



NLR Air Transport Safety Institute

Research & Consultancy

The NLR Air Transport Safety Institute is a research and consultancy organisation that develops and applies world-class knowledge and tools to help sustain and improve air transport safety.

The mission of the institute is to support stakeholders in air transport to understand and resolve the safety implications of the growing demand for efficient and sustainable air transport.

Customers of the safety institute include air navigation service providers, aviation authorities, governments, airports and airlines around the world.

Our main business areas are:

- Operational & flight technical assessment
- Safety management
- Safety regulation & oversight
- Safety cases
- Air safety data analysis
- Security



When safety matters

The NLR Air Transport Safety Institute delivers top-quality products and services, and employs recognised international experts. We combine a high level of knowledge and experience with great enthusiasm, skills and creativity.

The expert areas of the employees vary from aircraft flight mechanics, performance and operations to mathematical modelling, simulation and policy development. Our employees are involved in a wide range of projects varying from detailed safety assessments of new flight operational procedures and on-site accident investigation to participation in parliamentary inquiry committees.

Being an independent not-for-profit organisation, the safety institute contributes to global as well as national safety initiatives and actively contributes to the public debate regarding air transport safety.



On solid ground

Expert knowledge and experience are a main pillar of the safety institute. Therefore, part of the safety institute's turnover is dedicated to research and development aimed at further advancing existing methodologies and tools, and developing new ones.

The safety institute participates in key national and international working groups and committees like the European Safety Strategy Initiative (ESSI), the US Commercial Aviation Safety Team (CAST) and the European Advisory Committee of the Flight Safety Foundation, the FAA–EUROCONTROL Action Plan Team on Safety and various ICAO Working Groups.

Safety management

Systematic, explicit and comprehensive safety management is needed to actively manage safety risks and achieve high and consistent levels of safety in air transport. However, putting in place a fully integrated, truly effective and affordable safety management programme is not always straightforward, particularly for government agencies. That is why the safety institute provides tailor-made safety management solutions for different types of air transport organisations.

Main services of the institute in this area include:

- Safety risk portfolio development
- Safety management programme development and training
- Public policy process analysis and design
- Safety culture surveys
- Safety cost-benefit analysis

Assignments completed recently in this area are a major review of safety management of air transport in Switzerland (Swiss Government), the development of a framework of safety performance indicators for air traffic management (EUROCONTROL), and the development of a framework to incorporate safety in a cost benefit analysis (the EU-supported project ASICBA).

Safety regulation & oversight

To keep up with technological and operational developments in the sector, rules, standards and recommended practices are subject to continuous development. To ensure that changes in regulation are effective and operationally acceptable, it is necessary that their development is supported by operational experience and well-founded theoretical considerations.

The safety institute assists rule makers by providing the underlying analyses. In Europe in particular, the regulatory environment is in a state of radical change, which means that the roles, organisation and processes of the national authorities are also undergoing important changes.



Main products and services of the safety institute in this area include:

- Technical & operational analyses in support of rulemaking
- Risk based oversight & regulation
- Organisational and institutional design
- Development of oversight processes and practices

Recently completed assignments in this area include flight technical & data analysis regarding cross-wind limits, balked-landings, obstacle clearance, and flight crew intervention. And also benchmarking of various national authorities, review of oversight policies for flight operations, and design of risk-based oversight concepts.



Air safety data analysis

Analysis of flight data is an important part of flight safety assurance. The NLR Air Safety Database, maintained by the safety institute for many years, contains up to date, detailed information on accidents and incidents of fixed wing aircraft from 1960 onward. Currently, the NLR Air Safety Database contains world-wide information on more than 34,000 accidents and serious incidents.

Besides data on accidents/incidents, the NLR Air Safety Database contains a large collection of other data. This includes airport databases, flight exposure data (hours & flights at the level of airlines, aircraft type, and airports), weather data, fleet data, and more.

It is the combination of different data sources and the aviation knowledge of our experts that allows unique analysis capabilities.

Main products of the safety institute in this area include:

- Quantification of the contribution of specific factors to accident risk
- Statistical analysis of the analysis results
- Focused data collection campaigns
- Detailed Flight Data Analysis using advanced data processing algorithms

Recent assignments of the institute in this area are a landing and braking performance analysis based on flight data, analysis of causal and contributing factors in Air-Ground communication failures, the development of a runway incursion risk grading tool, and the estimation of Standard Probabilities for use in certification.



Safety cases

A safety case is a formal analysis presenting an overall justification for the declaration that a particular operation is sufficiently safe. Building a safety case while developing equipment, operations or services, improves the design and can help making it inherently safe. In air traffic management building, a safety case is a formal regulatory requirement whenever an important change is introduced.

The safety institute has a broad experience in:

- Conducting affordable and convincing safety assessments for complex changes
- Applying standardised safety assessment methodologies, such as SAM and ED-78a, as well as specialised methods such as TOPAZ

- Applying and developing techniques such as hazard brainstorming, expert elicitation, fault tree analysis, Monte Carlo simulations and many more
- Assisting air navigation service providers and authorities in developing safety criteria
- Acquiring and analysing quantitative data to support risk estimation and performance monitoring

Recently completed assignments in this area include safety cases for a runway crossing operation at a major airport, for changes in the staffing concept of control towers in Norway, and for airspace changes in Switzerland.

Operational and flight technical assessment

The actual flight operation is where all concerted safety actions should result in the practical achievement of a safe flight. It is thus essential that new or modified systems and flight procedures are carefully analysed concerning operational safety and flight technical aspects, before being introduced. The institute has extensive experience in these “operational and flight technical assessments”.

Main products of the safety institute in this area are:

- Safety assessments for specific conditions, procedures or equipment
- Aircraft handling & performance analysis
- Accident & incident investigation

Based on its operational and flight technical expertise, the safety institute is involved in a broad range of such assessments. Recent assignments include the flight technical & operational assessment of development options for Reykjavik airport, a safety assessment for changes to the width, pavement and slope of various runways, risk assessment for P-RNAV approaches, and a flight technical assessment of the safety impact of changes in the wind climate due to buildings near runways.

Security

After the events of 11 September 2001, the safety institute has implemented an air transport security research program to develop methods and tools to assist stakeholders and government authorities in dealing with threats to airspace security, on-board security, ground security, and information and communications security.

Main products of the safety institute in this area are:

- Security cases (incl. threat assessment and incident/accident analysis)
- Training concepts
- Advisory tools for cockpit crew, cabin staff and air marshals
- Operational concept validation
- Active hazard assessment support for air traffic controllers
- Safety cases and business cases for security

The safety institute is well acquainted with the security regulations of international organisations like ICAO, EU, and ECAC and participates in all main European security programs and projects (SAFE, PATIN, COUNTERACT, SINBAD).



Connection with NLR

The Air Transport Safety Institute is embedded in the National Aerospace Laboratory NLR. Thus, the knowledge and experience of hundreds of experts in all fields of aerospace are directly available to the safety institute to support virtually any safety related project.

Key NLR-facilities such as fast-time and real-time ATC simulators (tower and en-route), and moving-base flight simulators are used for validation and training of concepts and systems, supporting safety assessments for the whole chain of air transport: ATC, airports, and flight operations. The NLR research aircraft are available to perform flight tests for new operational procedures, the evaluation of avionics, and new air traffic management concepts (data link, airborne self-separation, etc.).

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