

ANNUAL SAFETY REPORT 2020



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List of Abbreviations

A/C	Aircraft	GM	Guidance Material
AAB	Airprox Analysis Board	ICAO	International Civil Aviation Organization
AIB	Accident Investigation Bureau	IFR	Instrument Flight Rules
AMC	Acceptable Means of Compliance, Applicable Means of Compliance	LDG	Landing
APU	Auxiliary Power Unit	LFN	Low Flight Network
ASR	Annual Safety Report	LFV	Aviation Ordinance
ATC	Air Traffic Control service	LS	Listening Squawk
ATM	Air Traffic Management	NCSC	National Cybersecurity Centre
AVISTRAT-CH		NLR	Royal Netherlands Aerospace Centre (Stichting Nationaal Lucht- en Ruimtevaartlaboratorium)
	Swiss Airspace and Aviation Infrastructure Strategy	PIC	Pilot in Command, Pilot-in-Command
CAT	Commercial Air Transport	Rega	Swiss Air Ambulance
CS	Certification Specification	SASP	Swiss Aviation Safety Plan
CTR	Control Zone	SPO	Specialised Operations
DETEC	Federal Department of the Environment, Transport, Energy & Communications	SRM	Safety Risk Management
EASA	European Union Aviation Safety Agency	SUSI	Swiss U-Space Implementation
EPAS	European Plan for Aviation Safety	TMA	Local Traffic Area/ Terminal Manoeuvring Area
FAA	Federal Aviation Administration	TMZ	Transponder Mandatory Zone
FOCA	Federal Office of Civil Aviation	UAV	Unmanned Aerial Vehicle
GA	General Aviation	VFR	Visual Flight Rules

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1 Foreword by the Director General



With its lines of airliners parked at Dübendorf Air Force Base, with its unprecedented slumps in flight movements and passenger volumes, with airlines and others fighting for their survival and with dramatic job losses worldwide, 2020 will remain in the memory of the civil aviation sector for a long time to come.

For us as Switzerland's national supervisory civil aviation authority, last year was a watershed, too. From one day to the next, our Office switched to a work-from-home arrangement, and our entire planning of all our audits and inspections had to be jettisoned and organized anew. We had to clarify, together with the general aviation community, under what conditions training could continue to be conducted and pilots' licences obtained.

The rescue packages compiled in response to the crisis for the hard-suffering airline industry involved the Federal Office of Civil Aviation, too. Many of our economics specialists were required to work at week-ends to provide the foundations and conduct the clarifications needed, together with industry representatives and other federal entities. And in summer, when civil aviation showed some slight signs of recovery, our inspectors were hard pressed to ensure that aircraft which had been mothballed for months could be safely returned to service, and also to oversee the conversions of a number of passenger aircraft into temporary cargo freighters.

The loss of Junkers Ju 52 HB-HOT on 4 August 2018 continued to occupy our Office in 2020. What has become clear is that our oversight of the special case of the Ju-Air association which operated the aircraft had been inadequate. While the European Union Aviation Safety Agency basically gives our supervisory activities favourable grades, we must still seek and identify any blind spots in our organization and rectify these. An external audit which has been commissioned by the General Secretariat of the Swiss Federal Department of the Environment, Transport, Energy & Communications and will be conducted by NLR of the Netherlands should help us appropriately modify our activities and constantly further improve them, too.

A handwritten signature in blue ink, which appears to read 'Ch. Hegner'.

*Christian Hegner, Director General
Federal Office of Civil Aviation, 29 March 2021*

2 Executive Summary (English)

The Annual Safety Report (ASR) 2020 provides an overview of FOCA's safety projects and challenges as well as the most relevant findings and developments from the data analyses of the occurrence reports received last year.

In the reporting year 2020, FOCA registered 3,724 occurrences, consolidated from over 5,600 occurrence reports. This is a decrease of around 45% compared to the previous year, with the most significant decline seen in commercial air transport (-53%). This is little surprising as the sector was hit hardest and most persistently by the COVID-19 pandemic. In the General Aviation sector, preliminary data show a different picture: the number of aircraft movements remained almost at the previous year's level, except during the national lockdown in March/April. The number of reports decreased by 23% in this area.

The recorded 26 accidents (2019: 26) and 30 serious incidents (2019: 33) indicate a constant level as in the year before. However, a positive trend can be seen in the number of fatal accidents (6): With ten fatalities, the number has almost halved compared to the previous year.

From the reports received, the most important safety problems were identified for each risk area and assessed according to severity. In the area of Aerodrome operations, the high number of collisions with wildlife (including birdstrikes) and damage to aircraft on ground is noticeable. In the area of Air Traffic Management, a large increase of airspace conflicts in mixed VFR/IFR traffic from 13 to 32 incidents can be identified. A mid-air collision obviously harbours a great potential for damage, which is why this negative trend is increasingly being counteracted with suitable measures.

Deviations from procedures and checklists concern most reports in the area of (fixed-wing) flight operations, while unstabilised landings account for the highest degree of severity in relation to the reports received. In Helicopter operations, the number of injured flight assistants during external load operations slightly increased again in 2020. In addition, an increase in the number of reported spontaneous cargo hook openings and stop disruption as well as rotor strikes was noted.

In both commercial and general aviation, the percentage decrease in reported technical occurrences was higher than the decrease in aircraft movements. At present, it is not fully understood whether this relative decrease is due to an actual improvement or if it is the result of a change in reporting behaviour influenced by factors such as a reduced availability of manpower due furlough. The aggregate severity of reported engine and fuel system incidents was higher in 2020 than in previous years. This was mainly due to four non-commercial aviation accidents, which were caused by engine problems.

The outbreak of the COVID-19 pandemic also had profound consequences on Swiss civil aviation and FOCA's supervisory activities. Constantly striving to improve safety, various safety projects were nevertheless initiated or continued: the Swiss Airspace and Aviation Infrastructure Strategy (AVISTRAT-CH) in collaboration with the various stakeholders; the Low Flight Network (LFN), which will initially enable Swiss Air Ambulance and the Swiss Air Force to operate an IFR corridor on low flight levels 24/7 on the north-south axis; the introduction of a Transponder Mandatory Zone (TMZ) in north-eastern Switzerland, which is intended to avoid the risk of collisions between IFR/VFR mixed traffic in the complex airspace structure to the east of Zurich-Kloten Airport; and the Aviation Ordinance, which is being amended with regard to historic aircraft.

For 2021, the aim is to incorporate the transition to the "new normal" into the planning of supervisory tasks. In the future, the topic of cyber security will gain increased importance and the U-Space project, which will enable the introduction of automated drone traffic management, will be continued at both national and European level.

3 Zusammenfassung (Deutsch)

Der vorliegende Annual Safety Report (ASR) 2020 bietet einen Überblick auf die Sicherheitsprojekte und Herausforderungen des BAZL sowie die wichtigsten Erkenntnisse und Entwicklungen aus den Datenanalysen der eingegangenen Vorfallmeldungen im letzten Jahr.

Im Berichtsjahr 2020 registrierte das BAZL 3'724 Vorfälle, konsolidiert aus über 5'600 Vorfallmeldungen. Das sind rund 45 % weniger Vorfälle als im Vorjahr, wobei der deutlichste Rückgang bei der kommerziellen Luftfahrt zu verzeichnen ist (-53 %). Dies ist wenig erstaunlich, da dieser Bereich am stärksten und nachhaltig von der Covid-19-Pandemie getroffen wurde. Im Bereich der General Aviation zeigen vorläufige Daten ein anderes Bild: Die Anzahl der Flugbewegungen ist, ausser während dem nationalen Lockdown im März/April, nahezu auf Vorjahresniveau verlaufen. Die Zahl der Meldungen verringerte sich in diesem Bereich um 23 %.

Die verzeichneten 26 Unfälle (2019: 26) und 30 schweren Vorfälle (2019: 33) bedeuten ein gleichbleibendes Niveau wie im Jahr zuvor. Ein positiver Trend kann hingegen bei der Anzahl von tödlichen Unfällen (6) verzeichnet werden: Mit zehn Todesopfern hat sich die Zahl gegenüber Vorjahr fast halbiert.

Aus den eingegangenen Meldungen wurden für jeden Risikobereich die wichtigsten Sicherheitsprobleme identifiziert und nach Schweregrad beurteilt. Auffällig im Bereich Flugplätze ist dabei die hohe Anzahl der Kollisionen mit Wildtieren und der Beschädigungen von Flugzeugen am Boden. Im Bereich Flugverkehrsmanagement lässt sich eine grosse Zunahme der Konflikte im Luftraum im Mischverkehr VFR/IFR von 13 auf 32 Vorfälle ausmachen. Ein Zusammenstoss in der Luft birgt ein grosses Schadenspotential, deshalb wird diesem negativen Trend verstärkt mit geeigneten Massnahmen entgegengewirkt.

Abweichungen von Prozeduren und Checklisten betreffen die meisten Meldungen im Bereich Flugbetrieb (Flächenflugzeuge), während unstabilierte Landungen den höchsten Schweregrad in Relation zu den erhaltenen Meldungen ausmachen. Im Helikopterbetrieb ist die Zahl der verletzten Flughelfer bei Aussenlasteinsätzen im Jahr 2020 wieder leicht angestiegen. Ausserdem wurde ein Anstieg der gemeldeten spontanen Ladehakenöffnungen und Seilrisse sowie Rotorbeschädigungen festgestellt.

Sowohl in der kommerziellen als auch in der nicht-kommerziellen Luftfahrt war der prozentuale Rückgang der gemeldeten Vorfälle im Bereich Technik höher als der Rückgang der Flugbewegungen. Es ist derzeit nicht vollständig geklärt, ob dieser relative Rückgang auf eine tatsächliche Verbesserung oder auf eine Änderung des Meldeverhaltens aufgrund von Einflüssen, wie z. B. einer geringeren Verfügbarkeit von Arbeitskräften wegen Kurzarbeit, zurückzuführen ist. Der aggregierte Schweregrad der gemeldeten Triebwerks- und Treibstoffsystemvorfälle war im Jahr 2020 höher als in den vergangenen Jahren. Dies wurde hauptsächlich durch vier Unfälle in der Leichtaviatik aufgrund von Triebwerksproblemen verursacht.

Der Ausbruch der Covid-19-Pandemie hatte auch auf die Schweizer Zivilluftfahrt und die Aufsichtstätigkeit des BAZL einen prägenden Einfluss. Ständig um die Verbesserung der Sicherheit bestrebt, wurden dennoch verschiedene Sicherheitsprojekte initiiert, bzw. weitergeführt:

Die Luftraum- und Aviatikinfrastruktur-Strategie Schweiz (AVISTRAT-CH) in Zusammenarbeit mit den verschiedenen Anspruchsgruppen; das Low Flight Network (LFN), welches v. a. der Rega und der Luftwaffe vorerst auf der Nord-Süd-Achse rund um die Uhr einen IFR-Korridor auf niedrigen Flugflächen ermöglicht; die Einführung einer Transponder Mandatory Zone (TMZ) Nordostschweiz, welche in der komplexen Luftraumstruktur östlich des Flughafens Zürich-Kloten das Risiko eines Zusammenstosses von IFR/VFR-Mischverkehr vermeiden soll und die Luftfahrtverordnung, welche in Bezug auf historische Flugzeuge angepasst wird.

Für das Jahr 2021 geht es darum, den Übergang zur «neuen Normalität» in die Planung der Aufsichtsaufgaben einzubeziehen. In Zukunft wird dem Thema Cybersicherheit vermehrt Bedeutung beigemessen und das Projekt U-Space, das die Einführung eines automatisierten Drohnenverkehrsmanagements ermöglichen wird, wird sowohl auf nationaler als auch auf europäischer Ebene fortgesetzt.

4 Sommaire (Français)

Le présent rapport annuel sur la sécurité aérienne 2020 (RSA) passe en revue les projets et défis de l'OFAC en matière de sécurité de même que les principaux enseignements et tendances qui se dégagent de l'analyse des comptes rendus d'incidents notifiés l'année dernière.

Durant l'année sous revue, l'OFAC a enregistré 3724 incidents - en recul de 45 % par rapport à l'année précédente - pour plus de 5600 comptes rendus d'incidents. Le recul le plus net concerne l'aviation commerciale (-53 %), ce qui n'est pas une surprise puisque c'est elle qui paye le plus lourd tribut à la pandémie de COVID-19 et qui en subit durablement les effets. La situation se présente sous un tout autre jour pour l'aviation générale si l'on en croit les chiffres provisoires qui montrent que le trafic, si l'on excepte le semi-confinement des mois de mars et d'avril, est pratiquement à son niveau de l'année précédente. On enregistre ici un recul de 23 % des comptes rendus par rapport à l'année précédente.

Le nombre d'accidents (26, 2019 : 26) et d'incidents graves (30, -3 par rapport à 2019) reste stable. L'évolution du nombre d'accidents mortels (6) est quant à elle plutôt positive : le bilan s'établit à 10 victimes, soit presque deux fois moins que l'année précédente.

Les principaux problèmes de sécurité ont été identifiés et leur degré de gravité évalué pour chaque type de risque à partir des comptes rendus adressés. Le domaine « Exploitation des aéroports » se distingue par le nombre élevé de collisions avec des animaux sauvages et de cas d'avions endommagés au sol. Au chapitre de la gestion du trafic aérien, on enregistre une forte progression des cas de conflits dans l'espace aérien utilisé conjointement par le trafic IFR et le trafic VFR, qui représentent 13 incidents sur un total de 32. Attendu les dommages importants qui pourraient résulter d'une collision en vol, des mesures correctives accrues seront prises afin d'enrayer cette tendance négative.

Au niveau de l'exploitation des avions, la plupart des comptes rendus renvoient au non-respect des procédures et check-lists prescrites, tandis que les atterrissages non stabilisés constituent les événements les plus graves parmi les comptes rendus notifiés dans le cadre de l'exploitation des hélicoptères. Toujours au chapitre de l'exploitation des hélicoptères, le nombre d'assistants de vol blessés lors de transports de charges externes a connu une légère hausse en 2020 après une baisse l'année précédente. On enregistre par ailleurs une hausse des cas d'ouverture inopinée du crochet de charge, de rupture de câble ou d'endommagement du rotor.

Tant dans l'aviation commerciale que dans l'aviation non-commerciale, le recul des incidents notifiés en lien avec le domaine « Technique » est proportionnellement plus important que le recul des mouvements d'aéronef. On ignore si ce recul relatif traduit une réelle amélioration ou est imputable à un changement des comportements en matière de compte rendu, dû par exemple à une moindre présence du personnel en raison du chômage partiel. En 2020, le niveau agrégé de gravité des incidents touchant le système de propulsion et le circuit de carburant était plus important que l'année précédente. En cause, quatre accidents d'appareils en exploitation non-commerciale résultant de problèmes de moteur.

La pandémie de COVID-19 a laissé des traces dans l'aviation civile suisse et sur l'activité de surveillance de l'OFAC. Dans le souci d'améliorer sans cesse la sécurité, des projets ont néanmoins été mis en chantier ou se sont poursuivis. Ce sont la Stratégie en matière d'espace aérien et d'infrastructure aéronautique Suisse (AVISTRAT-CH) développée en collaboration avec les diverses parties prenantes ; le Low Flight Network (LFN), qui met à la disposition principalement de la Rega et des Forces aériennes 24 heures sur 24 un couloir IFR au niveau de vol inférieur. Le réseau couvre pour l'instant l'axe nord-sud ; la mise en place d'une zone à utilisation obligatoire de transpondeur (TMZ) qui vise à atténuer le risque de collision entre trafic VFR et IFR dans l'espace aérien très complexe situé à l'est de l'aéroport de Zurich-Kloten et l'adaptation de l'ordonnance sur l'aviation au sujet des avions historiques.

Pour 2021, il s'agira d'intégrer le passage à une « nouvelle normalité » dans la planification des tâches de surveillance. Les questions de cybersécurité risquent de gagner en importance à l'avenir, tandis que le projet U-Space, qui vise l'instauration d'une gestion automatisée du trafic des drones, poursuivra son développement à l'échelon suisse et européen.

5 Sintesi (Italiano)

L'Annual Safety Report (ASR) 2020 presenta una panoramica dei progetti di sicurezza e delle sfide dell'UFAC nonché i principali esiti e sviluppi emersi dalle analisi dei dati relativi alle notifiche di eventi critici occorsi nel 2020.

Nell'anno in esame, l'UFAC ha registrato 3'724 eventi, a fronte di più di 5'600 notifiche. Si tratta di un calo del 45 per cento rispetto all'anno precedente; la diminuzione più significativa è stata registrata dall'aviazione commerciale (-53 %). Il dato non sorprende poiché questo settore è stato toccato in misura maggiore e per periodi prolungati dalla pandemia COVID-19. Nel settore dell'aviazione generale i dati provvisori evidenziano uno scenario diverso: il numero di movimenti aerei si è attestato praticamente ai livelli dell'anno precedente, eccezion fatta per la fase del lockdown nazionale nei mesi di marzo e aprile. In questo settore il numero di eventi notificati è diminuito del 23 per cento.

I 26 incidenti (2019: 26) e i 30 eventi gravi registrati (2019: 33) corrispondono all'ordine di grandezza dei dati rilevati nel 2019. Una tendenza positiva si constata invece per il numero di incidenti mortali (6): le vittime sono state dieci, ossia quasi il 50 per cento in meno rispetto all'anno precedente.

Sulla base delle notifiche pervenute, per ogni settore di rischio i principali problemi di sicurezza sono stati individuati e classificati secondo la gravità. Nel settore aerodromi sorprende l'elevato numero di collisioni con animali selvatici e di danni subiti da aeromobili a terra. Per quanto riguarda la gestione del traffico aereo, si riscontra un forte aumento delle situazioni critiche, nello spazio aereo, relative al traffico misto VFR/IFR, passate da 13 a 32. Le collisioni in aria causano spesso danni ingenti, ragione per cui si cerca di contrastare questa tendenza negativa con misure adeguate.

Nel settore esercizio (velivoli ad ala), gran parte delle segnalazioni riguarda il mancato rispetto delle procedure e delle liste di controllo (checklist); se rapportati al numero di casi segnalati, gli atterraggi instabili sono caratterizzati dal maggiore grado di gravità. Nelle operazioni con elicotteri, il numero di assistenti di volo feriti in occasione di atterraggi esterni nel 2020 è aumentato di nuovo leggermente. Inoltre, è stato registrato un aumento delle aperture inopinate dei ganci di carico, delle rotture di cavi nonché dei danni ai rotori.

Sia nell'aviazione commerciale che in quella non commerciale, il calo degli eventi notificati è stato percentualmente più marcato nel settore tecnico rispetto al calo del numero di movimenti aerei. Attualmente non è ancora del tutto chiaro se questo calo è da ricondurre a un effettivo miglioramento della situazione oppure a una modifica della procedura di notifica sulla base di influssi quali ad esempio la minore disponibilità di risorse umane a seguito del lavoro ridotto. Il livello di gravità aggregato degli eventi riguardanti i motori e i sistemi di carburante nel 2020 è risultato maggiore rispetto agli anni precedenti. I casi registrati riguardavano quattro incidenti dell'aviazione non commerciale causati da problemi ai motori.

La pandemia COVID-19 ha avuto un notevole influsso anche sull'aviazione civile svizzera e sull'attività di vigilanza dell'UFAC. Nell'intento di migliorare costantemente il livello di sicurezza, sono comunque stati avviati o portati avanti diversi progetti inerenti alla sicurezza: la Strategia per lo spazio aereo e l'infrastruttura aeronautica in Svizzera (AVISTRAT-CH) in collaborazione con diversi gruppi d'interesse; il Low Flight Network (LFN), che consente in particolare alla Rega e alle Forze aeree, in un primo tempo sull'asse nord-sud, di seguire un corridoio IFR 24 ore su 24 a quote di volo più basse; l'introduzione di una Transponder Mandatory Zone (TMZ) Svizzera nord-orientale che, nel complesso spazio aereo a est dell'aeroporto di Zurigo-Kloten, dovrebbe permettere di evitare il rischio di collisioni tra voli IFR e VFR (traffico misto) e l'ordinanza sulla navigazione aerea, che viene modificata negli articoli riguardanti gli aeromobili storici.

Nell'anno 2021 si tratterà di integrare nella pianificazione dei compiti di sorveglianza il passaggio a una sorta di «nuova normalità». In futuro il tema della cibersicurezza crescerà d'importanza e il progetto U-Space, che consentirà di introdurre una gestione automatizzata delle operazioni di volo con droni, verrà portato avanti sia a livello nazionale che a livello europeo.

6 Introduction

Thanks to continuous and systematic efforts, high levels of safety have been achieved to date in the civil aviation field. In view of the dynamic nature of its operating environment, the aviation system must be able to identify complex system risks and, above all, be able to anticipate the ramifications of change.

The present 2020 Annual Safety Report (ASR 2020) describes what projects the Federal Office of Civil Aviation (FOCA) pursued in 2020 in the safety field, what occurrences were reported in Swiss aviation in 2020 in the categories defined, how appropriate action was taken and what further actions are currently being planned. The report is primarily aimed at aviation professionals, but is also publicly available.

The publication of the ASR 2020 is primarily intended to:

- 1) provide data and further information deriving from occurrence reporting requirements to serve as benchmarks for Swiss civil aviation;
- 2) determine key safety parameters and the degree of achievement of the safety targets set by the Federal Department of the Environment, Transport, Energy & Communications (DETEC);
- 3) assess the risks present and inherent in selected issues and illustrate developments therein;
- 4) outline actions based on occurrence data and the findings obtained.

The ASR 2020 focuses on the areas of the FOCA's direct supervisory responsibility (Swiss airspace, Swiss aerodromes, HB-registered aircraft and Swiss-certificated air transport operators). On the basis of this, and in line with the Swiss Aviation Safety Plan (SASP) and the European Plan for Aviation Safety (EPAS), ASR 2020 provides data for the categories of Commercial Air Transport (CAT), Non-Commercial Air Transport (NON-CAT, NC or GA) and Specialised Operations (SPO) and addresses, wherever possible, any differences between them.

In 2020 the focus of such data analyses was on those safety issues which had been identified by the FOCA's Safety Risk Management (SRM) division and which can be assigned to certain "safety risk areas". This approach is intended to provide more transparency on those issues that require greater attention on the FOCA's part.

After the first chapters (the foreword by the Director General and the present introduction), Chapter 7 of this report offers a brief review of the FOCA's prime projects in 2020. Chapter 8 is devoted to current safety trends, both worldwide and within Switzerland. Chapter 9 focuses on the systemic issues of safety promotion and reporting culture. Chapter 10, the report's main element, presents all the relevant operational safety issues and their corresponding occurrence data for 2020, all in accessible chart form. Chapter 11 provides the latest information on the issues of drones, and cybersecurity. The concluding Chapter 12 offers an appraisal of the results and draws conclusions from the same, while also providing a corresponding outlook on coming activities to maintain and further enhance safety in Swiss civil aviation.

7 FOCA Safety-related Projects in 2020

7.1 AVISTRAT

The AVISTRAT-CH (new airspace and aviation infrastructure strategy Switzerland) program entered its strategy phase at the beginning of 2020. The goal of this current phase is to establish a robust strategy that orients itself on the user needs of 2035 (i.e. the vision of AVISTRAT-CH) and is written together with the aviation stakeholders in Switzerland. The project team set up an “architecture competition” during which five different organizations came up with different draft strategies.

Currently, the committee of experts assesses and concludes these ideas to the final AVISTRAT-CH strategy that will guide the upcoming implementation projects until the vision is reached. Final results are expected until autumn 2021 - latest news are regularly updated on the FOCA website¹.

7.2 Low Flight Network (LFN)

The LFN (Low Flight Network) is a network of IFR flight routes at low level for helicopters all over Switzerland. Initially launched by Swiss Air Ambulance (Rega) and the Swiss Air Force, the network serves the purpose to connect the most important hospitals and airbases in all weather conditions.

After the first implementation steps, FOCA set up a coordination project. Obviously, establishing new low level IFR routes in an already very busy Swiss airspace is a complex task for all affected stakeholders. At the end of 2020, this first project ended with significant improvements in coordination and process efficiency between Swiss Air Ambulance, Swiss Air Force, skyguide, MeteoSwiss and FOCA. One positive example is the constant connection between the Ticino and Lucerne/Zurich. A succeeding project will start in April with the goal to further improve the operations and expand the LFN with more system relevant hospitals and airbases.

7.3 Airspace Redesign TMA Zurich

Zurich-Kloten is Switzerland’s most important national airport with an annual volume of approximately 278,000 aircraft movements. A safety review of the airport conducted in 2012, revealed among other things, that the complexity of the airspace with two control zones (CTR) and 17 local traffic areas (TMA) must be assessed as safety-critical.

After a primary project had to be abandoned in 2017, the FOCA resumed work on the redesign of the Zurich TMA at the request of the air navigation services provider Skyguide, the airport authorities of Flughafen Zürich AG (FZAG) and the national carrier Swiss International Air Lines Ltd. The second version of the redesign incorporated objections primarily from the light aviation sector and was presented to the stakeholders in December 2019. Due to the COVID-19 pandemic, the further continuation of the project has been delayed and therefore, could not be submitted in late autumn 2020 as initially planned. The third draft for a new TMA Zurich is now scheduled for spring 2021.

¹ <https://www.bazl.admin.ch/bazl/de/home/sicherheit/infrastruktur/avistrat.html>

7.4 Introduction TMZ Northeastern Switzerland

By refraining from introducing a nation-wide transponder obligation for balloons and gliders in airspace class E, FOCA accommodated the objections of glider pilots in particular, as they considered such a solution to be disproportionate. Therefore, a FOCA working group assessed in which "hotspots" the introduction of a Transponder Mandatory Zone (TMZ) could reduce the risk of a mid-air collision in mixed IFR/VFR traffic situations.

One of these zones is located in northeastern Switzerland in the area of the air traffic control sector ARFA. A risk assessment showed that the risk of a mid-air collision is in the "orange" range of the FOCA risk matrix. Measures must therefore be examined and, if proportionate, implemented in order to reduce this risk and move into the "green" (i.e. acceptable) range without creating new risks. This can be achieved with the introduction of a TMZ.

In addition to motorised VFR traffic, gliders and balloons also become visible to air traffic control in the TMZ. On the one hand, this enables air traffic controllers to provide IFR traffic with important information about VFR traffic, and on the other hand, VFR traffic becomes directly visible in the cockpit for IFR flights equipped with TAS. This means a safety gain for both IFR traffic and VFR traffic.



Figure 1: Draft of TMZ Northeastern Switzerland (map source: Federal Office of Topography swisstopo/FOCA)

Listening Squawk (LS) is currently not used in Switzerland. FOCA will clarify open questions in this regard. In particular, it must be checked whether new risks arise with the introduction of LS, which must be avoided. In addition, the FOCA will re-examine the selected dimension of the TMZ and clarify the possibility of exemption procedures for historic aircraft and aerobatic aircraft. The TMZ northeastern Switzerland, initially still without a listening squawk, will be decreed in March/April 2021 at the latest and will be established in spring 2022. By this time, open questions regarding the listening squawk should also be clarified. In addition, the FOCA experts are currently conducting risk assessments in order to identify further hot spots for which the introduction of a TMZ makes sense.

7.5 Historic Aircraft

The accident of an over 80-year-old Junkers Ju-52 on 4 August 2018 with 20 fatalities revealed that the operational and technical operation of large historic aircraft is associated with special risks. A risk analysis by the FOCA concluded that commercial operation of historic aircraft in Switzerland would no longer be possible in the future.

This adjustment is to be incorporated into the Aviation Ordinance LFV in 2021. In addition, the number of persons on board will generally be limited to a maximum of nine, including a maximum of six passengers. As a basis for certification, the special category "Historic" will be revised and divided into various sub-categories, which are directly related to the complexity of an aircraft. Clustering historic aircraft in sub-categories will ensure that older light aircraft, such as the Bücker biplane, do not have to fulfil the same requirements for certification as complex aircraft, such as a Ju-52 or large helicopters. Hence, the operation of historic aircraft in Switzerland will not be unnecessarily restricted. Nevertheless, it will no longer be possible in a commercial, but a private context.



Figure 2: Parked narrow-body aircraft at Dübendorf Air Force Base (Photo: Walter Rahm)

8 Safety level

8.1 Safety level in Switzerland

The consequences of the COVID-19 pandemic resulted in a massive disruption of air traffic worldwide and Switzerland was not spared either. It is crucial that these circumstances are taken into account when making comparisons to previous years and drawing any conclusions. While commercial aviation (CAT) continues to suffer, preliminary data show that the general aviation sector (GA) recovered quickly after the national lockdown in mid-March 2020 and almost reached the previous year's level.

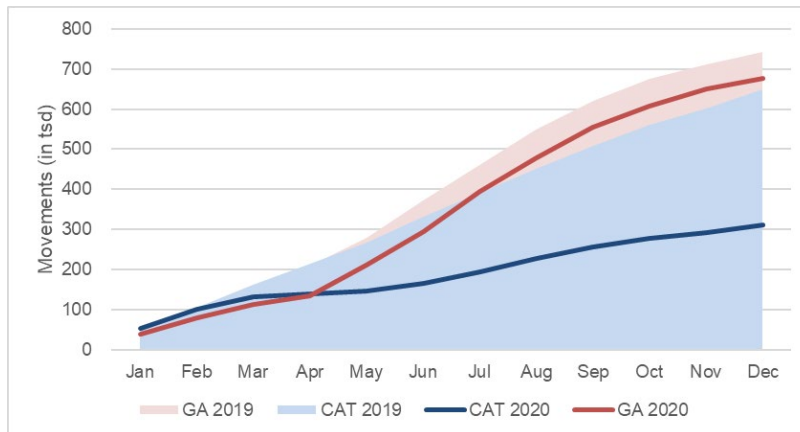


Figure 3: CAT and GA movements 2020 vs PY (cumulative)

In 2020, 26 accidents (2019: 26) and 30 serious incidents (2019: 33) were recorded in Switzerland. Compared to the previous year, the absolute numbers have remained stable at a low level. Considering the decline in air traffic movements, this may seem surprising at first glance. However, given the fact that all accidents and serious incidents solely affected the general aviation sector - and in this area the movements only slightly decreased by 9% - no negative development can be identified.

A positive trend can be seen in the number of fatalities: Not only the total number of fatal accidents has further decreased (2020: 6; 2019: 8), but also the number of fatalities has been reduced by half. The exceptionally high number in 2018 in the chart below stems from the accident with the Ju-52 (HB-HOT) with 20 fatalities.

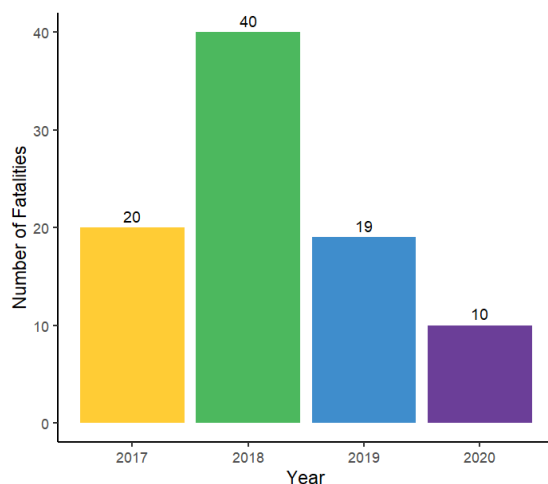


Figure 4: Fatalities in air transport 2017-2020

In normalized terms, there were 2.56 fatalities per 100,000 general aviation movements² in 2019 in contrast to 1.48 fatalities in the reporting year. Including the commercial air transport movements as well, the rate decreases further to 1.37 fatalities in 2019 and to 1.01 in 2020, respectively.

The main goal of the FOCA – to protect the citizens of and the travellers into and from Switzerland – was achieved last year, as there were no fatalities involving commercial air transport affecting Swiss territory or a HB-registered aircraft.

8.2 Global safety level

According to the EASA Air Ops Risk Review for 2020³, 10 fatal accidents with 327 fatalities occurred in the commercial air transport sector. Despite “there was a 51% reduction of seats offered by airlines overall in 2020, the number of accidents is the same as 2015 and the number of fatalities is close to those in 2016” (source: ICAO/EASA Air Ops Risk review for 2020).

Although the reduction of capacities, the decline in fatal accidents was not equally as one would expect (-29%). It is worth mentioning that no EASA Member State was affected by a fatal accident in the reporting year 2020.

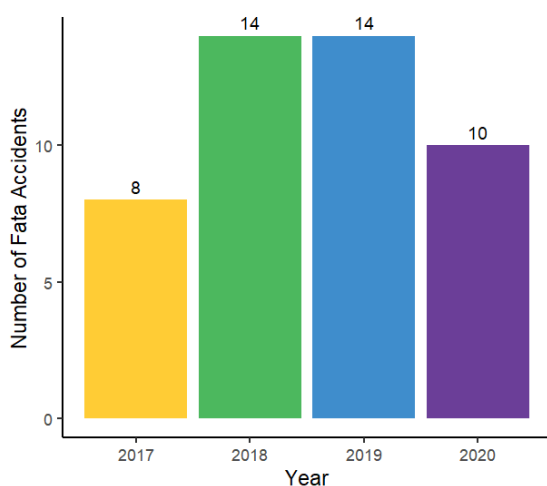


Figure 5: Global fatal accidents (CAT) 2017-2020

² one movement corresponds to a departure or landing, i.e. one flight = two movements

³ <https://www.easa.europa.eu/document-library/general-publications/air-ops-risk-review-2020>

9 Systemic issues

9.1 Safety promotion

Despite the COVID-19 pandemic, the FOCA organised some of its events in 2020 (incl. Safety Oversight Committee, Chief of Aerodrome Meeting) in order to be able to inform the various Swiss aviation stakeholders about important projects and innovations. Due to sanitary regulations, these events took mostly place in reduced form and online. In this way, the FOCA was able to promote safety at all times, even in exceptional times. In 2020, the FOCA also participated in several events and seminars in order to be able to engage in dialogue with the various key players within the aviation safety domain. A great effort is continuously made to reach the target group of the general aviation community via the "Stay Safe" social media channel, which broadcasts safety-related topics. Stories or lessons learned are also an integral part of safety promotion via this channel. With its presence on new social networking platforms, a greater number of people can be reached through the numerous articles published on this channel.

9.2 Reporting culture

In 2020, 3,724 incidents were registered, a decrease of 45% compared to the previous year. The largest decrease in occurrences was recorded in the area of Commercial Air Transport namely 53%. The reduction is also noticeable, although less significant, in the non-commercial operation category with a decrease of 23%. In the area of specialised operations (aerial work), occurrence reports remained at the same level.

In 2020, the FOCA processed over 5,600 reports (initial reports from several involved parties, interim and final reports). The COVID-19 measures imposed in March are also apparent in the number of occurrences reported - the seasonal curve shows a sharp drop from March onwards with the number of reports increasing again from May onwards to reach the usual annual peak in July.

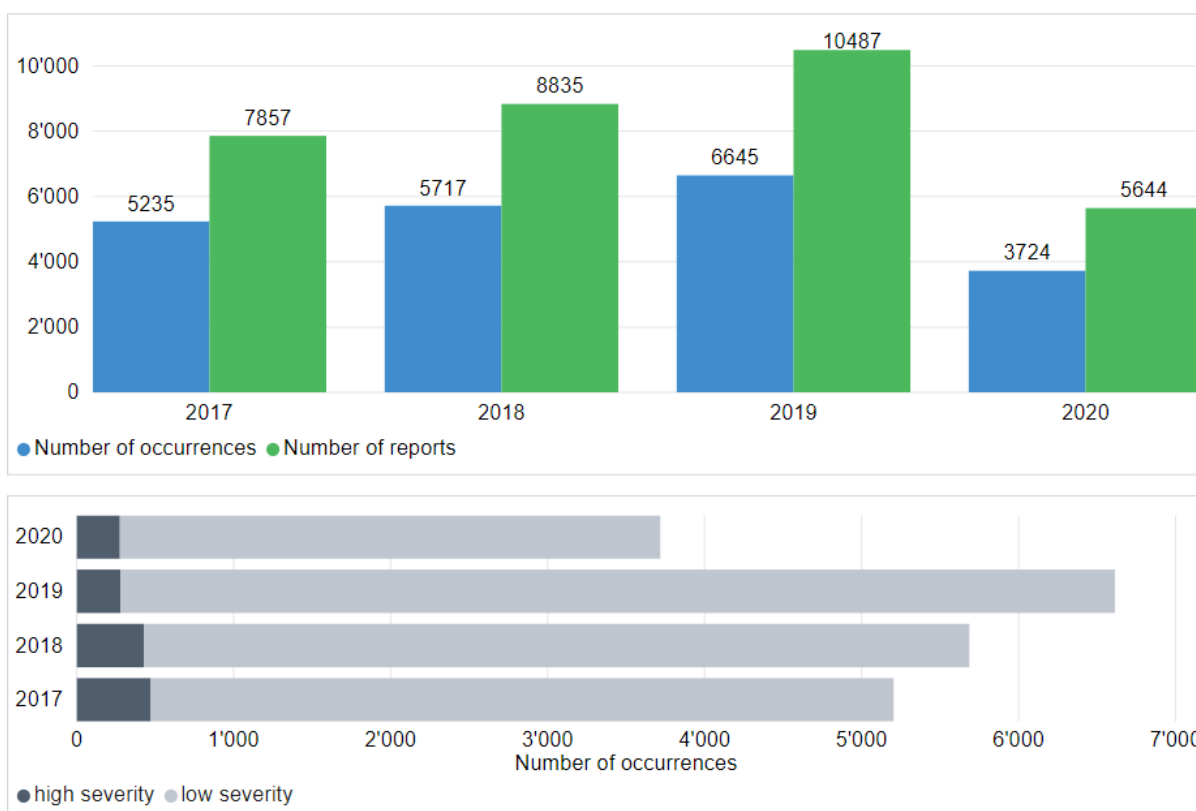


Figure 6: Development of the reporting culture and severity of occurrences in Swiss civil aviation between 2017 and 2020

10 Operational issues

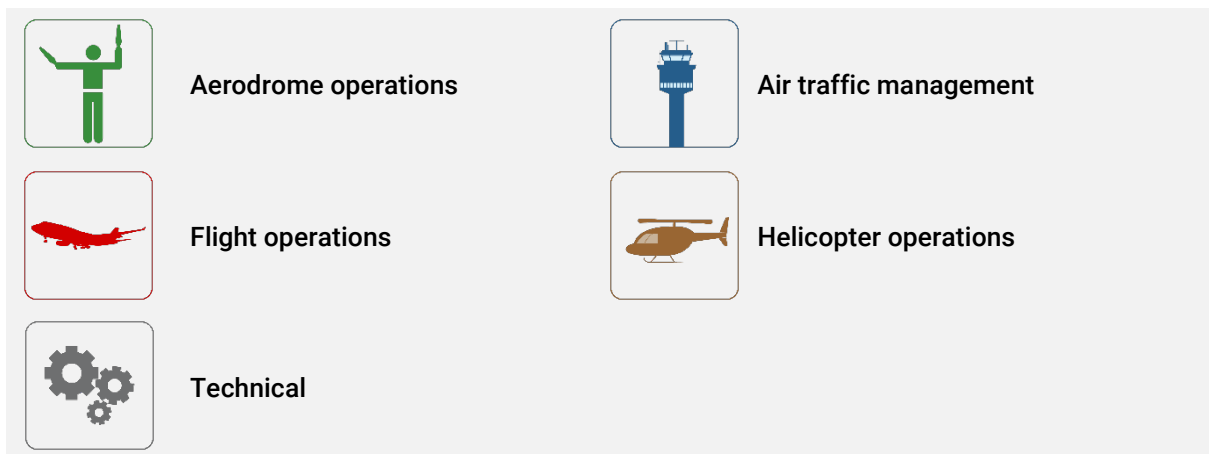
This chapter takes a closer look at the operational issues that are currently of most relevance to Swiss civil aviation in safety terms. These extend throughout the safety risk areas defined for civil aviation (see chapter 6.2 below), and may have an impact on the safety of flight operations.

As part of its data analyses, and with due regard to the numbers of occurrences reported and the severity classifications thereof, the FOCA identified safety-relevant issues in various operational areas in 2020 which were subjected to extensive analysis since they could lead to accidents in the safety risk areas mentioned above.

To monitor these safety risk areas, the FOCA has developed a number of safety indicators that enable it to continuously track their general development and also conduct any more extensive analyses or risk assessments which may be required. The data studied derive from both commercial and non-commercial aviation and also from specialized operations.

The safety issues identified may vary over the next few years, depending on corresponding developments in the associated trends.





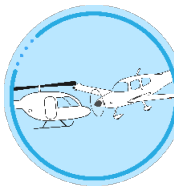



These safety issues have been assigned to the following operational categories, each of which is individually elaborated on in the subchapters below:



10.1 Structure of sub-chapters

Each operational category features an overview of the corresponding safety issues including their definition and their assignment to a particular safety risk area. Following this, the safety issues are presented in chart form according to the number of occurrences assignable to them in 2020 and with due regard to the average severity thereof. A further chart shows the number of such occurrences, divided into high and low severity for each safety issue. A multi-year comparison showing the occurrence trends over the past four years is provided as well. Each subchapter concludes with a brief discussion of the current situation and trends for each safety issue, whenever possible together with comments on their potential causes.

10.2 Safety risk areas in aviation

	<p>Aircraft upset</p>	<p>This safety risk area includes uncontrolled collisions with the ground/open terrain, as well as occurrences in which the aircraft deviates from the planned flight path or planned flight parameters, regardless of whether the aircraft crew notices the deviation or not. The causes can be of a technical, handling and/or operational nature.</p>
	<p>Runway excursion</p>	<p>These occurrences are usually caused by weather conditions (strong tail wind, slippery runways), technical defects or human error.</p>
	<p>Injuries and damages</p>	<p>This safety risk area includes occurrences that cannot be allocated to the other safety risk areas but have caused damage or injury.</p>
	<p>Runway collision</p>	<p>(Near)Collision between two aircraft on the runway and occurrences where runways, including the protected area, are entered or used without permission by an aircraft, vehicle or person.</p>
	<p>Airborne collision</p>	<p>Mid-air collision between aircraft.</p>
	<p>Ground collision (off runway)</p>	<p>A taxiing aircraft is involved in a (near) collision with another aircraft, vehicle, person or other obstacle in its path.</p>
	<p>Terrain collision</p>	<p>The aircraft is unintentionally flown into the ground under control. Typically, the crew notices the impending crash too late.</p>
	<p>Obstacle collision</p>	<p>The aircraft collides with an obstacle (e.g. power line) during flight.</p>

Your guide to the following sub-chapters

Definition: Safety Risk Areas

These categories used to be called accident categories. The FOCA has expanded this term in line with EASA’s terminology and it now means safety-relevant risk areas at an operational level.

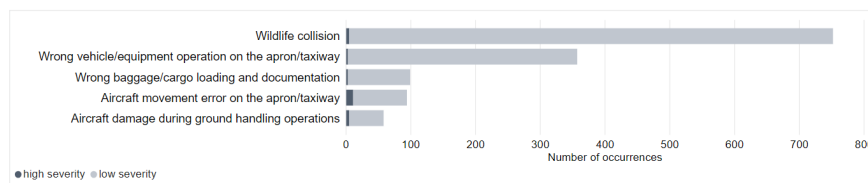
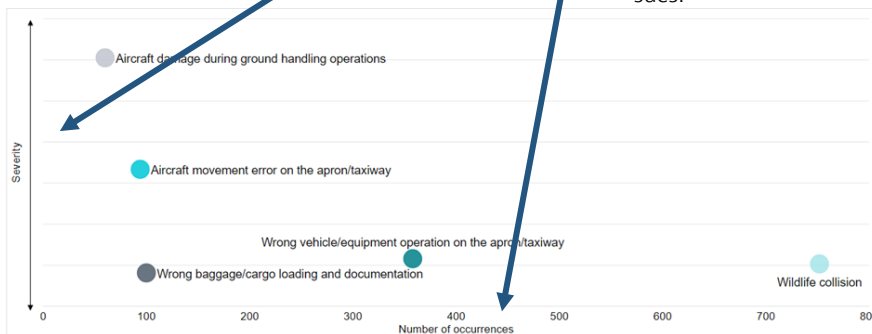
Safety issues Aerodrome operations	Safety Risk Areas			
	Aircraft upset	Runway excursion	Injuries/damages	Ground collision (off runway)
Aircraft damage during ground handling operations	•			
Wrong baggage/cargo loading and documentation	•	•		
Wildlife collision	•	•		
Aircraft movement error on the apron/taxiway (own power)			•	•
Wrong vehicle/equipment operations on the apron/taxiway			•	•

Definition: Safety Issues

Group of occurrences in a given area – in this example “Aerodrome operations”. A safety issue, depending on its impact, can lead to an accident in one of the identified safety risk areas – the potential accident is marked in the table with a dot per safety issue and allocated to the appropriate safety risk area. Safety issues are defined based on the number of occurrences and their severity.

Chart: Number and severity of occurrences

This gives an overview of safety issues by number of occurrences (X-axis) and average severity (Y-axis), where the higher the dot on the Y-axis, the higher the severity. The subsequent chart shows the proportion of occurrences with high/low severity per safety issues.



Definition: Severity

The FOCA analyses each individual occurrence and assesses its severity based on the available information.


High severity: Accident, serious or major incident

Low severity: Occurrences classified as significant/no safety impact/not determined.

10.3 Aerodrome operations

This chapter deals with safety issues in aerodrome operations. An aerodrome is defined as a specific facility for the arrival and takeoff of aircraft, for their stationing and maintenance, for the transport of passengers and for the handling of goods. For the purposes of this report, aerodrome operations include all safety-related activities carried out by the airport operator or a third party, including airport infrastructure maintenance, wildlife management, winter services and aircraft handling.

10.3.1 Safety issues in aerodrome operations

Aircraft damage during ground handling operations	Safety Risk Areas				
<p>A stationary aircraft is damaged during ground handling: collision with equipment/vehicle, incorrect manipulation (e.g. incorrect opening of cargo hold doors). Damage may compromise operational safety in flight. This does not include damage caused by foreign bodies.</p>	 <p>Safety issues Aerodrome operations</p>	Aircraft upset	Runway excursion	Injuries/damages	Ground collision (off runway)
<p>Wrong baggage/cargo loading and documentation</p>					
<p>An aircraft is not loaded by the ground handling staff in accordance with the instructions or is loaded based on incorrect rules. The loading plan is incorrect; wrong takeoff weight, balance calculation, flight parameters. Aircraft is loaded incorrectly; cargo may shift in flight. Loading errors can compromise operational safety in flight. This does not include the loading of dangerous goods or an assignment error at the check-in counter.</p>	Aircraft damage during ground handling operations	●			
	Wrong baggage/cargo loading and documentation	●	●		
	Wildlife collision	●	●		
<p>Wildlife collision</p>	Aircraft movement error on the apron/taxiway (own power)			●	●
<p>Bird strike or collision with an animal during approach or takeoff. The collision may cause damage and/or compromise flight safety. Animal sightings and carcass finds that cannot be clearly attributed to a collision are not included.</p>	Wrong vehicle/equipment operations on the apron/taxiway			●	●
<p>Aircraft movement error on the apron/taxiway (own powered)</p>	The crew deviates from the taxiing rules, procedures or clearances when taxiing on the apron, which results in an unintentional near ground collision or a ground collision with another aircraft, vehicle or obstacle. This does not include movement errors or collisions on the runway.				
<p>Wrong vehicle/equipment operations on the apron/taxiway</p>	A vehicle deviates from the instructions/traffic rules on the apron or taxiway, which results in an unintentional near ground collision or a ground collision with a taxiing or towed aircraft. Equipment or vehicles are parked incorrectly on the apron and obstruct a taxiing aircraft. This does not include movement errors on the runway or a collision between a vehicle/equipment with another object/vehicle.				

Overview of safety issues in "Aerodrome operations" – number and severity of occurrences

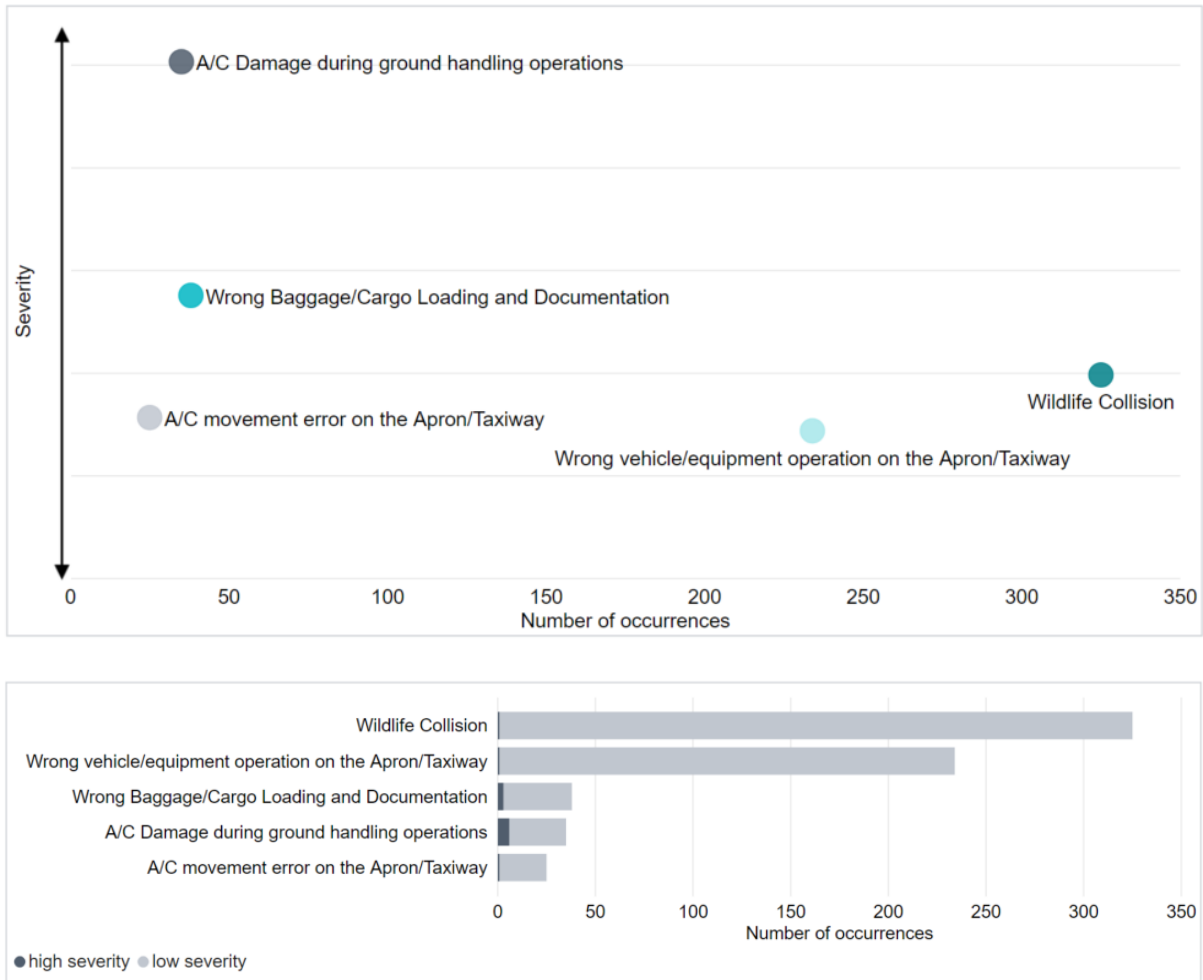


Figure 7: Number and severity of occurrences in "Aerodrome operations" safety issues

Number of occurrences in "Aerodrome operations" safety issues in the last four years

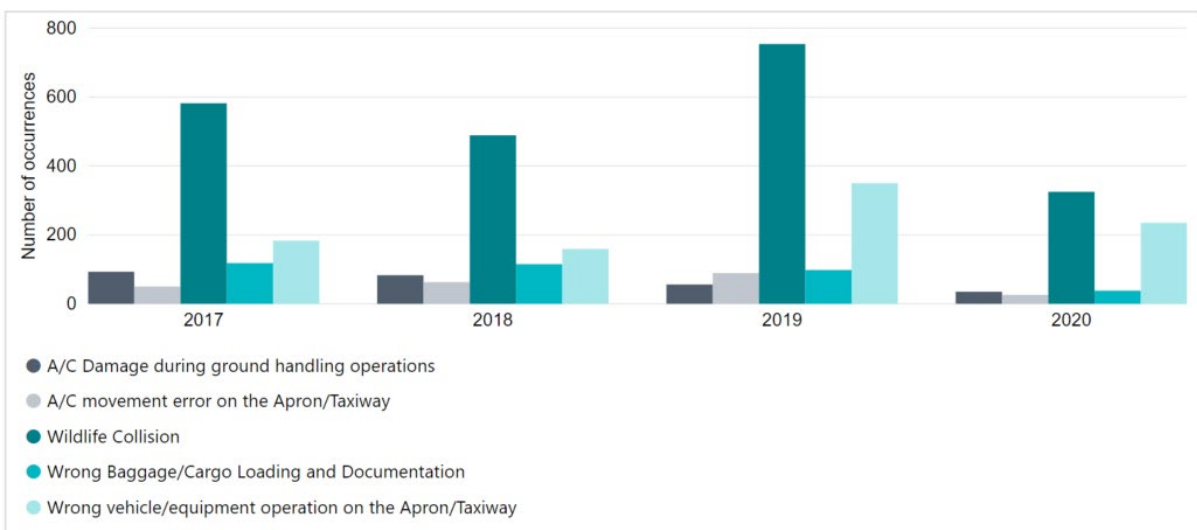


Figure 8: Number of occurrences in "Aerodrome operations" safety issues 2017-2020

Data analysis of “Aerodrome operations” safety issues

Aircraft damage during ground handling operations

In 2020, 35 occurrences were reported in which aircraft were damaged due to incorrect handling of equipment or vehicles in Switzerland and abroad. Commercially operated aircraft were involved in 85% of the reported incidents. The remaining 15% involve non-commercial traffic. A total of 80% of the reported occurrences during the year took place at a Swiss airport. Less than 20% of the reported occurrences were classified as serious because of the structural damage caused to the aircraft and/or its consequences on operations. Tight space on the stands combined with carelessness by ground handling staff led to collisions between equipment and a parked aircraft. Although the number of reported occurrences in 2020 appears to have decreased compared to 2019 by 40%, due to the COVID-19 pandemic and the drastic reduction of the number of air traffic movements, it remains high. In particular, the number of serious incidents remained almost the same as last year.

Wrong baggage/cargo loading and documentation

Almost 40 occurrence reports were received in 2020 relating to loading errors. Fewer than 40% of the recorded occurrences concern incidents that took place at a Swiss airport. Nearly half of the cases are due to incorrect loading of commercially operated aircraft. The other half mostly concern loadsheet errors or misrouted baggage. Less than 10% of the received occurrences were classified as serious incident due to their impact on the flight operations. A decrease in this type of incident of more than 60% can be observed since 2019. In relation to the reduced number of air traffic movements in this year, the number of such incidents appears to be stable.

Wildlife collision

Some 325 collisions with wildlife, principally birds, have been reported to the FOCA in 2020. One half occurred at a Swiss airport. The remaining 40% of the collisions took place abroad and 10% en-route. Similar to the previous year, few cases caused damage to the aircraft or affected operations. Less than 1% of all reported cases were classified as serious. Nearly 75% of the reported collisions occurred between June and October. The number of wildlife collisions seems to remain relatively high in relation to the number of air traffic movements.

Aircraft movement error on the apron/taxiway (own powered)

In 2020, 25 occurrences were reported involving an own powered aircraft movement error on the apron or taxiway in Switzerland and abroad. Almost all of the reported occurrences concerned taxi clearance deviations or navigation errors. Reported occurrences in which a non-commercially or commercially operated aircraft failed to maintain a safe distance from other aircraft, vehicles or objects while taxiing or parking, resulting in a collision where material damages were recorded, represent 12% of the total. With the amount of reduced air traffic in 2020, it is difficult to define a particular trend for this category.


Wrong vehicle/equipment operations on the apron/taxiway

In this category, around 235 reports of incidents at airports in Switzerland and abroad were registered. Two collisions were recorded between taxiing aircraft and equipment or vehicles, resulting in material damage. However, less than 1% of the reported incidents were classified as serious. As in the previous year, the majority of the cases recorded concerned reports at Swiss airports. The main cause of the reports is an apron or taxiway incursion resulting from the incorrect positioning of equipment or vehicles on those movement areas. Although the total number of reports has been reduced by 33% due to the COVID-19 pandemic, the number of incidents in this category remains high. This trend can partly be explained by a constant improvement in the reporting culture of the ground handling service providers.

10.4 Air traffic management

The task of air traffic management is to ensure the safe and efficient movement of aircraft during all phases of their operation. In this chapter, we provide information about the safety issues relating to air traffic management (ATM) and airborne conflicts between aircraft.

10.4.1 Safety issues in air traffic management

Airborne conflicts This includes collisions, airproxes and occurrences that can lead to an airborne collision, as well as resolution advisories from collision warning systems. Airspace infringements All reported (confirmed and suspected) airspace infringements are recorded in this category. This includes airspace infringements caused by Swiss-registered aircraft abroad, as well as infringements of controlled airspace (Delta and Charlie airspace classes) by any aircraft within Skyguide's area of responsibility (i.e. including delegated airspace in Germany, France, Italy and/or Austria). This category also includes infringements of restricted areas (LS-Rxx in Switzerland, restricted areas abroad). Communication error between pilot and ATC This includes all occurrences that are mainly (or at least initially) due to missing, defective or misunderstood communication between pilots and air traffic control authorities (or vice versa). ATC clearance & navigation error by pilot Occurrences where pilots fail to act in accordance with the rules/clearance of air traffic control (ATC) or where pilots have not followed prescribed standard ATC procedures. This includes all occurrences reported by Skyguide involving all aircraft under its responsibility (controlled Swiss airspace plus delegated airspace), as well as occurrences by Swiss-registered aircraft abroad in connection with air traffic control issues (usually reported by crews, safety offices or foreign supervisory authorities). Pilot deviation from ATM procedures Occurrences where pilots do not operate according to internationally agreed and valid ATM rules and procedures. This includes all occurrences reported by Swiss airports or airfields, as well as occurrences reported by Swiss air traffic control service providers involving Swiss and foreign registered aircraft in Switzerland (including delegated airspace). This also includes occurrences involving Swiss cockpit crews and/or Swiss certified flight operators (mainly reported by their safety offices) in Switzerland and abroad that have violated ATM procedures and regulations.	Safety Risk Areas					
	Aircraft upset	Runway collision	Airborne collision	Ground collision (off runway)	Terrain collision	Obstacle collision
 Safety issues Air traffic management						
Airborne conflicts			●			
Airspace infringements			●			
Communication error between pilot and ATC		●	●	●		●
ATC clearance & navigation error by pilot		●	●	●	●	
ATM procedure deviation by pilot	●		●	●	●	

Overview of safety issues in "Air traffic management" – number and severity of occurrences

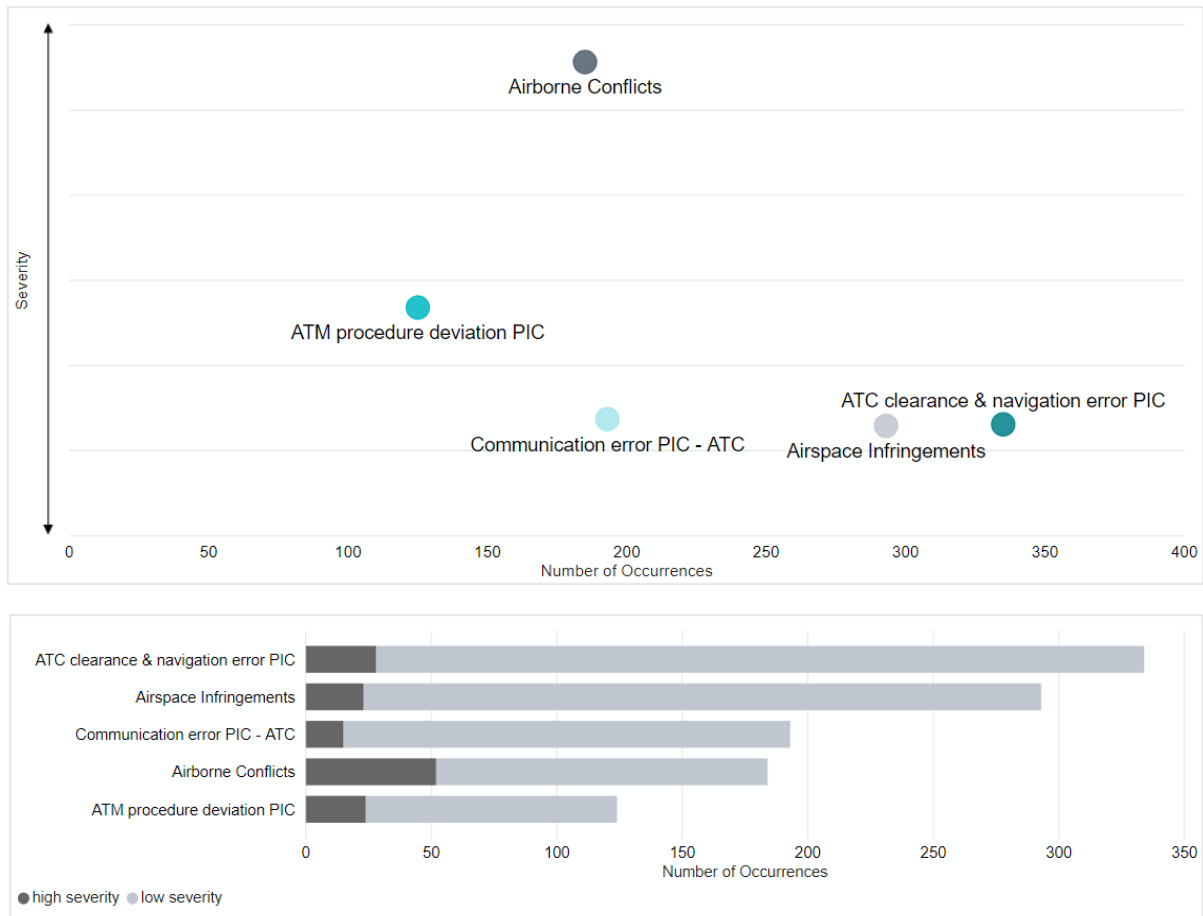


Figure 9: Number of occurrences and severity level in "Air Traffic Management"

Number of occurrences in "Air traffic management" safety issues in the last four years



Figure 10: Development of safety issues in Air Traffic Management 2017-2020

10.4.2 Data analysis of safety issues in “Air traffic management”

Airborne conflicts

In 2020, a total of 141 airborne conflicts were reported in Swiss airspace - in the delegated airspace managed by the Swiss Air Navigation Service Provider Skyguide, a further 48 registered occurrences must be added, resulting in a total of 189 reported occurrences.

In 2020, a number of 32 occurrences (2019: 13) were registered in a mixed traffic situation⁴ in airspace class G / E. This negative trend will be monitored regularly in the near future. The introduction of a transponder mandatory zone (TMZ) in northeastern Switzerland is currently being prepared to mitigate one of the hotspots in Switzerland.

In 2020, no mid-air collision with a Swiss aircraft is registered.



- **C** Airspace class Charlie (C), controlled airspace, terminal manoeuvring areas surrounding major airports, air routes and upper airspace primarily used for IFR flights. There are clear separation criteria for air traffic in these airspaces, which must be applied by air traffic control.
- **D** Airspace class Delta (D), controlled airspace, control zones and terminal manoeuvring of airports, regional and military airfields for mixed use by VFR and IFR air traffic. Requires high discipline from pilots in mandatory radio contact with air traffic control.
- **E** Airspace class Echo (E), controlled airspace for IFR flights at lower altitudes and from/to uncontrolled regional airports and airfields, but is mainly used by light aircraft operations for sightseeing flights and by the air force for VFT training flights. No permanent radio link with air traffic control authorities required for VFR flights.
- **G** Airspace class Golf (G), uncontrolled airspace for IFR flights, only used in Grenchen and Samedan. One single maxim applies: see and avoid.

Figure 11: Number of airborne conflicts in Swiss airspace 2017-2020

The proportion of occurrences with increased severity of airborne conflicts in 2020 has increased compared to the previous year. 30% of reported occurrences are classified as high severity in 2020 - (2017: 24%, 2018: 22% 2019: 16%). This can be attributed to the fact that the occurrence reports with CAT involvement, in controlled airspace, show a decrease of -55% in 2020 and the activities in general aviation have barely decreased overall.

⁴ one aircraft under Instrument Flight Rules (IFR) and the other one under Visual Flight Rules (VFR)

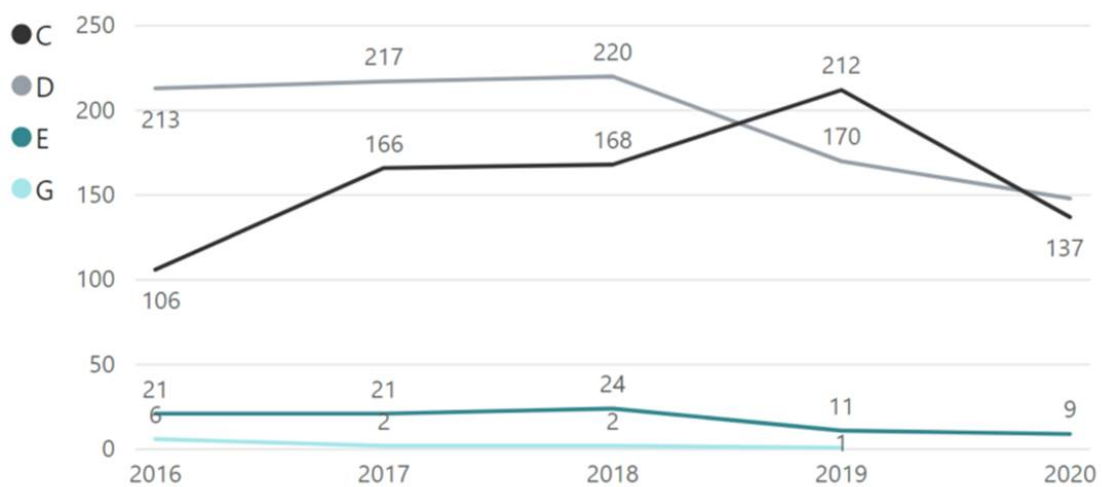
Airspace infringements

With a decrease of 28% compared to the previous year, the number of airspace violations reported by the air navigation service providers fell less than one would have expected due to the decrease in movement figures (around 35% for all aerodromes in Switzerland) in connection with the COVID-19 pandemic.

This is due, among other things, to the fact that commercial aviation slumped much more sharply, while GA and business aviation were only marginally affected by COVID-19. At some regional airports (such as Bern, Locarno or Samedan), the number of these movements actually increased compared to the previous year.

The percentage of airspace violations by foreign-registered light aircraft reported by air traffic control increased from approximately 38% in the previous two years to 44% in the year under review.

In particular, the proportion of GA aircraft carrying a German registration and involved in airspace violations within Swiss-controlled airspace increased to almost one fifth of all AI reports received.



- **C** Airspace class Charlie (C), controlled airspace, terminal manoeuvring areas, air routes and upper airspace. Airspace infringements in this class cause a lot of extra work for air traffic control, since they are required to always guarantee the separation criteria between IFR traffic and intruders with an unknown flight path.
- **D** Airspace class Delta (D), controlled airspace for mixed VFR and IFR flights, unauthorised transits endanger aircraft approaching and taking off in the control zones around civil and military airfields.
- **E** Airspace class Echo (E), controlled airspace for IFR flights at lower altitudes at regional airfields, though primarily used for VFR flights in light aircraft operations. Airspace infringements occur in temporarily established restricted areas due to poor flight preparation.
- **G** Airspace class Golf (G), uncontrolled airspace. Temporarily restricted areas (mostly created for military activities) are often ignored in flight planning by light aircraft operations, so are flown through unconsciously and without permission.

Figure 12: Number of airspace infringements in Swiss airspace 2016-2020

Communication error between pilot and ATC

Despite the significant reduction in radio frequency occupancy in COVID-19 year 2020, problems in communications between pilots and air traffic controllers have not decreased to the same extent as the greatly reduced traffic numbers would suggest. In particular, the GA still has great difficulties in some cases to correctly understand the instructions of ATC and to act as expected.

ATC clearance & navigation error by pilot

An increasingly occurring phenomenon are the violations of clearances during taxiing after landing to the stand and vice versa from the stand to the taxi holding point. These incident reports were all classified as

"low severity". In Switzerland, this mainly affects Zurich Airport with commercial aviation and Sion Airport with general aviation.

ATM procedure deviation by pilot

The proportion of incidents with "high severity" classifications remained constant compared to the previous year at around 7%.

These are mainly procedural errors during approach and landing at airfields without ATC. In the year under review, the airport of Lausanne-Blécherette (LSGL) alone recorded six incidents involving approaches to the wrong runway with simultaneous takeoff traffic on the actively designated runway.


In addition, there were more reports of low-level flights, both over inhabited areas and in the Alps.

Particularly worthy to mention in the COVID-19 period are the violations of changed, but correctly published opening hours of the airports and their air traffic control centers.

10.5 Flight operations

This chapter focuses on safety issues in the operational use of aeroplanes in the area of the human performance of flight crews.

10.5.1 Safety issues in flight operations

Wind shears and turbulences Wind shears and turbulences are caused by air movements associated with convective activity, especially within or near a thunderstorm or near a jet stream. Turbulences can also occur in the absence of clouds and at high altitudes. Turbulences tend to be unproblematic for large aircraft. However, for smaller aircraft turbulences can lead to uncontrollable flight attitudes, which must be quickly counteracted. Nowadays aircraft operated by airlines are equipped with modern warning systems that alert pilots to wind shears at an early stage so that they can react as quickly as possible.	Safety Risk Areas				
	Aircraft upset	Runway excursion	Injuries/damages	Airborne collision	Terrain collision
 Safety issues Flight operations					
Wind shears and turbulences	●		●		
Insufficient flight preparation	●	●		●	
Deviation from procedures and checklists	●	●			●
Unstabilised approach	●	●			●
Flight parameter exceedances	●	●			
Dangerous goods transportation	●		●		
Unstabilised landing		●			
Insufficient flight preparation Flight planning consists of planning the intended route through the various airspaces at the required flight altitude, accurately calculating performance data and the required amount of fuel, checking weather data and collecting other relevant information for executing the flight.					
Deviation from procedures and checklists Many years ago, the cockpit of an aircraft would contain two pilots, a navigator and a flight engineer. The latter roles are no longer required in modern aircraft since much of the work is performed by computers, cutting-edge technology and the pilots. However, due to the increasing complexity of technology and systems, special procedures and checklists have had to be defined to minimise the error rate for operating the controls. Such procedures and checklists tell the pilots the specifications by which they should fly and the on-board systems to use in order to ensure passengers are transported as safely as possible.					
Flight parameter exceedances Flight parameters can be infringed in all flight phases of an aircraft. This is usually caused by pilot carelessness or external influences, such as turbulences or wind shears, as well as rapid changes in wind direction. Such deviations generally include a rapid change in airspeed, flight direction, horizontal/vertical flight attitude, but also operational limits of aircraft systems, such as engine/engine temperatures, g-force loads or load values on flight control surfaces. In extreme cases, such deviations can cause aircraft upset.					
Unstabilised landing During landing and taxiing, influences such as wind shears, thermal convections, optical illusions or an incorrect assessment of the rate of descent can lead to unstabilised landings. As a result, the aircraft may hit the runway too hard or, due to too much lift, flare too long over the runway until touchdown. Undercorrecting such situations can cause the aircraft to overshoot or veer off the runway; overcorrecting can cause a rear-end impact.					

Overview of safety issues in "Flight operations" – number and severity of occurrences

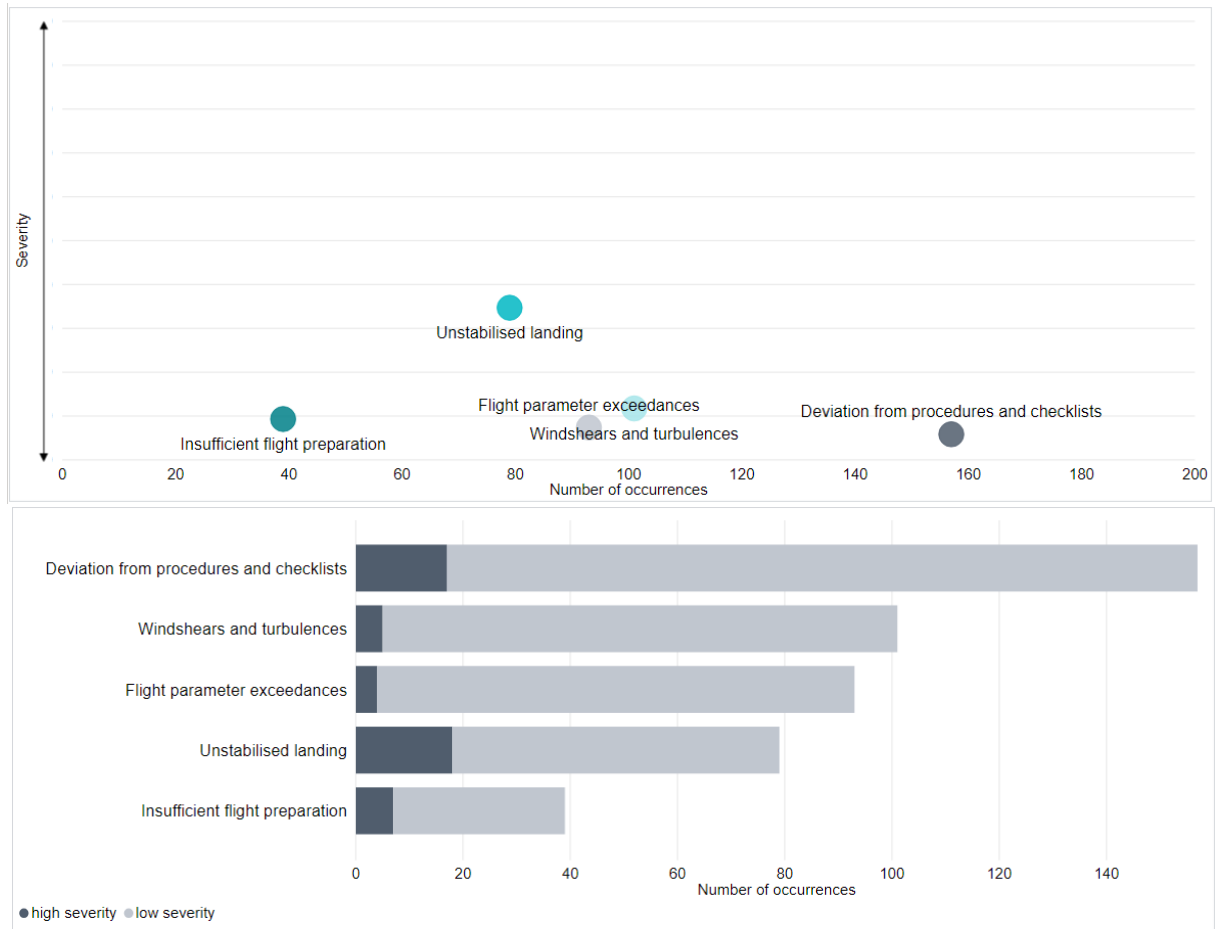


Figure 13: Number of occurrences and severity in "Flight Operations" safety issues

Number of occurrences in "Flight operations" safety issues in the last four years

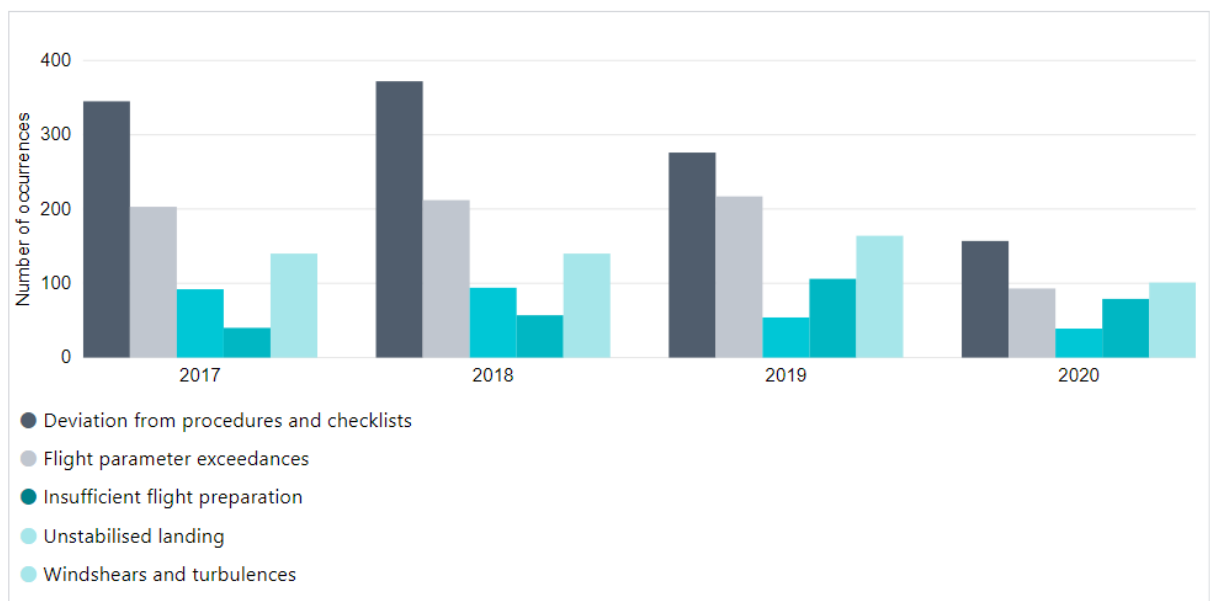


Figure 14: Number of occurrences in "Flight operations" safety issues 2017-2020

10.5.2 Data analysis of “Flight operations” safety issues

Wind shears and turbulences

The number of reports received has remained stable compared to the reduced flight hours flown in 2020. 85% were reported from the commercial air transport and 15% from the general aviation domain. Out of a hundred reports, there were 60% in the approach and landing phase with no serious incidents nor accidents or fatalities. Six events happened during the takeoff phase with two accidents with no fatalities or injuries and which are under investigation by the AIB. In one case, a light aircraft was unable to gain enough lift after takeoff when encountering turbulences and downdrafts and was forced down in an acre. In another case, an aircraft was flying into a tree close to the airfield due to strong wind forces.

Deviation from procedures and checklists

The main safety issues in flight operations are the improper use of checklists or deviation from standard procedures (50%) by the flight crew on ground or in the air. Causal factors for such deviations are the lack of or delayed actions inflight (31%) influenced by all kind of distractions from the cockpit environment (communication, noise, navigation, weather, etc.). Only a few events concerning wrong altimeter setting (6%), configuration setting errors (9%), performance calculation and data entry errors (4%) have been recorded. Such distractions, errors and deviations can lead to gear up landings, damages to aircrafts, level busts, deviations from vital flight parameters, runway incursions, navigational errors, deviations from ATM procedures, etc.

Flight parameter exceedances

Exceedances of flight parameters are mainly reported by commercial air transport flight crews (>90%). Such flight parameter deviations, include overspeed or underspeed (67%) in all flight phases, excess of an aircraft lateral bank (12%) or pitch deviations (21%). More than 70% of the deviations are observed during the approach or landing phases, often caused by turbulences or wind shifts. One accident with a sailplane and one with a homebuilt aircraft with only minor injury was recorded.

Unstabilised landing, runway excursion

A big increase in runway excursions is observed in the area of non-commercial air transport during the year 2020. Lack of training seems to be the main contributing factor here. A total of nine accidents and serious incidents with one minor injury are investigated by the AIB.

In commercial air transport there were 19 hard- and 39 long landings recorded - mainly due to the influence of adverse wind conditions in the landing phase followed by difficult manual control of the aircraft. No events had a high-risk bearing. Precursors are unstabilised approaches and low flight training by flight crews due to reduced flights schedules in the COVID-19 year.

Insufficient flight preparation

Flight preparation is an important task in order to perform a safe flight in a complex airspace environment as we do have in Switzerland. It consists of planning the intended flight route through the various airspaces, accurately calculating performance data and the required amount of fuel, and checking weather data of relevance to executing the flight safely. Commercial flight operations have specialists trained in this important task, while in recreational aviation private pilots are responsible themselves. Weaknesses in flight planning are mostly seen amongst recreational pilots, mainly in the selection of the flight route. This may cause airspace infringements which can lead to air traffic control having to divert other airspace users in order to avoid dangerous airproxes.


Dangerous goods transportation

The number of reported dangerous goods incidents decreased significantly in this reporting period. The numbers dropped by more than 50% in comparison to 2019, from 240 to 116. Most of the cases concerned undeclared goods, followed by insufficiently packaged or damaged shipments.

10.6 Helicopter operations

This sub-chapter mainly looks at safety issues relating to aerial work.

10.6.1 Safety issues in helicopter operations

<p>Rotor strike</p> <p>An event involving damage caused to the aircraft when its main or tail rotor blade collided with obstacles on ground (cable/wires, vegetation, poles etc.).</p> <p>Total or partial loss of load</p> <p>During transport, all or parts of the external load are lost.</p> <p>Laser attack</p> <p>The sudden appearance of a strong light source that exposes a pilot to glare can have different impacts, depending on its intensity. The possible consequences range from a brief distraction to temporary blindness or permanent eye damage. Exposing crews to glare is illegal and can have fatal consequences, especially in the crucial phases of approach, takeoff or low-altitude flight, which require a pilot's full attention.</p> <p>Spontaneous cargo hook opening, strop disruption</p> <p>Failure of either a hook and/or strop that is used for hoisting cargo or passengers from a surface below the aircraft or securing cargo to the aircraft's cargo hook</p> <p>Injuries due to sling load operations</p> <p>Injuries sustained by persons while being part of a sling load operation.</p>	Safety Risk Areas				
	Aircraft upset	Injuries/damages	Ground collision	Terrain collision	Obstacle collision
 <p>Safety issues Helicopter operations</p>					
Rotorstrike			●	●	●
Total or partial loss of load		●			
Laser attack	●				
Spontaneous cargo hook opening, strop disruption		●			
Injuries due to sling load operation		●			

Overview of safety issues in "Helicopter operations" – number and severity of occurrences

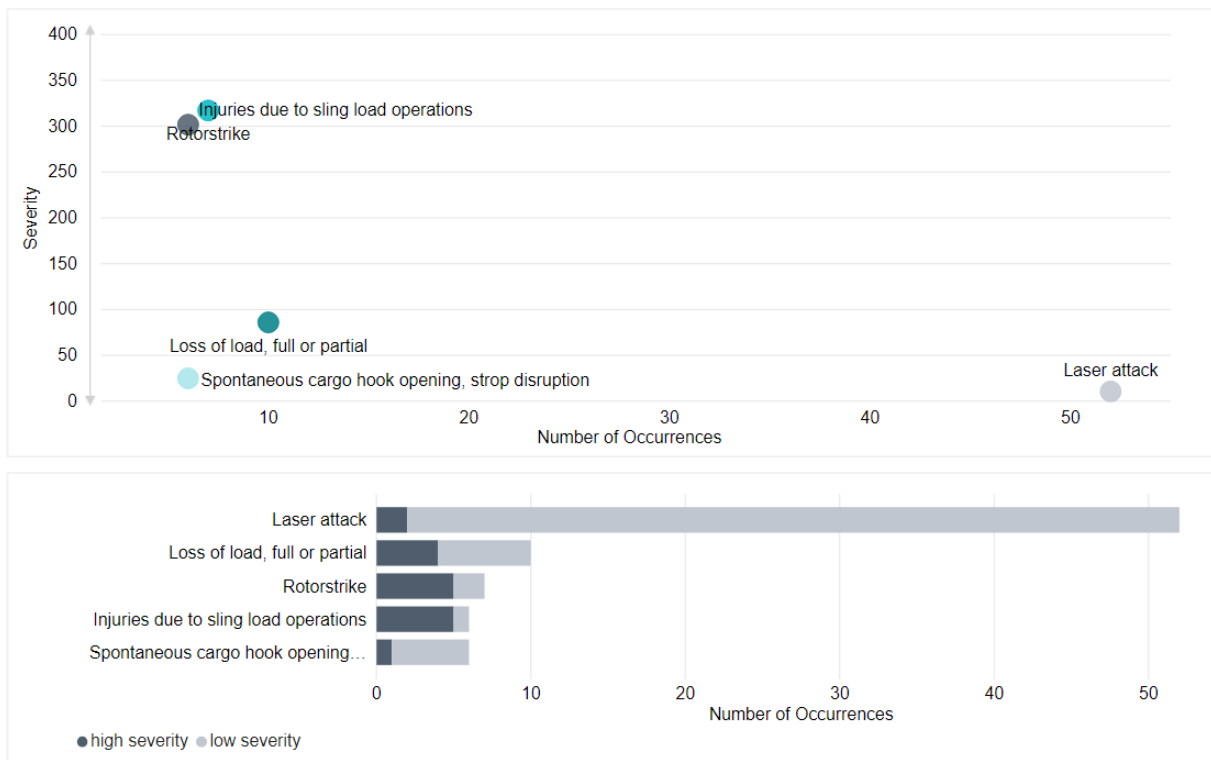


Figure 15: Number of occurrences and severity in "Helicopter operations" safety issues

Number of occurrences in "Helicopter operations" safety issues in the last four years

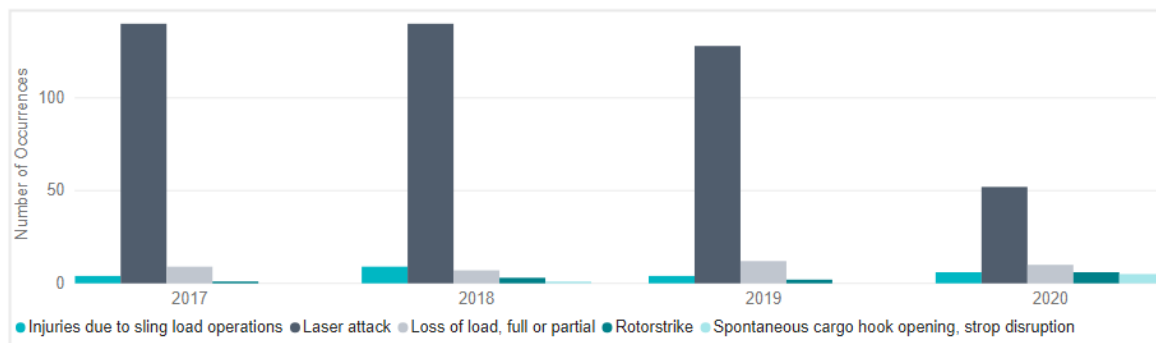


Figure 16: Number of occurrences in "Helicopter operations" safety issues 2017-2020

In 2020, the number of reported occurrences dropped by roughly 10% and is slightly below the average of the last few years. It must be noted that the numbers are repeatedly too small for a clear conclusion to be drawn about a possible trend.

After a light decrease in the previous year, the number of injured flight assistants and other ground personnel as a result of external load operations augmented again slightly in 2020. An increase in the number of reported spontaneous cargo hook openings/stop disruptions and rotor strikes was noted during the reporting period.

10.6.2 Data analysis of “Helicopter operations” safety issues

Rotor strikes

The number of reports in this regard grew during this reporting period. Whilst only two rotor strikes were reported in the previous year, seven reports were submitted to FOCA during 2020.

Total or partial loss of load

After an increase in 2019, the number of reported load losses declined again during this reporting period, however not significantly (2019: 12, 2020: 10). A risk assessment has been performed to assess the associated risk to loss of loads during aerial work. Put in relation to the number of aerial work flights (“cycles”), the risk is acceptable.

Laser attack

In recent years, we have seen an increase in the outdoor use of lasers for legitimate purposes, such as laser shows and commercial testing. Similarly, there has been an increase in the use by private individuals of hand-held laser pointers for the intentional (and illegitimate) illumination of airplanes and helicopters. Disruptions of this nature are very dangerous for pilots in critical flight phases such as takeoff and approach/landing, especially for helicopter pilots.

Awareness-raising campaigns and a legislative change criminalising laser glare are proving effective, with the total number of reports of laser glare decreasing once again in 2020 by nearly 60%. However, the numbers of Helicopter crews being affected by laser glare augmented in this reporting period. Helicopters were affected in 23% of all reports (5% in 2019).

Spontaneous cargo hook opening, strop disruption

After a couple of years without respectively very little incidents in this area, we had six reported cases during the reporting period. However, the numbers are so small that they are statistically insignificant. The trend will continue to be monitored over the next few years.

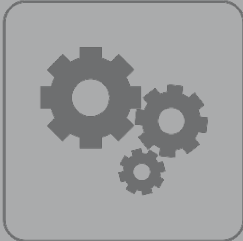
Injuries due to sling load operation

FOCA received six reports in regards to injured flight assistants or workers on ground during sling load operation in 2020. The numbers vary from year to year and no trend can be identified, also due to the fact that the figures are small. None of the six actual cases is under investigation of the AIB.

10.7 Technical

In this sub-chapter, we provide you with information about safety issues relating to technical occurrences.

10.7.1 Safety issues in Technical

Propulsion or fuel system malfunction A partial or complete loss of propulsion power can lead to an emergency landing or aircraft upset. Possible causes are technical defects in the propulsion systems (engine, propeller, transmission and related systems) or fuel system, faulty manipulation, maintenance errors, damage incurred on the ground, bird strikes, weather conditions, fuel shortage or contaminated fuel. A loss of power or engine failure does not always lead to an emergency. Modern passenger aircraft can be controlled, even after engine failure, and crews receive on-going training for this type of event. If necessary, pilots can also shut down engines or operate them at reduced power to prevent damage. This can be the case, for example, with engine vibrations, an EGT (exhaust gas temperature) exceedance or a low oil level or oil pressure.	Safety Risk Areas		
	Aircraft upset	Runway excursion	Injuries/damages
 Safety issues Technical			
Propulsion or fuel system malfunction	●	●	
Aircraft environment (smoke, smell, fumes, fire)	●		●
Flight control system malfunction	●	●	
Landing gear malfunction		●	
Aircraft environment (smoke, smell, fumes, fire) Smells can arise in an aircraft for various reasons. Depending on the source, concentration and chemical composition of the smell, the health or performance of the aircraft occupants may be adversely affected. To avoid potential risks due to smell or smoke in the cockpit, the crew may decide to make a precautionary landing or use oxygen masks. Airlines follow established processes to investigate such incidents and mitigate their causes. In general, the following causes in particular can cause smells to form in aircraft: <ul style="list-style-type: none"> • Traces of oil from an engine or APU (auxiliary power unit) that penetrate into the air-conditioning system • Defective electrical/electronic components • Development of smells in the galley due to defects, soiled ovens or coffee machines • Defects in the cabin pressure and air-conditioning system • External sources of smells on the ground (e.g. de-icing, ambient air) • Luggage, cargo, passengers Uncontrolled fire in an aircraft is one of the hazards with potentially the greatest impact and can lead to aircraft upset as a result of damage to the structure, control systems or injury to the crew.			
Flight control system malfunction The flight control system serves to control the aircraft around its three axes and comprises the various control surfaces and their control mechanisms; in helicopters, this is mainly the main and tail rotor control mechanism. Failure or malfunction of flight control systems may result in aircraft upset. In passenger aircraft, the important systems are generally designed with redundancy; if one system fails, others take over some or all of its functions and the aircraft can still be controlled. Failures and problems are displayed to the pilots, according to their severity, as caution indications or warnings, in order to enable appropriate measures to be taken. In addition, the crews receive periodic training to handle potential failures of the various systems.			

Landing gear malfunction
 A malfunction of the landing gear including its extension/retraction system, the brakes or a tire failure can be the cause of a wheels-up landing, collapse of the landing gear during landing, failure to retract the gear after takeoff or a runway excursion.

Overview of safety issues in "Technical" – number and severity of occurrences

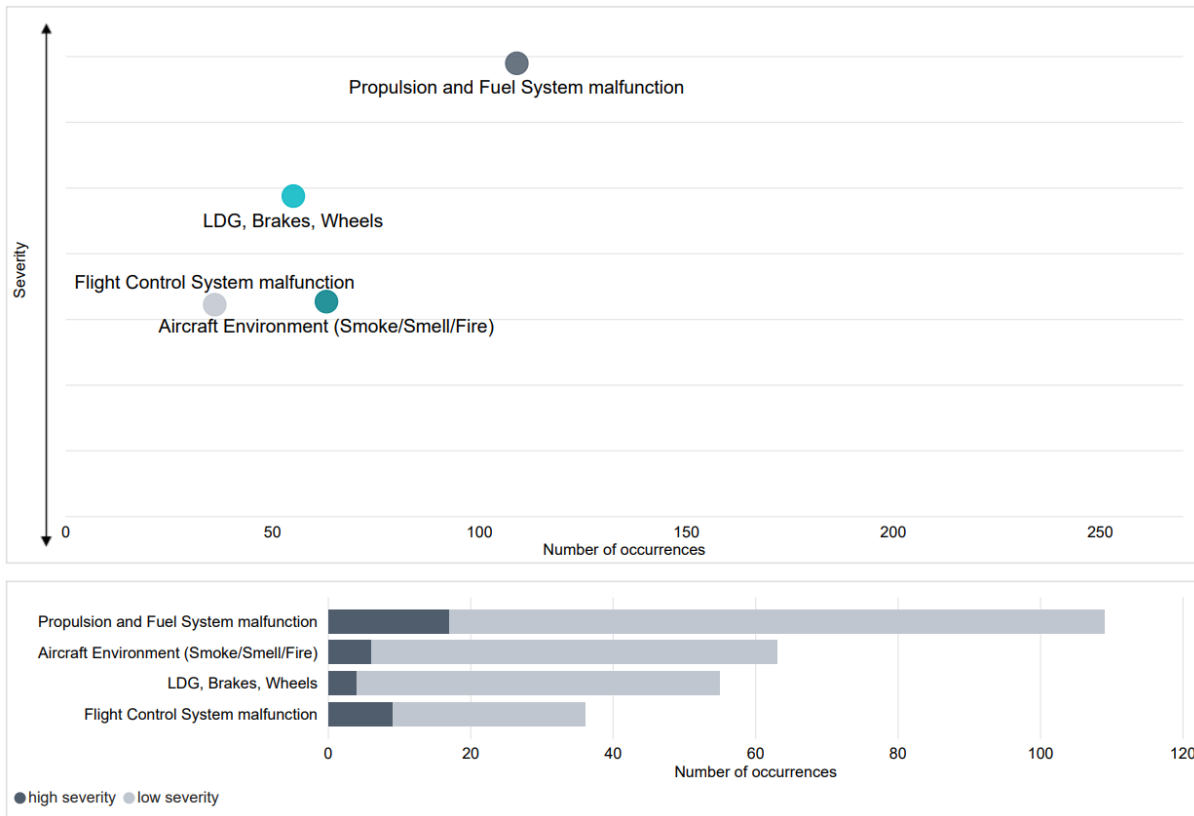


Figure 17: Number of occurrences and severity in "Technical" safety issues

Number of occurrences in "Technical" safety issues in the last four years

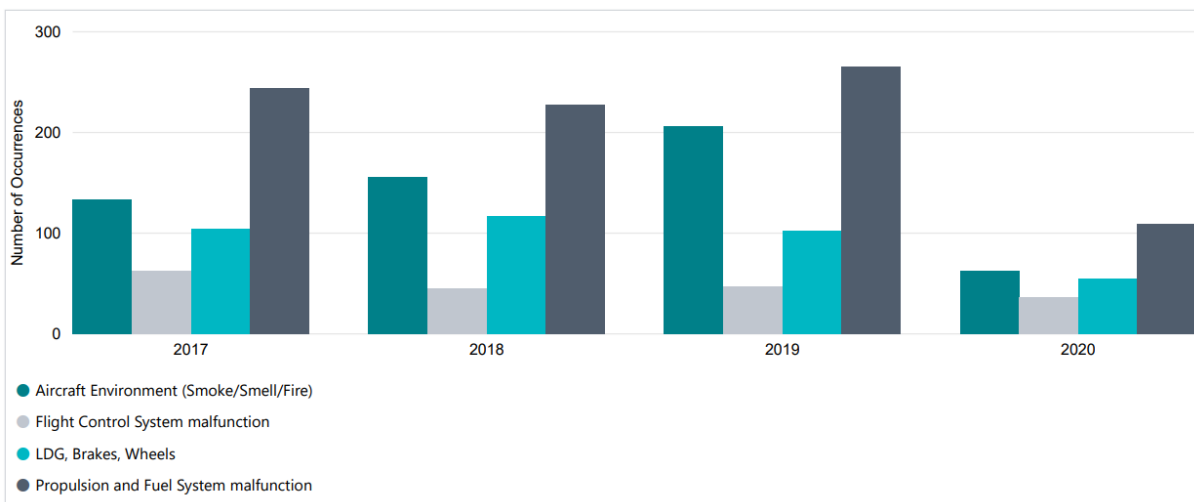


Figure 18: Number of occurrences in "Technical" safety issues 2017-2020

10.7.2 Data analysis of “Technical” safety issues

Propulsion or fuel system malfunction

Due to the restrictions imposed by the COVID-19 pandemic and the reduced number of flights and flight hours flown, the number of reported incidents in 2020 for the various technical safety issues was significantly lower than in previous years. However, a simple comparison of absolute values can be misleading. In both commercial and non-commercial aviation, the percentage decrease in reported incidents was higher than the decrease in aircraft movements. At present, it is not fully understood whether this relative decline was due to an actual improvement or to a change in reporting behaviour because of influences such as reduced workforce availability due to the pandemic.

The aggregate severity of reported engine and fuel system incidents was higher in 2020 than in previous years. This was mainly caused by four non-commercial aviation accidents due to engine problems. Three of these involved single-engine aircraft and one a single-engine helicopter, all powered by piston engines. As in the previous years, loss of engine power was one of the main causes of accidents due to technical reasons in general aviation.

In commercial aviation, the severity of incidents was at a similar level to previous years and there was no accident due to known technical causes.

If a design or manufacturing fault is identified as the cause, the corresponding occurrence is forwarded to the responsible certification authority for it to clarify and initiate possible corrective measures and improvements with the responsible stakeholders (type certificate holder, design organisation, manufacturer). This applies to all technical areas.

Aircraft environment (smoke, smell, fumes, fire)

In both commercial and non-commercial aviation, the percentage decrease in reported events from 2019 to 2020 is greater than the decrease in flight movements during the same period.

For reported smoke or smell incidents, the aggregate severity for 2020 increased compared to the previous year. The main reason for this increase was one accident caused by an electrical fire and three high severity incidents in non-commercial aviation.

The severity of occurrences in commercial aviation stayed at a similarly low level as in the previous years and there was no accident due to known technical causes.

Flight control system malfunction

In commercial aviation, the reported incidents decreased more than the number of flights, while in non-commercial aviation the number of reports remained at a similar level to previous years, resulting in a slightly increased number of reports per flight.

The overall severity of commercial aviation incidents increased slightly, mainly due to three incidents with a higher severity. In this context, it should be noted that with the small number of reported incidents in 2020, a few higher severity incidents may have a relatively large impact on the statistics. The aggregate severity of non-commercial aviation incidents remained at about the same low level as in previous years.

Landing gear malfunction

The decrease in reported incidents was greater than the decrease in flights in both commercial and non-commercial aviation.

In contrast, the aggregate severity increased mainly in non-commercial aviation and, to a lesser extent, in commercial aviation. The main causes were two accidents in non-commercial aviation: a gear-up landing with partly technical origin and a collapsed landing gear on landing - the technical origin of which is under investigation and has not yet been confirmed. In commercial aviation, a twin turboprop aircraft failed to extend and lock its nose gear during landing.

11 Emerging issues

11.1 Drones and U-Space

The number of occurrence reports and occurrences involving drones declined to 40 in 2020 from the 79 of the previous year. The trend is probably largely attributable to the COVID-19 situation that prevailed throughout much of 2020.

The FOCA has long been specifically urging the various parties active in Swiss aviation to report all drone-related occurrences, so as to gain the most comprehensive and objective picture possible of the current drone situation. It will still be some time, however, before the impact of an improved reporting culture can be properly assessed. Moreover, the exceptionality of 2020 has only further delayed this process.

The number of sightings of unmanned aerial vehicles (UAVs) by aircrews in 2020 was 16 cases. A decline of some 80% from the 79 of the previous year. Of these 16 reports, nine related to sightings near aerodromes, including four within the perimeter of non-Swiss aerodromes. In one of the cases outside Switzerland, the flight was forced to use a different takeoff runway. Two further drone sightings were around hospital landing sites in Switzerland.

A further 21 incursions by UAVs into prohibited zones (such as the five-kilometre-radius area around aerodromes) were recorded in 2020. Sixteen of these were by UAVs identified as multicopter drones.

Three crashes of UAVs were reported. In one such case, one person was injured when a model aircraft crashed in Ottenbach, Canton Zurich. The cause of the crash was the operator's loss of control over the aircraft after becoming blinded by the sun.

The sales of drones, especially for hobby flying, again rose less strongly than they had in previous years. Estimates made a few years ago suggested that over 100,000 drones had been sold in Switzerland. However, precise numbers on how many of these are currently in use are not available.

To estimate the risk of a collision between a drone and another Swiss airspace user, a detailed risk assessment was conducted back in 2018 which determined the likelihood of a collision between a drone weighing up to two kilograms and an aircraft (an airliner, business jet, small aircraft or helicopter). This risk assessment was updated in 2019, and again in 2020. The ramifications of the COVID-19 pandemic have prompted a decline in both manned flights and the reports from the pilots thereof, and this in turn has basically reduced the collision risk. Given the exceptional nature of the present situation, however, no general conclusions should be drawn from this latest trend.

The FOCA continues to assume that the risk situation here is broadly stable. It is aware, though, that ensuring the responsible use of the still-growing numbers of such devices designed for the public will require heightened attentiveness and an intensification of the Office's corresponding communications endeavours.

The development of the U-Space system, which will permit the adoption of automated drone traffic management, continues at both the national and the European level. Subjecting drones to such automated traffic management enables them to be identified and have their movements monitored and coordinated with those of other airspace users, and can additionally ensure the easier and more effective protection of particularly sensitive airspace areas. Since it will incorporate all the necessary elements for enforcing the applicable legal provisions, U-Space is set to become the core instrument for ensuring the safe and controlled operation of drones, and should serve as a basis for this Europe-wide.

A number of the parties required in Switzerland to operate the U-Space system have now teamed up under the Swiss U-Space Implementation (SUSI) public-private partnership. SUSI will not only enable U-Space to be developed and adopted on the basis of European provisions and in line with its overall objectives; it will also permit further trials and demonstrations to be conducted in Switzerland, such as automated traffic management among the drones registered by the various service providers.

Thanks not least to our industry's strong innovation credentials, U-Space is being developed at an impressive pace, and may well deliver substantially more advantages over the next few years that will benefit manned

aviation, too. In combination with AVISTRAT-CH in particular, these developments could make a sizeable contribution to the safety of an aviation system that continues to grow in complexity.

Switzerland is playing a leading role in the rapid-pace developments in the UAV and U-Space fields, and also had a major say in the devising of Europe's corresponding legal foundations. This has helped result in forward-looking legislation that will enable the safe integration of unmanned aviation into the existing aviation system. The rules and regulations devised also ensure that the continent's various civil aviation authorities will be fully competent in all the relevant areas, while simultaneously facilitating the outstanding research and development that are being conducted in the field. The FOCA is determined to further support all these endeavours, and to regard all these changes as genuine opportunities.

The adoption of European drone regulations in Switzerland has currently been delayed as a result of Motion 20.3916 to exclude model aircraft flying from the same. What impact the present non-adoption of these European provisions may have on the safe operation of UAVs in Switzerland is currently impossible to assess.

11.2 Aviation Cybersecurity

With the growing extent of both digitalization and online network interconnections, the risk landscape has also expanded in the cybersecurity field.

On this front the FOCA is in close dialogue with Switzerland's National Cybersecurity Centre (NCSC), which has the requisite technical expertise on information security issues and can offer additional assistance in the event of an occurrence. Parallel to this, the necessary know-how will also be steadily acquired and further expanded within the FOCA over the next few years. The new FOCA position of Cybersecurity Coordinator was also successfully filled in summer 2020.

The FOCA also continues to cultivate its international collaborations on aviation cybersecurity, within Europe and worldwide. The endeavours here have already resulted in the approval of an ICAO Action Plan based on the organization's cybersecurity strategy which lays out the principles and the actions required to achieve its strategic cybersecurity objectives.

From a European perspective, the new EASA Part-IS (Information Security) regulations are at the end of their drafting phase, and are currently expected to enter into effect in 2022. There will then follow a grace period of two years within which their provisions must be adopted by the FOCA and the further organizations under FOCA supervision. The corresponding Guidance Material and Acceptable Means of Compliance (GM/AMC) will shortly be devised, in a process in which the FOCA will also be playing an active role.

In June 2020 the ED Decision 2020/006/R dealing with airworthiness information security was issued. It applies from Jan 2021. The objective of this Decision is to mitigate the potential effects of cybersecurity threats on safety. Such threats could be the consequences of intentional unauthorised acts of interaction with the aircraft on-board electronic networks and systems.

This Decision issues amendments to CS-25, CS-27, CS-29, CS-APU, CS-E, CS-ETSO, CS-P, and to the related acceptable means of compliance (AMC) and/or guidance material (GM), together with AMC-20, AMC/GM to CS-23 and AMC/GM to Part 21.

The amendments are expected to reflect the state of the art of the protection of products and equipment against cybersecurity threats. They are also expected to improve harmonisation with the Federal Aviation Administration (FAA) regulations.

12 Assessment and outlook

The priorities for Swiss civil aviation in terms of safety are well known, thanks to the data and the further information provided by the air transport industry and the private aviation sector. Analyzing occurrences is a key element in the risk assessment analysis which FOCA conducts in connection with safety-relevant activities. More and more management decisions are being taken on the basis of risk and performance considerations and predefined criteria. The information from occurrences is serving, for instance, as a key decision-making foundation (among others) in the AVISTRAT project and on the mandatory transponder issue (TMZ).

The safety risk areas of "Airborne collision" and "Aircraft upset" are at the top of the priority list in Switzerland, too, also in view of the European risk portfolio and the findings thereof. The Airprox Analysis Board (AAB), newly constituted in 2018, was further developed in 2020 with a new mandate and terms of reference to give it the requisite weighting. Some major decisions lie ahead here, on issues such as transponder mandatory zones (TMZs), which are being discussed with various specialists in the field to determine whether the creation of such zones could reduce the risk of future airborne collisions.

Our ASR 2020 should provide our industry partners with a review of the reports and occurrences in Swiss civil aviation in 2020. Our special thanks here go to our industry for its constantly improving reporting culture. The present safety report has taken a closer look at systemic, operational and other emerging issues. Drawing on our data analyses of 5,600 occurrence reports, we have been able to identify safety issues in various categories.

These focuses help the FOCA to make more targeted use of its resources, both in supervisory terms and in its defining the actions required to steadily further enhance safety performance. Our analyses of these occurrence data provide a vital foundation, too, for our further discussions and work. And on the issues of drones, U-Space and cybersecurity in particular, we need to collect even more data in future to draw our lessons from such information and from any occurrences in these fields.

In addition to proactively identifying opportunities and risks in Swiss civil aviation, the FOCA will continue to put a strong emphasis on analyzing occurrence data (with due and full regard, too, to further information sources such as the findings from audits and inspections, accident reports, developments outside Switzerland and more) to maintain an optimum overview in all the areas concerned, in order to draw the right conclusions and remain as alert and sensitive as possible to further changes and developments in the aviation system.

As already mentioned, new findings from the FOCA COVID-19 risk catalogue were incorporated into the respective supervisory tasks in 2020. For the year 2021, it is a matter of incorporating the "return to the new normal" into the planning with regard to supervisory tasks.