Swiss Transportation Safety Investigation Board STSB
Annual Report 2024


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Swiss Transportation Safety Investigation Board STSB

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1 Foreword by the President

The number of notifications of safety-relevant events received by the Swiss Transportation Safety Investigation Board (STSB) has been steadily increasing for more than ten years. In 2024, the STSB received a record number of such notifications (2,295), particularly from the aviation sector. A good notification culture is very welcome and a basic prerequisite for improving the safety of our modes of transport and the public's trust in aviation and public transport. For these notifications to be useful, they must be assessed in terms of their potential to prevent further incidents. The STSB conducts preliminary enquiries to determine whether it should open an extensive investigation. Safety deficits can then be identified and safety recommendations or safety advice notices addressed to the regulatory authorities and the sectors involved. As the number of notifications continues to grow, the task of selecting those cases that are important for prevention is becoming more complex. These preliminary enquiries take priority and require an immediate response from the Investigation Bureau's on-call organisation, a high level of expertise and a great deal of experience. Set against this increase in the volume of work is a decline in the financial resources available to the STSB. In 2017, the STSB still had a total of CHF 8.21 million at its disposal; only CHF 8.03 million was budgeted in the reporting year. Inflation was offset by efficiency gains and strictly limiting the work to the most essential investigations. The available funds were also better utilised. However, the year 2024 shows that, if the STSB does not wish to become less effective, it needs to find a way of balancing the resources at its disposal with the additional workload involved in the increasing number of cases. This will pay off many times over, because one thing is certain: each accident prevented saves enormous costs and avoids a great deal of human suffering.

Pieter Zeilstra,
President of the extra-parliamentary commission

2 Management Summary

The STSB received 2,295 incident notifications in the year under review. Following assessment, these resulted in 31 new investigations.
A total of 25 extensive and 18 summary investigations were completed during the year, and one interim report was published on an ongoing investigation. Five investigations were discontinued in 2024.
The STSB completed 43 investigations, fewer than in the previous year (62).

The investigations revealed safety deficits for which the STSB issued 8 safety recommendations and 12 safety advice notices. These figures are distributed as follows across the different modes of transport:

	Aviation	Public transport
Incident notifications	1952	343
Opened investigations	19	12
Interim reports published	0	1
Extensive investigations completed	16	9
Summary investigations completed	15	3
Safety recommendations issued	4	4
Safety advice notices issued	7	5

The STSB did not receive any notifications of incidents involving maritime navigation in 2024. No investigation was launched and no reports were published.

A record number of 2,295 notifications were received in the reporting year. This was due to a renewed increase in notifications in the Aviation Division, which accounts for the majority. The number of notifications dealt with by the Rail/Navigation Division has remained fairly constant for many years.

Seventy investigations were pending in the Aviation Division at the end of 2024. This is significantly fewer than the 89 investigations still open at the end of 2023. In the Rail/Navigation Division, 16 investigations were still ongoing at the end of the year (previous year: 16).

3 The STSB

3.1 Remit

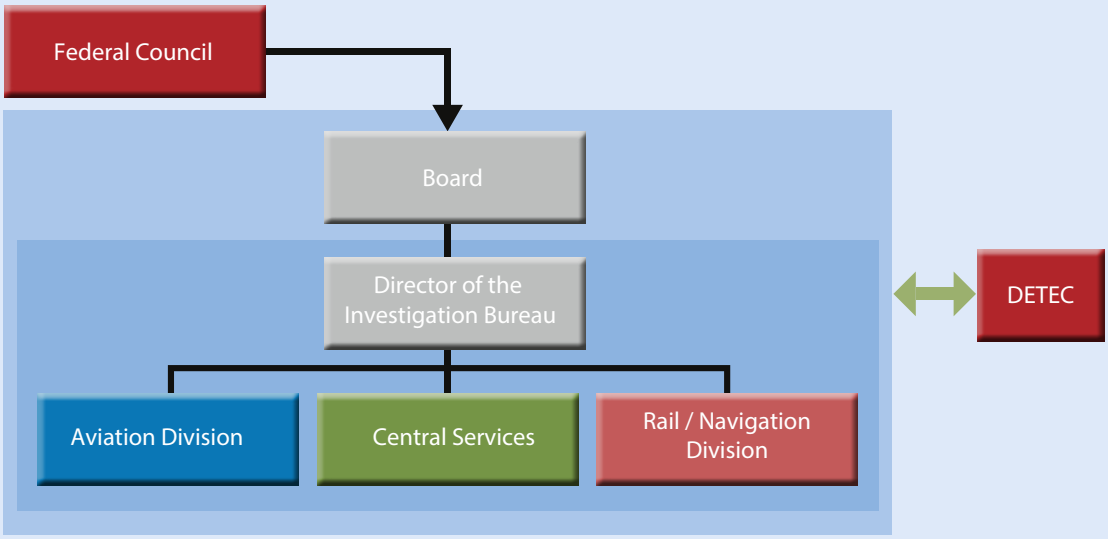
The Swiss Transportation Safety Investigation Board (STSB) investigates incidents in civil aviation, public transport and inland and maritime navigation in accordance with the relevant national and international laws.

Specific requirements regarding organisation and investigation procedures are set out in the Ordinance on the Safety Investigation of Transportation Incidents (OSITI; SR *742.161*).
The revised version of the OSITI was approved by the Federal Council in 2024 and took effect on 1 January 2025. Besides a number of other minor adjustments and corrections, the revision included the following improvements:

- The investigation procedure has been streamlined to increase efficiency; a difference is no longer made between extensive and summary investigations.
- There is now a regulated consultation procedure for each investigation, in which the addressees can make their views known within 30 days.
- The safety investigation consists of a preliminary investigation and a main investigation; this is particularly important in dealings with foreign authorities.
- Reports are no longer sent out in paper form, but instead are available in digital format.
- Developments in and amendments to superordinate Swiss and international law are taken into account.

These amendments to the ordinance reestablish an up-to-date statutory basis for the work of the STSB.
Switzerland's cooperation with the Principality of Liechtenstein in the area of safety investigations in civil aviation was also realigned in 2024. In June 2024 the STSB assumed the role of safety investigation authority for the Principality of Liechtenstein. The statutory basis for this cooperation is found in Liechtenstein's Aviation Act. Specific implementation requirements and financial remuneration are regulated in an administrative ordinance.

STSB investigations consist of an independent examination of the technical, operational, human, organisational and systemic circumstances and causes that led to the given incident. The findings are intended to help prevent similar incidents occurring in the future. As stated explicitly in the Swiss Railways Act (RailA; SR *742.101*) and the Swiss Aviation Act (AviA; SR *748.0*), questions of culpability and liability are beyond the scope of the investigations.
Where the STSB establishes safety deficits in the course of its investigations, it issues safety recommendations to the competent supervisory authorities, or safety advice notices to the companies, bodies or organisations concerned. The task then is to determine what measures are appropriate to reduce or eliminate the risks attached to the deficit that has been identified. The authorities do this as part of their supervisory activities, the companies as part of their safety management systems.
The STSB collates and publishes the findings of investigations in the form of reports aimed at professionals in the sectors concerned and the interested public. They are explicitly not aimed at law enforcement authorities.
The STSB forms part of the overall transport safety framework in Switzerland. This is made up of companies, authorities and organisations, such as transport operators, manufacturers, vehicle keepers, safety investigation bodies, supervisory authorities, accreditation and certification bodies, conformity assessment bodies, and others. Each element of the system helps to ensure



the safety of its particular mode of transport by performing specific tasks that are assigned to it under the relevant legal provisions.

3.2 Organisation

The STSB is structured as an extra-parliamentary commission under Articles 57a–57g of the Swiss Government and Administration Organisation Act (GAOA; SR *172.010*). The Board is appointed by the Federal Council. It was boosted by an additional member in 2024 and now comprises four independent experts from the relevant transport areas. The STSB's Investigation Bureau is responsible for conducting the investigation process. Administratively, the STSB is attached to the General Secretariat of the Federal Department of the Environment, Transport, Energy and Communications (DETEC), although it acts independently.

3.3 Performance targets

The Federal Administration's New Management Model (NMM) was introduced on 1 January 2017. It is designed to strengthen administrative management at all levels and to increase the transparency and manageability of performance. Within the framework set by the NMM, the STSB defined the following projects, initiatives and performance targets for the year under review:

Projects and initiatives

Replacement database for recording and analysing investigation data: Evaluation of user-specific database requirements:

The STSB currently uses the EMAS incident management system to record and manage reported incidents and safety investigations. The current database no longer meets the Confederation's security requirements, nor all those of the STSB. Furthermore, it cannot be adapted to changes in business processes; for example, process changes cannot be mapped.

It was therefore necessary to procure a new system, and an internal project was launched to this end in late 2022. Following a detailed needs analysis and description of the data structure, workflow processes and user requirements, a public procurement process was launched in 2024. The invitation to tender was published at the end of the year. A new system will be introduced in the course of the next few years.

Performance targets

The STSB sets itself challenging performance targets for the application of state-of-the-art investigation methods and the swift publication of investigation findings.

Targets and indicators	2024 TARGET	2024 ACTUAL	2025 PLAN
Conformity assessment: The Aviation Division's internal guidelines and procedures are in line with the latest international requirements.			
Conformity assessment procedure conducted once a year in accordance with ICAO Annex 13, EU Regulation No 996/2010 (yes/no)	ja	ja	ja
Rapid conduct of safety investigations: By applying suitable measures, the STSB ensures that incident investigations are conducted promptly and in compliance with the law.			
Prompt completion of safety investigations concerning serious incidents and accidents involving aircraft (%, minimum)	50	12	60
Prompt completion of safety investigations concerning serious incidents and accidents involving railways, buses and boats (%, minimum)	50	62	60

Once again in 2024, the targets for the prompt completion of investigations (cf. Art. 52 OSITI) in civil aviation could not be achieved. The STSB has managed to continuously reduce the number of open investigations in recent years, from 164 (2020) to 70 (2024), including many older cases. Ongoing work on older cases continues to negatively affect our ability to complete investigations within the required timeframe. Even though progress was made in this regard in 2024, there are still many pending aviation cases to deal with.

In 2024, a new record number of notifications was received. Priority is always given to assessing the notifications to determine whether the incident in question warrants investigation. An on-site inspection is conducted immediately so that the accident site can be cleared and data secured. The large number of notifications and the fact that the work involved in assessing them is generally increasing means that fewer resources are available to carry out investigations.

In the case of incidents on state licensed public transport, in 2024 the target for the prompt completion of investigations was significantly exceeded.

3.4 Resources

The STSB had a budget of approximately CHF 7.9 million in 2024. Of this, CHF 4.1 million was earmarked for staff expenses, and CHF 3.6 million for material and operating expenses. The latter item included CHF 1.7 million for external services, used to finance investigations conducted by external experts and specialist organisations. Approximately 95% of

the budget was used. The budget surplus results from gains achieved when vacant positions were filled.

As is usual in other countries, the work of the STSB is a core service provided by the state to improve safety. It is therefore almost exclusively publicly funded. Consequently, all STSB products, and in particular final investigation reports, are freely available on the internet.

The head of the Rail/Navigation Division retired at the end of October and was succeeded by Philippe Thürler, who brings considerable experience to the post.

In 2024 the extra investigator-in-charge position, which had been planned and approved in 2023, was filled. The position is shared by two persons, and is fully funded from the global budget (transfer from materials to staffing budget).

The STSB Investigation Bureau had a staff of 19 (17.2 FTEs) at the end of 2024. In its investigative activities, the STSB can also call upon the support of around 130 external contract investigators, in particular when specific specialist skills are required.

4 Investigations and findings

4.1 Overview of investigations by the entire Investigation Bureau

The STSB received a record 2,295 incident notifications in the year under review. The continued increase is due to a further rise in notifications concerning aviation. The number of notifications dealt with by the Rail/Navigation Division has remained fairly constant for many years.

Following assessment of the notifications received, 31 new investigations were opened.

A total of 25 extensive and 18 summary investigations were completed during the year, and one interim report was published on an ongoing investigation. The STSB completed 43 investigations, fewer than in the previous year (62). A further 5 investigations were discontinued.

The investigations revealed safety deficits, for which the STSB issued 8 safety recommendations and 12 safety advice notices.

In 2024, the STSB did not receive any notifications of incidents involving maritime navigation. No investigations were launched and no reports were published.

	Aviation	Public transport
Incidents reported	1952	343
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The Rail/Navigation Division is currently investigating 16 incidents (previous year: 16).

The Aviation Division was able to reduce the number of outstanding investigations further: at the end of 2024, 70 investigations were still pending, compared to 89 at the end of 2023. This reduction was achieved by restricting the criteria applied when assessing whether the potential preventive safety benefit justifies opening an investigation. Cases were identified in which simply publicising the facts of the case would have a significant preventive benefit. Since 1 January 2024, these cases have been published in a Prevention Bulletin, a summary of which appears on a quarterly basis on the STSB website. These bulletins are organised chronologically and include those incidents for which preliminary investigations were completed by the end of the respective quarter. The key facts of individual incidents are presented in anonymised form. The information is not exhaustive and is intended to raise safety awareness among stakeholders.

4.2 Aviation

The STSB received 1,952 notifications of incidents in aviation during 2024. Each of these was reviewed in terms of its potential preventive value. In many cases, additional technical aids were brought in to assess the danger in incidents that were thought to be serious, especially aircraft proximity hazards (airproxes), where there is a risk of collision between two aircraft. These preliminary enquiries resulted in a total of 9 accident investigations and 14 serious incident investigations, including 6 airproxes involving a high or significant risk of collision. An extensive investigation was opened for 13 incidents, whilst the initial investigation findings suggested a summary investigation for 10 events.

There were 31 investigations completed and their findings published in 16 final and 15 summary reports. The final reports contained four safety recommendations and seven safety advice notices (Section 5.2).

In the reporting year, there were three accidents involving aircraft registered in Switzerland, with five fatalities.

Based on the objective of an investigation and the mandate to use the available resources in such a way that the greatest possible effect can be achieved, the STSB Investigation Bureau reviewed the pending cases and identified those where it became apparent in the course of the investigations that, for various reasons, the potential preventive value was low. In the process, five cases were identified in which the investigation was subsequently discontinued in order to meet the requirement of using resources effectively and for their intended purpose.

4.3 Public transport

Railways and tram

The STSB received 294 notifications of safety-related incidents concerning trains (261) and trams (33) in 2024. An investigator-in-charge attended the scene in 24 cases. The notifications having been assessed for prevention potential, an investigation was opened in nine of the cases. These concern three derailments, three runaway vehicles, two industrial accidents and one incident involving hazardous goods.

Seven extensive and three summary investigations were completed last year. In response to the safety deficits identified during the extensive investigations, the STSB addressed four safety recommendations to the supervisory authority and four safety advice notices to transport/infrastructure operators (Section 5.3).

The investigation into the derailment of a freight train in the Gotthard Base Tunnel was given high priority in 2024. The draft report was sent out for comments at the end of the year.
The derailment of a tram on Kornhausplatz in Bern, in which fortunately no one was injured, required the attention of the Investigation Bureau.

Cableways

There were 26 notifications of safety-related events involving cableways during the reporting year. An investigator-in-charge attended the scene in one case. An analysis of the received notifications with regard to their potential to prevent further incidents led to an investigation in one case. Important safety findings were made during the investigation that could require immediate action. The STSB therefore published an interim report with a corresponding safety recommendation.

Buses

Thirteen notifications were received relating to bus transport. An assessment in each case did not reveal any potential for an investigation, so none was opened.

Inland navigation

Ten notifications of inland navigation incidents were submitted to the STSB in 2024. One notification revealed prevention potential, and so an investigation was launched.

4.4 Maritime navigation

No incident notifications concerning maritime navigation were received during the reporting year, and no reports were published.

4.5 Principality of Liechtenstein

In 2024, the STSB received four notifications concerning incidents involving aircraft registered in the Aircraft Register of the Principality of Liechtenstein. In one case, an investigation was opened by the German Safety Investigation Board. An accredited representative of the STSB is supporting the investigation.

Number of notifications concerning aircraft in the Liechtenstein register	Opened investigations	Completed investigations
4	1 (by a foreign authority)	–

5 Safety recommendations and safety advice notices

5.1 General

In the first half of the last century, accidents in the transport sector were usually investigated by the oversight authority for the mode of transport concerned. However, since the activities of the authority itself may have contributed to the cause of the accident or hazardous situation, over the course of recent decades there has increasingly been a separation of tasks and powers. In most countries, in addition to the oversight authority, an independent, state-run safety investigation body exists, which is expected to impartially establish the reasons for an accident or a serious incident. In Switzerland, the Railways Act (RailA; SR *742.101*) and the Aviation Act (AviA; SR *748.0*) provide the legal framework for such an independent safety investigation body.

Because of the separation of powers, an investigation body does not itself mandate safety measures to the relevant authorities. These retain their full responsibility. The safety investigation body – the STSB in Switzerland – identifies any safety deficits and issues the corresponding safety recommendations in an interim or final report to the relevant oversight authority or government department. It is then up to the body to which the safety recommendation was directed to decide – along with the stakeholders concerned – whether and how the safety recommendations should be implemented. This principle applies to all modes of transport for which the STSB is responsible for investigating incidents.

However, there are certain differences in both international and national legal frameworks regarding the responsibilities in oversight of the individual transport modes. These affect the specific procedures followed, as described below.

The EU established the European Union Aviation Safety Agency (EASA) in 2002. EASA's mission is to provide uniform and binding rules on aviation safety in the European aviation sector on behalf of the EU member states. Here, the national supervisory authorities primarily play an executive

and mediating role and their exclusive competence is increasingly limited solely to the nationally regulated aspects of civil aviation. For this reason, the STSB addresses its safety recommendations concerning aviation either to EASA or the Federal Office of Civil Aviation (FOCA), depending on the responsibilities. In individual cases a different authority in Switzerland or abroad may be responsible for ensuring that a safety deficit is rectified. In these cases the STSB addresses its safety recommendation to the competent authority concerned.

Regulation by the EU is becoming increasingly important for the railways, in particular with regard to technical and operational interoperability in international transport. Meanwhile, responsibility for overseeing railway safety essentially lies with the national safety oversight authority, which in Switzerland is the Federal Office of Transport (FOT). However, since June 2019, the European Union Agency for Railways (ERA) has issued single safety certificates and market authorisations for rolling stock and approved control-command projects. As a further result of the changes to the legal foundations in the railway sector, other authorities and organisations also take on a supervisory role alongside the national authority. These include the Swiss Accreditation Service (SAS) and various certification bodies for companies that are responsible for maintenance. The STSB addresses its safety recommendations to that authority or body whose mandate gives it the power to implement or order action on the basis of the recommendation submitted to it.

Safety objectives and requirements for cableway installations and their operation are governed by the EU Cableways Regulation (EU) 2016/424 dated 9 March 2016. However, oversight and enforcement lie fully within the remit of the national oversight authority, which in the case of federally licensed cableways is the FOT. STSB recommendations are therefore addressed to this authority.

The regulations applying to licensed inland navigation in Switzerland are primarily national ones. Consequently, recommendations from the STSB are addressed to the FOT as the national supervisory authority for safety.

With regard to maritime navigation, the European Union established the European Maritime Safety Agency (EMSA) in 2002. Its mission is to reduce the risk of accidents at sea, the pollution of the seas through maritime navigation and the loss of human life at sea. EMSA advises the European Commission on technical and scientific matters concerning the safety of maritime traffic and in relation to preventing the pollution of the seas by ships. It plays a part in the ongoing drafting and updating of legislative acts, the monitoring of their implementation and in assessing the efficacy of existing measures. However it has no authority to issue directives to Switzerland specifically. Any safety recommendations from the STSB are therefore addressed to the Swiss Maritime Navigation Office (SMNO) as the national oversight authority, or to the International Maritime Organization (IMO).

Having received a safety recommendation, the addressee notifies the STSB of the action it intends to take to rectify the safety deficit, as well as a timeline for its implementation. The feedback from the addressees and the current implementation status can be found on the STSB website (https://www.sust.admin.ch/en/safety-recommendations/aviation or https://www.sust.admin.ch/en/safety-recommendations/railnavigation).

Occasionally, an investigation brings safety deficits to light that cannot be eliminated by amending rules or regulations or by direct oversight; instead, there is a need to alter or raise risk awareness. In these cases the STSB formulates a safety advice notice which is addressed to particular transport-related stakeholder or interest groups. This is intended to help the companies, people and organisations concerned to identify a risk and the associated action that is required. There is no requirement to report on the implementation of measures taken in response to safety advice notices. Unlike safety recommendations, safety advice notices are not published separately on the STSB website.

All of the safety recommendations and safety advice notices issued by the STSB in interim or final reports during 2024 are set out below. To aid understanding, these are accompanied by a brief description of both the incident concerned and the safety deficit which is to be eliminated.

5.2 Aviation

Dangerous approaches between a powered aircraft and gliders in the vicinity of the control zone at Les Eplatures aerodrome, 21.05.2023

Shortly before midday, two gliders took off independently in a westerly direction for cross-country flights over the Jura mountains. In the early afternoon, a motorised aircraft took off on a training flight to carry out two IFR approaches at Les Eplatures (LSGC).
As the crew in the motorised aircraft prepared for the second approach in the holding pattern above the airfield, within seven minutes of each other the two gliders made dangerous approaches at an altitude of around 7000ft amsl, one of which resulted in a near-collision.

Safety deficit
The two serious incidents investigated here are not isolated cases; within 12 days, three further similar incidents occurred outside and in the immediate vicinity of the control zone around Les Eplatures aerodrome in Class E airspace.

Safety advice notice No 61, 13.09.2024
All airspace users should be aware that outside and in the immediate vicinity of an aerodrome, i. e. also above the control zone (CTR) with upper limit 6500ft (2000m/M) amsl, a large volume of both VFR and IFR air traffic is to be expected, especially in good gliding weather conditions, at weekends and on public holidays. This class E airspace between the CTR and flight restriction areas for gliders is a kind of buffer zone in which 'large' cloud clearances, i. e. 1500 m horizontally and 300 m vertically, apply to VFR air traffic; this should provide IFR air traffic with sufficient reaction time to conduct an avoidance manoeuvre. In addition, safety can be increased by the use of appropriately configured and modern transponders or collision warning devices and by the use of anti-collision lights.

Engine problems on a training aircraft, Hausen am Albis (ZH), 13.01.2022

During a training flight in an Aquila AT01 single-engine light aircraft, a sudden loss of engine power caused strong vibrations.

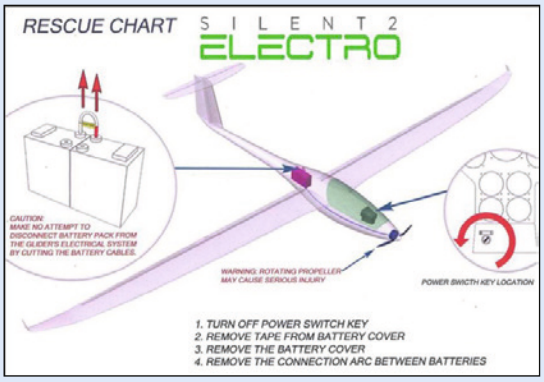
Safety deficit
The investigation revealed damage indicating that the valve disc on one of the cylinders' exhaust valves had cracked suddenly and metal had become fused. This defect was caused by deposits with a high lead content in the combustion area of the cylinder head and especially on the valves, most likely caused by the engine operating with a fuel mixture with a high lead content.
The engine manufacturer states that the engine oil and oil filter should be changed every 50 engine hours and a compression test should be carried out every 100 hours if the engine is operated with leaded fuel such as AVGAS 100LL for more than 30% of the engine hours. In Service Instruction SI-912-016 it is also recommended that the oil and oil filter should be changed after 25 engine hours if the engine is primarily operated with AVGAS.

Safety advice notice No 53, 23.01.2024
It should be noted that the engine manufacturer's documentation states that its Rotax engines should be operated with unleaded fuel such as MOGAS wherever possible. If leaded fuel such as AVGAS 100LL is used over longer periods of time, the engine manufacturer's recommendations regarding shortening the interval for a compression test and an oil and oil filter change should always be observed and, in case of doubt, interpreted conservatively.

Loss of control of an ultralight glider with electric propulsion, La Mapas, Conthey (VS), 22.07.2021

Having fallen below the minimum airspeed during a turn close to the ground, the single-seater microlight glider lost control and collided with the terrain.

Safety deficit
Emergency crews are increasingly exposed to a range of hazards at accident sites, such as rocket propellants in ballistic parachute systems or high-voltage systems in electric motors. The accident involving an ultralight glider with electric motor showed that information on the presence or otherwise of such hazards is often lacking or cannot be provided within an appropiate amount of time, yet this is necessary to avoid endangering the emergency services and delaying life-saving emergency measures.



Safety recommendation No 596, 28.05.2024
The International Civil Aviation Organization (ICAO), in co-operation with its member states, should provide a database from which the emergency services can immediately obtain information on the hazards posed by any aircraft involved in accidents.

Safety recommendation No 597, 28.05.2024
Until the implementation of safety recommendation No 596, the Federal Office of Civil Aviation (FOCA) should provide a database from which the emergency services can immediately obtain information on the hazards posed by any aircraft involved in accidents in Switzerland, regardless of their country of registration.

Safety recommendation No 598, 28.05.2024
The Council of the International COSPAS-SARSAT Programme Agreement, in cooperation with the states party to the agreement, should take steps to ensure that information on the presence or otherwise of ballistic parachute systems (BPS) is included in the coding of aircraft 406 MHz emergency locator transmitters (ELTs).

Safety advice notice No 57, 28.05.2024
ATC flight plans contain information relevant to search and rescue (SAR), including details of the number of occupants, the aircraft's colour scheme and emergency equipment. Any other information may also be entered.
An ATC flight plan provides a range of information that is easily and promptly accessible to search and rescue teams in the event of an accident. This allows emergency services to be informed about potential hazards, and they can conduct life-saving emergency measures without unnecessary delay. Submitting an ATC flight plan thus clearly represents a fundamental safety gain and it makes sense to submit one for all flights, regardless of the type of aircraft or the planned flight. For example, for glider flights where no specific flight route is planned, a destination point in the intended flight direction can be entered as the route in the ATC flight plan. In order that the emergency services have the most detailed information possible in an emergency, information on a BPS or other potential hazard such as an electric motor should be entered in field 18 'Other information' in the ATC flight plan. This information should include specific details such as the manufacturer and the BPS type (example: 'RMK/BPS installed, type Galaxy GRS6-600').

Collision with the terrain, Gotthard Massif (UR), 18.07.2021

The motorised aircraft collided with the terrain while flying over the main Alpine ridge after continuing under VFR in unsatisfactory weather conditions.

Safety deficit
406MHz emergency location transmitters (ELTs) are capable of transmitting their position provided they are equipped with an integrated GPS data source or connected to an external GPS receiver and they are programmed with a complete GPS data transmission protocol. Some ELTs do not have this capability, which can greatly increase the time it takes for the emergency services to arrive at the scene of an accident. The motorised aircraft involved in the accident was equipped with a 406MHz ELT, whose signals were received within a minute of the accident. However, as the ELT did not transmit a position, it was very difficult to locate the aircraft, which was not found until after midnight. It is a fairly simple matter to retrofit an aircraft with a GPS data source.

Safety advice notice No 58, 28.05.2024
406MHz ELTs should be checked for their ability to transmit position data and to ensure that they are correctly programmed, and modified accordingly.

Collision in the air, Piz Neir (GR), 12.06.2021

All aircraft occupants were killed in a collision between a motorised aircraft and a glider.

Safety deficit
Search and rescue (SAR) operations are often complex and multi-layered and involve many different organisational partners. Operations in the Rescue Coordination Centre (RCC) require a great deal of experience and expertise, which can only be built up over many years and by actively accompanying actual SAR processes.
The investigation revealed potential for improvement with regard to the organisation and working methods of the RCC. The RCC, which has been run by the Air Force since 1 January 2021, was not the main hub of the SAR operation throughout. The investigators also received the impression that the Flarm Technology Ltd specialists had not been included sufficiently in the workings of the RCC in advance and so were not sufficiently known to the other partners. The numerous changes in RCC management in the past were not conducive to building up experience and knowledge.

Safety recommendation No 595, 20.08.2024
The Federal Office of Civil Aviation (FOCA), together with the rescue coordination centre (RCC), should review and where necessary adapt the RCC's organisational form and operational methods.

Safety deficit
The investigation revealed that technical, human and operational aspects in the area of collision prevention, already recognised in previous investigations and addressed in corresponding safety recommendations, had again played a role. The STSB therefore issued the following comprehensive safety advice to remind pilots of ways to improve collision prevention when flying under VFR.

Safety advice notice No 56, 20.08.2024
The 'see and avoid' principle to avoid collisions does not always work satisfactorily. It should therefore be supplemented by technical and operational aids, towards a 'sense and avoid' principle.
The following can be used for this purpose:
- Mutually compatible collision warning devices;
- ELTs with ADS-B Out;
- Anti-collision lights;
- Striking colour scheme;
- Regular and meaningful position reports via radio.

Technical aids are only of benefit if they are correctly installed and maintained to ensure that they function properly. This includes any necessary software and database updates.
Furthermore, such aids can only be effective if their users are aware of how they work and of their possibilities and limitations, so that they can be used appropriately and effectively to help prevent a collision.

Loss of control at the performance limit in the mountains, Blatten (VS), 25.07.2020

On a warm summer's day, the pilot of a Cessna 172R motorised aircraft with three adult passengers on board flew into the Lötschental valley (VS) shortly after midday. The well-laden, tail-heavy aircraft climbed to its performance limit and flew at a sharp angle close to the terrain and almost at stall speed. After stalling at an altitude of around 13,000ft amsl, the aircraft entered an unintentional flat spin, which the pilot was unable to recover from. The aircraft hit a rockface and caught fire; all four occupants were fatally injured on impact.

Safety deficit
The passengers were not weighed before the flight, but their weights were entered in the mass and centre of gravity calculation in the aircraft manifest. The maximum take-off mass (MTOM) of the aircraft was thereby nearly reached. The STSB reconstructed the actual mass ratios and found that the actual mass of the powered aircraft at take-off and at the time of the accident was above the MTOM and the centre of mass was above and therefore outside the limits permitted by the Pilot's Operating Handbook (POH).
Other safety investigations into accidents in the general aviation sector have also shown that the mass of the aircraft being operated was close to or above the MTOM. The passengers were not weighed in advance, meaning that the actual mass of the aircraft was not known for certain.

If an aircraft is operated at its performance limitations, for example at high altitudes, at high temperatures or when taking off or landing on a wet grass runway, the safety reserves can only be estimated accurately if the actual mass of the aircraft is known with sufficient precision.

Safety advice notice No 59, 05.11.2024
In the case of an aircraft flown at its performance operating limitations, it is essential to determine the actual total mass of the aircraft as accurately as possible in order to assess the performance and safety reserves and to be able to establish measures that reduce the risk involved. In particular, the aircraft occupants and luggage should be weighed, and the weight of fuel in the aircraft determined, e. g. by means of a dipstick.

Safety deficit
In accordance with the regulations for non-commercial operations with marginal activity, the route of Fluggruppe Reichenbach's 'sightseeing flight no 5' takes off in the direction of Spiez, Interlaken and Grindelwald, passing the Gauli Glacier towards Finsteraarhorn. The route then leads to Saas-Fee, Gorner Glacier, Zermatt and Leuk before returning via Kandersteg to Reichenbach. As became apparent in the course of the investigation, the aircraft type used in sightseeing flight operations with three adult passengers could not reasonably be used for this sightseeing flight, in view of the operating requirements.

Safety advice notice No 60, 05.11.2024
Operators of non-commercial operations (NCO) in the marginal activity sector should define operating conditions that allow sightseeing flights to be made safely in compliance with these operating requirements. These must be monitored by a nominated person responsible for flight safety. It should be ensured that pilots flying sightseeing flights have full training and that the operating instructions are understood and applied during the flight. Less experienced pilots should be given support and advice on planning and flying aircraft on sightseeing flights.

5.3 Railways

Runaway road-rail vehicle, Poschiavo (GR), 17.11.2023

On 17 November 2023 at 04:25, an unbraked road-rail vehicle (dumper truck) rolled backwards above Poschiavo (GR) during on-tracking and collided with a stationary construction train in the tunnel further down the track. The driver on board was seriously injured.

The collision between a road-rail vehicle (dumper truck) and a construction train in a tunnel above Poschiavo on 17 November 2023 was due to the rail axles being unintentionally unbraked as the vehicle was transferred to the track, whereupon it rolled away on a steep gradient.
The following contributed to the accident:

- The machine operator relied on his colleague's information that the rear rail undercarriage had been successfully lowered.
- The dumper truck was not additionally secured to prevent it rolling away unintentionally during on-tracking. There was no specification to this effect in the operating rules.

Safety deficit
During on- or off-tracking of road-rail vehicles, one rail axle remains unbraked for a short amount of time, during which the other axle must apply the entire holding force. If this holding force is insufficient, the vehicle will slip or roll away, especially on steep gradients. Little training or consideration is given to protection against this risk.

Safety advice notice No 39, 13.08.2024
Target group: Keepers of road-rail vehicles and their operators
Keepers of road-rail vehicles and their operators should define and implement measures to ensure that vehicles do not roll away unintentionally during on-/off-tracking on slopes.

Failure of a railway vehicle braking equipment, Sendy-Sollard (VD), 09.06.2022

On 9 June 2022 at around 11:20, the HGem 2/2 locomotive No 2501 had to manoeuvre two loaded ballast wagons parked on track 111 below Les Avants station. The two ballast wagons were then to be shunted back to Les Avants station. Having initially moved out of the station on open line, the train experienced adhesion problems on its return journey.
As the train was unable to climb the gradient back to Les Avants station, the MOB operations centre instructed the shunting supervisor to drive it down to Chamby station in-

stead, in order to clear the line for an approaching passenger train that was on its way to Les Avants station. The train travelled down the line and came to a halt in front of the Sendy-Sollard entry signal, which was set at stop. Having received authorisation to enter the station on track 1 with the signal at stop, the train set off again. When braking to come to a halt on track 1, the train was unable to stop. It broke away, hit the downline exit point at Sendy-Sollard station, and ran on open line before coming to a halt some 900 metres further on.

The train broke away from track 1 at Sendy-Sollard station and ran for some 900 metres on open line because, when braking in the station, the two axles of the HGem 2/2 No 2501 locomotive jammed, causing the locomotive to lose adhesion. The train slowed down solely thanks to the two loaded Fdk wagons, which each had a braking ratio (65%) insufficient for the line the train was on, thereby reducing the train's braking ratio to below 60%. This was too low to be able to stop the train.
The following factors contributed to the incident:

- The locomotive brake release was activated by the electronic controls; this inhibited the locomotive's air brake during the final phase of braking and prevented reactivation, resulting in a sudden rise in brake cylinder pressure, which made the axles lock up.
- The pneumatic anti-skid system is inactive below 5km/h.
- The magnetic brakes did not function.

The following may have contributed to the train breaking away:

- There had been a software modification affecting the automatic compensation of buffer force.

Safety deficit
The implementing provisions of the MOB rail service regulations (IP-RSRs) do not comply with the content of IP-RailO 77.2 Section 4.2, which stipulates that no more than 50% of the braked weight of the safety brakes may be considered on gradients greater than 60‰. MOB considers the entire braked weight when calculating braking.

Safety recommendation No 185, 26.03.2024
The STSB recommends that the Federal Office of Transport (OFT) ask MOB to check the magnetic braked weight values of all their vehicles and to adapt the table of braked weight values to be considered in the braking calculation mentioned in their IP-RSRs accordingly.

Safety deficit
The MOB's integrated management system (IMS) contains a procedure on releasing vehicles after maintenance, repair or modification, which describes the various stages of inspection and testing until the vehicle is returned to service. However, it does not specify how essential and non-essential modifications are categorised and by whom, nor who is responsible for taking the necessary steps with the supervisory authority, the FOT.

Safety recommendation No 186, 26.03.2024
The STSB recommends that the Federal Office of Transport (FOT) ask the MOB to adapt the procedures of its integrated management system (IMS) so that, when modifications are made to vehicles, it is clear who is responsible for categorising such modifications and ensuring that they are submitted to the FOT for vehicle approval.

Safety deficit
The expert assessments carried out as part of the technical-operational safety checks for the approval of non-interoperable vehicles differ from those carried out for the approval of standard vehicles running on the main network covered by the Locomotives and Passengers TSI. As these assessments are not carried out regularly, it is difficult for experts to have the specific knowledge e.g. of the details of the implementing provisions to the Railways Ordinance, or to keep up to date with the regulations as is necessary to carry out their tasks.

Safety recommendation No 187, 26.03.2024
The STSB recommends that the Federal Office of Transport (FOT) ensure, when conducting spot checks, that all specific requirements are taken into account in the expert reports relating to the authorisation procedures for non-interoperable vehicles. The interaction between the various braking systems in their respective operating environments is particularly important.

Runaway road-rail vehicle, Ringlikon (ZH), 30.04.2018

On 30 April 2018 at 20:30, a road-rail vehicle (dumper truck) ran off the rails during off-tracking at the Uetlibergstrasse railway crossing in Ringlikon (ZH) and collided with a road-rail excavator in the so-called 'Ringlikerkurve'.

The incident involving a runaway road-rail vehicle (dumper truck) on 30 April 2018 in Ringlikon resulted from the fact that off-tracking was initiated on a railway crossing with a 65‰ gradient, which caused the vehicle to slip.

The following contributed to the accident:

- Use of a road-rail vehicle that was not authorised for the gradient involved.
- Lack of information on the gradient up to which the road-rail vehicle may be used.

- Lack of vehicle-specific operating rules governing the use of the road-rail vehicle in railway operations.
- The operator's lack of vehicle-specific training, meaning he had insufficient knowledge of how to use the road-rail vehicle and how to brake it in an emergency.

Safety deficit
There were no operating rules for the use of the road-rail vehicle or regarding safety measures necessary in railway operations. As a result, there were no rules for the staff as to where and how the vehicle should be used and what safety measures should be taken.

Safety advice notice No 42, 13.08.2024
Target group: Railway undertakings
Railway undertakings should issue the necessary guidelines for the safe operation of the road-rail vehicles used under their responsibility in accordance with the directive on operating and rail service regulations (BV-FDV). Operating rules may be issued jointly by several railway undertakings.

Safety deficit
The operator of the road-rail vehicle had valid proof of training in accordance with LDO 10b. He was therefore familiar with the basic regulations for the use of road-rail vehicles in railway operations. However, he was not familiar with the vehicle-specific operation of the road-rail vehicle and had not received any training in this regard. He was therefore unaware of the fact that the vehicle should only be used up to a maximum gradient of 40‰.

Safety advice notice No 43, 13.08.2024
Target group: Keepers of road-rail vehicles
The keepers of road-rail vehicles should train operators in vehicle-specific operation and ensure they are familiar with and are able to apply the necessary safety precautions when operating such vehicles on the railways.

5.4 Cableways

Collision of a cable car cabin material transport platform with obstacles, Laax (GR) 05.01.2022

On 5 January 2022 between 14:20 and 14:26, cable car cabin No 2 and the material transport platform it was carrying struck several treetops during the ascent from Laax Mulania to Crap Sogn Gion. The platform subsequently collided with the ground. The cable car cabin and the material transport platform carried underneath grazed several treetops and the platform subsequently collided with the ground because it was overloaded and so the permissible rope slack was exceeded.

The following contributed to the accident:
- The load measuring device in cable car cabin No 2 was deactivated.
- The cable car was operated with the load measuring device deactivated and passengers and material were transported at the same time.
- The machine operator incorrectly calculated the weight of the material transported.
- The cabin attendant had limited operating experience.

Safety deficit
A load measuring device is a safety device that plays a key role in the safe operation of a cableway system when people and material are transported at the same time. It is only permitted to override this load measuring device in emergency situations, i. e. not permanently. Because it frequently malfunctioned, the load measuring device was regularly deac-

tivated and sometimes for long periods of time. There was no evidence that measures had been taken to permanently improve the availability and reliability of the load measuring device.

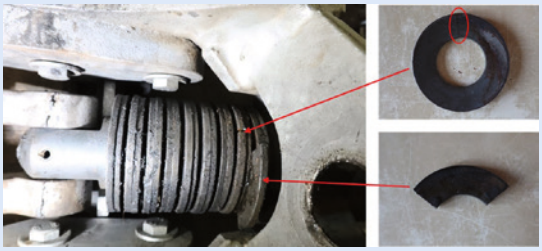
Safety advice notice No 40, 09.07.2024
Target group: Weisse Arena Bergbahnen (BFL)
BFL should take measures to permanently improve the reliability and availability of the load measuring device.

Safety deficit
New employees working on a cable car installation have little operating experience. This makes it all the more important that the knowledge required to carry out operations safely, in particular how to deal with possible deviations from normal operation, is addressed thoroughly in training. The fact that an inexperienced employee was on duty and that the load measuring device was deactivated – meaning that the overload was not indicated – led to the situation being misjudged and hesitant action when the cable car cabin initially hit the obstacles.

Safety advice notice No 41, 09.07.2024
Target group: Weisse Arena Bergbahnen (BFL)
BFL should ensure that their operating staff receive adequate training.

Collision between two cable car chairs, Visperterminen (VS), 03.01.2024 (interim report)

On 3 January 2024 at around 16:05 a collision occurred between two two-seater carriers on the Visperterminen-Giw detachable grip chairlift run by the company GIW AG (SVG). On the downhill run, shortly after passing the third mast from the upper station (Mast 11), carrier No 68 slipped downwards along the cable and collided with carrier No 67 immediately below. Two people were slightly injured. The two chairlift carriers were damaged.



Safety deficit
The failure of a cable clamp can result in a serious accident. Loss of gripping force may, as in this incident, result in the clamp slipping on the haul rope and thus a collision between chairlift carriers or, in the worst case, causing a carrier to fall to the ground. The cable clamp gripping force must be maintained at all times.
Disc springs with different clamp types are used in numerous cableway installations. These disc springs are arranged in spring stacks.
The investigation results suggest that the disc springs in use were of insufficient quality.

Safety recommendation No 179, 01.02.2024
The Federal Office of Transport (FOT) should ensure that manufacturers and operators of installations involving clamps with AK Type disc spring systems (AK 2, AK 2.1, AK 4, AK 4.1, AK 6 und AK 6.1) are made aware of the problem that occurred in Visperterminen and take appropriate action to check for and correct any faults.

5.5 Buses

No safety recommendations or advice notices were issued for buses as a mode of transport in 2024.

5.6 Inland navigation

No safety recommendations or advice notices were issued for inland navigation as a mode of transport in 2024.

5.7 Maritime navigation

No safety recommendations or advice notices were issued for maritime navigation as a mode of transport in 2024.

6 Time series

The following sections illustrate the trend over time in a range of data specific to the individual modes of transport. This was taken from the information that the STSB received or collected in connection with notifications of incidents and the associated preliminary enquiries. In each case, the figures cover the period between 2015, when the Ordinance of the Safety Investigation of Transportation Incidents (OSITI) came into force, and the reporting year. The time series data are presented in Annex 4.

6.1 Aviation

Figure 6.1.1 shows the incident notifications received and investigations opened per year since 2015. In the years prior to 2015, the STSB received notification of approximately 1,036 aviation incidents per year. If this figure is taken as the baseline, the STSB had around 20% more notifications to process in the 2015 to 2017 period, and 51% more than the baseline in 2018 and 2019. There was a sharp drop in the number of incident notifications in 2020 (894) in connection with the impact of the COVID-19 pandemic on commercial aviation. The number rose again markedly in 2021 (1,309). This increase is likely to be linked with developments in commercial aviation. The STSB received a record 1,952 incident notifications in the year under review. The trend seen since 2015 thus continued in 2024.

A decision on whether or not to open an investigation is based on one key criterion: whether that investigation might help to prevent similar incidents or, in other words, whether the case holds any potential preventive value. As the trend in the number of investigations shows (Figure 6.1.1), there is no correlation between incident notifications and investigations opened. For example, just under half as many incident notifications were received in 2020 (894) as in 2024 (1,952). In contrast, 63 investigations were opened in 2020, slightly more than three times the number in 2024 (19).

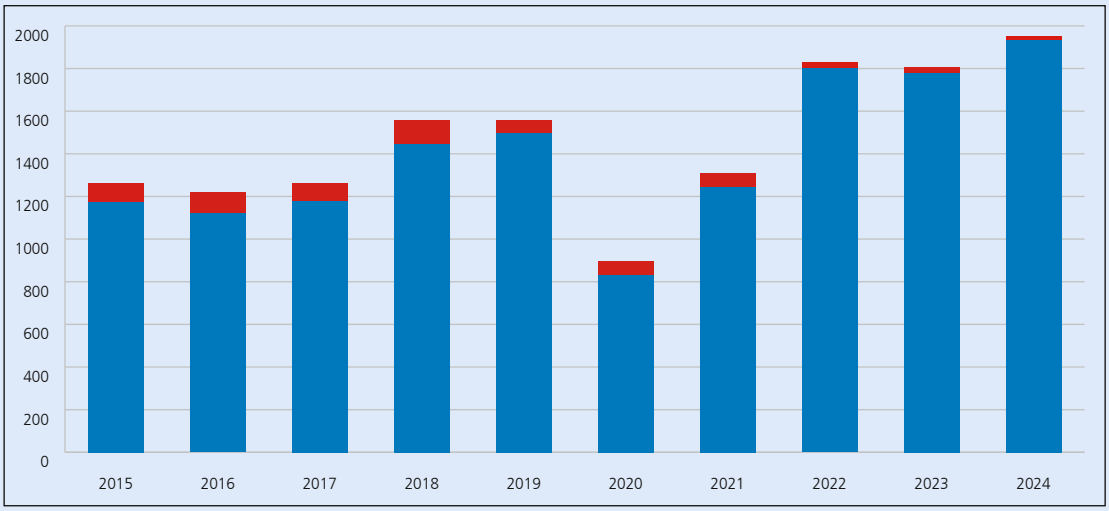


Figure 6.1.1: Number of incidents reported per year (red and blue) and investigations opened (red) since 2015.

Figure 6.1.2 tracks the quantitative trend in those incidents that satisfy the definitions of 'accidents' and 'serious incidents'.[1] It includes only those incidents which involved aircraft registered in Switzerland. The development in this subcategory differs from the time series for reported incidents overall.

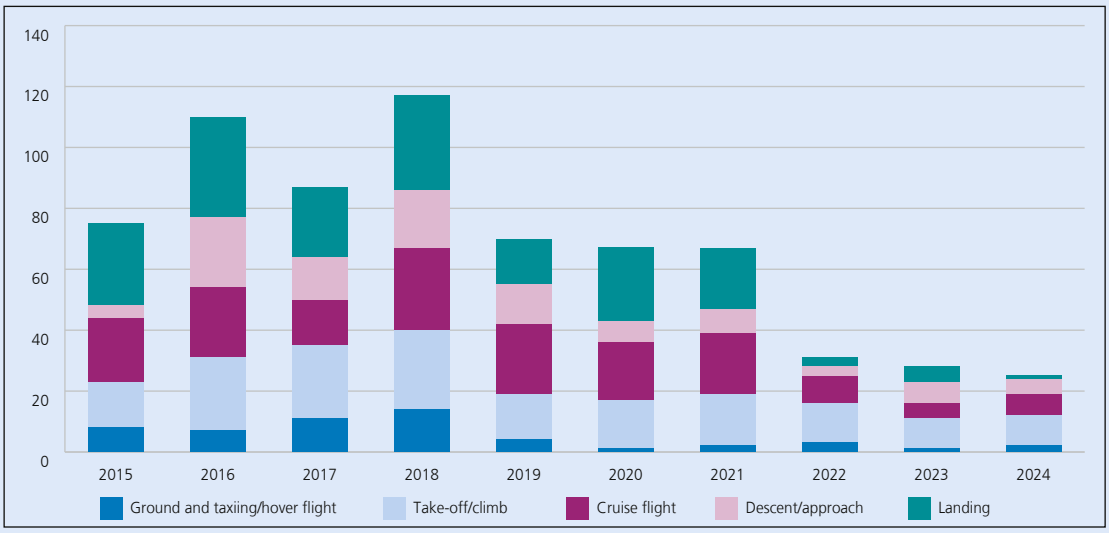


Figure 6.1.2: Total of accidents and serious incidents reported since 2015, broken down by flight phase. These figures cover events in Switzerland and abroad involving aircraft registered in Switzerland..

[1] As stated in Article 5 of the Ordinance on the Investigation of Transportation Incidents (OSITI; SR 742.161), the term 'serious incident' corresponds to the definition for the identical term set out in Article 2 paragraphs 1 and 16 of Regulation (EU) No 996/2010 of the European Parliament and of the Council of 20 October 2010 on the investigation and prevention of accidents and incidents in civil aviation.

Building on Figure 6.1.2, Figure 6.1.3 shows the changes over time in reported aviation accidents that resulted in a fatal or serious injury. This data reflects events that took place in Switzerland, irrespective of where the aircraft was registered, and events abroad involving an aircraft registered in Switzerland.

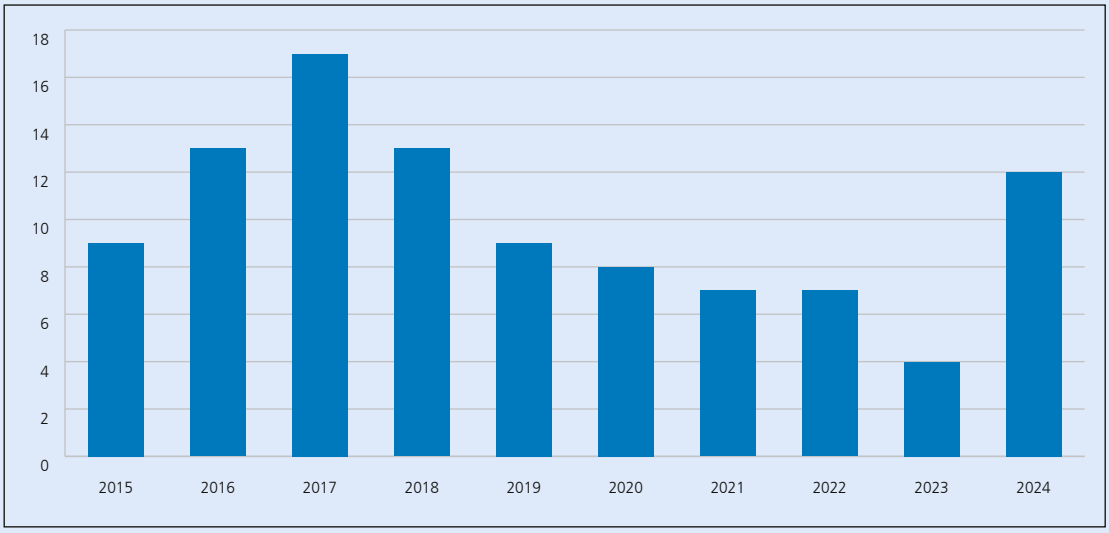


Figure 6.1.3: Development over time of aviation accidents that resulted in a fatal or serious injury.[2] The data covers accidents in Switzerland and abroad involving an aircraft registered in Switzerland, as well as accidents involving foreign-registered aircraft that occurred in Switzerland.

As described in Section 5.1, where an investigation reveals safety deficits, the STSB issues safety recommendations and safety advice notices. Figure 6.1.4 below shows the number of such recommendations and advice notices published per year by the Aviation Division. Annex 4 contains additional tables giving an overview of which aspect of operations, whether technical, human, operational or organisational, was identified as the safety deficit on which the safety recommendation or safety advice notice was based.

[2] The terms 'fatal injury' and 'serious injury' are defined in Article 2 paragraphs 5 and 17 respectively of Regulation (EU) No 996/2010 of the European Parliament and of the Council of 20 October 2010 on the investigation and prevention of accidents and incidents in civil aviation.

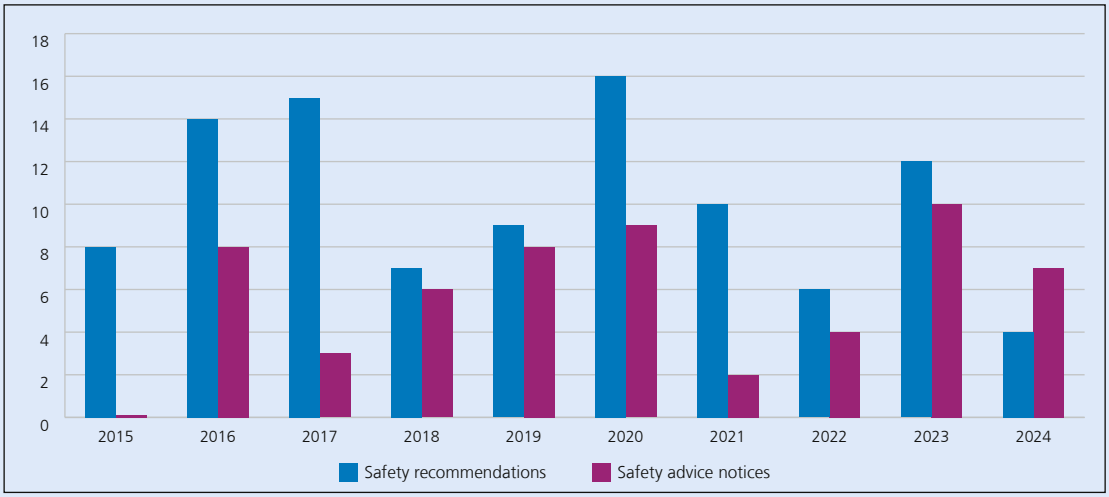


Figure 6.1.4: Number of safety recommendations and safety advice notices published since 2015 by the Aviation Division.

6.2 Railways, trams, cableways, buses, inland and maritime navigation

Figure 6.2.1 shows how the number of reported incidents and investigations opened has changed since 2015 for railways, trams, cableways, buses, and inland and maritime navigation. The figures for notifications vary between just under 300 and 400 per year, with increases and decreases over the years but no significant trend.

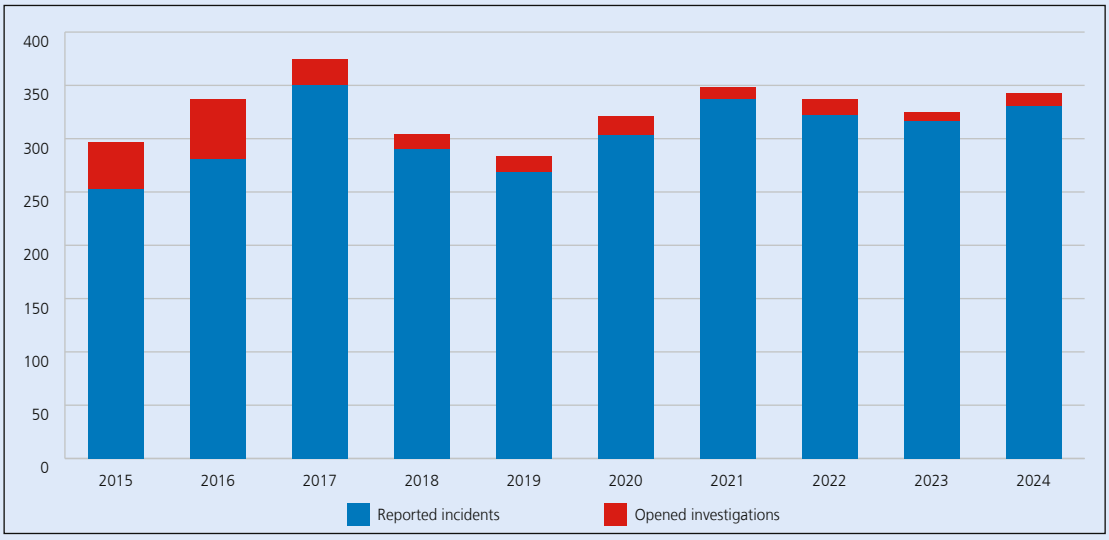


Figure 6.2.1: Number of incidents reported per year (red and blue) and investigations opened (red) for railways, trams, cableways, buses, and inland and maritime navigation.

The number of investigations opened each year since 2015 is shown in Figure 6.2.2, broken down according to the individual modes of transport. As expected, most investigations were opened into incidents on the railways, since they significantly exceed other modes of transport in terms of transport volume and service frequency. Since 2017 the decision on whether or not to open an investigation has been made consistently according to the potential preventive value of the case. This approach has reduced the number of investigations and thus resulted in a targeted and efficient use of resources.

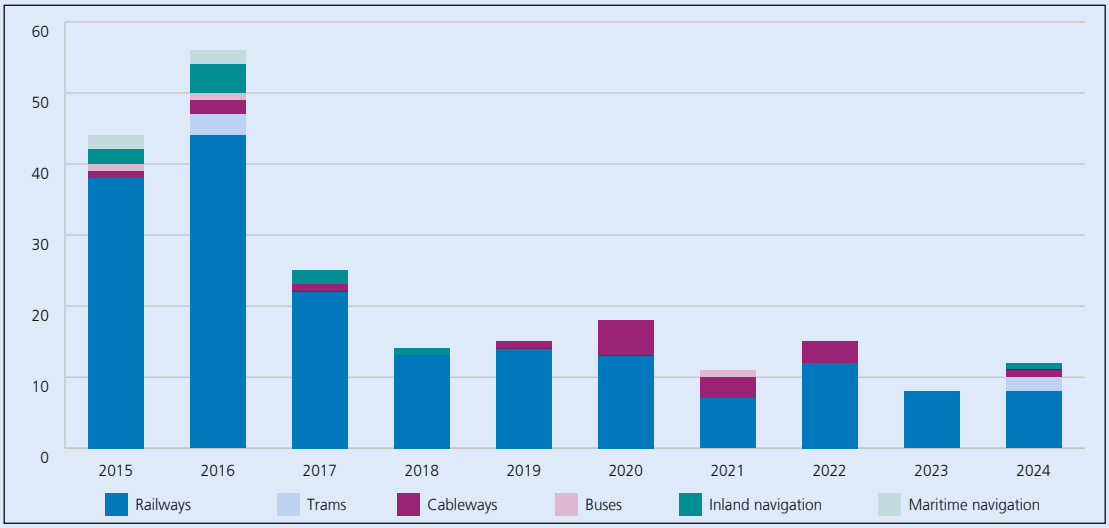


Figure 6.2.2: Number of investigations opened per year since 2015 concerning railways, trams, cableways, buses, inland and maritime navigation.

As is the case with the number of investigations opened, the majority of reported incidents also concern rail travel. Figure 6.2.3 illustrates what types of event led to notifications. Besides near-accidents (15–25%), most notifications concern accidents involving persons (15–20%), followed by derailments and collisions (10–15% each).

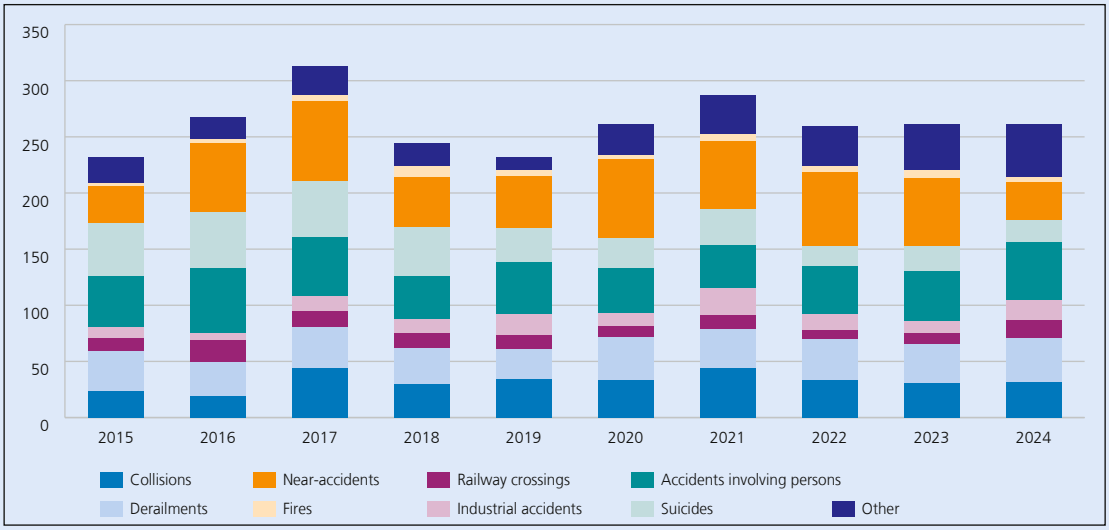


Figure 6.2.3: Number of incidents reported per year since 2015 for railways, broken down by type of event.

Depending on the outcome of its investigations, the STSB will publish safety recommendations or safety advice notices (see Section 5.1). The development over time of the number of recommendations and advice notices published is presented in Figure 6.2.4. Annex 4 contains additional tables giving an overview of which aspect of operations, whether technical, human, operational or organisational, was identified as the safety deficit on which the recommendation or advice was based.

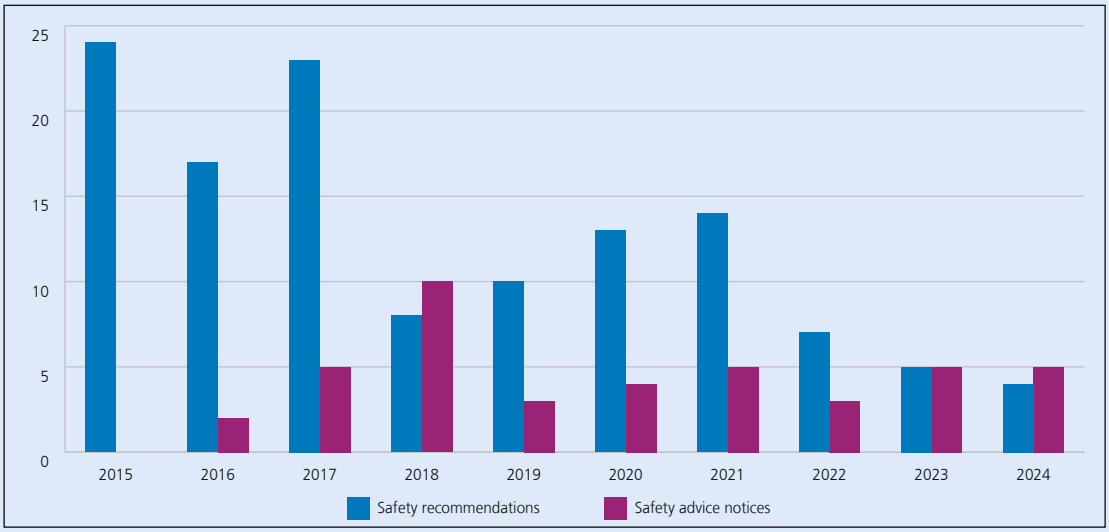


Figure 6.2.4: Number of safety recommendations and safety advice notices published per year since 2015.

Annexes[3]

Annex 1: Lists of the number of notifications, as well as opened, ongoing and completed investigations and interim reports and studies published with regard to aviation

Annex 2: Lists of the number of notifications, as well as opened, ongoing and completed investigations and interim reports and studies published with regard to public transport and maritime navigation

Annex 3: Additional details of incidents and investigations in aviation and public transport

Annex 4: Time series data (Section 6)

[3] The statistics include cases occurring in the territory of the Principality of Liechtenstein or involving its aircraft.

Annex 1

Lists of the number of notifications, as well as opened, ongoing and completed investigations and interim reports and studies published with regard to aviation

Notifications and opened, ongoing and completed investigations

Aviation						
Year	Number of notifications	Opened investigations	Completed investigations[4]			Ongoing investigations
			Total:	Extensive:	Summary:	
2024	1952	19	31	16	15	70
2023	1803	24	53	22	31	89
2022	1828	27	36	15	21	135
2021	1309	66	70	9	61	157
2020	894	59	40	9	31	164
2019	1566	64	76	14	62	162
2018	1556	119	83	22	53	156
2017	1259	86	93	30	48	111
2016	1219	92	58	27	31	142
2015	1260	86	33	33	n. e	n. e.

Extensive investigations completed

Number	Registration	Date of incident	Location	Safety recommendation	Safety advice notice
2420	HB-QZU	17.06.2023	Rainmatt, Hünenberg		
2419	HB-LBU/ HB-2283 / HB-3118	21.05.2023	Near Les Eplatures aerodrome		61
2424	HB-2449	16.08.2022	Glacier du Giétro, Val de Bagnes		
2414	HB-ZDQ	15.06.2022	Gruyère aerodrome (LSGT)		
2423	HB-2347	11.06.2022	Mont Tendre, Montricher		
2422	HB-2320	28.05.2022	Crêta Besse, Savièse	(584)*	(43)*
2413	HB-EJE	28.04.2022	Lake Constance, St Gallen-Altenrhein aerodrome (LSZR)		
2412	HB-SFU	13.01.2022	Hausen am Albis airfield (LSZN)		53
2417	HB-ZVK	30.09.2021	Ägerten, Neuendorf (SO)		
2409	HB-KOP	09.08.2021	Grenchen aerodrome (LSZG)		
2418	D-MANS	22.07.2021	La Mapas, Conthey	596, 597, 598	57
2421	D-EMPE	18.07.2021	Pizzo Centrale in the Gotthard Massif		58

[4] Figures prior to 2020 show the number of reports published, not the number of investigations completed.

Number	Registration	Date of incident	Location	Safety recommendation	Safety advice notice
2406	HB-KLB / HB-3412	12.06.2021	Piz Neir, Surses	595	56
2416	HB-TLF	25.07.2020	Gletscherspitza above Blatten		59, 60
2425	HB-POG	07.02.2020	Raron aerodrome (LSTA)		
2407	HB-WYI	27.06.2019	Les Capises, Château-d'Oex		

* The figure in brackets means that the safety recommendation in question had already been published along with the interim report for the case or another final report

Summary investigations completed

Registration	Date of incident	Location	Type of incident
HB-ZAP	16.01.2024	Sion (LSGS) airfield	Damage due to downwash
HB-PQG / HB-UCT	21.01.2024	North-east of Ballwil	Collision between two aircraft in flight
HB-ZOW	04.09.2023	Duillier	Uncontrolled ground contact
HB-ZMK	20.06.2023	Zillis	Bird strike
HB-CKU	17.06.2023	Buttwil aerodrome (LSZU)	Loss of control in the air
HB-TBX / 29039	04.03.2023	Gumen, Braunwald	Near miss
HB-LNW	26.01.2023	Bern Airport (LSZB)	Loss of control in the air
HB-KBK / HB-KAU	21.04.2022	Lake Geneva	Near miss
HB-KGG / N521FH	13.02.2022	Locarno aerodrome (LSZL)	Near miss
HB-KAW	22.07.2021	Bex aerodrome (LSGB)	Damage due to tow rope
HB-ZQJ	24.03.2021	Bretigny-sur-Morrens	Bird strike
HB-CYP / SP-WTF	09.03.2021	Ursenbach	Near miss
CS-LTC	08.11.2020	MOLUS waypoint	Emergency descent due to rapid loss of pressure in the cabin
HB-QYM	05.09.2020	East of Zofingen	Collision with obstacles
HB-ZWR	09.09.2019	Vorabgletscher mountain landing site (LSVV)	Loss of control upon landing

Discontinued investigations

Registration	Date of incident	Location	Type of incident
HB-ZWX / wingsuits	04.06.2021	Ecuvillens aerodrome (LSGE)	Near miss
HB-PRI	23.04.2021	Les Eplatures airport (LSGC)	Loss of control upon landing
HB-2355	02.11.2020	Lommis aerodrome (LSZT)	Smoke in cabin
HB-PPG / CX-CCT	01.08.2019	Grenchen aerodrome (LSZG)	Airprox
HB-CZO / HB-PQY	19.02.2017	Sion airport (LSGS)	Airprox

Annex 2

Lists of the number of notifications, as well as opened, ongoing and completed investigations and interim reports and studies published with regard to public transport and maritime navigation

Notifications and opened, ongoing and completed investigations

Public transport and maritime navigation						
Year	Number of Notifications	Opened investigations	Completed investigations[5]			Ongoing investigations
			Total:	Extensive:	Summary:	
2024	343	12	12	9	3	16
2023	325	8	9	7	2	19
2022	337	15	20	9	11	20
2021	346	11	17	11	6	24
2020	321	19	21	10	11	32
2019	283	15	15	8	7	35
2018	304	14	32	13	17	33
2017	376	25	38	27	12	50
2016	332	64	39	13	26	79
2015	296	87	31	18	13	n. e.

Extensive investigations completed

Number	Mode of transport	Type of incident	Date	Location	Safety recommen-dation	Safety advice notice
2024020101	Tram	Tram derailment	01.02.2024	Bern		
2023122801	Railway	Derailment during shunting	28.12.2023	Bern		
2023112401	Tram	Accident involving persons	24.11.2023	Zurich		
2023111702	Railway	Runaway train	17.11.2023	Poschiavo		39
2022060901	Railway	Failure of safety devices	09.06.2022	Sendy-Sollard	185, 186, 187	
2022010502	Cableway	Collision between cabin and obstacle	05.01.2022	Laax		40, 41
2020101901	Railway	Incident involving hazardous goods	19.10.2020	Basel SBB shunting yard	(167)*	
2018043001	Railway	Runaway train	30.04.2018	Ringlikon		42, 43
2017091701	Inland navi-gation	Collision between boat and jetty	17.09.2017	Zug		

* The figure in brackets means that the safety recommendation in question had already been published along with the interim report for the case or another final report.

[5] Figures prior to 2020 show the number of reports published, not the number of investigations completed.

Interim reports published as part of ongoing investigations

Number	Mode of transport	Type of incident	Date	Location	Safety recommen-dation	Safety advice notice
2024010302	Cableway	Vehicle collision	03.01.2024	Visperterminen	179	

Summary investigations completed

Number	Mode of transport	Type of incident	Date	Location
2024052201	Railway	Incident involving hazardous goods	22.05.2024	Goppenstein
2023071701	Railway	Near miss/hazard	17.07.2023	Unterterzen
2023070602	Railway	Fire	06.07.2023	Zurich Altstetten

Annex 3

Additional information on aviation incidents and investigations

Air accidents and serious incidents involving Swiss-registered aircraft with investigation

Year	Accidents with extensive investigation	Accidents with summary investigation	Total accidents	Serious incidents (incl. airproxes)	Airproxes investigated	Total accidents and serious incidents	Fatalities
2015	14	2	16	13	2	29	4
2016	22	17	39	48	16	87	5
2017	22	23	45	28	6	73	18
2018	14	16	30	64	25	94	38
2019	16	6	22	34	11	56	5
2020	14	16	30	32	9	62	10
2021	10	14	24	31	14	55	8
2022	8	1	9	15	6	24	3
2023	6	4	14	11	4	25	3
2024	8	1	9	14	6	23	5

Air accidents and serious incidents involving Swiss-registered aircraft with up to 5,700 kg maximum take-off mass (MTOM)

Year	Accidents with extensive investigation	Accidents with summary investigation	Total accidents	Serious incidents (incl. airproxes)	Airproxes investigated	Total accidents and serious incidents	Fatalities
2015	14	2	16	5	1	21	4
2016	22	17	39	31	7	70	5
2017	22	23	45	23	4	68	18
2018	13	16	29	47	16	76	18
2019	16	6	22	26	8	48	5
2020	14	16	30	30	8	60	10
2021	9	14	23	28	12	51	8
2022	8	1	99	15	6	24	3
2023	6	4	14	7	4	21	3
2024	7	1	8	8	3	16	4

Accidents and serious incidents with and without injuries involving Swiss-registered aircraft in Switzerland

		Total	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Aircraft up to 2,250 kg MTOM	with injury	30	5	1	7	3	3	3	5	2	1	0
	without injury	240	32	21	41	43	25	28	30	8	7	5
Aircraft 2,250–5,700 kg MTOM	with injury	1	0	0	0	0	0	0	0	0	0	1
	without injury	21	0	3	1	2	3	5	3	3	1	0
Aircraft exceeding 5,700 kg MTOM	with injury	1	0	0	0	1	0	0	0	0	0	0
	without injury	44	7	9	3	13	2	2	4	0	3	1
Helicopters	with injury	22	2	3	5	2	2	0	0	4	0	4
	without injury	86	10	14	6	14	10	8	9	5	5	5
Motor gliders and gliders	with injury	15	1	3	2	3	0	2	1	3	0	0
	without injury	41	6	8	5	7	2	8	3	2	0	0
Balloons and airships	with injury	1	0	0	0	0	0	0	0	0	1	0
	without injury	4	1	0	0	2	0	1	0	0	0	0
Ultralight aircraft	with injury	0	–	0	0	0	0	0	0	0	0	0
	without injury	2	–	2	0	0	0	0	0	0	0	0
Total[6]	with injury	70	8	7	14	9	5	5	6	9	2	5
	without injury	438	56	57	56	81	42	52	49	18	16	11

[6] The total number of accidents and serious incidents may differ from the sum of the individual categories. The reason for this is the allocation of events involving several aircraft of different categories. These are recorded in those individual categories, but are only counted as one event in the total.

Accidents and serious incidents with and without injuries involving foreign-registered aircraft in Switzerland

		Total	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Aircraft up to 2,250 kg MTOM	with injury	9	1	3	1	2	0	0	1	0	1	0
	without injury	24	3	6	4	0	4	1	3	1	2	0
Aircraft 2,250–5,700 kg MTOM	with injury	2	0	0	1	0	0	0	0	1	0	0
	without injury	3	0	0	0	1	0	1	1	0	0	0
Aircraft exceeding 5,700 kg MTOM	with injury	0	0	0	0	0	0	0	0	0	0	0
	without injury	33	5	8	3	4	6	2	2	1	1	1
Helicopters	with injury	2	0	1	0	1	0	0	0	0	0	0
	without injury	1	0	0	0	0	0	0	0	0	1	0
Motor gliders and gliders	with injury	5	2	0	0	0	1	0	1	0	0	1
	without injury	6	0	1	0	1	2	1	0	0	0	1
Balloons and airships	with injury	0	0	0	0	0	0	0	0	0	0	0
	without injury	1	0	0	0	0	1	0	0	0	0	0
Ultralight aircraft	with injury	0	–	0	0	0	0	0	0	0	0	0
	without injury	1	–	0	0	0	0	0	1	0	0	0
Total	with injury	18	3	4	2	3	1	0	2	1	1	1
	without injury	69	8	15	7	6	13	5	7	2	4	2

Accidents and serious incidents with and without injuries involving Swiss-registered aircraft abroad

		Total	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Aircraft up to 2,250 kg MTOM	with injury	8	2	0	1	1	2	1	0	0	1	0
	without injury	34	3	3	4	10	6	2	2	1	3	0
Aircraft 2,250–5,700 kg MTOM	with injury	1	0	0	0	0	0	1	0	0	0	0
	without injury	11	0	2	0	4	3	0	0	1	1	0
Aircraft exceeding 5,700 kg MTOM	with injury	1	0	0	0	0	0	0	0	0	0	1
	without injury	40	5	15	7	5	2	0	0	0	1	5
Helicopters	with injury	0	0	0	0	0	0	0	0	0	0	0
	without injury	3	0	0	0	0	0	0	2	0	0	1
Motor gliders and gliders	with injury	5	0	1	1	0	1	1	0	0	1	0
	without injury	6	0	1	0	3	1	0	0	1	0	0
Balloons and airships	with injury	0	0	0	0	0	0	0	0	0	0	0
	without injury	2	0	1	0	1	0	0	0	0	0	0
Ultralight aircraft	with injury	0		0	0	0	0	0	0	0	0	0
	without injury	1		0	0	1	0	0	0	0	0	0
Total	with injury	15	2	1	2	1	3	3	0	0	2	1
	without injury	97	8	22	11	24	12	2	4	3	5	6

Additional information on public transport incidents and investigations

Notifications and opened, ongoing and completed investigations – railways

Railways						
Year	Notifications	Opened investigations	Completed investigations			Ongoing investigations
			Total:	Extensive:	Summary:	
2015	232	38	28	17	11	69
2016	267	44	33	12	22	64
2017	313	22	34	24	10	46
2018	244	13	29	14	16	35
2019	232	14	16	9	8	28
2020	261	13	16	8	8	26
2021	286	7	11	8	5	18
2022	271	12	16	9	7	11
2023	261	8	7	5	2	12
2024	261	8	8	5	3	13

Notifications and opened, ongoing and completed investigations – trams

Trams						
Year	Notifications	Opened investigations	Completed investigations			Ongoing investigations
			Total:	Extensive:	Summary:	
2015	33	0	0	0	0	2
2016	32	3	1	0	1	2
2017	30	0	1	0	1	1
2018	27	0	1	0	1	0
2019	24	0	0	0	0	0
2020	23	0	0	0	0	0
2021	21	0	0	0	0	0
2022	12	0	0	0	0	0
2023	28	0	0	0	0	0
2024	33	2	2	2	0	0

Notifications and opened, ongoing and completed investigations – cableways

Cableways						
Year	Notifications	Opened investigations	Completed investigations			Ongoing investigations
			Total:	Extensive:	Summary:	
2015	10	1	1	1	0	2
2016	18	2	1	1	0	4
2017	10	1	3	2	1	4
2018	14	0	0	0	0	1
2019	12	1	0	0	0	2
2020	20	5	5	2	3	2
2021	20	3	4	4	1	1
2022	26	3	2	0	2	2
2023	15	0	0	0	0	2
2024	26	1	1	1	0	2

Notifications and opened, ongoing and completed investigations – buses

Buses						
Year	Notifications	Opened investigations	Completed investigations			Ongoing investigations
			Total:	Extensive:	Summary:	
2015	18	1	0	0	0	3
2016	12	1	2	1	2	2
2017	18	0	1	1	0	0
2018	14	0	0	0	0	0
2019	9	0	0	0	0	0
2020	12	0	0	0	0	0
2021	8	1	0	0	0	1
2022	18	0	0	0	0	1
2023	12	0	1	1	0	0
2024	13	0	0	0	0	0

Notifications and opened, ongoing and completed investigations – inland navigation

Inland navigation						
Year	Notifications	Opened investigations	Completed investigations			Ongoing investigations
			Total:	Extensive:	Summary:	
2015	2	2	2	0	2	1
2016	6	4	2	1	1	3
2017	3	2	1	0	1	4
2018	4	1	0	0	0	5
2019	4	0	1	0	1	5
2020	5	0	0	0	0	5
2021	10	0	2	2	0	2
2022	5	0	0	0	0	2
2023	8	0	1	1	0	1
2024	10	1	1	1	0	1

Annex 4

Time series data (Section 6)

Aviation (Section 6.1)

Total number of accidents and serious incidents reported per year, broken down by flight phase (aircraft registered in Switzerland and abroad)

Year	Total	Ground and taxi-ing/hover flight	Take-off/climb	Cruise flight	Descent/ approach	Landing
2015	75	8	15	21	4	27
2016	110	7	24	23	23	33
2017	87	11	24	15	14	23
2018	117	14	26	27	19	31
2019	70	4	15	23	13	15
2020	67	1	16	19	7	24
2021	67	2	17	20	8	20
2022	31	3	13	9	3	3
2023	28	1	10	5	7	5
2024	25	2	10	7	5	1

Development over time of air accidents resulting in injury, broken down by aircraft category (aircraft registered in Switzerland in Switzerland and abroad, as well as aircraft registered abroad in Switzerland)

Year	Motorised aircraft	Gliders	Helicopters	Total[7]
2015	7	0	2	9
2016	5	3	5	13
2017	1	4	3	17
2018	7	3	3	13
2019	5	2	2	9
2020	5	3	0	8
2021	6	2	0	7
2022	3	1	3	7
2023	3	1	0	4
2024	3	0	9	12

[7] The total number of accidents and serious incidents may differ from the sum of the individual categories. The reason for this is the allocation of events involving several aircraft of different categories. These are recorded in those individual categories, but are only counted as one event in the total.

Number of safety recommendations and safety advice notices published per year

Year	Technical	Human	Operational	Organisational	Total
2015	2	0	4	2	8
2016	7	1	1	5	14
2017	7	0	2	6	15
2018	2	0	2	3	7
2019	6	0	2	1	9
2020	3	0	5	8	16
2021	5	0	2	3	10
2022	3	0	2	5	10
2023	8	2	7	5	22
2024	1	0	5	4	11

Railways, trams, cableways, buses, inland and maritime navigation (Section 6.2)

Investigations opened per year, broken down by mode of transport

Year	Railways	Trams	Cableways	Buses	Inland navigation	Maritime navigation	Total
2015	38	0	1	1	2	2	44
2016	44	3	2	1	4	2	56
2017	22	0	1	0	2	0	25
2018	13	0	0	0	1	0	14
2019	14	0	1	0	0	0	15
2020	13	0	5	0	0	0	18
2021	7	0	3	1	0	0	11
2022	12	0	3	0	0	0	15
2023	8	0	0	0	0	0	8
2024	8	2	1	0	1	0	12

Incidents reported per year, broken down by event type – railways

Year	Collisions	Derailments	Railway crossings	Industrial accidents	Accidents involving persons	Suicides	Near-accidents	Fires	Other	Total
2015	24	35	12	9	46	47	33	3	23	232
2016	19	30	20	6	58	50	61	4	19	267
2017	44	36	15	13	53	49	72	5	26	313
2018	30	32	13	13	38	43	45	10	20	244
2019	34	27	12	19	46	31	46	5	12	232
2020	33	39	9	12	40	27	70	4	27	261
2021	44	35	12	24	39	32	60	6	35	286
2022	33	37	8	14	43	17	66	6	35	271
2023	29	34	12	22	45	23	60	7	30	261
2024	32	39	16	17	52	20	33	5	47	261

Number of safety recommendations and safety advice notices published per year

Year	Technical	Human	Operational	Organisational	Total
2015	6	4	1	13	24
2016	6	1	3	7	17
2017	9	1	7	6	23
2018	1	1	6	0	8
2019	4	2	1	3	10
2020	6	0	4	3	13
2021	7	2	2	3	14
2022	5	0	3	2	10
2023	4	1	4	1	10
2024	2	0	4	3	9



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