



**ENVIRONMENTAL
Code of Practice for
Aircraft Operations**

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Amenity Values

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SOUND AWARENESS

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Introduction

In accordance with the requirements to preserve amenity values as described in the RMA, aerial operators need to manage aircraft sound. By following the principles detailed in this code, that can be achieved. This code forms part of the Environmental Management System offered as part of the AIRCARE™ Accreditation Programme run by the Aviation Industry Association of NZ.

It recognises the issues involved with the operation of aircraft in and around sound sensitive areas and details a plan by which the aviation industry and regulators can work together so that short term gains can be made in order to achieve the long term goal of limiting the environmental impact of aircraft.

Technology is becoming available to make an impact on sound reduction in existing fixed wing aircraft and manufacturers are working to develop lower sound levels in new generation helicopters. Some quieter aircraft are already available. Pilots flying both new and older types can modify their in-flight procedures to minimise the impact of their sound and this code details how that can be achieved. Operators joining this program should commit to a program of fleet replacement or modification that will see the adoption of quieter aircraft.

By taking a proactive approach the aviation community has an opportunity to circumvent the possibility that legislation will be enforced upon the industry that could itself be unworkable and not recognise the limitations that effect aircraft.

Aircraft serve specialised functions and important roles in the nation's commerce and transportation system. Aircraft are a versatile and valued segment of the multimodal transportation infrastructure. Aircraft provide the only means *all* people, regardless of age, infirmity and physical capability, can experience our remote and rugged areas without leaving any lasting trace on the environment such as tracks, roads, huts and litter.

The helicopter's unique hovering; vertical takeoff and landing capabilities fulfill a broad range of missions. Helicopters carry out vital roles including:

- air ambulance services
- law enforcement
- fire fighting
- rescue
- Regional Council/DOC track servicing/remote hut servicing/riverbed surveys/weed and pest control
- wild animal control

In addition aircraft *enable*:

- flexible shuttle services
- news coverage
- heli-hunting
- heli-skiing
- aerial tourism
- aerial support of agriculture, horticulture, viticulture and forestry

Some of these activities involve flight at low level. When aircraft are involved in low-level operations, there are fewer options for sound mitigation than when operating at higher levels. Nevertheless, this code advises ways to mitigate sound that can be achieved.

In 2009 aircraft operations contributed \$9.7 billion to the NZ economy. (*NZ Trade & Enterprise New Horizons Report 2010*)

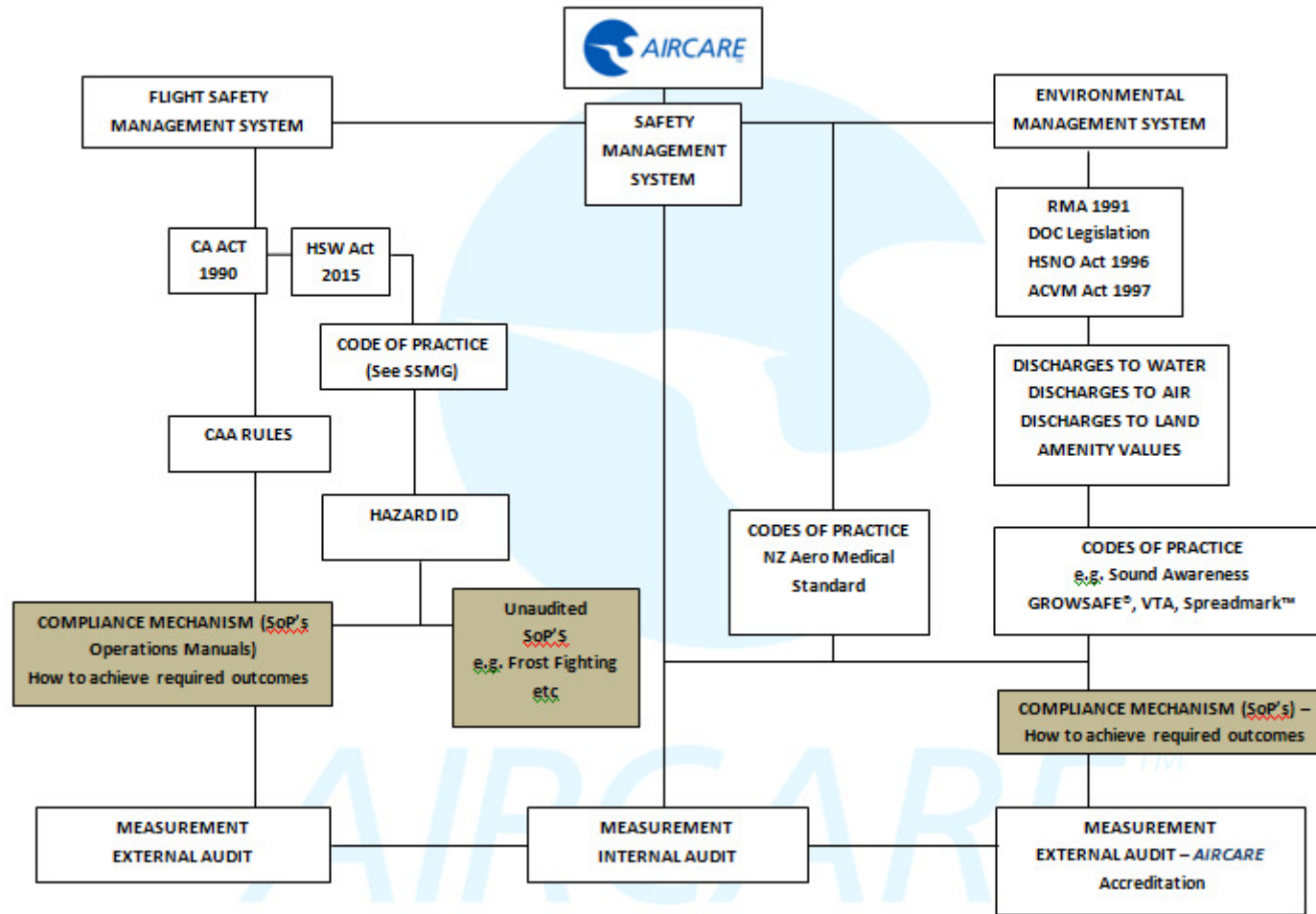
It is obvious that people see aircraft in different ways depending on the aircraft's mission and their own circumstances. A trumper who criticizes the sound a helicopter makes as it overflies him is likely to be accepting of that sound if he has a broken leg and the same machine is flying in to affect his rescue. Some visitors to national parks may have a perception that they will experience peace and quiet whilst they enjoy the scenic values on offer yet completely disregard the footprint they may have made getting access to the park in the first place whether they travelled by bus, boat, car or aircraft. Regulators e.g. DOC have a responsibility to warn visitors that if they tramp in *Valley Y* they are likely to hear aircraft sound whereas if they tramp in *Valley X* they may not hear aircraft. By providing this notification, visitors' expectations are more likely to be met.

The aviation community extends an invitation to regulators to work with the industry to identify flight paths that reduce the impact of aircraft sound.

Members of the aviation community are invited to join this accreditation program that both trains and measures pilots and operators in 'flying neighbourly' procedures and in sound abatement methods.

AIRCARE™ Management Committee

Compliance Flowchart



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Appendix 1.....	Fly Neighbourly Guide

Referenced Documents

- Non-military Urban Noise Study, Report to Congress, December 2004
- Quiet Aircraft Technology For Propeller Driven Airplanes and Rotorcraft US Congressional Report, 1996
- The IATA Technology Roadmap Report, Issued June 2009
- http://www.space.com/business/technology/070727_helicopter_industry.html
- Fly Neighbourly Guide, Helicopter Association International, Inc.
- Resource Management Act 1991 including the RM Amendment Act 2009

Abbreviations

AGL	Above ground level
AIA	Aviation Industry Association of NZ Inc trading as Aviation NZ
AMC	AIRCARE™ Management Committee
CAA	Civil Aviation Authority of NZ
DOC	Department of Conservation
FAA	Federal Aviation Authority (USA)
H&S	Health and Safety
NZHA	NZ Helicopter Association – a division of AIA
RMA	Resource Management Act including amendments
SMS	Safety Management System

Definitions

AIRCARE™	A brand owned by AIA. AIRCARE™ is an integrated accreditation program for all of an aviation business
Accreditation	The reward for demonstrating compliance with a code of practice every time operations referred to in that code are carried out
Aircraft	Fixed wing aeroplanes and helicopters
Amenity values	Means those natural or physical qualities and characteristics of an area that contribute to people's appreciation of its pleasantness, aesthetic coherence, and cultural and recreational attributes
Sound Sensitive Area	An area where the impact of adverse effects from sound diminishes the amenity values of that area
Populous Area	A collection of ten residences or more in an area less than two hectares, or a gathering of more than 100 people.

1. SCOPE

This code has been developed to cover the operation in New Zealand of General Aviation aircraft having a CAA Type Certificate or CAA Type Acceptance Report for a maximum of up to 18 passengers. It does not cover the operation of aircraft operating under Instrument Flight Rules.

1.1 NZ Legislation

- a) The Resource Management Act 1991 empowers legislators to control elements of aircraft operations e.g. sound as it impacts on amenity values. This voluntary code seeks to address aircraft sound issues that impact on people when the aircraft is being operated.
- b) The Civil Aviation Act 1990 empowers the CAA to control aircraft operations. The Civil Aviation Act does not empower CAA to have any control of aircraft sound. Notwithstanding this, the majority of complaints that CAA fields are sound related.
- c) The Conservation Act 1987, Specifically Part 3B Concessions Section 170 (2) says that no activity will be carried out in a conservation area unless authorized by a concession.
- d) The National Parks Act 1980 Specifically Section 14 Wilderness Areas s14(2)(d) This clause prohibits aircraft landing or hovering in Wilderness Areas.

1.2 Compliance

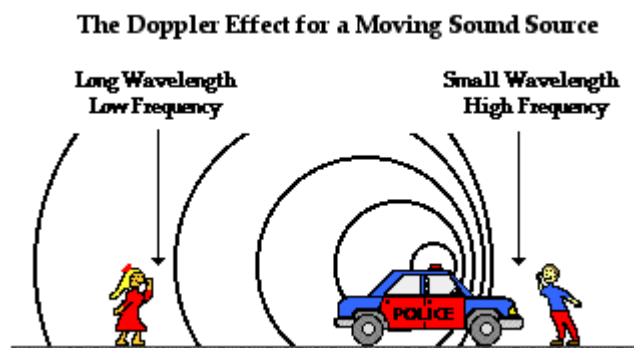
For the purposes of this Code the word “shall” refers to practices that are mandatory for compliance with the Code and the word “should” refers to practices that are advised, recommended or are industry best practice.

2. OVERVIEW

2.1 SOUND – CAUSE & REMEDIES

Over the past couple of decades, significant technological advances have been made in aviation sound reduction. In fixed wing aircraft, new types of aircraft, propellers and engines have been developed that generate a significantly smaller sound footprint than older types. A number of older types can be retrofitted with these new engines and propellers. There are exceptions but in general turbine powered aeroplanes are quieter than piston powered ones. In the case of propeller driven aeroplanes the majority of the sound people hear comes from the propeller(s). Progress has been made in the sound these types produce by developing aircraft and engines that have propellers that run at lower speed than older types. This does not eliminate the sound they emit but it certainly reduces it. Pilots are able to minimize propeller sound by operating at lower RPM when it is safe to do so. Reducing RPM from say 2700 to 2400 is likely to halve the sound level.

Another phenomenon in respect of aircraft sound is the Doppler Effect. The Doppler Effect can be described as the effect produced by a moving source of waves in which there is an apparent upward shift in frequency for observers towards whom the source is approaching and an apparent downward shift in frequency for observers from whom the source is receding. It is important to note that the effect does not result because of an actual change in the frequency of the source.



The Doppler Effect can be particularly annoying to person in the vicinity of a circling aircraft whether it be an aeroplane or a helicopter. The frequency and type of sound heard by an observer on the ground, even though it might be of similar decibel level, is a significant factor in sound annoyance. The higher the frequency the more annoying it is.

The wind also plays a part with the sound of aircraft being heard more if the observer on the ground is downwind of the aircraft. Pilots can reduce their sound footprint by flying downwind of sensitive areas.

Helicopters exhibit a unique “impulsive” sound characteristic which is different from that produced by fixed wing aircraft. Much of the scientific investment for rotorcraft

has benefited in physical understanding and phenomenon modeling, such as Blade Vortex Interaction (BVI) and High Speed Impulsive (HSI) sound during approach and high speed cruise, respectively. Blade-Slap or BVI sound occurs during the descent condition for landing and when maneuvering. It is the result of interaction by a rotor blade with previously shed tip vortices. These interactions generate a complex unsteady pressure field that propagates below the rotor as high impulsive sound.

A Congressional Report on "Quiet Aircraft Technology for Propeller-Driven Airplanes and Rotorcraft" identified the technical status of the United States Research and Technology (R&D) for the rotorcraft sector. The 1996 report concluded that, in general, quiet rotorcraft technology was immature and too slow to market.

The FAA and the International Civil Aviation Organization (ICAO) continue to assess and revise helicopter sound certification requirements for increased sound stringency that are based upon reasonably achievable sound reduction technology. The sound certification process establishes reference conditions for the manufacturer to demonstrate that a design complies with the standard. These standards are changing over time as technological advances lead to the increased ability to reduce helicopter sound.

One area in which manufacturers are concentrating their technological development efforts is in reducing the aerodynamic sound made by helicopter main and tail rotors. Aerodynamic sound is responsible for most helicopter sound that people on the ground hear.

Manufacturers are now designing new helicopters with four or more main rotor blades. This avoids the distinctive chopping sound that the older, twin-bladed Bell UH-1 "Huey" helicopter makes, which can be heard miles away.

Meanwhile, Eurocopter uses a technology called the "fenestron" to reduce the sound made by tail rotors. The fenestron is a tail rotor enclosed within a duct and positioned in line with the fuselage. This reduces sound and improves safety. Eurocopter also spaces its aircraft' tail-rotor blades unevenly, reducing "phase modulation" effects to make the tail rotors quieter and more pleasant-sounding.

There are two major challenges facing the helicopter industry:

- Balancing cost to implement low sound technology within an overall affordable market cost to users and operators.
- Quiet helicopter technology is immature and too slow to market although some manufacturers have taken on the challenge and successfully developed quieter machines.

One further remedy for sound reduction is the use of larger capacity aircraft. One aircraft carrying 15 passengers makes a smaller sound footprint than three aircraft carrying five passengers.

2.2 SOUND - EFFECT

In general, there are a number of possible explanations for heightened community response to aircraft sound. The possible explanations, which are not mutually exclusive, include the following:

1. A subsection of the population may be more sensitive to low-frequency helicopter sound than is the majority of the population;
2. Sound-induced building vibration and rattle has been shown to significantly increase concerns;
3. Sound annoyance and aircraft sound is rich in low-frequency content;
4. There is some evidence that suggests helicopter sound is slightly more annoying than fixed-wing aircraft sound at the same sound exposure level;
5. Helicopter sound may be more noticeable because of its periodic impulsive characteristic;
6. There is the possible phenomena of “virtual sound” in which a set of non-acoustical factors, such as bias (a personal judgment that the aircraft does not need to fly here) and fear (of crashes / injury / death), greatly enhances people’s negative attitudes; and
7. The way aircraft are operated can influence reactions.

Clearly it is the very fact aircraft are so versatile that makes it difficult to manage their footprint in a way that meets everyone’s expectations. Equally clearly, it is the responsibility of aircraft operators to ensure that they do everything within their power to minimise the impact of their presence on others.

The Fly Neighbourly Program offers the technical information necessary for helicopter operators to fly both current and new advanced helicopters as quietly as practical, and to make helicopter operations compatible with nearly all land uses. Whilst not targeted at fixed wing aeroplanes, elements of the Fly Neighbourly Program are adopted by this code in order to deliver the same benefits.

3 THE PROGRAM

3.1 Responsibilities

3.1.1 Pilots

- (a) To meet the requirements of this code pilots shall complete the Fly Neighbourly training program and pass an assessment set by the AIA. The Fly Neighbourly Guide upon which this training is based is included as Appendix 1. The term of this qualification shall be three years.
- (b) Pilots shall take all reasonable steps to minimize their sound footprint. In flight, pilots should observe the following sound abatement procedures:
 - 1) Avoid sound-sensitive areas altogether, when possible.
 - 2) Follow high ambient sound routes such as highways, or where possible, unpopulated routes.
 - 3) If it is necessary to fly near or over sound-sensitive areas maintain an altitude as high as possible in line with the recommendations in the Fly Neighbourly program. Fly normal cruising speed less 5-10 kts and observe low-sound speed and descent recommendations, avoid sharp manoeuvres, use steep takeoff and descent profiles (helicopters only) and vary the route, since repetition contributes to annoyance.
 - 4) When operating in sound sensitive areas, pilots of fixed wing aircraft should operate their propellers at the low end of the propeller recommended RPM operating range for all phases of the flight.
 - 5) When company operating areas or transit routes are developed, pilots should confine their flights to those places.
 - 6) When carrying out low level operations pilots shall give consideration to things they can do to manage their sound footprint. Some examples are operating RPM, repetitive track placement (e.g. keeping high ground or shelter belts between their tracks and any nearby residence when this is possible) hours of operation and timing of operation. If operations are required adjacent to a populous area then the impact of sound will be less during the working week than at the weekend when workers are more likely to be at home.
- (c) The requirements of this code do not apply where they would conflict with Civil Aviation Regulations, air traffic control clearances or instructions, or where an altitude of less than that recommended in the Fly Neighbourly Program is considered necessary by a pilot to operate safely. Pilots unable to comply with the company guidelines in respect to sound abatement for any of the above reasons shall document the event

and notify the operator using the Event Notification form used by the operator and required under the AIRCARE™ Accreditation Program.

- (d) For flight training organisations the “Pilot” referred to in this code shall be the company officer who sets or authorises the lesson plans.

Flight training organisations shall include a sound abatement module in pilot training which communicates the principles of sound abatement and practical implications for flying operations

3.1.2 Operators

- a) To meet the requirements of this code operators shall:
- 1) Maintain a policy on sound minimisation that shall be promoted to all staff. This policy shall reflect the operator’s intent to reduce the amount of sound created by the operator’s aircraft and other equipment. The policy will identify current and anticipated areas of sound concern and will be recorded in the company’s SMS along with policies on quality and safety.
 - 2) Plan flight operations in accordance with sound abatement procedures to minimize the impact of aircraft movements.
 - 3) In sensitive areas, develop the location of operational areas and transit routes in consultation with the relevant local authorities. Such routes shall take account of flight safety and adverse effects on passengers.
 - 4) Formulate guidelines that are intended to assist flight crews and flight operations personnel to formulate responsible mission profiles without infringing on operational reality. They must also not conflict with civil aviation regulations, air traffic control instructions, or aircraft operating limitations. These guidelines shall emphasize awareness of sensitive routes and landing areas.
 - 5) When low level operations are to be carried out near populous areas, consider the fleet and select an aircraft type that has the least intrusive sound footprint.
 - 6) Maintain a register of sound complaints including corrective and preventative actions undertaken. This register shall include the name and address of the complainant, location of the concern and the date and time to which the event refers.
 - 7) Maintain a procedure to ensure that all relevant staff attend the Fly Neighbourly training course approved by AMC and that each satisfactorily passes an assessment on the sound abatement procedures detailed in that course. The procedure shall ensure that each participant undergoes recurrent training and assessment every three years.
 - 8) In the case where a new pilot is engaged by an AIRCARE™ Accredited organisation and that pilot does not hold a Sound Abatement Certificate, the pilots may fly for a period of three

months provided that the organisation has a process that ensures the pilot understands the organisation's documented policy and procedures on managing its sound.

- 9) Ensure that when aircraft manufacturers provide information on sound abatement in an Aircraft Flight Manual, that pilots are assessed on their knowledge of this aspect of the aircraft at the time of their annual recurrency flight check.
- 10) Ensure that sound abatement procedures are considered at every annual recurrency flight check.
- 11) As part of the company management review required under the AIRCARE™ Management System, ensure that the sound minimisation policy is considered to ensure that it is still relevant in respect to any changing conditions or legislation and that it is revised when required.
- 12) Educate customers about sound abatement procedures, in order to prevent or minimize conflicts between their expectations and company policy.
- 13) Ensure that in areas where a User Group has been established under CAA and Airways protocols, the operator maintains membership of that User Group and takes an active part in its activities.
- 14) Ensure that the procedures detailed here result in continual improvement in respect to the operator's sound footprint.

(b) It is recommended that operators adopting this code of practice should:

- 1) Establish a practice of promoting both the safety record and the benefits of aircraft use to the public at large to improve public acceptance of aircraft.
- 2) Where possible, when operations below 500ft AGL are anticipated, arrange notification to all affected parties near the proposed flight path.
- 3) Develop good working relations with the media with a view to presenting favourable aircraft related media coverage of events, achievements and outcomes including Fly Neighbourly seminars.
- 4) Stage demonstrations and press conferences covering such capabilities as fire fighting, emergency medical evacuation, search and rescue and the benefits of aircraft transportation to the general public.
- 5) Engage in public relations to develop awareness of the Fly Neighbourly Program. This can be achieved through attendance at meetings of local government, government agencies, service clubs and environmental groups.

3.1.3 Land Owners/Administrators

- a) When aircraft operations are planned over sensitive areas, it is the responsibility of the Land Owner/Administrator to notify people who could be adversely affected by the aircraft sound. Doing this will reduce the element of surprise and disappointment that often lead to frustration for visitors and owners/administrators alike. Some examples include:
- 1) A restaurant owner should notify neighbours when an aircraft is being used to fly customers to or from the venue.
 - 2) All visitors to the DOC Estate should be advised that they might hear aircraft sound during their visit.
 - 3) In National Parks, trampers should be advised that they might hear aircraft sound and that it will be particularly prevalent on the days that tracks are being maintained or huts resupplied or other aerial work is planned.
- b) Landowners/Administrators should work with aircraft operators to identify flight routes that will cause the minimum of sound nuisance. Note that the requirements of 3.1.2 a) 3) shall be met.

4.0 Training Requirements

- 4.1** To satisfy the requirements of 3.1.1 and 3.1.2 a person undergoing initial training in sound abatement shall attend a face to face course run by AIA or be trained by a company senior person in accordance with 4.2 who uses the material available on the AIRCARE™ website page titled *Company Noise Abatement Training Package*. The subsequent three yearly renewal requirements for all certificate holders can be met by an on-line assessment. In both cases AIA Office shall issue a certificate to successful candidates.
- 4.2** Operators may elect to carry out the face to face sound abatement training for their own pilots in-house. When this option is selected the following conditions shall be met:
- The person responsible for training delivery and all Base Manager(s) shall have attended and qualified at an AIA run face to face course
 - It is recommended that the course material supplied by AIA be utilised
 - The Sound Abatement Assessment used at the AIA courses shall be used at company run courses
 - The individual assessments shall be marked by AIA
 - Those candidates completing the assessment shall each sign a statutory declaration certifying that they were the person completing the assessment
- 4.3** Accredited Operators employing staff who do not hold an AIRCARE™ Sound Abatement Certificate shall have such staff successfully complete

the training course within three months of being employed by that operator.

5.0 CONCLUSION

The adoption of this code of practice, together with the Fly Neighbourly training courses, and use of the sound abatement procedures that are detailed in the Fly Neighbourly Guide, provide the basis for lowering the sound generated by aircraft in day-to-day operations. In addition, the sound abatement procedures offer a way of reducing the impulsive sound characteristic of helicopters that occur during normal operations and often cause complaints. By adopting and following the Fly Neighbourly Procedures, a high level of public acceptance can be achieved and this is important given that new generation 'quiet' aircraft are still not widely used.

It should also be noted that current public acceptance of aircraft is in general, poor and unless the program outlined in this guide is adopted, further international, national, and local regulations will be enacted to limit aircraft operations. Therefore, AIA strongly recommends that its members adopt this code of practice.

If the procedures given in this code are followed, public acceptance will be improved and the aviation industry will be able to flourish and grow, without being restricted by the burden of new sound regulations and operational restrictions.