<thead>
<tr>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of aircraft deviating without valid reason (percentage of total flights)</td>
<td>7 (0.004%)</td>
<td>6 (0.003%)</td>
<td>5 (0.002%)</td>
<td>2 (0.001%)</td>
<td>5 (0.002%)</td>
<td>7 (0.003%)</td>
</tr>
<tr>
<td>Number of flights</td>
<td>191,426</td>
<td>187,237</td>
<td>272,078</td>
<td>226,182</td>
<td>208,220</td>
<td>235,190</td>
</tr>
</tbody>
</table>

Aircraft Tracking Map with Flight Corridors (Example)

Establishing and Monitoring Flight Corridors (Monitoring Zones)

To measure noise of take-off and landing aircraft, we have been monitoring aircraft noise since opening in 1978, presently with 33 monitoring stations around the airport throughout the year.

Flight corridor monitoring stations around the airport throughout the year. To measure noise of take-off and landing aircraft, we have been monitoring aircraft noise since opening in 1978, presently with 33

Short-Term Monitoring

Short-term monitoring is carried out by NAA to verify noise zone specifications according to the Aircraft Noise Prevention Law. Aircraft noise is monitored at 58 stations along the boundary of Class 1, 2 and 3 zones over a period of seven consecutive days, mainly in summer and winter. In locations where particularly detailed information is required, monitoring is also conducted in spring and autumn. LN values in fiscal 2015 were within the criteria for the specified zones under the Aircraft Noise Prevention Law at all short-term monitoring locations (see p. 61).

Aircraft Noise Measurements

Year-Round Monitoring

To measure noise of take-off and landing aircraft, we have been monitoring aircraft noise since opening in 1978, presently with 33 monitoring stations around the airport throughout the year.

The annual LN values, an index of aircraft noise, of all monitoring stations met the Aircraft Noise Prevention Law standards in fiscal 2015.

In addition to monitoring stations mentioned above, there are also 23 stations installed by Chiba Prefectural Government, 10 by Ichihara Prefectural Government and 36 by local municipal governments (as of April 2016). In total, 102 stations around the airport monitor aircraft noise continuously. Data from our 33 stations can be viewed in real time on our environmental information website, “the Narita Airport Environmental Community.”

Noise produced from the airport by various sources other than taking off and landing aircraft.

Airport Ground Noise Monitoring

We have installed five ground noise monitoring stations in and around the airport and conduct continuous monitoring to measure noise produced from the airport by various sources other than taking off and landing aircraft.

*LN: The Day-Evening-Night Averaged Sound Level (weighted by time of day). LN is a daily equivalent noise level, with evening and nighttime noise-weighted as louder.

**NAR: Aircraft Environmental Community: http://airport-community.naa.jp/ (Japanese version only)

*Noise caused by construction at the airport, landing aircraft, engine testing, using of auxiliary power units (APUs), and so on. Off-plane, noise from taxiing aircraft, engine testing, using of APUs are subject to aircraft noise reference values (Lden).
Engine Run-Up Noise Mitigation

When the maintenance on an aircraft is completed, it is important to test run the engines in order to ensure safe operations. To minimize the noise generated during these tests, we constructed a Noise Reduction Hangar in cooperation with airlines in 1999.

This facility ventilates air from the ceiling, thus engine tests are available at any time regardless of wind direction. Also, thanks to its hangar type structure, noise mitigation effect has been improved dramatically compared with conventional properties.

This facility reduces the noise level in the vicinity of the airport boundary (400 meters away) to under 60 dB, same loudness as normal conversation.

Features of the Noise Reduction Hangar (NRH)

The NRH uses an upper inlet system whereby streamlined air is ventilated in from the ceiling. The inner walls and ceilings are constructed of materials with excellent sound absorption and shielding materials.

Improved Airport Layout

Development of Noise Mitigation Embankments and Wooded Buffer Zones

We maintain noise mitigation embankments and wooded buffer zones around the airport to reduce the noise impact of aircraft running on the runway.

For example, an embankment of 100 meters width and 10 meters height reduces the noise level of taxiing aircraft to 10-12 dB on the other side of it (i.e., 600 meters away).

In areas where trees have been growing in adequate numbers for a suitable length of time, we take full advantage of their value as natural assets and their noise mitigation effects by creating wooded buffer zones.

Cross Section of a Noise Mitigation Embankment

Community Programs

Soundproofing

Subsidies for soundproofing for housing and public facilities are provided for under the Aircraft Noise Prevention Law so as to prevent or reduce aircraft noise disturbance.

Residential Soundproofing

When an area is classified as Class 1 under the Aircraft Noise Prevention Law, residences in that area are provided with subsidies in order to carry out necessary soundproofing and air conditioning according to their noise level.

For air conditioning that shows deterioration over a specified period of time, subsidies are also provided for replacement.

School and Public Facility Soundproofing

Under the Aircraft Noise Prevention Law, facilities such as schools, nursery schools, kindergartens, hospitals, pediatric hospitals, special nursing homes for the elderly and other public facilities also receive subsidies for soundproofing and air conditioning according to their noise level. As with private housing, subsidies are also provided in order to upgrade deteriorated air conditioning after a certain amount of time.

Relocation Compensation

Under the provisions of the Aircraft Noise Prevention Law and Special Act for Aircraft Noise Prevention, compensation for relocation is provided for residences in areas that are particularly susceptible to the impact from aircraft noise. In addition to the relocation of individual households, we also offer group relocation in order to preserve local communities and settlements which hold a long history of social ties.

Narita International Airport Noise Mitigation Committee

The Narita International Airport Noise Mitigation Committee is a forum for discussing the prevention of aircraft noise disturbance as well as measures to reduce that noise. The committee is comprised of local municipal leaders, academic experts, community representatives, the Ministry of Land, Infrastructure, Transport and Tourism, Chiba prefectural government, the airlines and NAA. Regional working groups have been set up under the committee for the individual areas around the airport to discuss issues presented in order to improve noise mitigation and achieve safe and proper airport operations. The committee was founded in 1972 and had its 42nd meeting in March 2016.

Grants for Community Programs

We contribute to the cost for prevention of any interferences caused by aircraft noise in the vicinity of the airport, and to development work in the surrounding community. Subsidies are provided for regional countermeasures in Chiba Prefecture, Ibaraki Prefecture and the 10 cities and towns surrounding the airport.

Since opening in 1978, we have contributed a total of approximately JPY 117.3 billion in subsidies, as of March 31, 2016. We contribute to the maintenance of soundproofed public facilities, and also roads, parks, fire-fighting facilities and community facilities around the airport.
### Initiative theme 2

**Air Quality Conservation**

- **Target and Performances**
  - Reduce NOx emissions (per flight)
  - kg/flight
  - 2010: 20.3
  - 2011: 20.6
  - 2012: 20.9
  - 2013: 16.7
  - 2014: 16.7
  - 2015: 12.9
  - 2015 Target: 13.2
  - Reduction: 19.2%

Monitoring is carried out at Narita International Airport to grasp the impact on air quality surrounding the airport due to emissions created by aircraft operations and other airport-wide activities. We work to limit air pollution from aircraft, from vehicles traveling within the airport, from operation of the Central Heating and Cooling Plant, and so on.

The Eco-Airport Master Plan (FY 2011–2015) called for reduction of nitrogen oxide (NOx) emissions per flight by 15% compared to fiscal 2010 (20.3 kg) by fiscal 2015. In fiscal 2015, NOx emissions per flight were 16.4 kg, a 19.2% reduction from fiscal 2010, fulfilling this target.

### Initiative theme 3

**Water Quality Conservation**

We take various measures to preserve water quality. For example, monitoring water quality to grasp the effect of rainwater runoff from Narita International Airport on the surrounding rivers and streams; adequate installation and operation of water treatment facilities; installation of facilities to separate oil and water so as to avoid any trouble in case of oil spillage in the aviation fuel tank farms, and so on.

### Water Quality Monitoring

We regularly monitor the surrounding rivers and streams in six locations once a month, and monitors 24 hours a day in three locations, including drainage canals. While storm drainage levels do fluctuate, care is taken to prevent a negative impact on rivers downstream (see p. 64). Slightly elevated coliform bacteria levels were observed in prior years, but testing conducted at those times revealed that the increases were due to natural causes, and confirmation was made that there was no adverse impact on health and sanitation.

Underground water levels are monitored continuously in the vicinity of the airport and the water quality is measured once each year. Monitoring results of fiscal 2015 confirmed that underground water quality met environmental standards.

### De-Icing

When snow accumulates on the wings and tail fins of aircraft, or frost and ice occur, it affects the lift required for takeoff as well as control functions. As this can cause accidents, de-icing—the spraying of an aircraft with de-icing agent—is essential in cold winter months or when snow falls. The main component of de-icing agent is propylene glycol. It is not harmful to humans and is even used in foods, but once it flows into rivers and streams, it may cause organic pollution.

We provide de-icing aircraft bays where de-icing agent that falls onto the apron can be collected in holding ponds. Water containing de-icing agent is carried from the apron via storm drains for treatment at a de-icing effluent treatment facility. Also, if de-icing is operated at other parking stands, de-icing agent is collected in special vehicles and treated in the same manner.