The **NLR Air Transport Safety Institute** is an independent, non-profit research and consultancy organisation that offers customer focussed services which are backed up by thorough and objective research.

Our mission is to deliver pragmatic and well-founded advice to resolve safety and operational issues in full recognition of the requirements and constraints the client has to meet.

The institute supports air navigation service providers with identifying, assessing and mitigating safety and operational risks. The needs of the customers are the starting point of every consultancy assignment.

Customers of the **Safety Institute** include air navigation services providers, airports, airlines, aviation authorities and governments around the world.

When safety matters for ANSPs

Our services

Safety case support: The Safety Institute provides support in the development of safety cases, by supplying underlying safety data, expert judgment or process organisation advice, and we may even take responsibility to develop a complete safety case for you.

Safety data and performance analysis: We provide analyses of accident, incident and occurrence data, including the development of safety performance indicators that help you identify and track risks.

Safety assessment: Qualitative and quantitative assessments of the safety performance of new or changed operations to support decision-making about safety risk, either by the customer or to provide the evidence needed to comply with regulations. Examples include obstacle clearance assessments, flight navigation procedure review and support application of performance based navigation.

Safety management: We support the assessment of the safety management system (SMS), its design, the organization, resources and procedures, and the development of specific elements of an SMS such as safety policies, safety performance monitoring, and safety assessments.

Safety culture: Safety culture is an essential element of safe operations. The Safety Institute assists in understanding, measuring, and improving safety culture. We have developed a Safety Culture Assessment Tool which can be applied in all sectors of the aviation industry, including ATM.

Our added value

We speak your language. We bring together a team of internationally recognised experts with a background in aviation safety, Air Traffic Management, procedure design, airport operations, regulations and standards, complemented with airline/test pilot and air traffic controller experience.

We understand your business. We have developed an excellent understanding of your processes and constraints through our work with international customers, ranging from airports, air navigation service providers and airlines, to governments and regulators,

We have the most currents insights and information. We have a well-established network within the aviation industry through our participation in national, European, and many global safety initiatives and think-tanks. The Safety Institute is part of the National Aerospace Laboratory NLR, providing us immediate access to the knowledge and experience of hundreds of specialists in all fields of aerospace.

We have the tools. We employ a range of models and techniques, including simulations to analyse airport and aircraft operations under various operational conditions.

We have the data. We use high quality safety data from the NLR-ATSI Air Safety Database. The database is one of the largest safety data repositories in the world. It allows us to provide objective proof in support of quantitative and qualitative risk assessments.

How we spend our spare time

- Member of the ICAO Separation and Airspace Safety Panel (SASP)
- Advisor to the ICAO Instrument Flight Procedures Panel (IFPP).
- European Commercial Aviation Safety Team (ECAST) of the European Strategic Safety Initiative ESSI
- Joint Safety Analysis Teams on controlled flight into terrain (CFIT), loss of control and runway incursions organised by the US Commercial Aviation Safety Team (CAST) initiative
- Flight Safety Foundation Task Forces on controlled flight into terrain (CFIT) and approach and landing (ALAR)

Snapshot of our work in support of air traffic management

- Development of a generic safety case on radius-to-fix legs in Standard Instrument Departures for noise abatement at Schiphol Airport.
- Development of future departure procedures for a local airport in the Netherlands, in compliance with noise abatement and other environmental constraints.
- NLR-ATSI conducted an assessment of the runway 14/16 operations at Zürich. This study included a structured approach towards procedure development and proposed a number of alternative modus operandi for the use of runways 14 and 16, enabling an increase in airport capacity during simultaneous use of these runways.
- Collision risk assessment for a proposed RNAV/visual approach procedures for Zurich airport.
- An aeronautical study was performed of an off-set steep approach procedure at Lugano Airport.
- Development of a runway incursion vulnerability assessment tool for Eurocontrol. The tool was applied at various airports across Europe.

- Safety assessments on the ATM services provided at three small, uncontrolled airports in Norway. The assessments concerned existing services and the foreseen changes in the current operation. For another regional airport in Norway the safety effects of proposed changes in manning, equipment and responsibilities of personnel in the tower and approach operations were assessed.
- Development of a safety case of the introduction of digital flight information strips in the air traffic control tower of a major European airport.
- Collision risk assessments were conducted for Reduced Vertical Separation Minima RVSM in the Africa Indian Ocean region. Under a contract by the ANSP of South Africa, collision risk assessments were conducted against two safety policy objectives prior to introduction of RVSM. NLR-ATIS also supported the safety case development.
- Safety data analysis was conducted for Eurocontrol on airspace infringements, runway incursions, and communication problems in ATM. These studies focused on causal factors,

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- Flight Safety Foundation Task Forces on CFIT and approach and landing accidents (ALAR)
- Flight Safety Foundation Runway Safety Initiative (RSI)
- European Advisory Committee of the Flight Safety Foundation
- ICAO working group on safety indicators
- CAST/ICAO Common Taxonomy Team (CICTT)
- User group of ECCAIRS (European Co-ordination centre for Accident and Incident Reporting Systems)

consequences, and recommendations for risk mitigation. In these projects one of the key elements was the NLR-ATSI Air Safety Database.
- Safety evaluation of operations in a Functional Airspace Block (FAB) for the FAB EC consortium. A detailed feasibility study was done to evaluate the effects of design options on safety, capacity, economy, and institutional issues, and to compare these to objectives in these areas. NLR-ATSI performed an analysis of the safety assessment methodologies and safety criteria of six ANSPs involved in the FABEC consortium

Safety assessment of ATM services at Norwegian airports

Situation: For several airports in Norway, varying from small uncontrolled airports to medium-sized controlled airports, changes were proposed such as implementation of a new TMA, renovation of tower equipment, or adapted composition of tower personnel.

Problem: A safety assessment to assess the risk level of existing services and foreseen changes was initiated following recommendations from the Norwegian Accident Investigation Bureau and requirements from the Norwegian CAA.

Solution: NLR-ATSI together with her Norwegian consultancy partner AconaCMG conducted a set of safety assessments. An approach was adopted that incorporates the basic objectives and elements of the Eurocontrol SAM methodology, i.e. hazard identification, risk assessment, and identification of risk mitigation measures. The approach is 'scenario-based', where safety issues are analysed in the context of operational scenarios, such that operational experts can easily be involved. The primary focus of the assessment is to support decision making on safety-related issues and to provide all stakeholders with a wider understanding of safety-critical issues. By applying the same approach to similar airports, a port-folio of the airports risk picture is built up and this helps the airport operator to compare and monitor the safety performance, thereby achieving an improved safety management.

Findings: The results of the studies have led to a set of requirements and recommendations that address (local) elements in the airport infrastructure, tower equipment, contingency plans, working procedures, as well as issues related to Letters of Agreement with other units, exchange of information throughout the airport operator, and the Safety Management System.

Runway incursion vulnerability assessment

Situation: Any airport runs a certain risk of a runway incursion. However due to specific characteristics, e.g. a high rate of runway crossings, some airports have a higher vulnerability than others.

Problem: There is a need amongst ANSPs to have a tool that enables them to assess their vulnerability to runway incursions and evaluate possible remedial actions.

Solution: NLR-ATSI developed the Aerodrome Runway Incursion Assessment (ARIA) tool. Using the results of previous studies on the causes and contributing factors of runway incursions, a set of risk factors has been selected that represents the most important determinants of runway incursion risk. Subsequently, the risk factors are weighted reflecting their relative importance for the risk of runway incursions. Likewise a set of risk reduction factors has been developed. The model has been validated with success against data from eighteen European airports, covering a wide range of characteristics (in terms of operations, layout etc.).

Result: ARIA is a computer based assessment that assists the Local Runway Safety Team in assessing the possibility of runway incursion and suggests appropriate actions to protect the runway. The tool is available for ANSPs and airport operators through EUROCONTROL.

The NLR-ATSI Air Safety Database

The Safety Institute maintains a large database with aviation safety related data. Air safety data are all data that characterise the activities of the air transport system. The Air Safety Database contains detailed information on accidents and incidents of fixed wing aircraft and helicopters from 1960 and onwards. The database contains information on more than 37,000 accidents and serious incidents that occurred worldwide.

In addition to data on accidents and serious incidents the database also contains over 310,000 commercial airline safety reports for both fixed wing aircraft and helicopters. Furthermore, the Air Safety Database contains worldwide non-accident related data, including airport databases, flight exposure data (flights/hours at the level of airlines, aircraft type, and departures/arrivals at airports), airport weather data, aircraft fleet data, and more.

The Air Safety Database has been used many times to make the difference in the acceptation of new procedures. Example studies that have benefited from the use of the database can be found on www.nlr-atsi.nl.

Connection with NLR

The Air Transport Safety Institute is embedded in the National Aerospace Laboratory NLR. The NLR is the central organisation in the Netherlands for aerospace research and development. Key NLR facilities such as fast-time and real-time ATC simulators (tower and en-route), and moving-base flight simulators are used for training and validation of concepts and systems, supporting safety assessments for the whole chain of air transport. The NLR research aircraft are available to perform flight tests for new operational procedures, the evaluation of avionics, and new air traffic management concepts.

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