Appendix to Opinion No 01/2024
Regulatory impact assessment (RIA)

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1. Introduction

The GH Roadmap and the Concept Papers developed in 2018-2019 in close consultation with affected and interested industry stakeholders and competent authorities presented the first analysis of the issue in the ground handling (GH) industry at that time and how the situation might evolve if there were no action. The GH Roadmap proposed the way forward, both for regulatory actions and safety promotion actions. The Concept Papers were practically the first step in the future development of the RIA as they actually identified and analysed Option 0 of the future impact assessment.

The first draft proposal for a GH regulation, published in 2022, was based on the GH Roadmap and the Concept Papers. It was prepared in parallel with the development of the RIA for RMT.0728.

In 2023, EASA adjusted the initial proposal taking into account the results of the completed RIA, as well as the stakeholders' comments on the first draft, and submitted a second draft to consultation with the EASA Advisory Bodies and the GH expert group that supported EASA throughout the rulemaking process of RMT.0728.

The proposed regulatory material presented in this Opinion has been further adjusted following the comments from the second consultation, to address some of the areas highlighted in this RIA that have a negative impact or need stronger requirements, as detailed in Sections 2.5.4 and 2.6 of the Opinion.

The impact assessment for RMT.0728 was developed by EASA with the support of the Ecorys and NLR consortium. It covers the safety, economic, social, proportionality and environmental impacts.

The impact assessment was developed by comparison with the 'No change in the current policy' option (or the usual 'Option 0' of an impact assessment), in which there is no EU GH regulation in place, the industry would continue to operate as today, and oversight by competent authorities would be conducted unevenly, or indirectly or not at all, depending on national legislations, where these exist. For more details, see the Concept Papers for the GH Roadmap published in March 2019.

Acronyms

AMC	acceptable means of compliance
AMS	apron management services
ANSP	air navigation service provider
EASA	European Union Aviation Safety Agency
EU	European Union
FTE	full-time equivalent
GH	ground handling
GHSP	ground handling service provider
GSE	ground support equipment
IATA	International Air Transport Association
IBAC	International Business Aviation Council

ICAO	International Civil Aviation Organization
ISAGO	IATA Safety Audit for Ground Operations
IS-BAH	International Standard for Business Aircraft Handling
JIG	Joint Inspection Group
LTIF	lost time injury[1] frequency
MS	Member State
NCA	national competent authority
NLR	Royal Netherlands Aerospace Centre
NPR	notice of proposed regulation
RIA	regulatory impact assessment
RMT	rulemaking task
SOP	standard operating procedure
SMS	safety management system
ToR	terms of reference

1.1. Background

To ensure a safe end-to-end process in the air transportation, the European Union (EU) included GH services in the EASA Basic Regulation (Regulation (EU) 2018/1139) in order to regulate GH services at EU level. Annex VII to the Basic Regulation establishes the essential requirements for ground handling service providers (GHSPs).

To address the requirements stemming from the Basic Regulation, EASA was tasked to draft the new safety rules for the GH domain. Therefore, a GH Roadmap was established in 2018. The purpose of the GH Roadmap was to determine what needs to be addressed through the future GH regulation. Following the GH Roadmap, the Terms of Reference (ToR) for rulemaking task (RMT).0728 'Development of requirements for groundhandling'[2] were published in November 2019 with the aim of implementing the provisions of Basic Regulation into a regulation for the GH domain.

RMT.0728 led to the issuing of a first draft version of the GH regulation accompanied by a Working Paper in April 2022[3]. The draft GH regulation proposed requirements for GHSPs, their oversight, and the interfaces with aircraft operators and aerodromes where the services are being provided based on the essential requirements in the Basic Regulation.

This RIA is part of a larger study for EASA, entitled 'Methodological Impact Assessment Support on ground handling, aviation financial size and social data for specific aviation sectors'

[1] A lost time injury (LTI) refers to an incident resulting in an employee's incapacity to perform their assigned duties, and time off is needed for recovery. The injury has to occur while the person is performing their assigned tasks in order to be considered an LTI. LTI may include permanent disabilities or conditions. [Note added by EASA]

[2] https://www.easa.europa.eu/en/document-library/terms-of-reference-and-group-compositions/tor-rmt0728

[3] https://www.easa.europa.eu/en/newsroom-and-events/events/webinar-eu-ground-handling-regulation

(EASA.2020.HVP.04_R0C01) performed by a study team of experts from Ecorys and NLR with Valdani Vicari & Associates (VVA) as a subcontractor.

The objectives of the study are:

— to provide methodological support in the field of assessment of social and economic impacts (Tasks 1 and 2). These two tasks enable the collection of specific data in the field of GH and national competent authority (NCA) staff, as well as on the GH turnover and profit margin in the EASA Member States and the NCA budgets (see the summary provided in Attachment E with relevant data for this Opinion);

— to perform a regulatory impact assessment of the GH regulation proposed from RMT.0728 'Development of requirements for ground handling' (Task 3).

The report contains six attachments. Attachment A contains the references. Attachment B provides a detailed description of the influence model used for this study. Attachment C contains a list of the stakeholders that were consulted. Attachment D contains the detailed description of the social impact assessment methodology that was applied. Attachment E contains a summary of the results of Tasks 1 and 2 that were used in this RIA. Attachment F contains the methodology used for the economic impact assessment.

1.2. Scoping

The geographical scope of this RIA includes the EASA Member States. The impacts are assessed using a time horizon of 10 years after the date of entry into force with an estimated transition period of 3 years.

Geographical scope

The geographical scope of this RIA includes the EASA Member States[4]. The EASA Member States include the EU27 Member States, Switzerland, Liechtenstein, Iceland, and Norway. The table below lists all 31 EASA Member States. States that are not an EU27 Member State are indicated in italics.

[4] The United Kingdom (UK) left the European Union (EU) on February 1, 2020. At the time, the EU and the UK agreed on a transition period lasting until December 31, 2020, during which EU law, including EU law on aviation safety, would continue to apply to the UK. See https://www.easa.europa.eu/en/brexit.

Table 1.1: List of EASA Member States

No	EASA Member State	No	EASA Member State
01	Austria	17	Latvia
02	Belgium	18	*Liechtenstein*
03	Bulgaria	19	Lithuania
04	Croatia	20	Luxembourg
05	Cyprus	21	Malta
06	Czechia	22	Netherlands
07	Denmark	23	*Norway*
08	Estonia	24	Poland
09	Finland	25	Portugal
10	France	26	Romania
11	Germany	27	Slovakia
12	Greece	28	Slovenia
13	Hungary	29	Spain
14	*Iceland*	30	Sweden
15	Ireland	31	*Switzerland*
16	Italy		

Time frame

Impacts are presented as impacts per year. Taking into account the time for the regulation to be fully implemented, the impacts are assessed using a time horizon of 10 years after the date of entry into force with a proposed transition period of 3 years. Information from the past 5 years is used to estimate the development of the ‘no change in the current policy’ option (Option 0).

2. Issue analysis

GH is a complex activity involving multiple actors. Often GHSPs offer a wide range of services to the aircraft operators. Moreover, different GHSPs may provide services on the same aircraft during turnaround. GH is considered an industry branch with a key function in the aviation value chain, subject to competition and commercial pressure which is currently challenged by staff shortages and a high turnover rate of staff.

Safety occurrences take place during the provision of GH services. These occurrences can result in delays, damage to the aircraft and equipment, and injuries to persons or even fatalities. In addition, undetected or unreported errors or damage during the provision of GH services can affect the aircraft's load and balance, aerodynamics, airworthiness, or performance having thus a direct impact on flight safety. Until recently, GHSPs have been the only major safety-critical stakeholder not being directly subject to a European aviation safety regulation[5].

2.1. Safety data analysis

2.1.1 Annual safety review data covering aerodromes and ground handling

For the review of the key safety risk areas in GH and aerodrome operations and the human factors presented in Section 2.1.3 of this document, the data has been extracted from the EASA occurrence repository used for the latest Annual Safety Review (published on 16 August 2023[6]) for aerodromes and GH, as the information is more accurate and allows a better analysis of the safety risks.

The statistics from the Annual Safety Review are provided below. This data does not include the UK. Only accidents and serious incidents have been included. However, it should be considered that the scope of the safety data analysis in the Annual Safety Review is broader than GH activities, as it also includes other aerodrome operations (marshalling, apron management services, taxiway/runway excursions or incursions related to aerodrome operations, aircraft collisions not caused by GH equipment, etc.).

2.1.2 Safety risks for aerodromes and ground handling

The safety risks for aerodromes and GH are derived from accident and serious incident data from the EASA occurrence repository, covering the period 2018-2022 (149 occurrences).

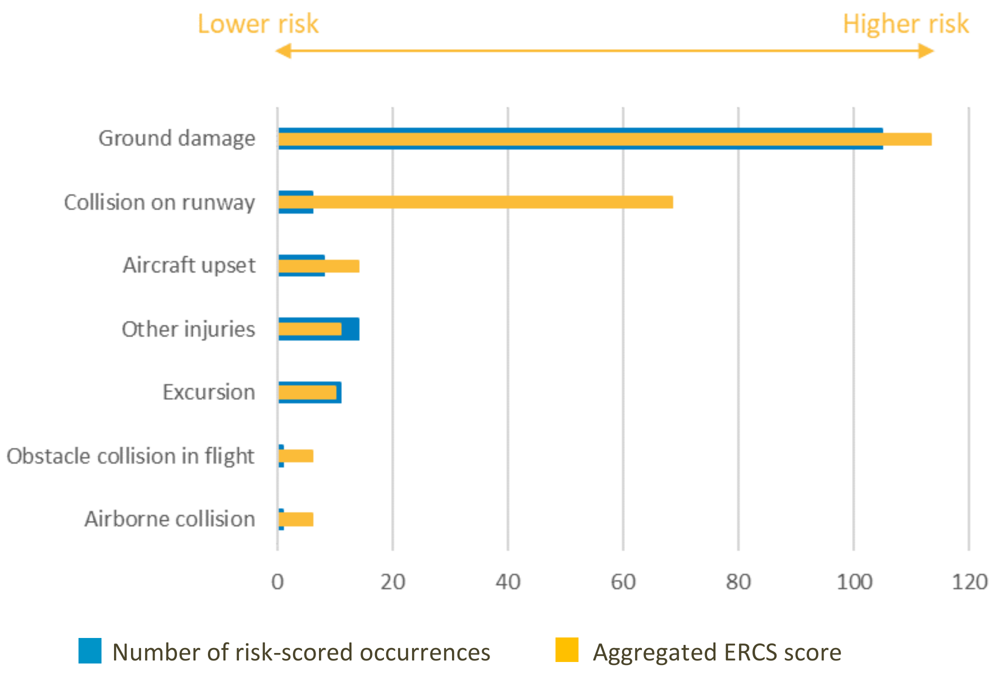
The key risk areas for aerodrome and GH are shown below in Figure 1[7].

[5] Source: ToR for RMT.0728 — https://www.easa.europa.eu/en/document-library/terms-of-reference-and-group-compositions/tor-rmt0728

[6] Annual Safety Review 2023 | EASA (europa.eu)

[7] Key risk areas and occurrence categories (see Figure 2) have different purposes. While occurrence categories describe actual factors and outcomes of an occurrence, key risk areas describe the potential outcome of an occurrence. The key risk area is defined by the most likely type of accident that an occurrence could have escalated to. Unlike occurrence categories, where multiple categories may be assigned to a single occurrence, there can be only one key risk area per occurrence. The key risk area is one element of the European Risk Classification Scheme (ERCS). This scheme is applied when determining the safety risk score of an occurrence (more details in the Introduction to the Annual Safety Review).

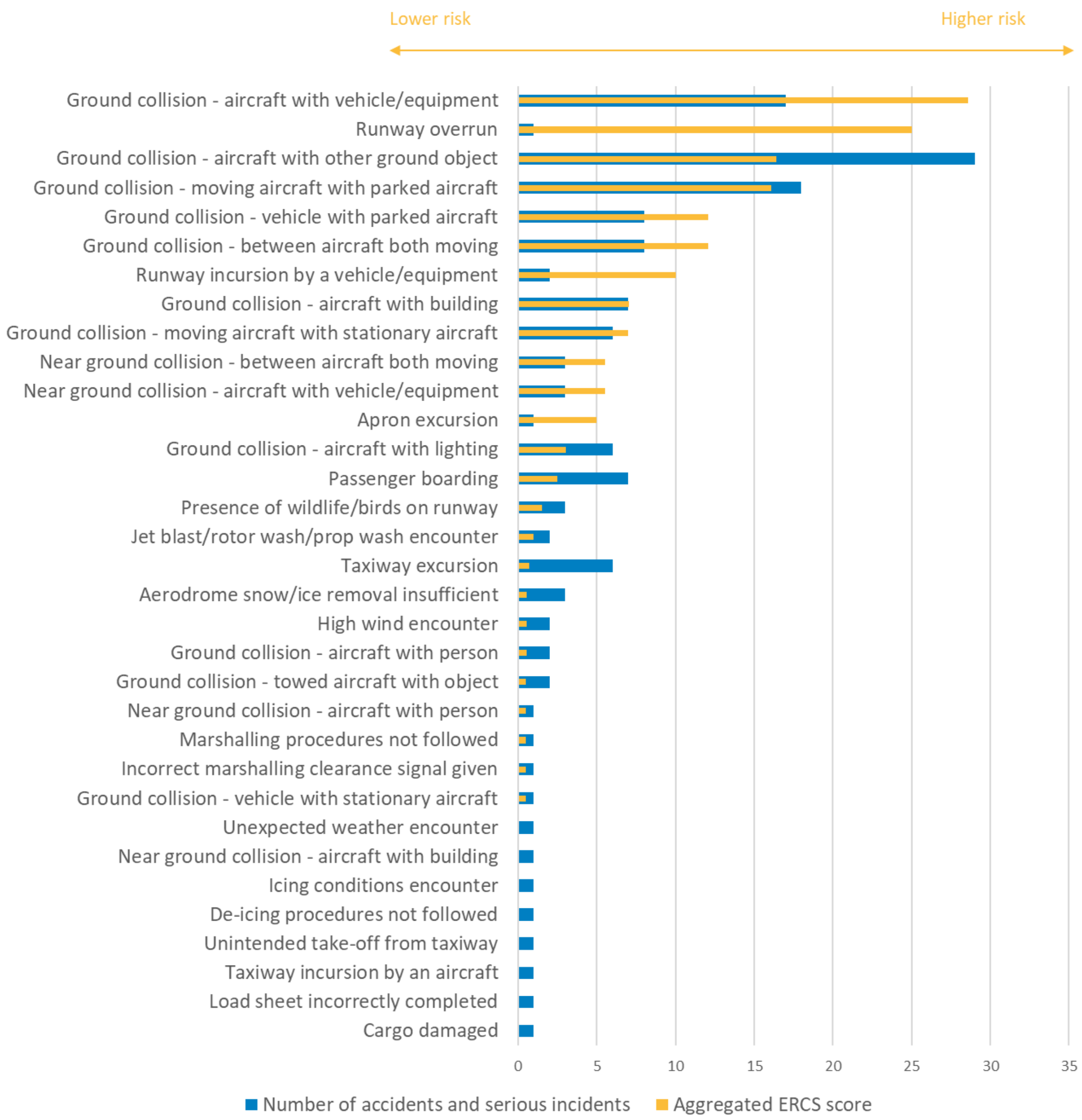
Figure 1: Key risk areas by aggregated European Risk Classification Scheme (ERCS) score and number of risk-scored occurrences involving aerodromes and ground handling



Ground damage was the type of accident most likely to occur in 2018-2022 in case of escalation (real or potential) of the accidents and serious incidents (105 occurrences out of 149). Ground damage also presented the highest cumulated safety risk in the domain (yellow bar).

The information in the Figure 2, like the one in Figure 1, is based on the last 5 years of data (149 occurrences). It shows a detailed distribution of the type of operational safety events identified in the accidents and serious incidents in the GH and aerodromes domain.

Figure 2: Type of operational safety event by aggregated ERCS score and number of occurrences involving aerodromes and ground handling

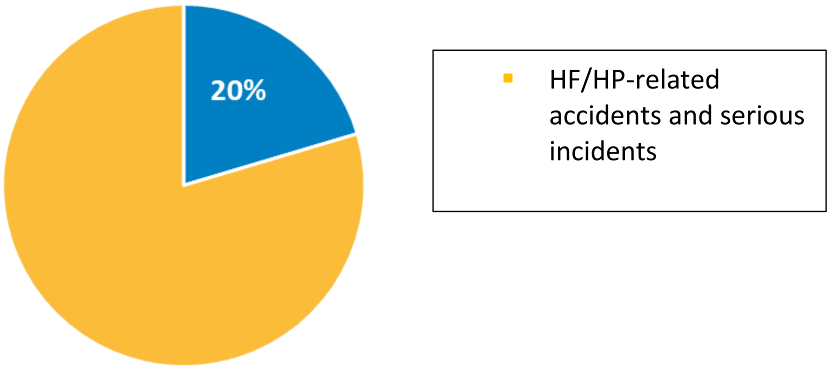


The number of occurrences for which an event was identified and the cumulated safety risk of these occurrences are provided for each type of aerodrome and GH operational safety event. A yellow bar in the graph, which is considerably longer compared to the underlying blue bar, indicates a low number of occurrences contributing to a high risk.

2.1.3 Human factors and human performance

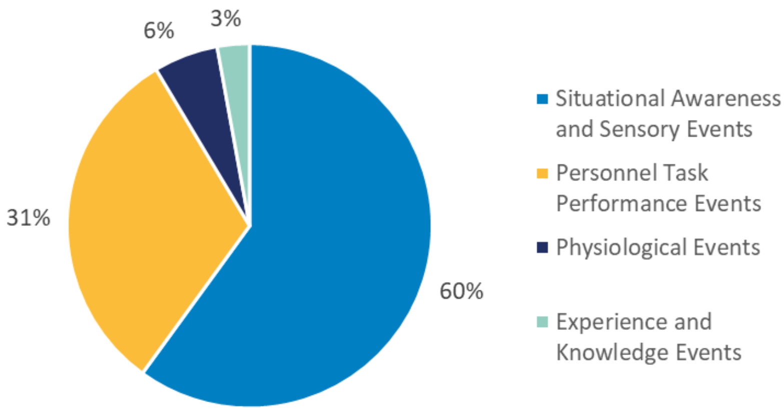
Over the period 2018-2022 (ECCAIRS, 149 occurrences), 1/5 of accident and serious incident reports in the aerodromes and GH domain identify human factors (HF) or human performance (HP) issues. Both HF and HP issues are labelled as personnel occurrences in the ECCAIRS taxonomy.

Figure 3: HF- and HP-related accidents and serious incidents involving aerodromes and ground handling



The application of HF or HP event codes at a high level can be seen in Figure 4. Situational awareness and personnel task performance are the most common category of HF or HP issues contributing to accidents and serious incidents involving aerodromes and GH, followed by sensory events. These may be more easily discernible in an investigation than the factors that cause them.

Figure 4: High-level HF and HP event codes applied to accidents and serious incidents involving aerodromes and ground handling



Error! Reference source not found. compares the numbers of accidents and serious incidents with the aggregated ERCS risk score of those occurrences, using detailed HF and HP event codes. Some events carry a greater safety risk than others, as indicated where the aggregated risk score is far higher than the number of accidents and serious incidents.

'Personnel task performance events' include the following:

— Personnel actions

— Personnel communication events

— Personnel decision-making

— Personnel memory-related events

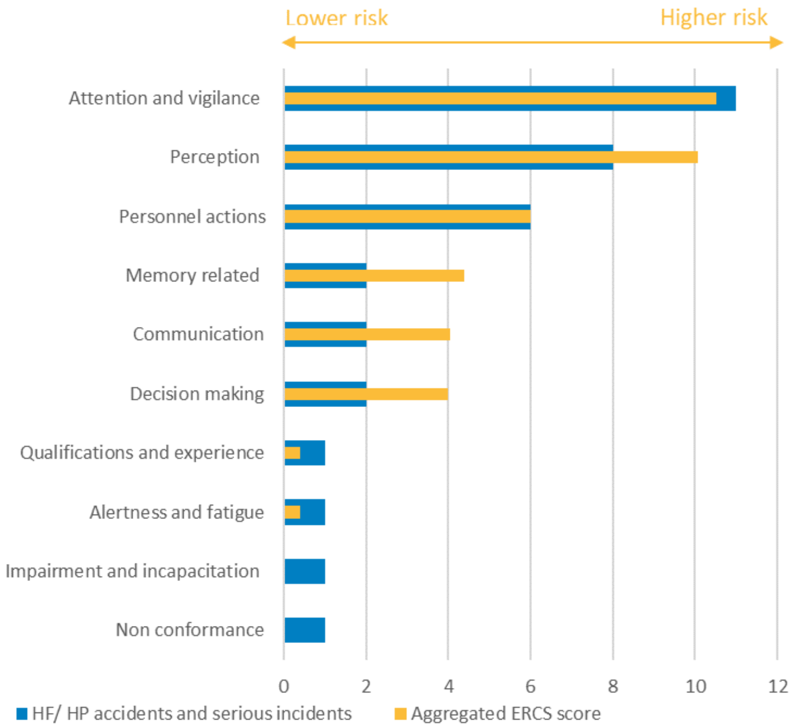
— Personnel non-conformance events

— Personnel use of equipment events

— Personnel use of information events

— Task management Events

Figure 5: Detailed HF and HP event codes by aggregated ERCS score and number of accidents and serious incidents involving aerodromes and ground handling activities



For awareness

A recent study published in the journal *Transportation Engineering* Volume 13 (1 June 2023)[8] analyses the human factors using, as a starting point, the HF 'dirty dozen' in GH in 87 accidents and serious incidents occurring in the interval 2000-2020 at aerodromes in Ireland (6), Germany (3), Belgium (1), Czechia (2), Denmark (2), Finland (3), France (5), Netherlands (3), Sweden (1), the USA, Australia, Canada, the UK, Singapore, India, and the UAE.

The study reveals the following three most relevant human factors (out of the 'dirty dozen'[9]) for the occurrences under analysis: lack of awareness (in 54 out of 87 reports, representing 62.07%), lack of

[8] *The role of human factors in aviation ground operation-related accidents/incidents: A human error analysis approach*. Authors: Nadine Muecklich, Ivan Sikora, Alexandros Paraskevas, Anil Padhra: https://www.sciencedirect.com/science/article/pii/S2666691X23000246?via%3Dihub

[9] The human factor 'dirty dozen': lack of communication, distraction, lack of resources, stress, complacency, lack of teamwork, pressure, lack of awareness, lack of knowledge, fatigue, lack of assertiveness, and norms.

resources (30 out of 87, representing 34.48%) and lack of communication (36 out of 87, representing 41,38%).

By comparison with the EASA recent information, lack of situational awareness continues to remain high as a contributing factor of the occurrences in aerodrome and GH.

The study also identifies three main operational areas related to the probable cause or major contributing factor:

— aircraft mass and balance (17 reports, representing 20 % of the total number of 87 reports) (special cargo procedures, misplaced unit load device (ULD), communication);

— aircraft pushback/towing (28 reports, representing 32 % of the total number) (communication before and during pushback, lack of experience);

— activities during aircraft arrival and departure (21 reports, representing 24 % of the total of 87).

The study further indicates **lack of awareness** as a cause or contributing factor in all operational areas of ground operations. This leads to errors such as personnel not noticing errors on load sheets during turnaround; or 'the pushback driver and wingwalker may not be aware of the improper clearance to obstacles or another aircraft'. Furthermore, the study identifies that 'this lack of awareness is often compounded by other human error preconditions, such as lack of communication or miscommunication (AR# 15, 40), lack of resources (AR# 42) or time pressure (AR# 6, 7). Miscommunication resulting in lack of awareness can involve unclear information on the payload for the aircraft (AR# 11, 12, 35), on the clearance of the aircraft to obstacles (AR# 15), and miscommunication between the GO and other subsystems (AR# 24, 29). Lack of resources typically involves insufficient GO personnel numbers (e.g., loading team, missing a load planner or wingwalker - AR# 3, 6, 19), missing the necessary equipment (e.g., a radio, a de-icing vehicle or a missing belt loader -AR# 24, 84), or even not having the appropriate manuals (AR# 38, 46, 67, 83).'

2.1.4 General statistics on reporting trend, reporting entities, and types of occurrences

The safety data analysis and the qualitative safety impact assessment conducted by EASA are based on data extracted from the European Central Repository (ECR) for the timeframe 2015-2022[10].

For the geographical scope of the extraction from the ECR, all EASA Member States have been selected as the State of occurrence. The UK is also included as it was part of the EU when this rulemaking task was initiated. Some graphs indicate two sets of data – one including the UK, the other one excluding the UK.

The occurrence categories included in the scope of this analysis are encoded as 'RAMP: ground handling' and 'aerodrome operations'. These categories exclude events related to load control; in particular, load planning (including mass and balance calculations) and communication of messages related to load control (loadsheet, loading instructions/report, NOTOC).

The events related to aircraft pushback and towing are also not reflected in these graphs.

Aerodrome-related occurrence categories are excluded from this analysis, such as: 'aircraft marshalling', 'aircraft parking', 'aerodrome security', 'aerodrome design and operation', 'aerodrome

[10] 2015 is the year when Regulation (EU) No 376/2014 became applicable.

service management', 'aircraft access not correctly secured after use', 'wildlife control', 'aerodrome maintenance'.

The types of events included in the scope ('occurrence class') are accident, serious incident, and incident (including major incidents and significant incidents).

The data extracted from ECR is intended mainly for general statistical purposes. The ECR extract does not guarantee a high accuracy of the data. A deeper safety analysis would be possible only by an assessment of each individual event reported. It is relevant to notice that all the occurrence categories of occurrences have a relatively high percentage of reports for which no additional information about what GH activity the report was related to (e.g. 22 % for aerodrome vehicle/equipment operations; 19 % for baggage handling and loading; 19 % for fuelling operations; 39 % for de-icing/anti-icing; 9 % for cargo handling; 16 % for dangerous goods handling; 18 % for passenger boarding). Furthermore, a significant percentage of the reports do not contain any data about which organisation is the originating reporting entity.

The total number of occurrences captured in the scope is 62 171.

The exposure data used for the rate is the cumulative number of airport movements (departure + arrival) of the airports located in EASA Member States and the UK, for which Eurocontrol was the data source.

The yearly number of occurrences and its equivalent rate is shown per 100 000 movements.

The rate of 'RAMP: ground handling' and 'aerodrome operations' occurrences reported in the ECR has improved significantly since the entry into force of the Regulation (EU) No 376/2014 on occurrence reporting. The decrease in the number of occurrences over 2020-2021 due to the decrease of airport traffic (due to the COVID-19 pandemic) is visible, but the rate kept increasing or at least remained stable.

2.1.4.1 Reporting trend, occurrence classes, reporting entities

*Figure 6: Yearly reporting trend since 2015, including the UK (2015-2022) — **62 171 reports***

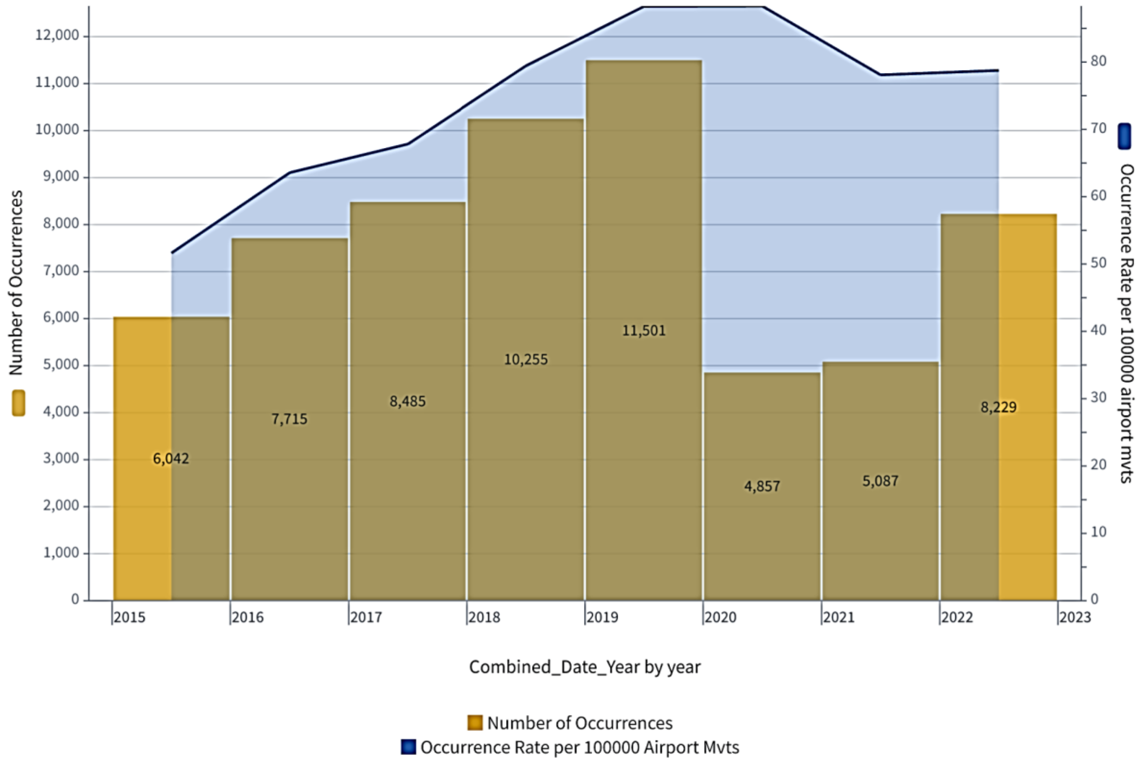
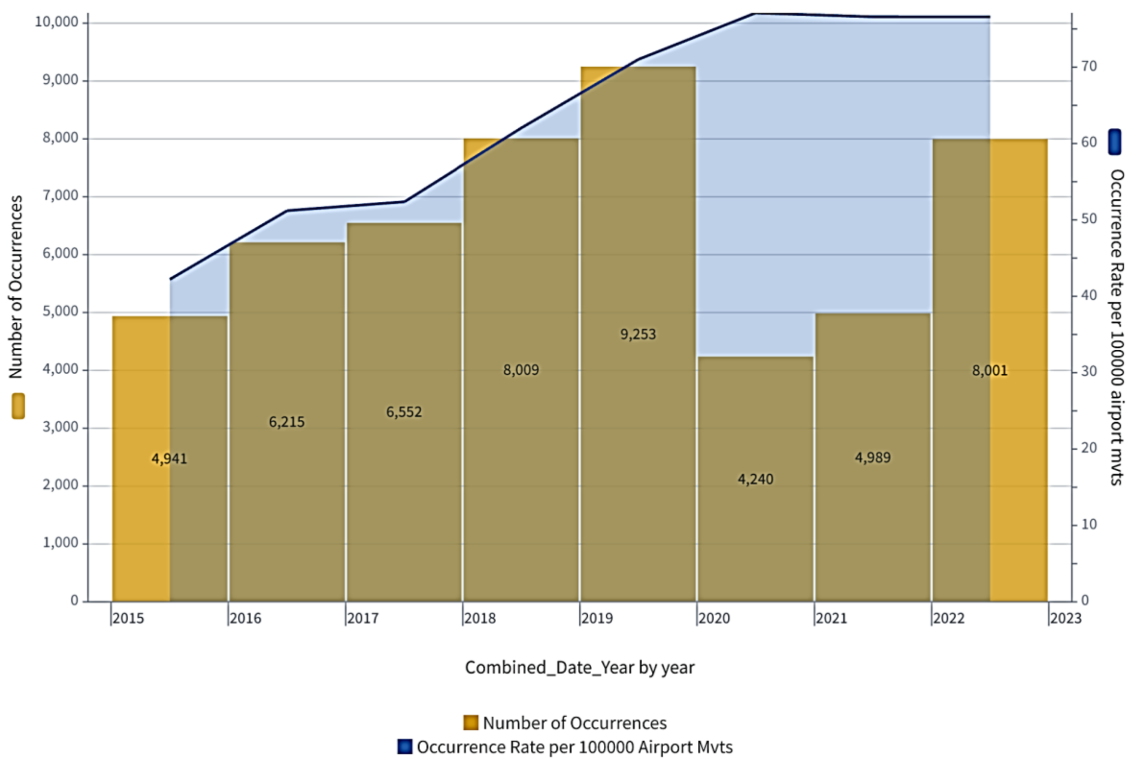


*Figure 7: Yearly reporting trend since 2015, excluding the UK (2015-2022) — **52 200 reports***

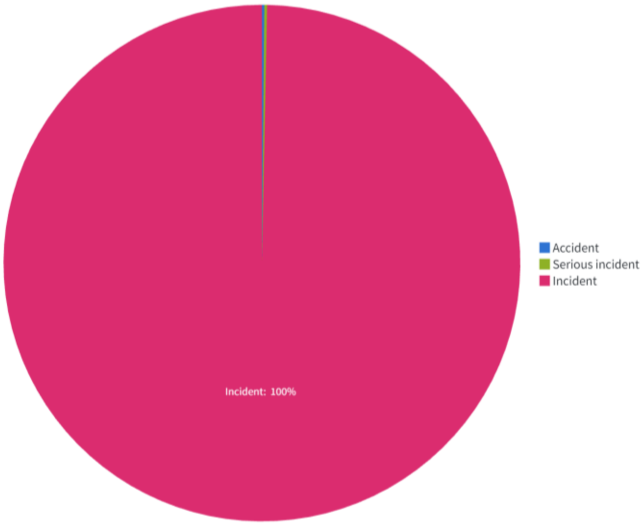
It can be noticed that the reporting trend is not significantly different without the UK data:



With the exceptional period of reduced activity due to the COVID-19 pandemic, an upward reporting trend can be noticed.

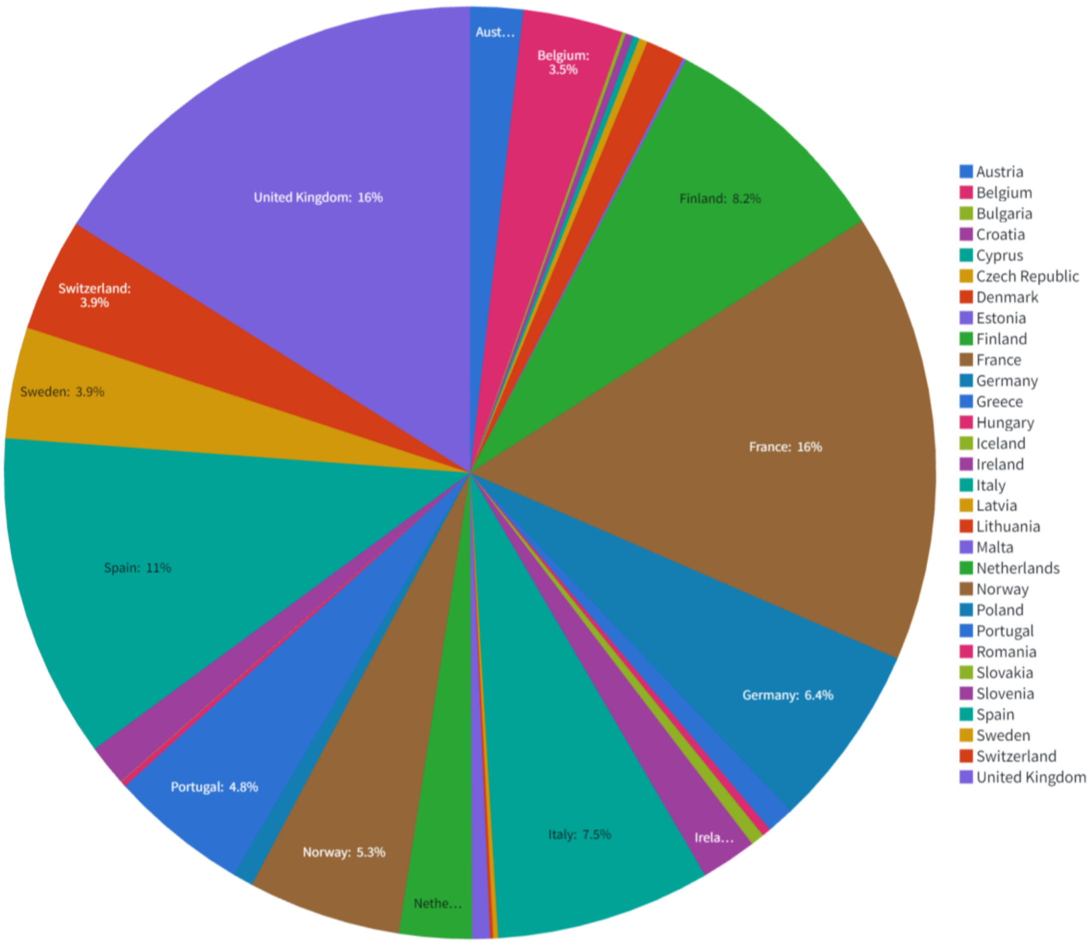
Distribution by occurrence class

Figure 8: 98 % of the reported GH occurrences are incidents (this includes serious incidents)



The next figure shows the States in which the reported occurrence took place.

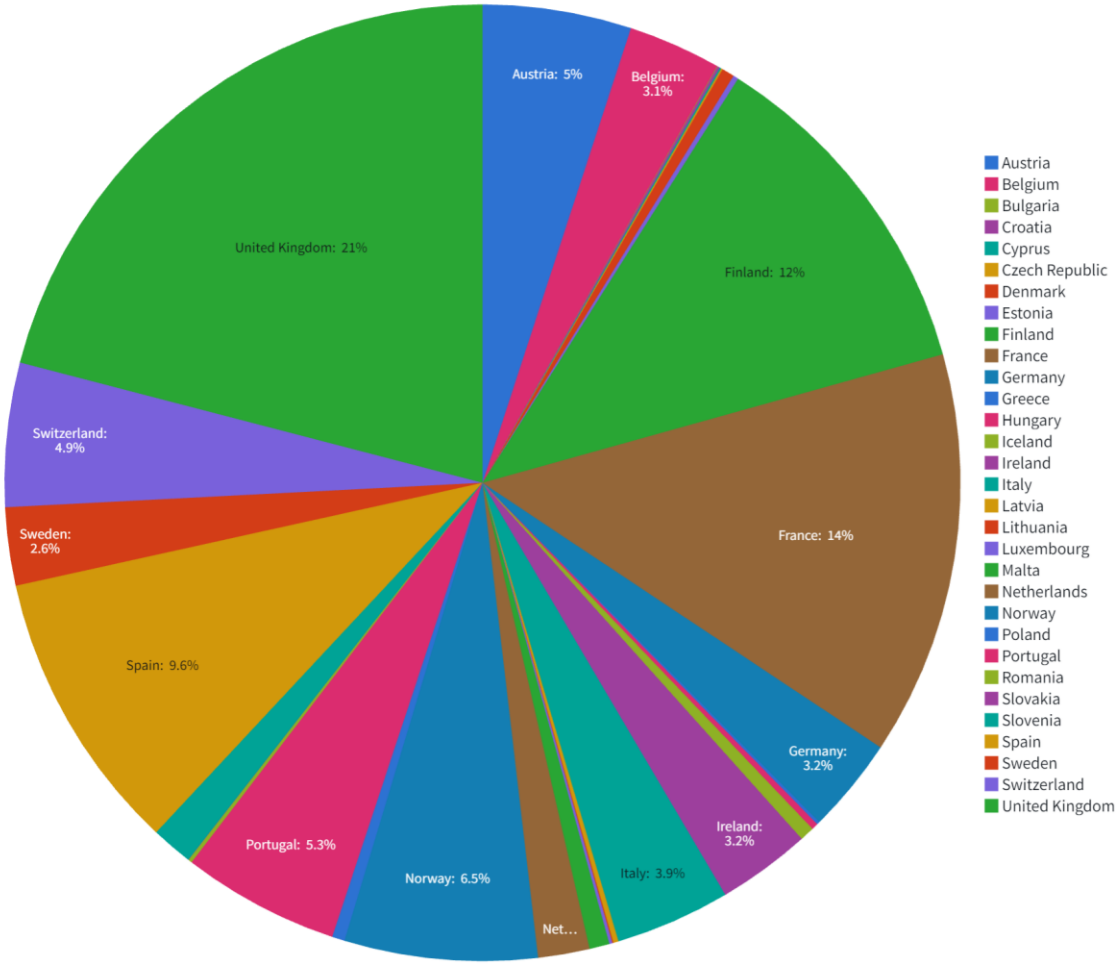
Figure 9: Location of occurrences, including the UK



Member State	Number of reports	Percentage
France	9 706	15.68 %
Spain	7 001	11.31 %
Finland	5 122	8.27 %
Italy	4 645	7.50 %
Germany	3 980	6.43 %
Norway	3 064	4.95 %
Portugal	2 986	4.82 %
Switzerland	2 437	3.94 %
Sweden	2 368	3.82 %
Belgium	2 158	3.49 %
Netherlands	1 568	2.53 %
Ireland	1 203	1.94 %
Austria	1 166	1.88 %
Slovenia	887	1.43 %
Denmark	813	1.31 %
Greece	600	0.97 %
Poland	438	0.71 %
Malta	385	0.62 %
Iceland	292	0.47 %
Hungary	190	0.31 %
Czechia	186	0.30 %
Croatia	167	0.27 %
Cyprus	138	0.22 %
Romania	122	0.20 %
Latvia	104	0.17 %
Bulgaria	79	0.13 %
Estonia	68	0.11 %
Lithuania	66	0.11 %
Slovakia	10	0.02 %
United Kingdom	9 967	16.10 %
Total	6 1916	

The next graph indicates the Member States to which the occurrences were reported. To note is that although the figures are comparable, there are some differences, which may hypothetically result from the fact that the reporting organisation was submitting its report to its own competent authority rather than to the authority of the State of occurrence.

Figure 10: States to which the occurrences were reported



The graph below, first published in the EASA Annual Safety Review 2023 (as Figure 6.4), indicates with a blue line the number of EASA aerodromes within the scope of Regulation (EU) No 139/2014 on aerodromes.

The amount of reporting per EASA Member State shown in the pie chart above should, however, be correlated with the number of aerodromes within the scope of Regulation (EU) No 139/2014 in each State (see below). A higher number of aerodromes in one State would also explain to some extent the amount of reporting registered in that State.

Figure 11: Number of EASA aerodromes within the scope of Regulation (EU) No 139/2014 on aerodromes

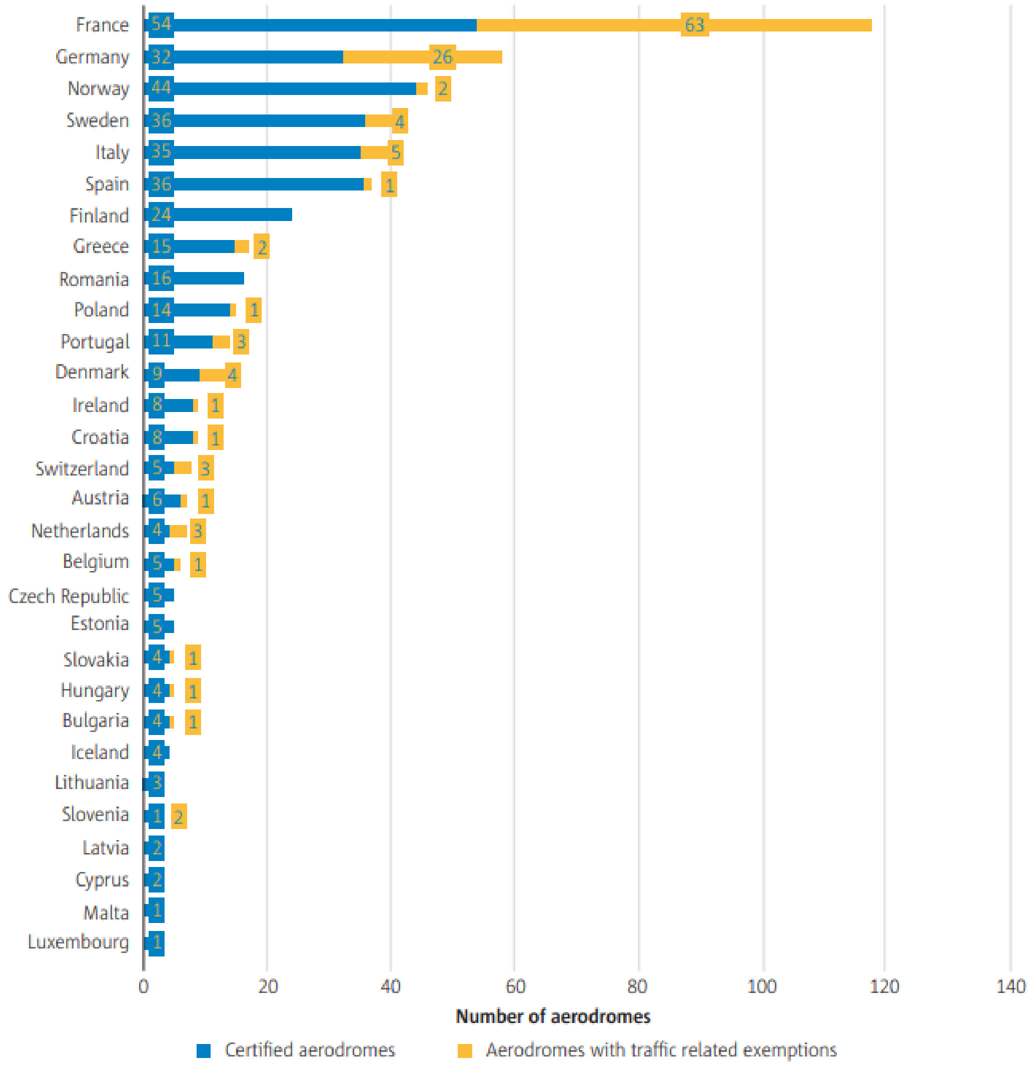
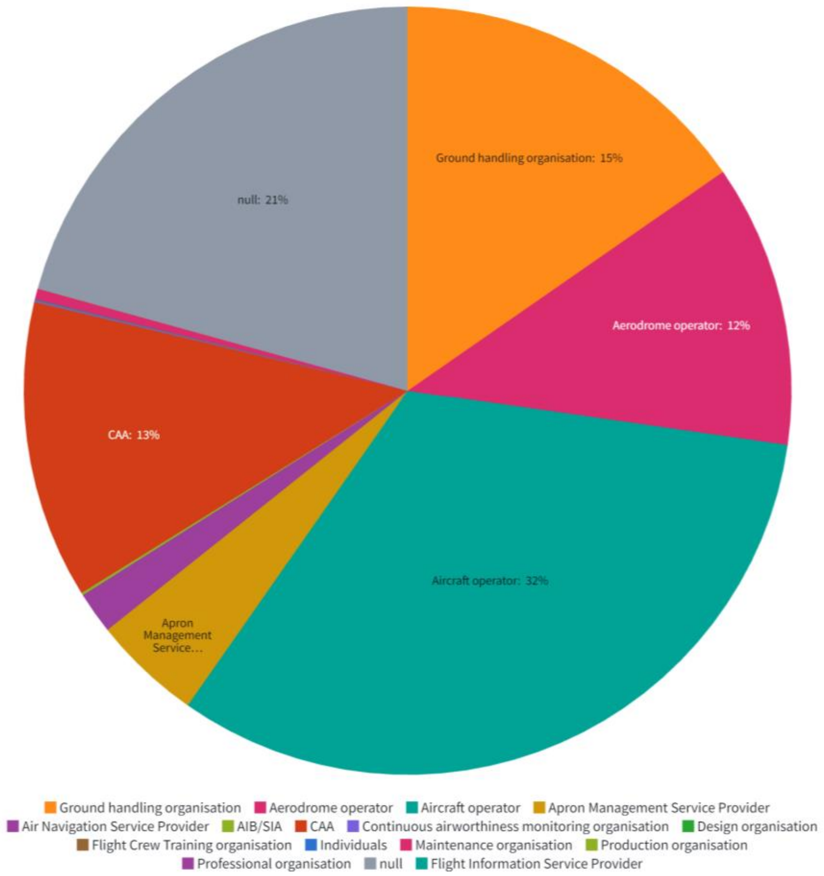


Figure 12: Types of entities that reported the occurrences (including the UK)



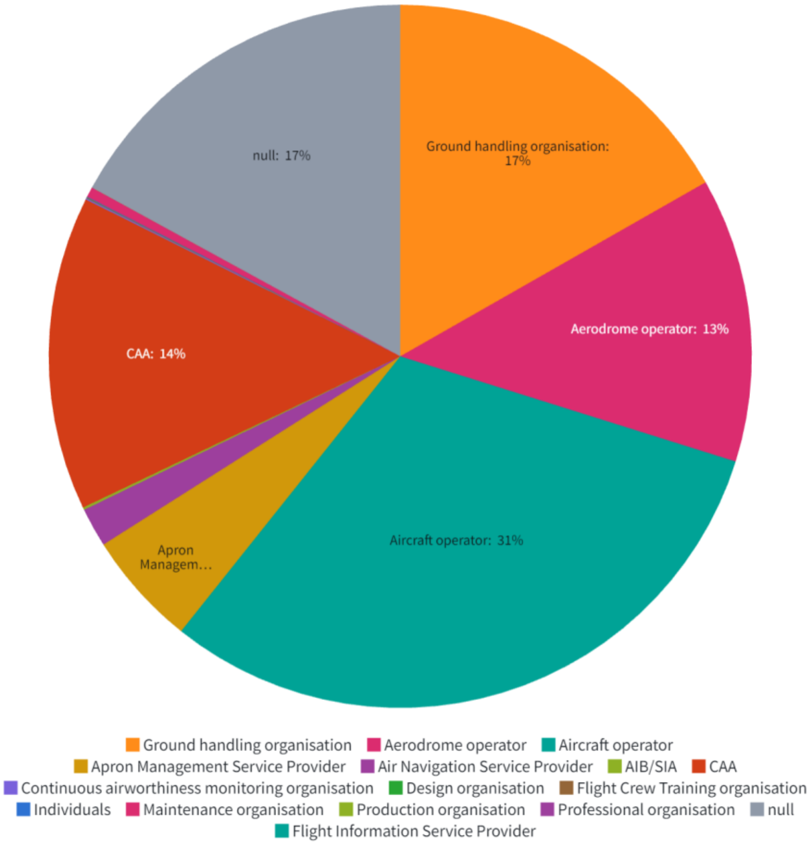
Type of reporting entity (including the UK)	**Number of ECR occurrences**	**% of total**
Aircraft operator	21 283	32.57 %
Null	13 585	20.79 %
GHSP	10 096	15.45 %
NCA	8 236	12.60 %
Aerodrome operator	7 823	11.97 %
Apron management services provider	2 771	4.24 %
Air navigation service provider	1 107	1.69 %
Maintenance organisation	291	0.45 %
AIB/SIA (accident investigation bodies, safety investigation authorities)	70	0.11 %
Continuing airworthiness maintenance organisation	35	0.05 %
Flight crew training organisation	20	0.03 %
Individuals	19	0.03 %
Design organisation	5	0.01 %
Production organisation	4	0.01 %
Flight Information services provider	1	0.00 %
Professional organisation	1	0.00 %
TOTAL	65 347	

The percentage of reports submitted by GH organisations is bigger than for other entities, however, it remains small compared to those from aircraft operators and competent authorities and also the percentage where the reporting entity is unknown (the grey 'null' slice of 21%).

For clarification: where the graphs or pie-charts indicate 'null', this means that there were no values entered by the reporter. Differently from 'null', where the pie-charts or graphs indicate 'unknown', this means that the reporter informs that they do not know whether there was damage or not, or what the extent of the damage is, if any.

The accuracy of this data is expected to improve in the future with the planned implementation support activities organised by EASA and the Member States, to raise awareness of GH organisations on the importance of submitting correctly filled reports, so that the safety data can be better processed and lead to more focused mitigation actions.

Figure 13: Types of entities that reported the occurrences (excluding UK):



Type of reporting entity (excluding UK)	Number of ECR occurrences	% of total
Aircraft operator	15 375	30.40 %
GHSP	9 236	18.26 %
NCA	8 000	15.82 %
Aerodrome operator	7 221	14.28 %
Null	6 699	17 %

Apron management services provider	2 702	5.34 %
Air navigation service provider	946	1.87 %
Maintenance organisation	253	0.50 %
AIB/SIA	63	0.12 %
Continuing airworthiness maintenance organisation	34	0.07 %
Flight crew training organisation	20	0.04 %
Individuals	15	0.03 %
Design organisation	5	0.01 %
Production organisation	3	0.01 %
Flight information services provider	1	0.00 %
Professional organisation	1	0.00 %
TOTAL	50 574	

It is noticeable that most of the reports were submitted by aircraft operators (31 %), GH organisations (18 %), and competent authorities (almost 16 %), with aerodrome operators coming fourth (13 %).

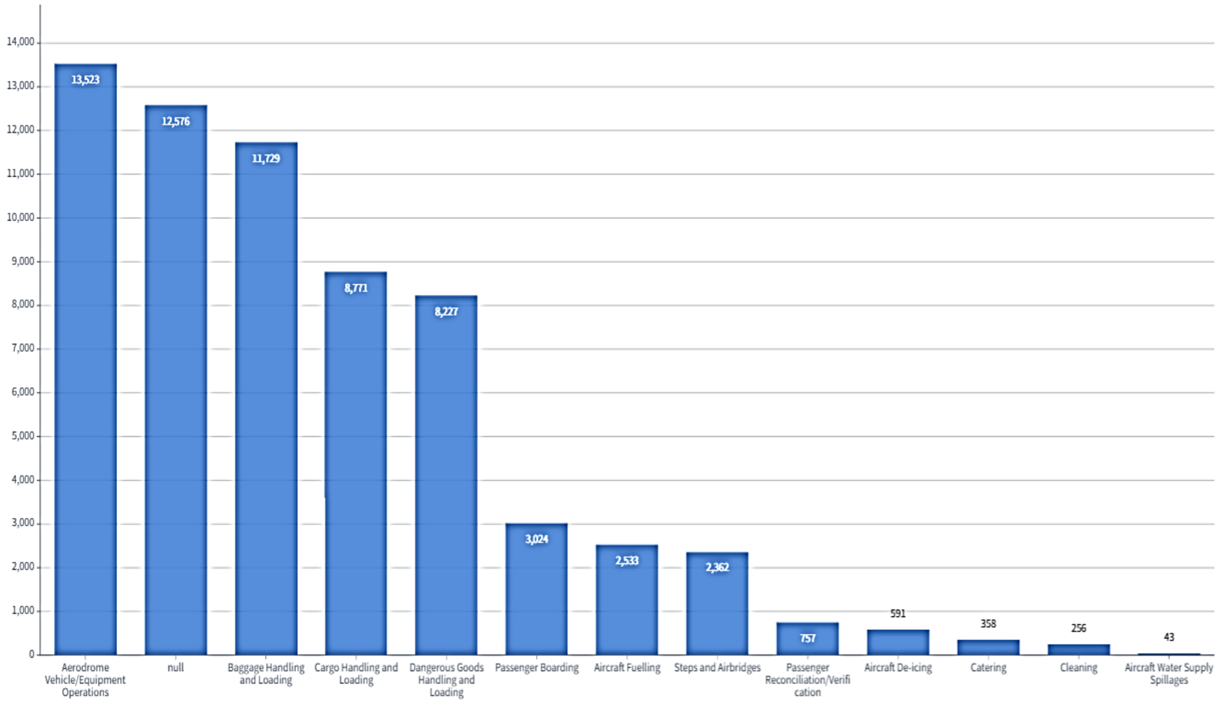
As it can be noticed here and also further in the next pie charts depicting individual GH operations, there is a large grey portion (17 %) indicating that the originator of the reports could not be established. This reduces the accuracy of the data presented in this pie chart and also in the next ones.

It is also important to keep in mind that the figures presented in this section do not indicate whether the reports submitted by aircraft operators and aerodrome operators include the cases when those organisations were providing GH services themselves.

Also, the competent authorities shown in the pie chart are not the originator of those reports, but rather the recipient of the reports originated by other entities. This is due to the fact that in the reporting form, the field containing information about the reporting entity is not mandatory to be coded as per Regulation (EU) No 376/2014 and often remains incomplete upon submission.

2.1.4.2 Types of reported events

Figure 14: Types of reported events (in absolute numbers, ECR, 2015-2022; the UK is included)



Event type	Absolute numbers	Percentage
Aerodrome vehicle/equipment operations	13 523	21 %
Null (only 'aerodrome operations')	12 576	19 %
Baggage handling and loading	11 729	18 %
Cargo handling and loading	8 771	14 %
Dangerous goods handling and loading	8 227	13 %
Passenger boarding	3 024	5 %
Aircraft fuelling	2 533	4 %
Steps (i.e. passenger stairs) and airbridges	2 362	4 %
Passenger reconciliation/verification	757	1 %
Aircraft de-icing	591	1 %
Catering	358	0.5 %
Aircraft cleaning	256	
Aircraft water supply spillage	43	

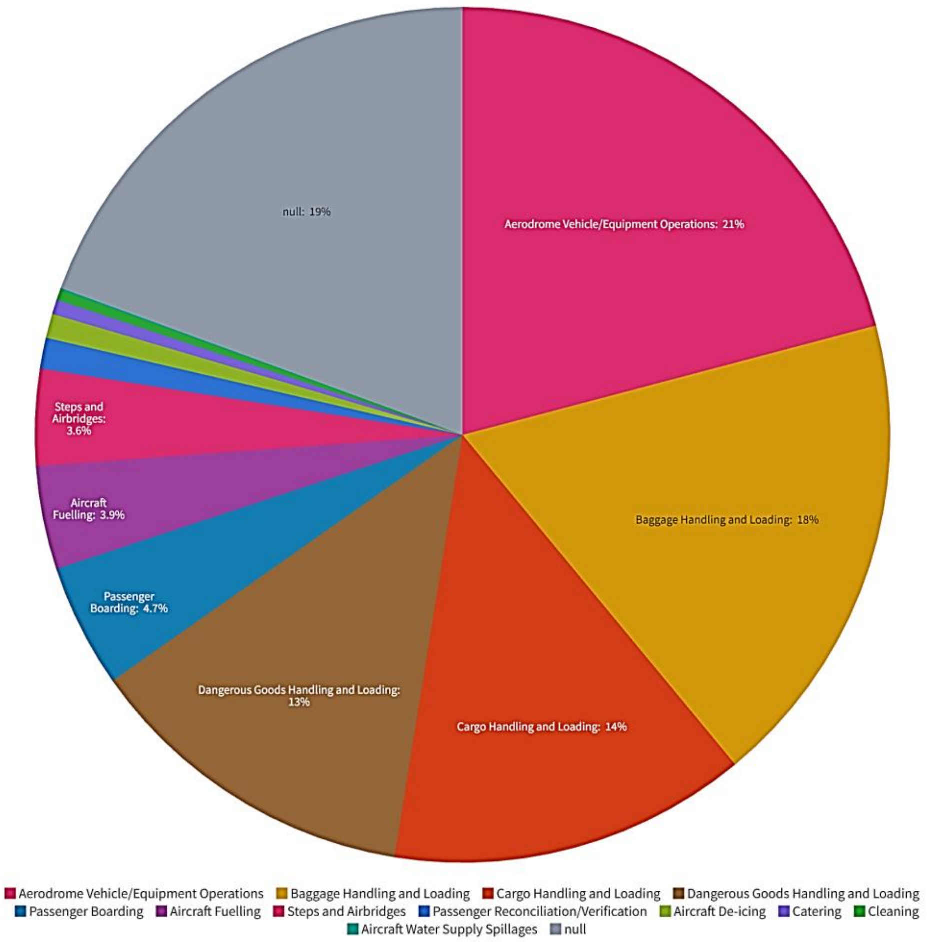
An IATA study on the aircraft ground damage published in December 2022[11] indicates that most of the ground aircraft damage is produced by motorised GSE striking the aircraft fuselage. The study shows that ground damage to the aircraft wide-body is 10 times higher than the narrow-body aircraft, but that 'regional jets, turboprop, and narrow-body aircraft are 30% more prone to severe ground damage'.

More details from the IATA study are provided in Section 2.1.5 of this RIA.

[11] IATA Ground Damage Report: The Case for Enhanced Ground Support Equipment: https://www.iata.org/en/pressroom/2022-releases/2022-12-06-04/.

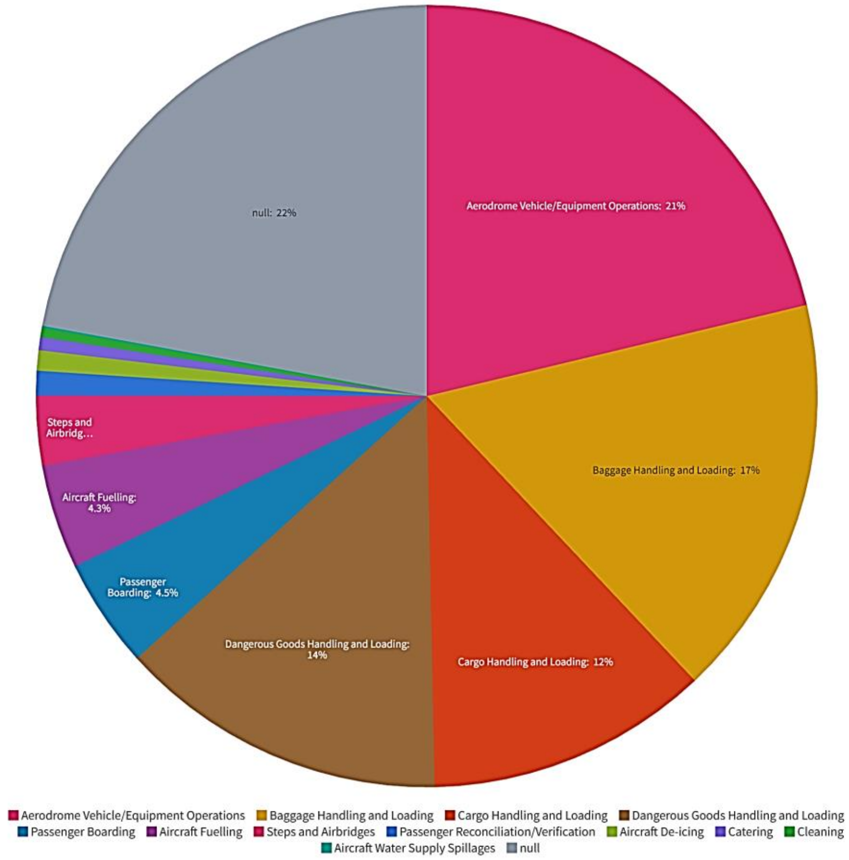
The next two pie charts provide a different image of the information presented above in Figure 12; one of them includes the UK, which was still an EU Member State for most part of the time under analysis.

Figure 15: Types of reported events, in percentages, including the UK (ECR data, 2015-2022)



Type of events (including the UK)	Number of ECR occurrences	% of total
Aerodrome vehicle/equipment operations	13 476	20.90 %
Null	12 447	19.30 %
Baggage handling and loading	11 724	18.18 %
Cargo handling and loading	8 721	13.52 %
Dangerous goods handling and loading	8 229	12.76 %
Passenger boarding	3 006	4.66 %
Aircraft fuelling	2 518	3.90 %
Steps and airbridges	2 365	3.67 %
Passenger reconciliation/verification	758	1.18 %
Aircraft de-icing	593	0.92 %
Catering	358	0.56 %
Cleaning	256	0.40 %
Aircraft water supply spillages	42	0.07 %
TOTAL	64 493	

Figure 16: Types of reported events, in percentages, excluding the UK (ECR data, 2015-2022)



To note here again is the large percentage of reports (22 %, more than one fifth) for which there is no data about the area of GH activity in which the event occurred, which diminishes the accuracy of data interpretation. The only classification that could help assigning those events to GH was their registration within the occurrence class coded as 'aerodrome operations' and 'RAMP: ground handling'.

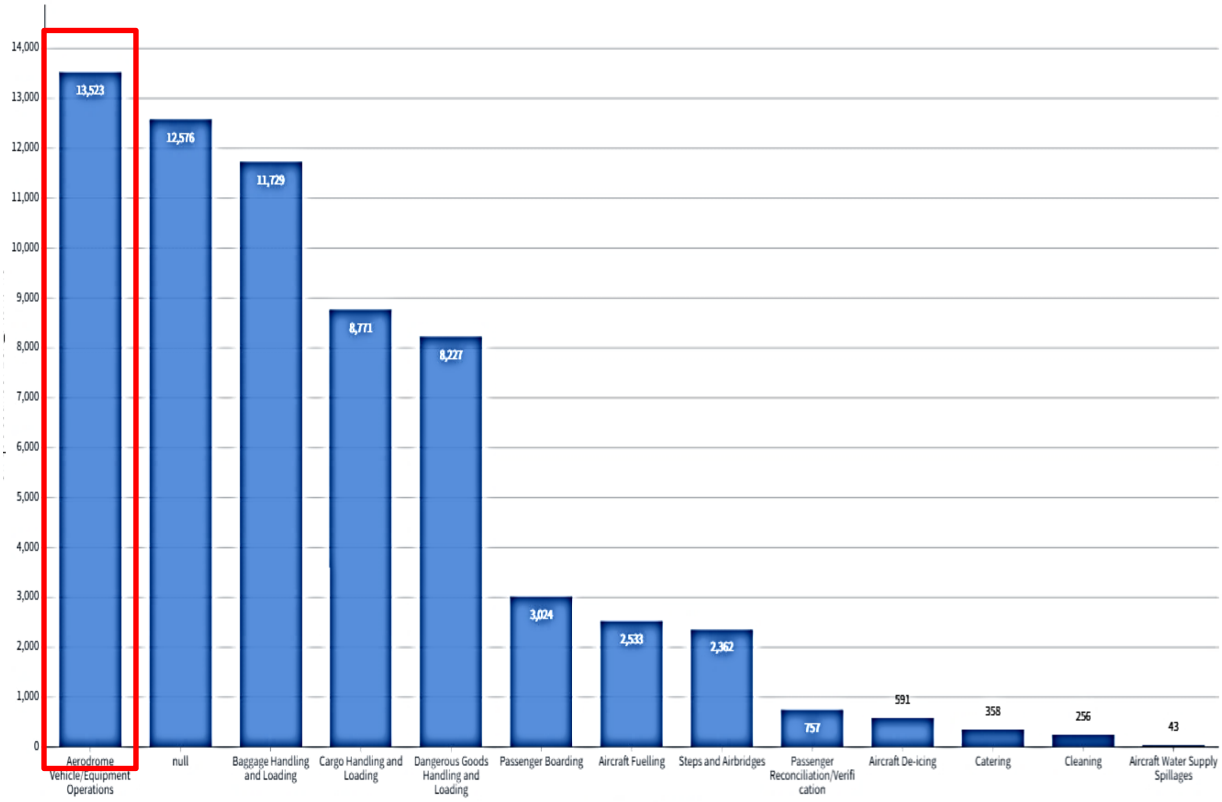
Type of reporting entity (excluding UK)	**Number of ECR occurrences**	**% of total**
Null	11 734	23.94 %
Aerodrome vehicle/equipment operations	11 066	22.58 %
Baggage handling and loading	7 288	14.87 %
Dangerous goods handling and loading	6 910	14.10 %
Cargo handling and loading	5 228	10.67 %
Aircraft fuelling	2 255	4.60 %
Passenger boarding	2 058	4.20 %
Steps and airbridges	1 136	2.32 %
Passenger reconciliation/verification	415	0.85 %
Aircraft de-icing	414	0.84 %
Catering	274	0.56 %
Cleaning	195	0.40 %
Aircraft water supply spillages	41	0.08 %
TOTAL	**49 014**	

2.1.5 Occurrences related to aerodrome vehicles/equipment operation

The occurrences involving equipment operation and aerodrome vehicles is in the top of safety events revealed from the ECR reports.

Number of occurrences: **13 523**, representing **21 %** of the total occurrences in the scope of this analysis.

Figure 17: Occurrences related to aerodrome vehicles/equipment operation



Events of this type may include the following categories:

GSE collision with aircraft – incidents in which any type of GSE (belt loader, de-icing truck, baggage trolley, catering truck, mobile passenger stairs, passenger bus, etc.) except a pushback vehicle makes contact with a stationary aircraft during manoeuvring or movement (intended and unintended).

Aircraft collision with GSE – incidents in which an aircraft moves (intended or unintended) against a stationary GSE (belt loader, de-icing truck, baggage trolley, catering truck, mobile passenger stairs, passenger bus, etc.) except a pushback vehicle.

Conflict or collision between aircraft and pushback vehicle – events during the pushback manoeuvre in which there is a collision between the aircraft and the pushback vehicle or any other type of conflict such as an unintended towbar disconnect.

Airbridge collision with aircraft – events where the airbridge moves (intended or unintended) in the direction of a stationary aircraft and makes unintended contact.

Aircraft collision with airbridge – events where an aircraft moves (intended or unintended) in the direction of a stationary airbridge and makes unintended contact.

Collision between aircraft during pushback – events where an aircraft that is being pushed back collides with another aircraft (stationary or moving).

Towed/pushed/marshalled aircraft collision with object/vehicle/building – events where an aircraft that is being towed, pushed back, or marshalled on the platform collides with an object (e.g. a blast fence), a vehicle or a building.

Figure 18: Reporting trend for aerodrome vehicles/equipment operation; the occurrence rate is calculated per 100 000 airport movements

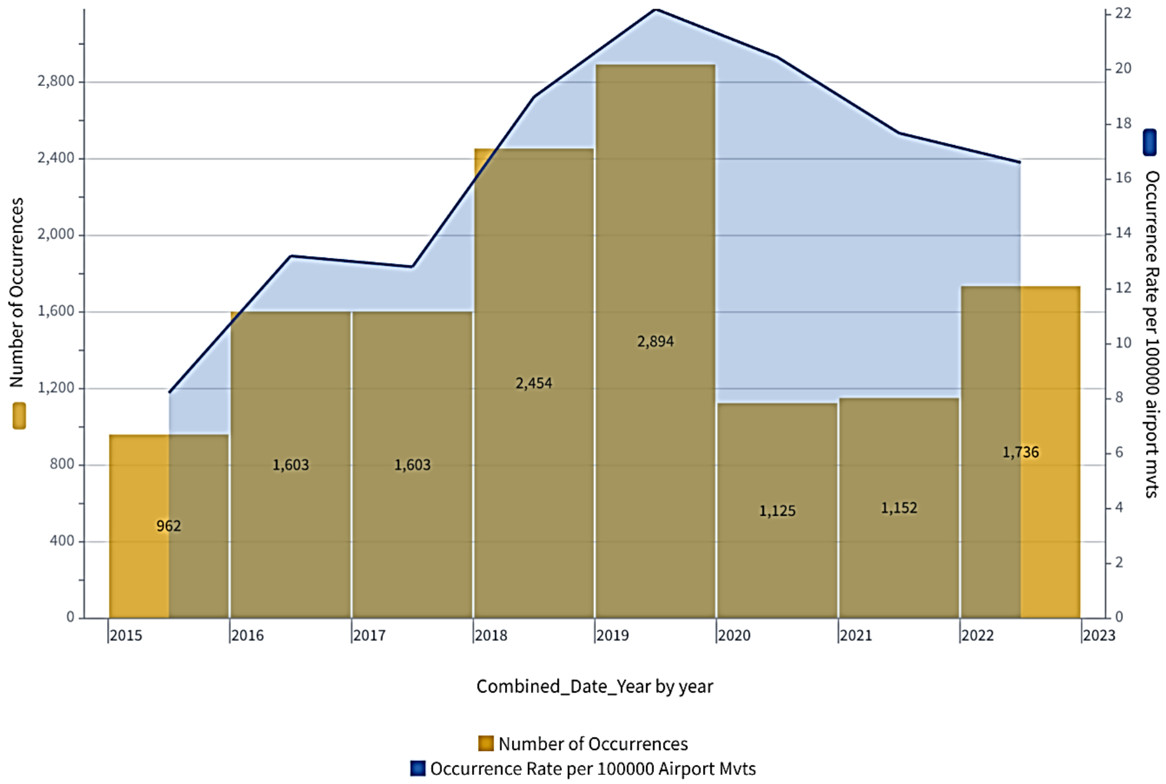
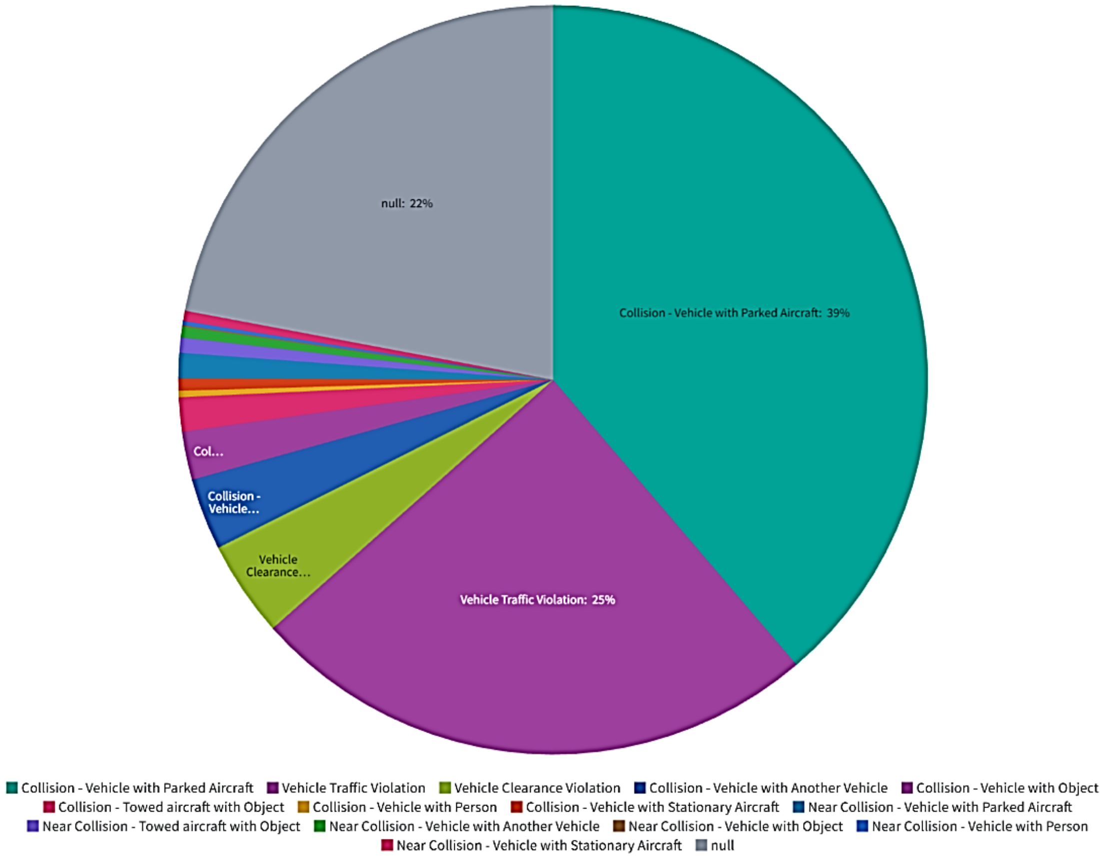


Figure 19: Detailed types of reported events in the category 'Aerodrome vehicles/equipment operation'



Detailed type of events — vehicle/equipment operation	Number of ECR occurrences	% of total
Collision — vehicle with parked aircraft	5 350	38.75 %
Vehicle traffic violation	3 413	24.72 %
Null	3 040	22.02 %
Vehicle clearance violation	573	4.15 %
Collision — vehicle with another vehicle	428	3.10 %
Collision — vehicle with object	286	2.07 %
Collision — towed aircraft with object	204	1.48 %
Near collision — vehicle with parked aircraft	151	1.09 %
Near collision — towed aircraft with object	89	0.64 %
Collision — vehicle with stationary aircraft	72	0.52 %
Near collision — vehicle with another vehicle	66	0.48 %
Near collision — vehicle with stationary aircraft	62	0.45 %
Collision — vehicle with person	38	0.28 %
Near collision — vehicle with person	25	0.18 %
Near collision — vehicle with object	8	0.06 %
TOTAL	13 805	

Also in this case, the significant amount of data for which there is no further information diminishes the accuracy of their interpretation. A deeper analysis of the individual reports will also provide more precise information about the involvement of GH personnel and GSE in these events.

The IATA study published in December 2022[12] indicates that most damage to the aircraft is caused by the operation of GSE: 'Belt-loaders, cargo-loaders, passenger stairs and passenger boarding bridges (PBB), cause 40% of total incidents (Source: IATA ground damage incident data base)'. Furthermore, 'belt loaders are the GSE causing the most severe damage, but passenger stairs and cargo loaders are both involved in more incidents, albeit with less severity'.

IATA offers a forecast of ground aircraft damage in the next 15 years if the aircraft servicing would continue with the GSE currently used, for a comparison basis with the use of enhanced GSE that is designed with anti-collision systems to prevent aircraft damage. The estimations are that with the current GSE with no enhanced anti-collision systems, the number of aircraft damage will almost double in the next 15 years, from approx. 28 000 in 2022 to approx. 54 000 in 2038.

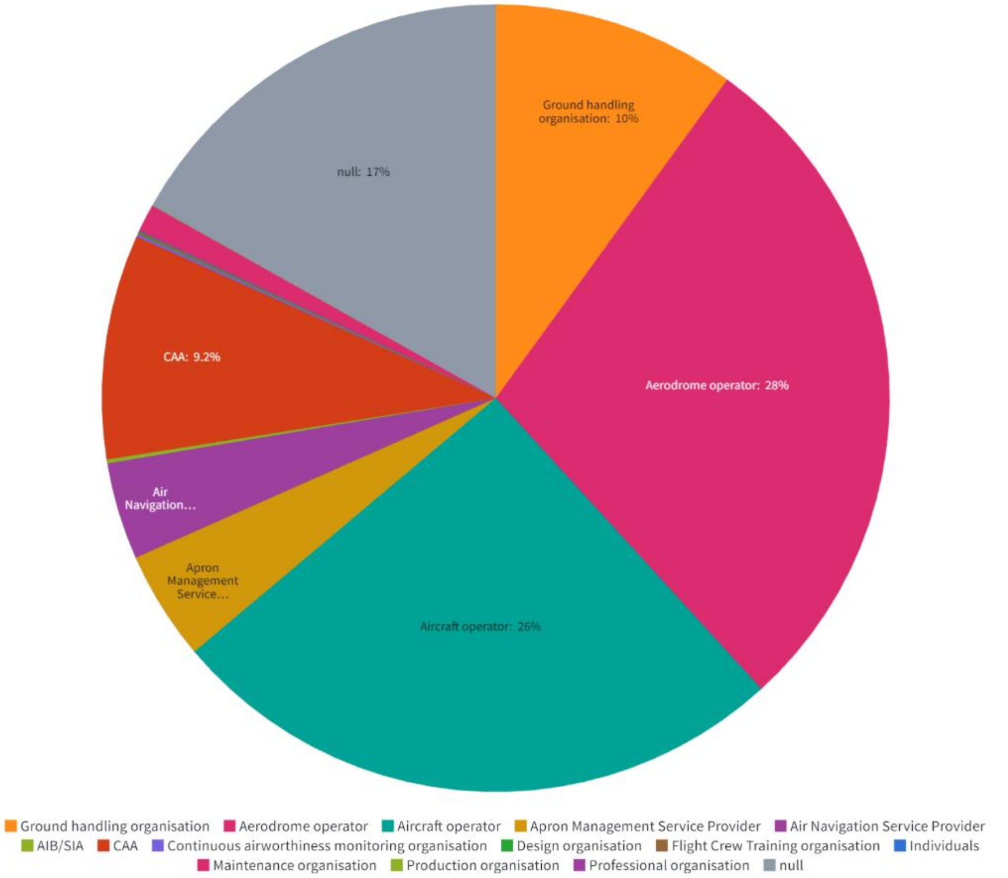
With narrow-body aircraft, the GSE used for baggage and cargo loading seems to be involved in slightly more incidents (40 %) than the GSE used for passenger handling (33 %) or technical servicing (27 %).

For wide-body aircraft, the clear tendency is that damage is caused by GSE during baggage and cargo loading (72 %) in comparison with GSE for passenger handling (15 %) or technical servicing (13 %).

The damage severity is higher for narrow-body and regional jet aircraft than for wide-body aircraft. The explanation provided by IATA is that this is due to the fact that the wings of narrow-body aircraft are lower and therefore more exposed to damage by GSE, which is in the same range of height. Damage to the aircraft wings is categorised as severe. The damage to the wide-body aircraft that use mostly ULDs for cargo and baggage loads, is mainly caused by cargo loaders to cargo doors and the cargo holds. These damage categories are considered to have a minor or low severity, while damage to the aircraft wings in wide-body aircraft is less frequent as the wings are usually higher than the range of the GSE (p. 19). The study also indicates a 'high level of human error in ground damage incidents involving GSE' (p. 32).

Figure 20: Entities reporting the events related to aerodrome vehicles/equipment operation

[12] IATA Ground Damage Report: The Case for Enhanced Ground Support Equipment, page 25.



Type of reporting entity — vehicle/equipment operation	Number of ECR occurrences	% of total
Aerodrome operator	4 314	28.28 %
Aircraft operator	3 913	25.65 %
Null	2 571	16.85 %
GHSP	1 524	9.99 %
NCA	1 407	9.22 %
Apron management services provider	679	4.45 %
Air navigation service provider	604	3.96 %
Maintenance organisation	172	1.13 %
AIB/SIA	26	0.17 %
Continuing airworthiness maintenance organisation	16	0.10 %
Flight crew training organisation	14	0.09 %
Individuals	6	0.04 %
Design organisation	5	0.03 %
Production organisation	2	0.01 %
Professional organisation	1	0.01 %
TOTAL	15 254	

As it can easily be seen from this pie chart (and similarly with the following ones indicating the reporting entities), most of the reports are submitted by aircraft operators and aerodrome operators while a great portion has no information (grey area representing 17 %). GH organisations represent 10 % of the reporting entities. It is unlikely that all reports submitted by competent authorities actually have the competent authorities as the originator of the report; most likely, the originator of the report was another entity, which sent the report to the authority and from there it was recorded in the ECR.

2.1.6 Occurrences coded as 'aerodrome operations'

The next category of data is related to occurrences that were coded only as 'aerodrome operations' only. No further categorisation can be identified from the recorded report. The high number of such events is worth noticing. These events could practically encompass any ramp activity, and to identify which GH activity they refer to, each report should be read and assessed individually.

Due to this missing information, the numbers and percentages of the other event types (which could be identified) may be diluted/inaccurate.

Figure 21: Occurrences coded as 'aerodrome operations', for which no specific value as type of operation was found

Number of occurrences: **12 576**, representing **19 %** of the total occurrences captured in the scope of this analysis

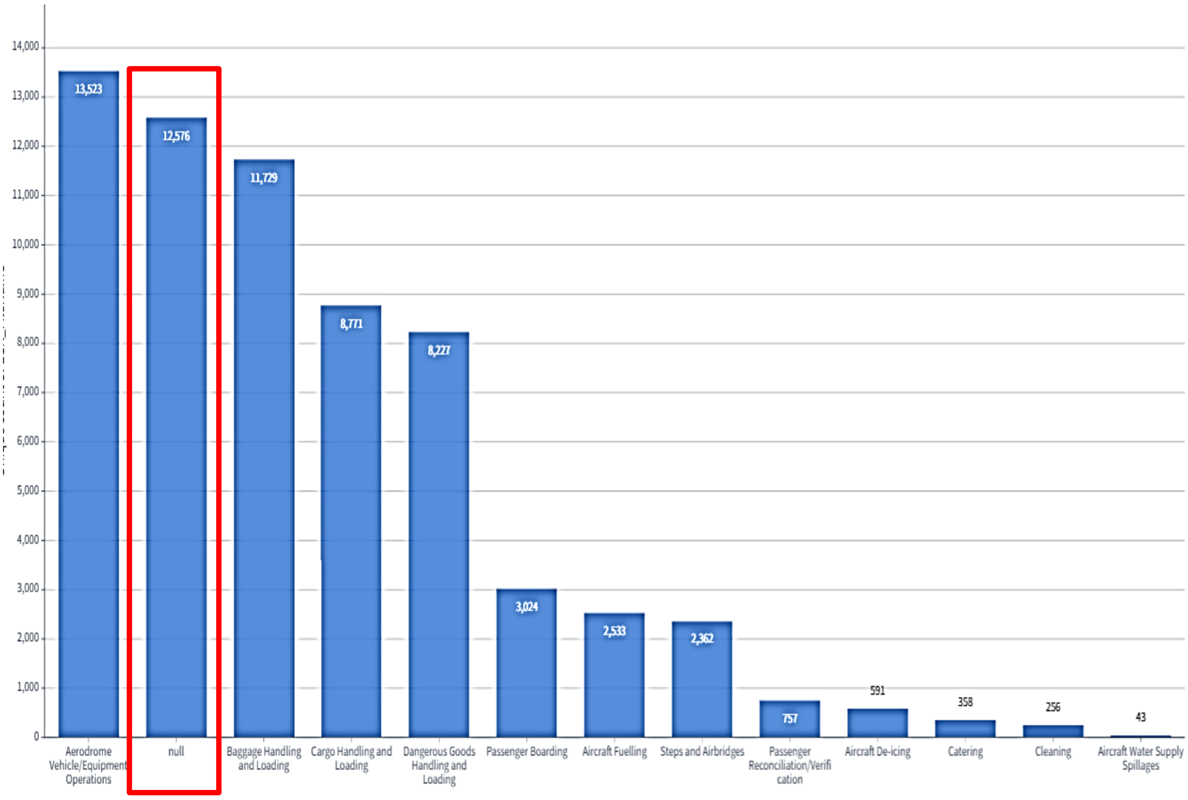


Figure 22: Reporting trend for occurrences coded as 'aerodrome operations', for which no specific value as type of operation was found

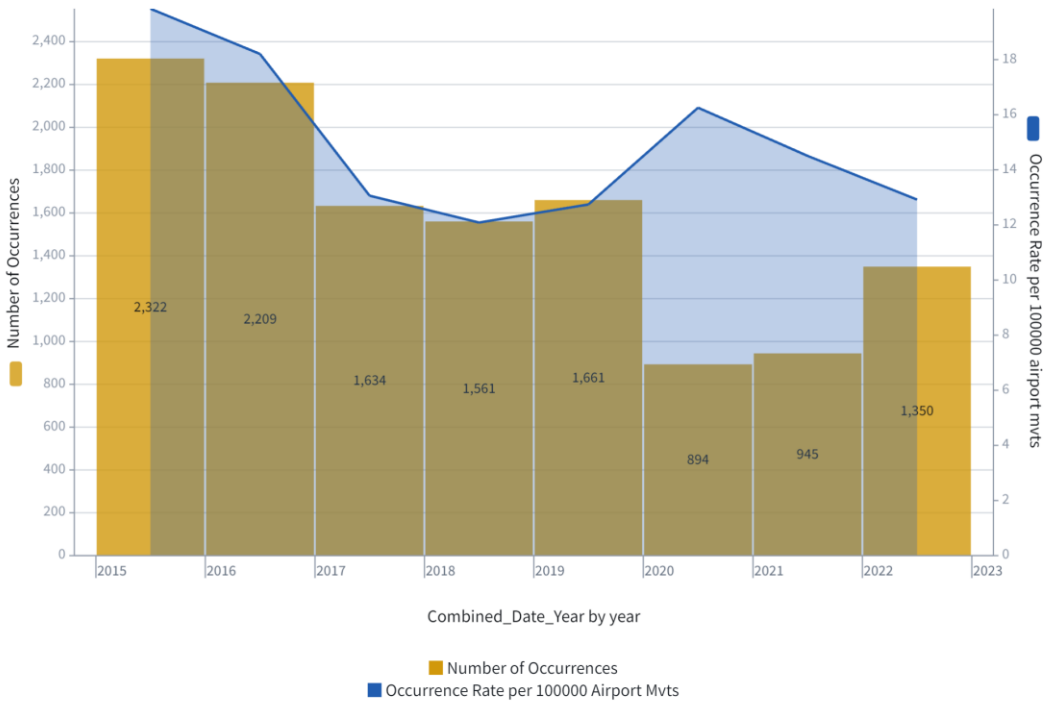
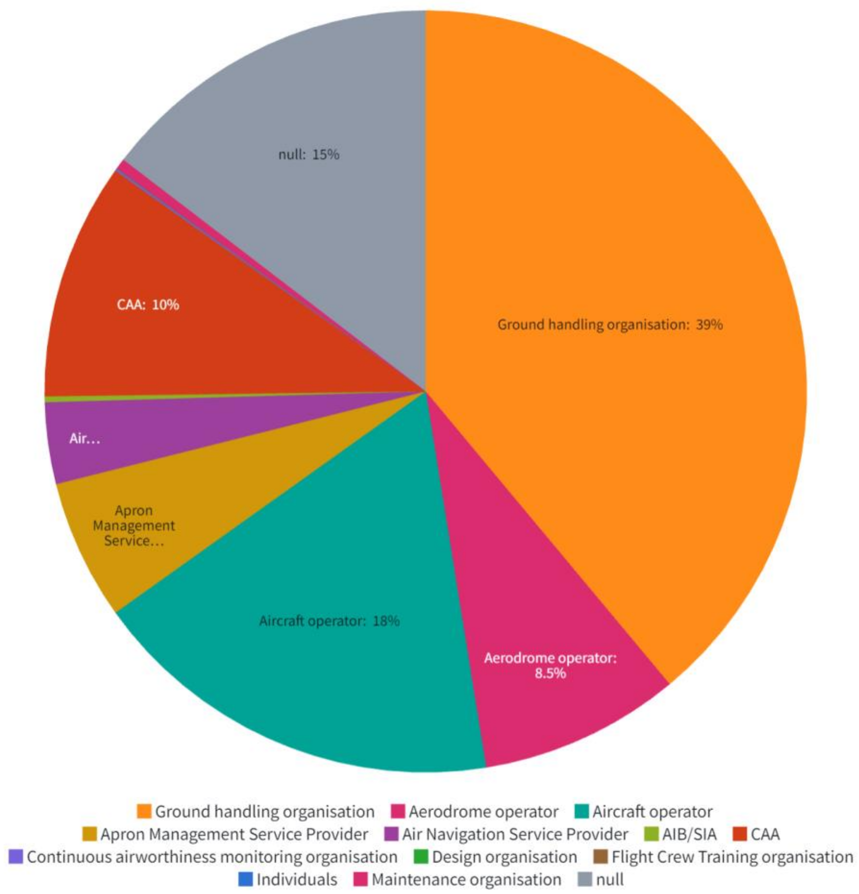


Figure 23: Entities reporting the events coded as 'aerodrome operations', for which no specific value as type of operation was found



Type of reporting entity — aerodrome event with no further detailed values coded	Number of ECR occurrences	% of total
GHSP	4 978	38.67 %
Aircraft operator	2 278	17.69 %
Null	1 893	14.70 %
NCA	1 304	10.13 %
Aerodrome operator	1 111	8.63 %
Apron management services provider	764	5.93 %
Air navigation service provider	440	3.42 %
Maintenance organisation	59	0.46 %
AIB/SIA	32	0.25 %
Continuing airworthiness maintenance organisation	8	0.06 %
Flight crew training organisation	3	0.02 %
Individuals	3	0.02 %
Design organisation	1	0.01 %
TOTAL	12 874	

2.1.7 Occurrences related to baggage handling and loading

Number of occurrences: **11 729**, representing **18 %** of the total occurrences captured in the scope of this analysis

Figure 24: Occurrences related to baggage handling and loading

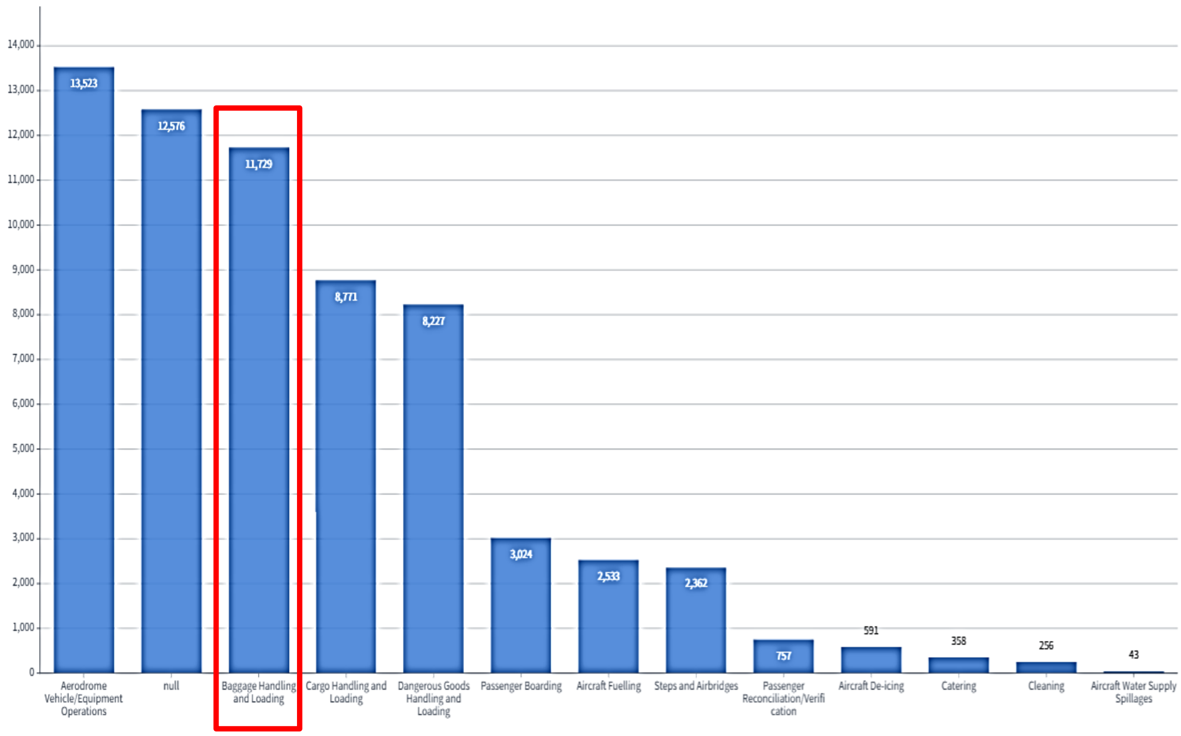


Figure 25: Reporting trend for events related to baggage handling and loading

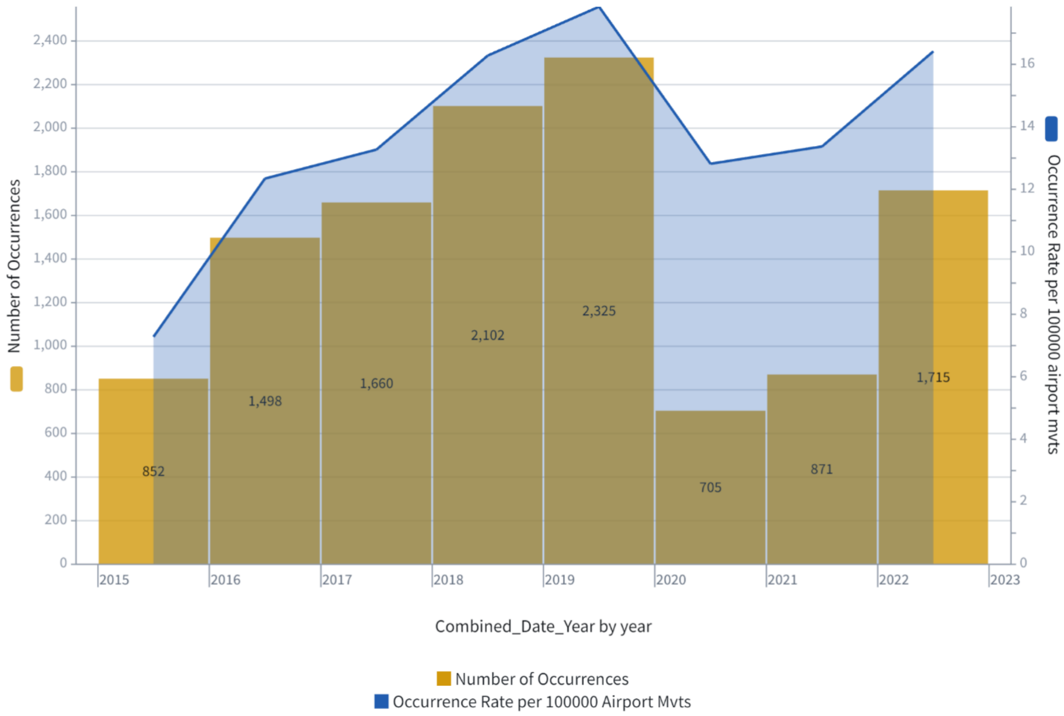
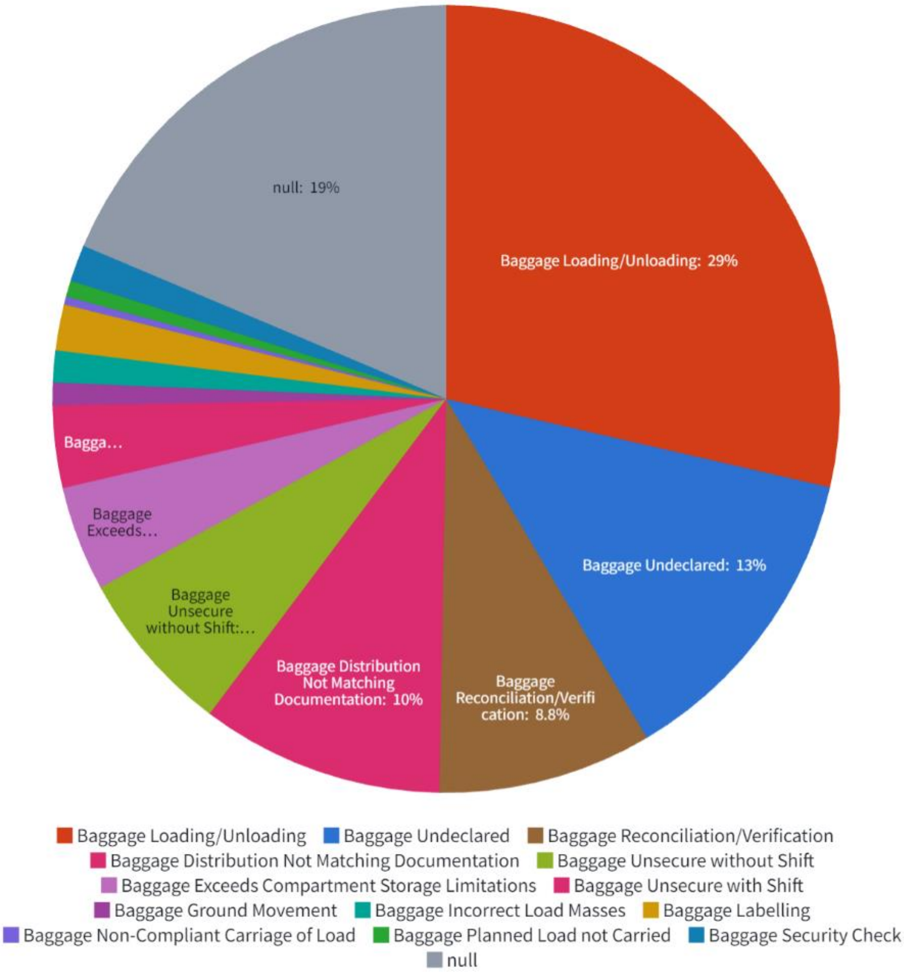


Figure 26: Detailed types of events reported in the category 'baggage handling and loading'



Note: Shifting refers to movement of baggage during flight.

Detailed type of events — baggage handling and loading	**Number of ECR occurrences**	**% of total**
Baggage loading/unloading	4 282	28.57 %
Null	2 809	18.74 %
Baggage undeclared	1 929	12.87 %
Baggage distribution not matching documentation	1 495	9.98 %
Baggage reconciliation/verification	1 314	8.77 %
Baggage unsecure without shift	1 018	6.79 %
Baggage exceeds compartment storage limitations	644	4.30 %
Baggage unsecure with shift	507	3.38 %
Baggage labelling	282	1.88 %
Baggage security check	223	1.49 %
Baggage incorrect load masses	195	1.30 %
Baggage ground movement	139	0.93 %
Baggage planned load not carried	100	0.67 %
Baggage non-compliant carriage of load	49	0.33 %
TOTAL	14 986	

On the category coded as 'baggage distribution not matching documentation', further analysis is necessary to identify the cause of such events. This activity has a second aspect to be considered, namely the issuance of documentation as a result of the load control process (NOTOC, loading instructions/report, loadsheet). The two steps in the load control process might be linked; on the other hand, this could be linked to the loading supervision tasks, so a better analysis of those reports could help in a better identification of the source of the problem.

The occurrences coded as 'baggage exceeds compartment storage limitations' should be further analysed to identify whether the problem lies in the improper application of the loading supervision tasks or the loading instructions/report documentation.

'Baggage incorrect load masses' is rather linked to the load planning than to baggage loading. The steps of the load control process need to be investigated further as the mass and balance errors could have some of the most catastrophic consequences.

The category coded as 'baggage planned load not carried' could be a reconciliation issue, a security issue, a load planning issue or an aircraft loading issue.

It is unclear what issues are coded as 'baggage ground movement', if this is a problem of ULD, baggage containers, pallets while stored on the ground, or the transportation of baggage between the airport terminal and the aircraft – which may also involve driving of vehicles, handling of baggage dollies, and other adjacent GH activities.

It is also unclear what events are coded as 'baggage non-compliant carriage of load'.

The occurrences coded as 'baggage undeclared' could also be linked to the passenger and baggage acceptance and gate and boarding activities, so the cause of the problem may be somewhere else, linked to another GH activity.

Finally, further details would be useful for events coded as 'baggage loading/unloading', to better determine to which aspect of the activity the reports are referring to.

For comparison, the IATA Annual Safety Report provides also relevant data related to loading issues, for example:

'Loading errors: Close to 3000 loading error events were reviewed from the reporting period of Jan 2021 – Apr 2022. The analysis was facilitated by IDX platform which helped recognize ongoing challenges in loading operations. The major areas of errors were:

— Cargo hold

— Nets improperly/not deployed (30%)

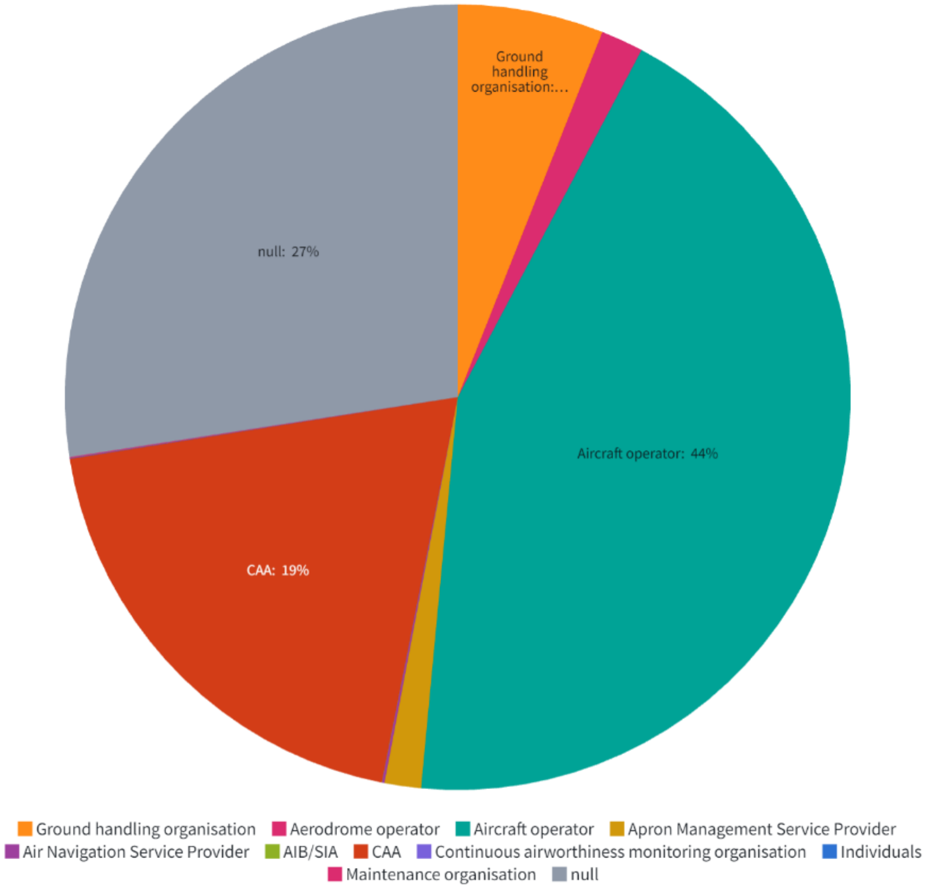
— Improperly secured cargo/baggage (18%)

— Loading checklist not performed (16%)

— Cargo/baggage exceeds fire suppression line (14%)'[13]

[13] IATA Annual Safety Report – 2022. Executive Summary and Safety Overview. Edition 59, page 15.

Figure 27: Entities reporting the events related to baggage handling and loading



Type of reporting entity — baggage handling and loading	Number of ECR occurrences	% of total
Aircraft operator	5 250	43.87 %
Null	3 280	27.41 %
NCA	2 317	19.36 %
GHSP	713	5.96 %
Aerodrome operator	208	1.74 %
Apron management services provider	177	1.48 %
Air navigation service provider	13	0.11 %
Maintenance organisation	5	0.04 %
Individuals	2	0.02 %
AIB/SIA	1	0.01 %
Continuing airworthiness maintenance organisation	1	0.01 %
TOTAL	11 967	

2.1.8 Occurrences related to cargo handling and loading

Number of occurrences: **8 771**, representing **14 %** of the total occurrences captured in the scope of this analysis

Figure 28: Occurrences related to cargo handling and loading

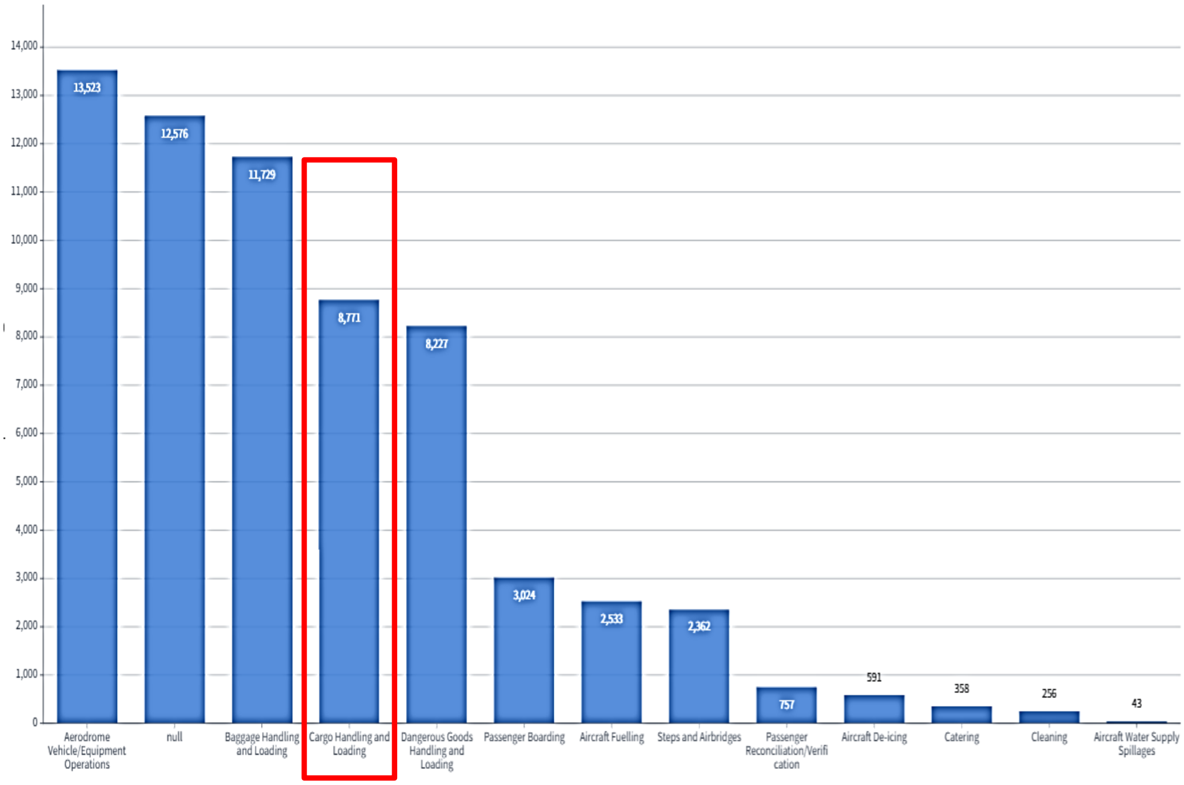


Figure 29: Reporting trend for events related to cargo handling and loading

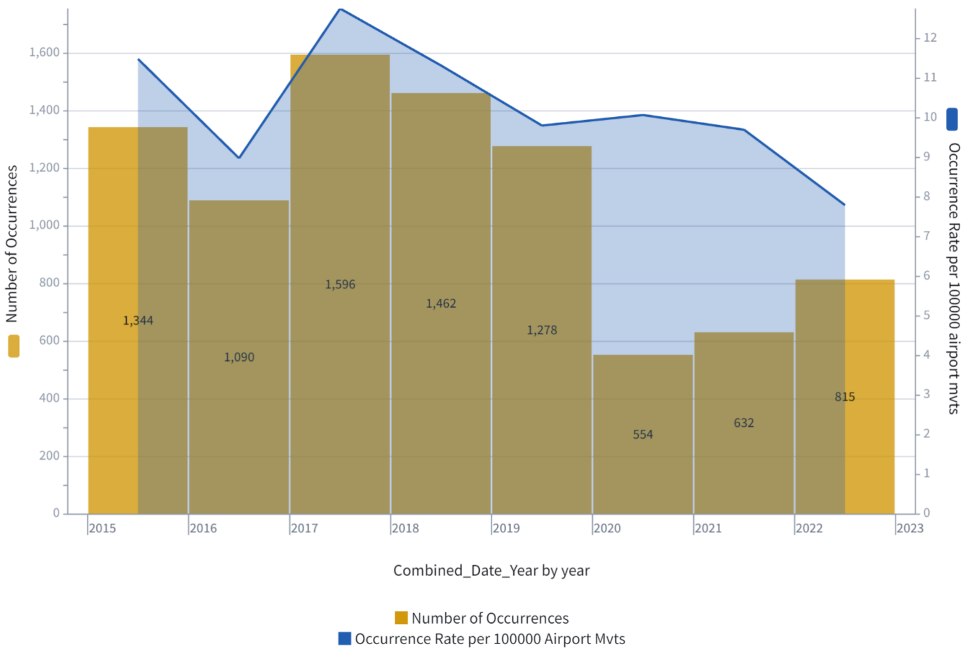
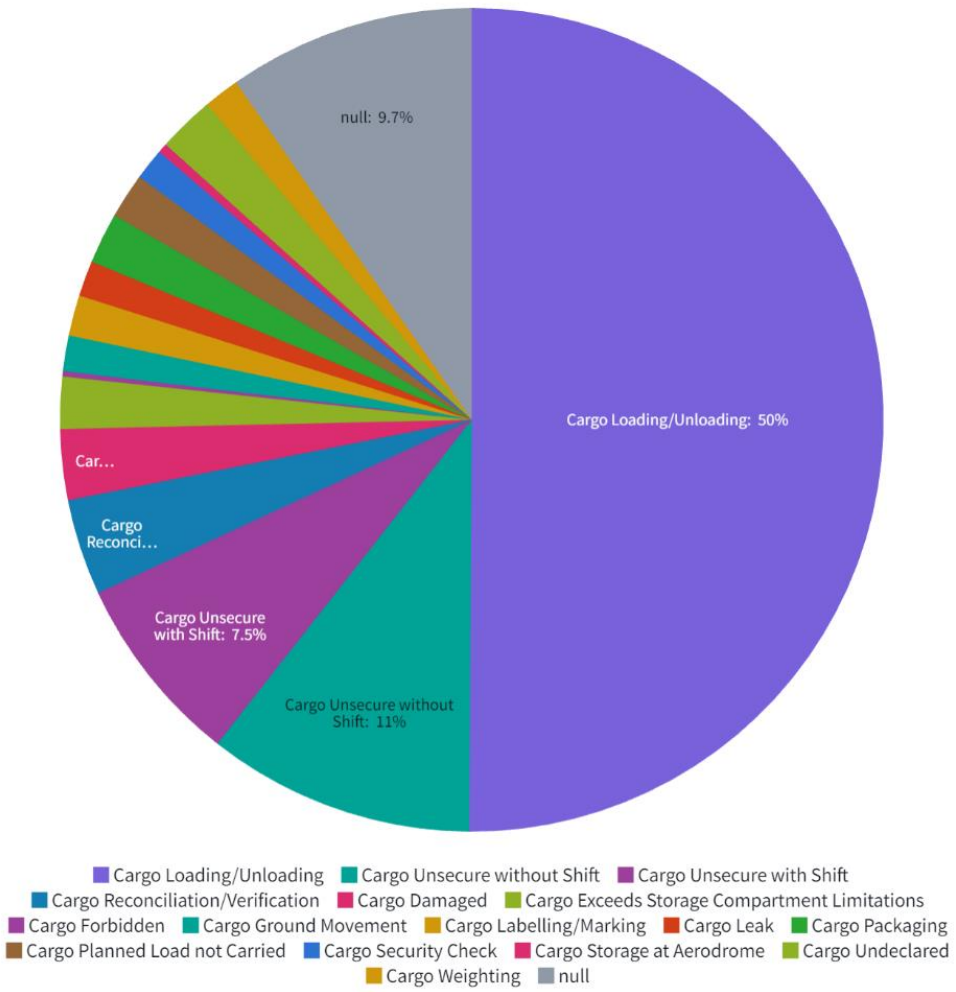


Figure 30: Detailed types of events reported in the category 'cargo handling and loading'



Detailed type of events — cargo handling and loading	Number of ECR occurrences	% of total
Cargo loading/unloading	5 055	50.11 %
Cargo unsecure without shift	1 060	10.51 %
Null	976	9.68 %
Cargo unsecure with shift	756	7.49 %
Cargo reconciliation/verification	381	3.78 %
Cargo damaged	279	2.77 %
Cargo undeclared	227	2.25 %
Cargo exceeds storage compartment limitations	205	2.03 %
Cargo packaging	201	1.99 %
Cargo planned load not carried	179	1.77 %
Cargo labelling/marking	161	1.60 %
Cargo ground movement	141	1.40 %
Cargo leak	141	1.40 %
Cargo weighting	141	1.40 %
Cargo security check	125	1.24 %
Cargo storage at aerodrome	38	0.38 %

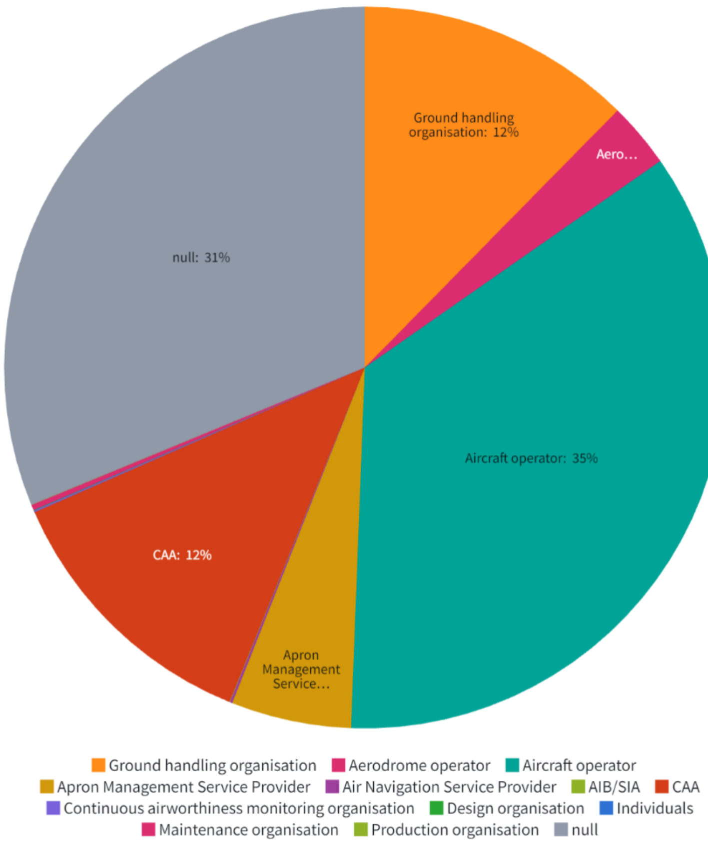
Cargo forbidden	21	0.21 %
TOTAL	10 087	

The majority of the reports are clearly linked to the loading/unloading activities. Nevertheless, further analysis would help determining other aspects involved, such as the use of cargo containers (ULD or pallets and nets), or whether the loading equipment is a contributing factor. It would also be relevant to find out how many of these occurrences took place on the apron and how many in the cargo warehouse. The events coded as 'cargo storage at aerodrome' could provide useful information about the storage conditions of at the aerodrome or the operational procedures.

As in the case of baggage-related reports, it is unclear what aspects are considered in the reports coded as 'cargo ground movement'.

The cargo weighing is again linked to the load control process and has serious consequences on the aircraft mass and balance calculation.

Figure 31: Entities reporting the events related to cargo handling and loading



Type of reporting entity — cargo handling and loading	Number of ECR occurrences	% of total
Aircraft operator	3 196	35.31 %
Null	2 828	31.24 %
GHSP	1 121	12.38 %
NCA	1 115	12.32 %
Apron management services provider	484	5.35 %

Aerodrome operator	265	2.93 %
Maintenance organisation	22	0.24 %
Air navigation service provider	10	0.11 %
Continuing airworthiness maintenance organisation	6	0.07 %
AIB/SIA	2	0.02 %
Design organisation	1	0.01 %
Production organisation	1	0.01 %
Individuals	1	0.01 %
TOTAL	9 052	

2.1.9 Occurrences related to dangerous goods handling and loading

Number of occurrences: **8 227**, representing **13 %** of the total occurrences captured in the scope of this analysis

Figure 32: Occurrences related to dangerous goods handling and loading

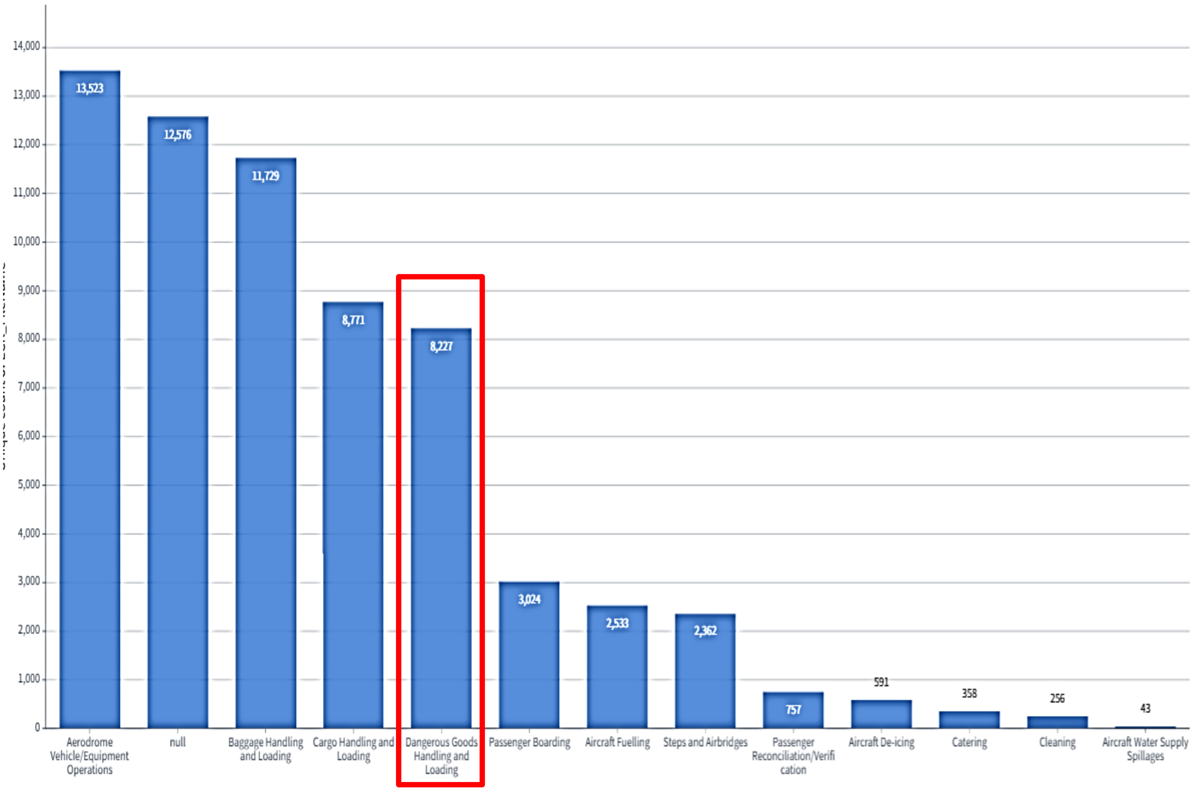


Figure 33: Reporting trend for events related to dangerous goods handling and loading

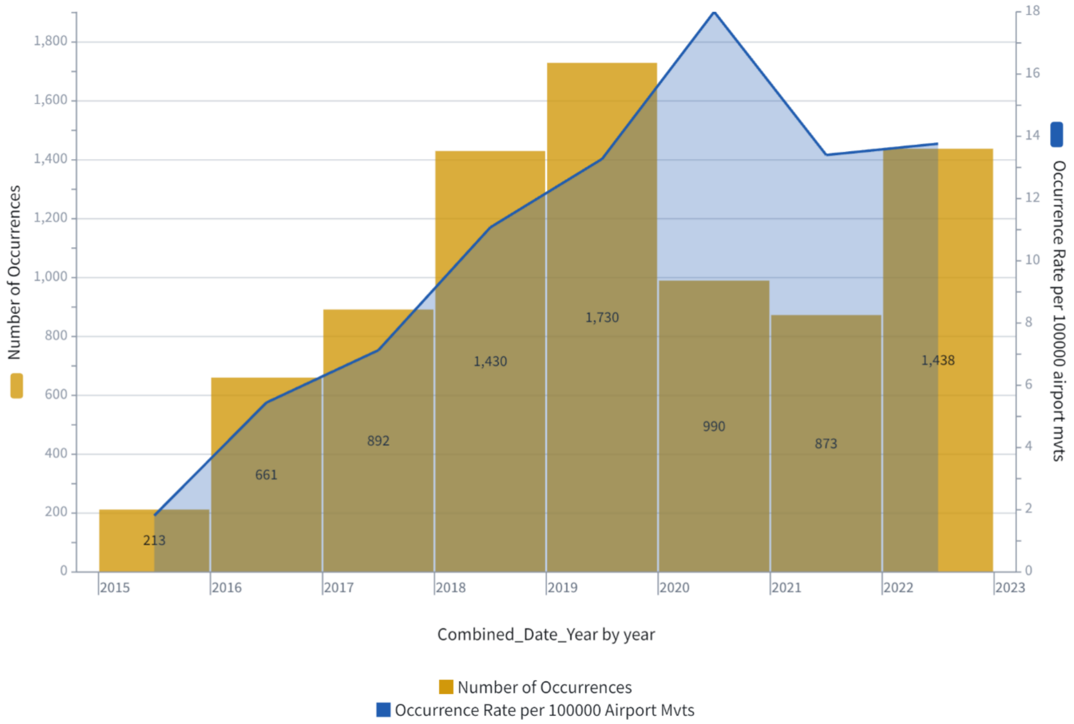
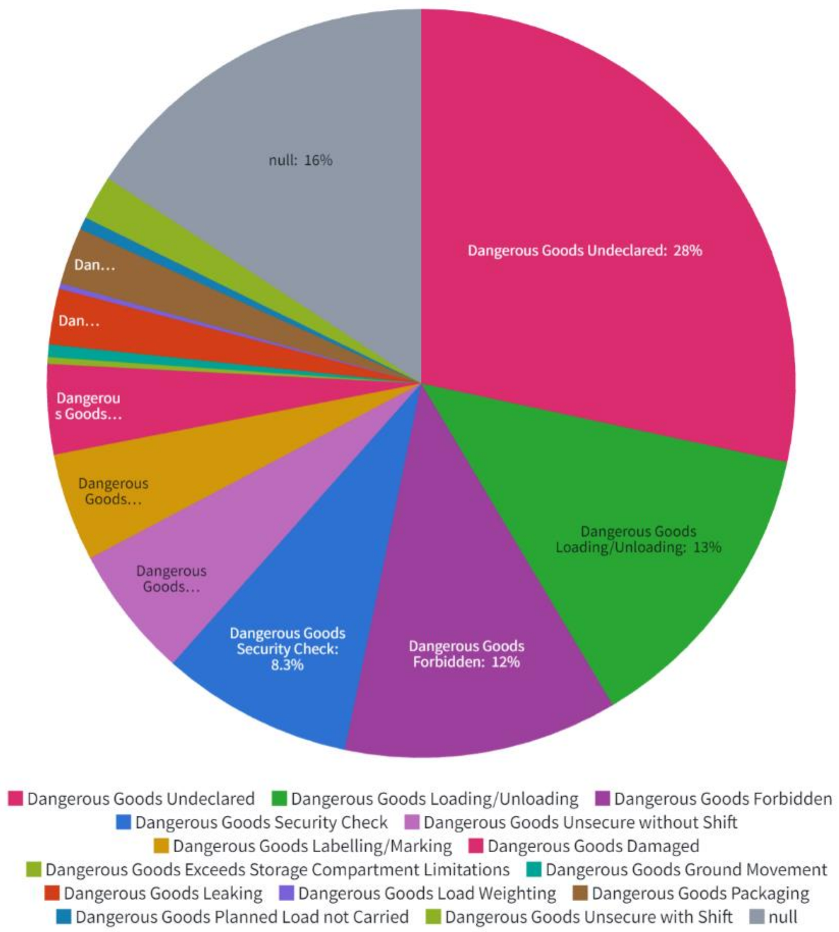
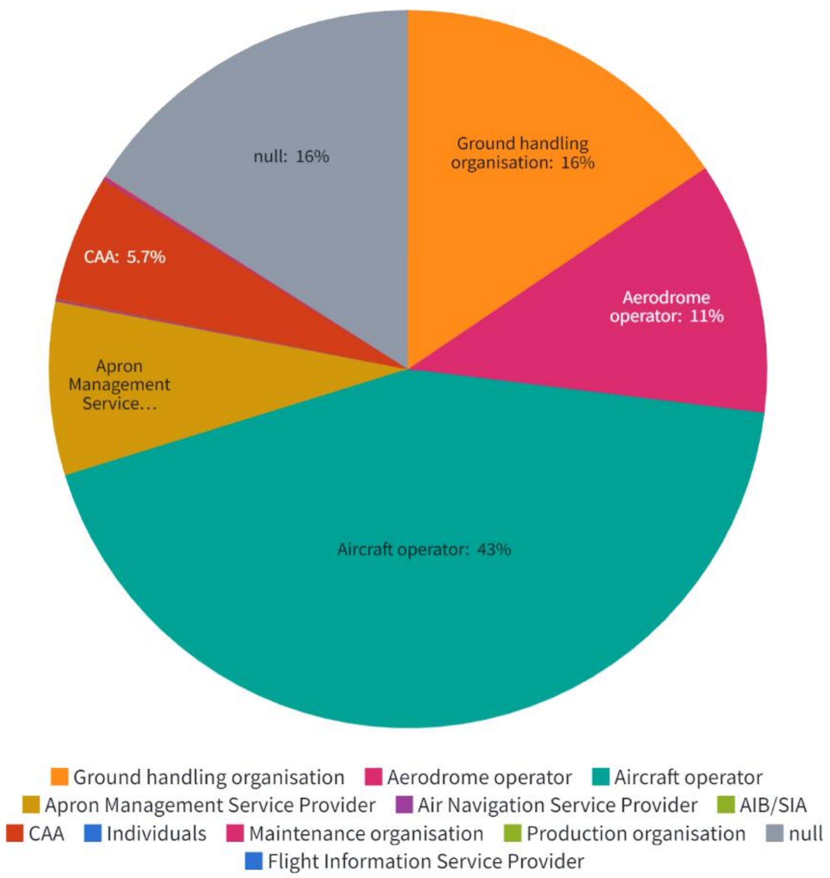


Figure 34: Detailed types of events reported in the category 'dangerous goods handling and loading'



Detailed type of events — dangerous goods handling and loading	Number of ECR occurrences	% of total
Dangerous goods undeclared	2 735	28.67 %
Null	1 487	15.59 %
Dangerous goods loading/unloading	1 249	13.09 %
Dangerous goods forbidden	1 128	11.82 %
Dangerous goods security check	785	8.23 %
Dangerous goods unsecure without shift	543	5.69 %
Dangerous goods labelling/marking	446	4.68 %
Dangerous goods damaged	371	3.89 %
Dangerous goods packaging	236	2.47 %
Dangerous goods leaking	229	2.40 %
Dangerous goods unsecure with shift	179	1.88 %
Dangerous goods ground movement	51	0.53 %
Dangerous goods planned load not carried	51	0.53 %
Dangerous goods exceed storage compartment limitations	27	0.28 %
Dangerous goods load weighting	23	0.24 %
TOTAL	9 540	

Figure 35: Entities reporting the events related to dangerous goods handling and loading



Type of reporting entity — dangerous goods handling and loading	Number of ECR occurrences	% of total
Aircraft operator	3 791	43.33 %
Null	1 393	15.92 %
GHSP	1 378	15.75 %
Aerodrome operator	991	11.33 %
Apron management services provider	672	7.68 %
NCA	500	5.71 %
Maintenance organisation	12	0.14 %
Air navigation service provider	8	0.09 %
Individuals	2	0.02 %
Production organisation	1	0.01 %
Flight information service provider	1	0.01 %
AIB/SIA	1	0.01 %
TOTAL	8 750	

2.1.10Occurrences related to passenger boarding

Number of occurrences: **3 024**, representing **4.5 %** of the total occurrences captured in the scope of this analysis

Figure 36: Occurrences related to passenger boarding

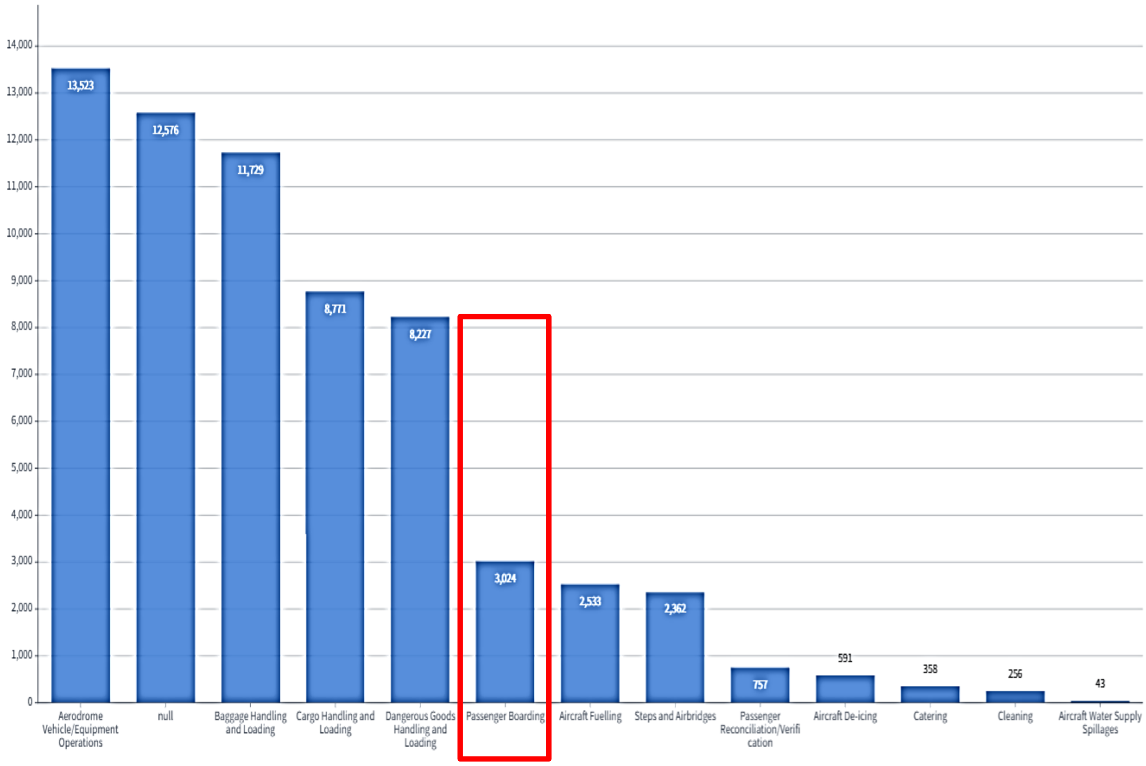
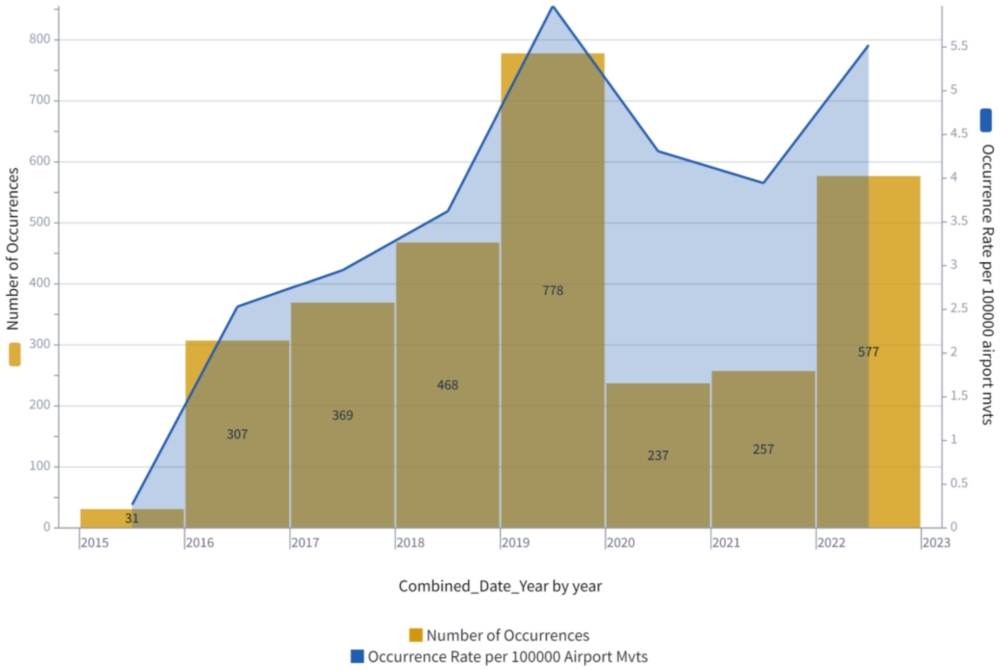
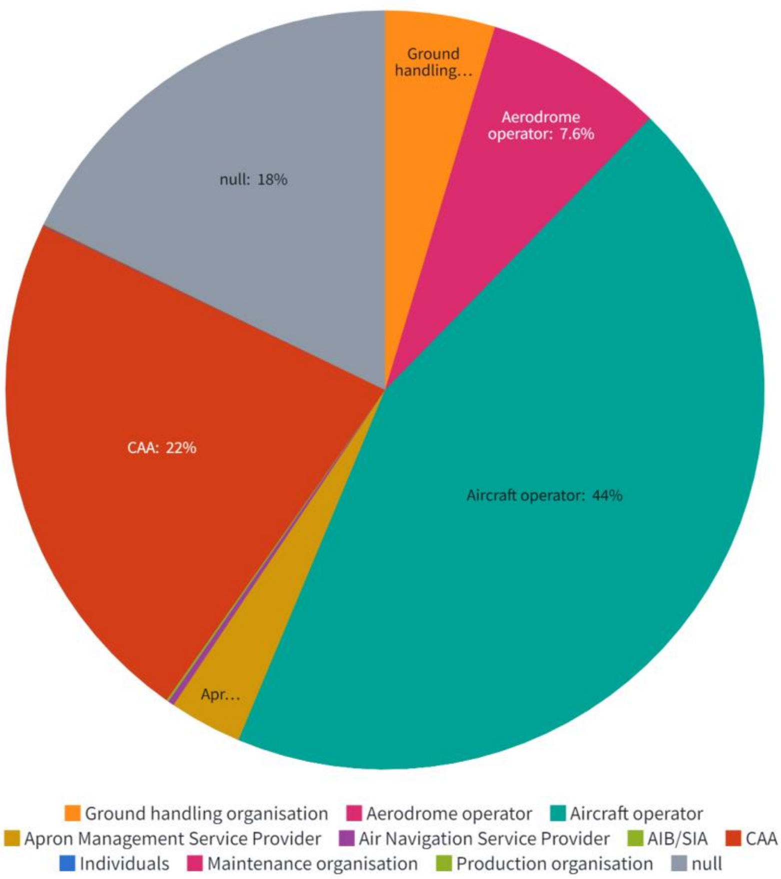


Figure 37: Reporting trend for events related to passenger boarding



Unfortunately, the ECR taxonomy does not go further down to classify the types of events recorded in the passenger boarding category.

Figure 38: Entities reporting the events related to passenger boarding



Type of reporting entity — passengers boarding	Number of ECR occurrences	% of total
Aircraft operator	1 365	44.17 %
NCA	692	22.39 %
Null	551	17.83 %
Aerodrome operator	230	7.44 %
GHSP	144	4.66 %
Apron management services provider	94	3.04 %
Air navigation service provider	8	0.26 %
AIB/SIA	3	0.10 %
Production organisation	1	0.03 %
Maintenance organisation	1	0.03 %
Individuals	1	0.03 %
TOTAL	3 090	

2.2.11Occurrences related to fuelling operations

Number of occurrences: **2 533**, representing **4.3 %** of the total occurrences captured in the scope of this analysis

Figure 39: Occurrences related to fuelling operations

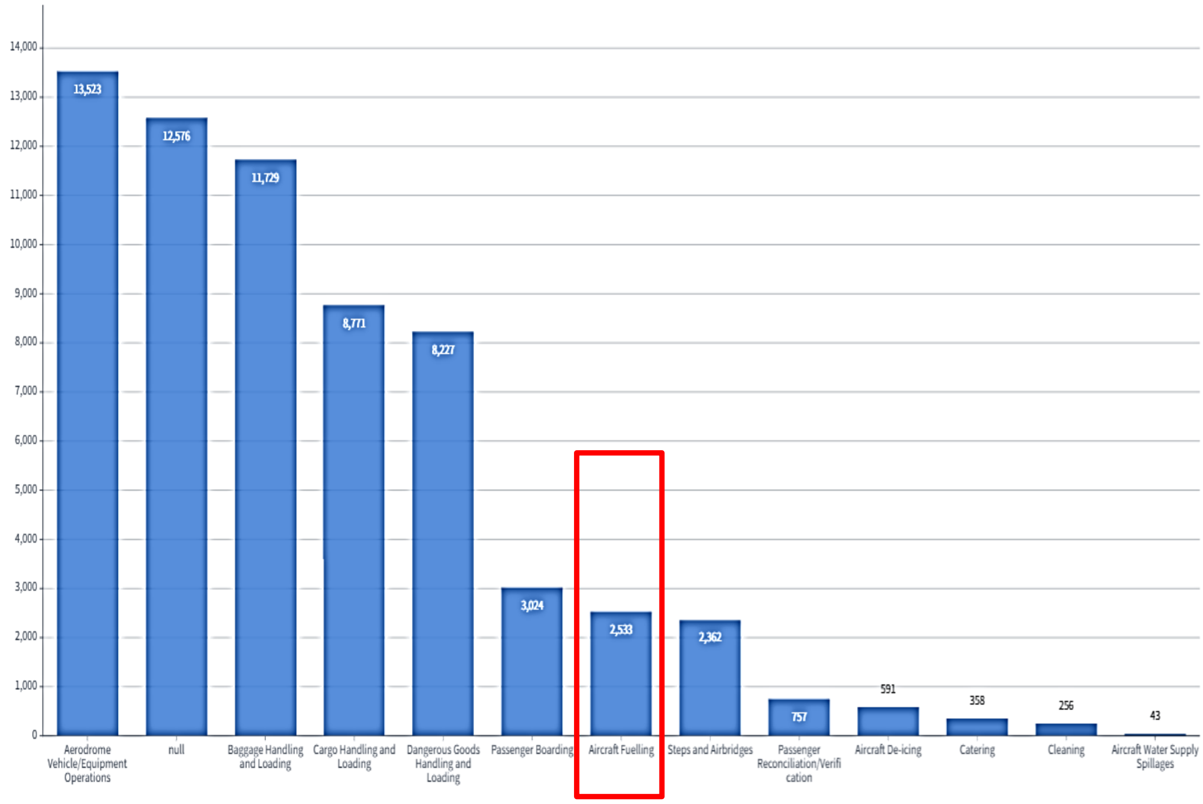


Figure 40: Reporting trend for events related to fuelling operations

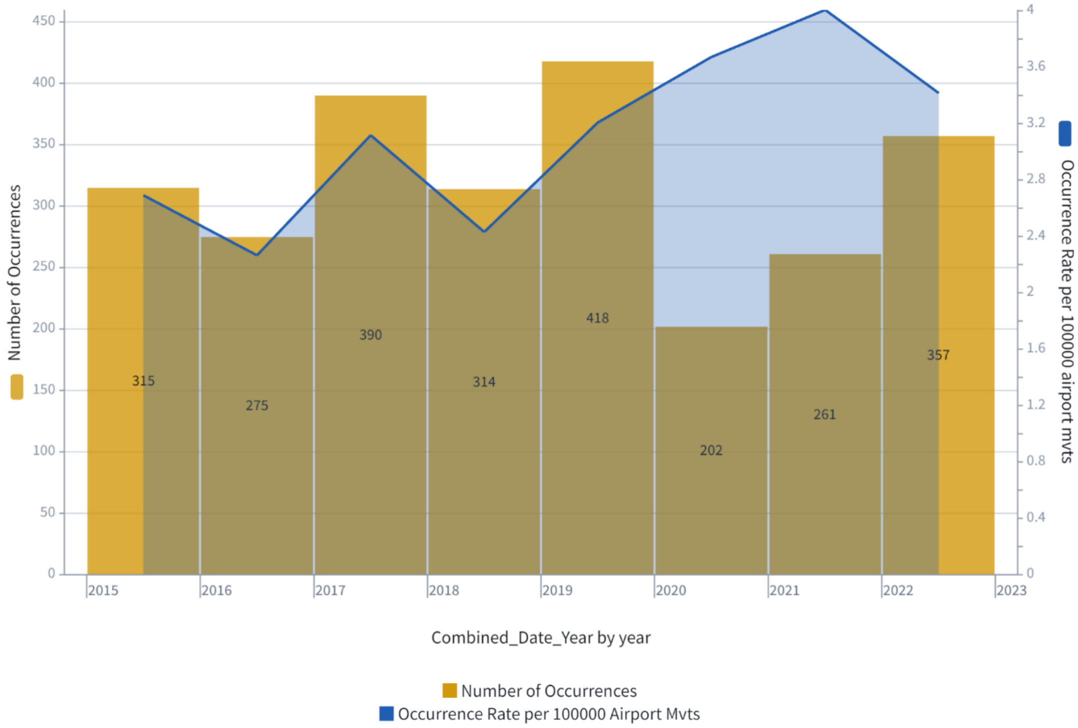
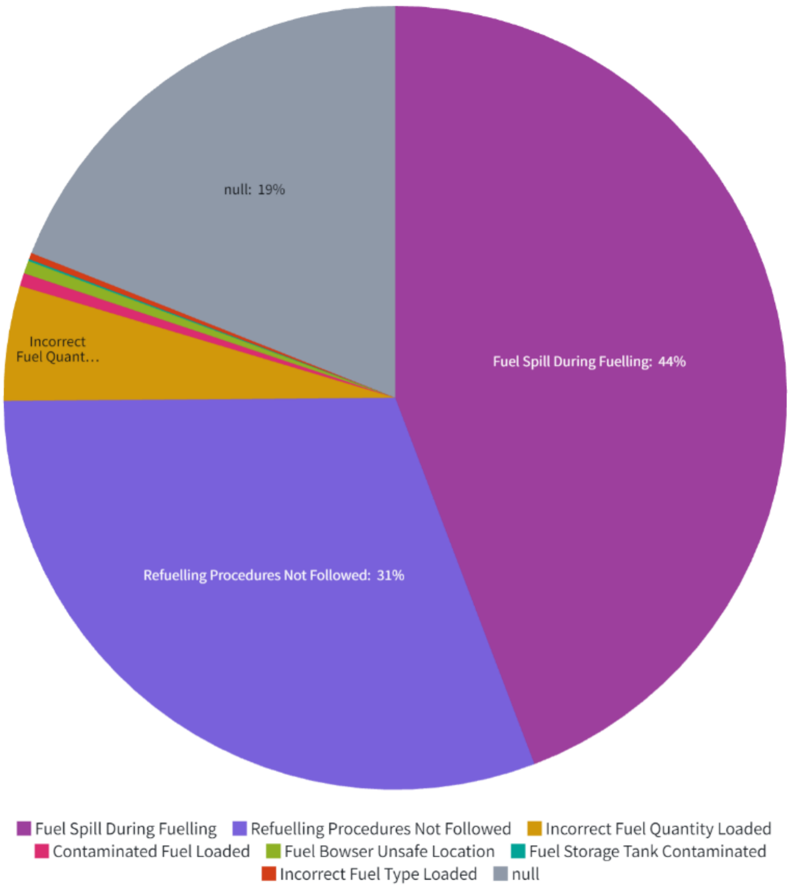


Figure 41: Detailed types of events reported in the category 'fuelling'

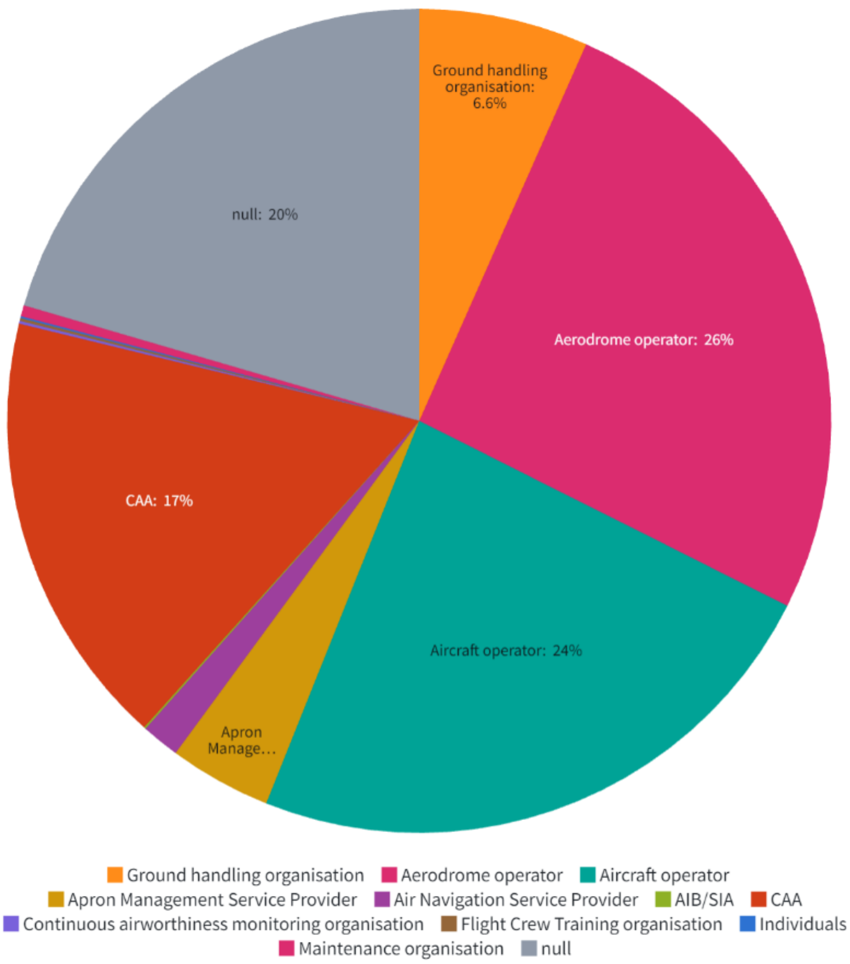


Detailed type of events — fuelling	**Number of ECR occurrences**	**% of total**
Fuel spill during fuelling	1 151	44.13 %
Refuelling procedures not followed	800	30.67 %
Null	496	19.02 %
Incorrect fuel quantity loaded	124	4.75 %
Fuel bowser unsafe location	14	0.54 %
Contaminated fuel loaded	14	0.54 %
Incorrect fuel type loaded	7	0.27 %
Fuel storage tank contaminated	2	0.08 %
TOTAL	2 608	

Although the events reported under this category are rather few compared to the other GH-related events, fuelling operations are safety-critical activities and worth analysing at a deeper level.

The large percentage of events reported as 'refuelling procedures not followed' and 'fuel spill during refuelling' indicate areas that require further investigation in the future.

Figure 42: Entities reporting the events related to fuelling



Type of reporting entity — fuelling	**Number of ECR occurrences**	**% of total**
Aerodrome operator	700	25.66 %
Aircraft operator	648	23.75 %
Null	561	20.56 %
NCA	470	17.23 %
GHSP	178	6.52 %
Apron management services provider	108	3.96 %
Air navigation service provider	41	1.50 %
Maintenance organisation	12	0.44 %
Flight crew training organisation	3	0.11 %
Continuing airworthiness maintenance organisation	3	0.11 %
AIB/SIA	2	0.07 %
Individuals	2	0.07 %
TOTAL	2 728	

2.1.12Occurrences related to passenger stairs and air bridges

Number of occurrences: **2 362**, representing **4 %** of the total occurrences captured in the scope of this analysis

Figure 43: Occurrences related to passenger stairs and air bridges (passenger boarding bridges (PBB))

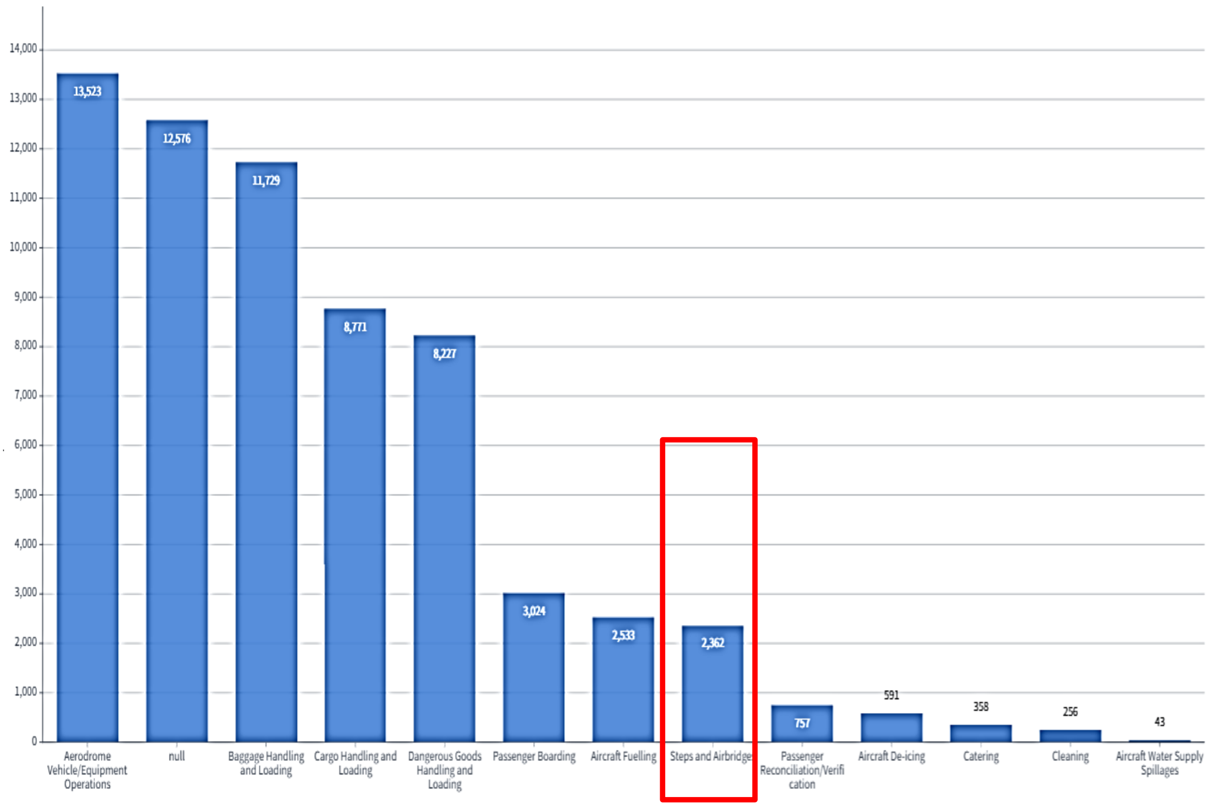
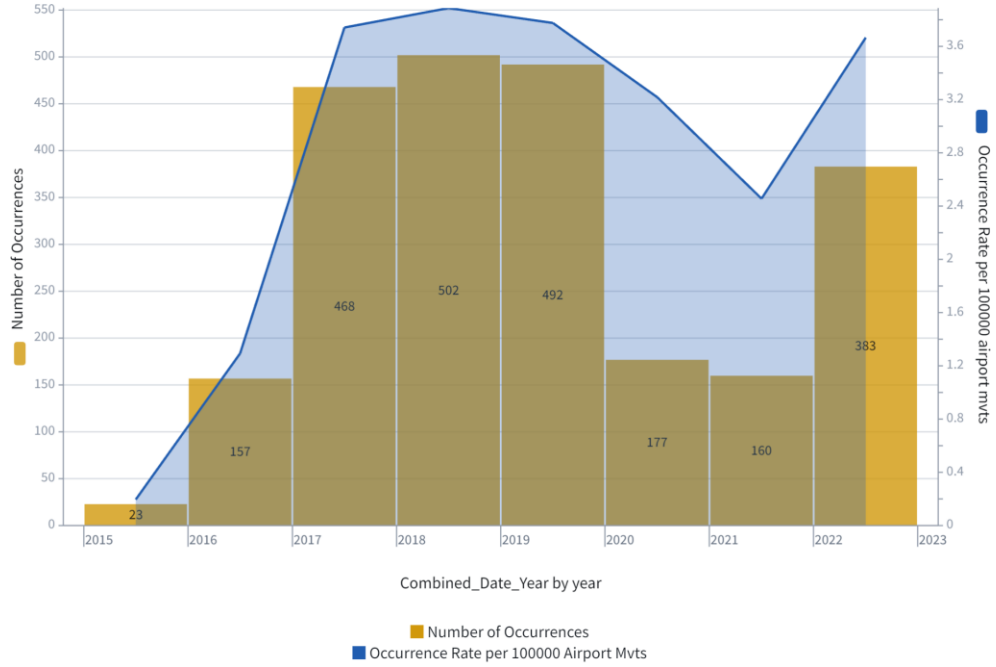
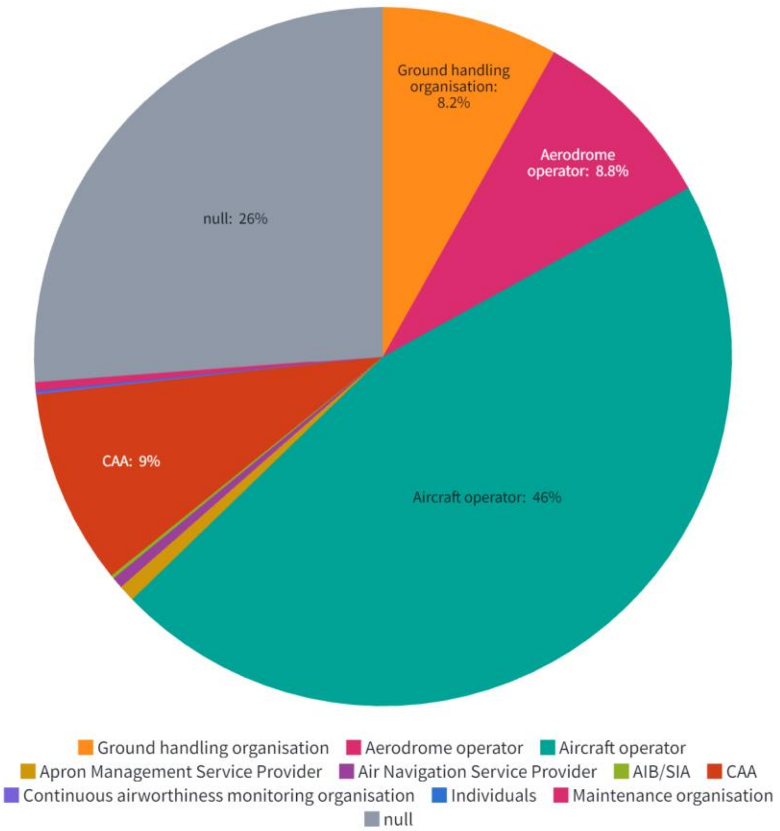


Figure 44: Reporting trend for events related to passenger stairs and air bridges (PBB)



As in the case of passenger boarding, this category also does not provide more details to help identify what kind of incidents occurred in relation to the passenger stairs and air bridges. They may include incidents with passengers falling off aircraft stairs during dis(embarking) and events where a passenger staircase is being moved while passengers are standing on the staircase.

Figure 45: Entities reporting the events related to passenger stairs and air bridges (PBB)



Type of reporting entity — steps and airbridges	Number of ECR occurrences	% of total
Aircraft operator	1 147	45.99 %
Null	654	26.22 %
NCA	226	9.06 %
Aerodrome operator	223	8.94 %
GHSP	194	7.78 %
Apron management services provider	19	0.76 %
Air navigation service provider	13	0.52 %
Maintenance organisation	10	0.40 %
AIB/SIA	4	0.16 %
Individuals	2	0.08 %
Continuing airworthiness maintenance organisation	2	0.08 %
TOTAL	2 494	

2.1.13Occurrences related to aircraft ground de-icing/anti-icing

Number of occurrences: **591**, representing **1 %** of the total occurrences captured in the scope of this analysis

Figure 46: Occurrences related to aircraft ground de-icing/anti-icing

Figure 47: Reporting trend for events related to aircraft ground de-icing/anti-icing

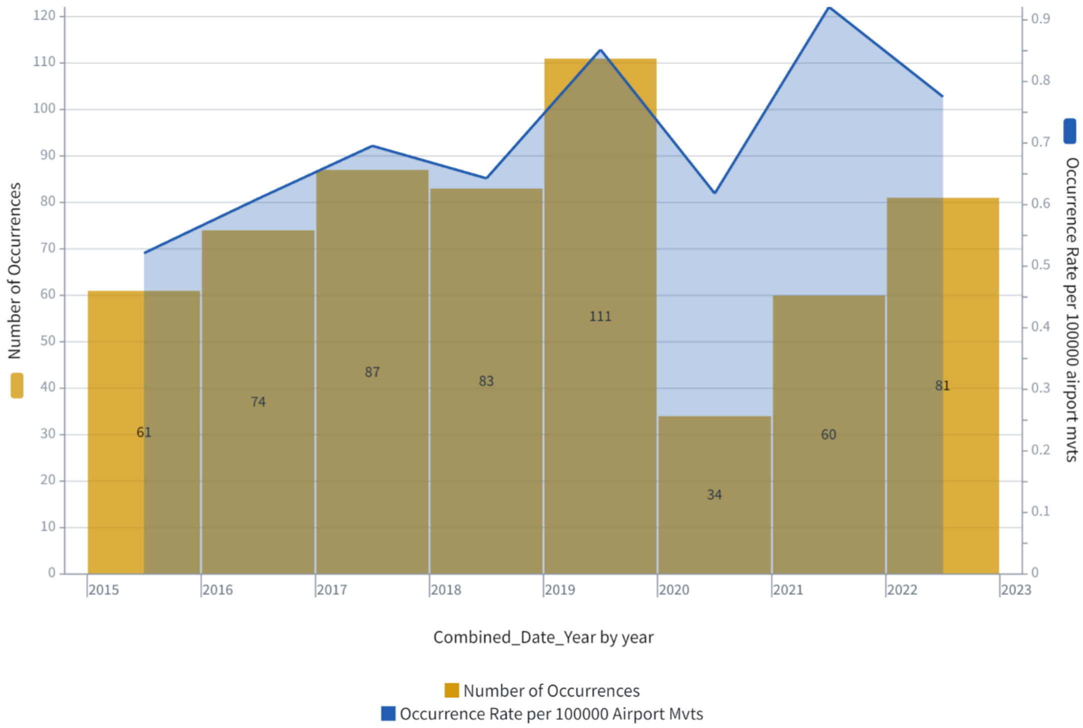
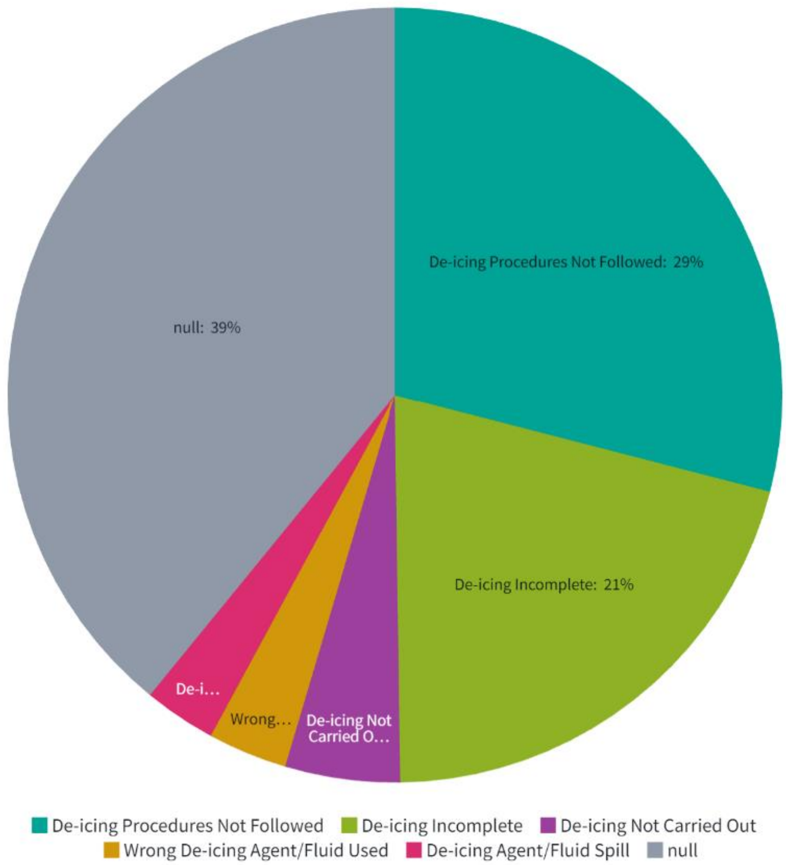


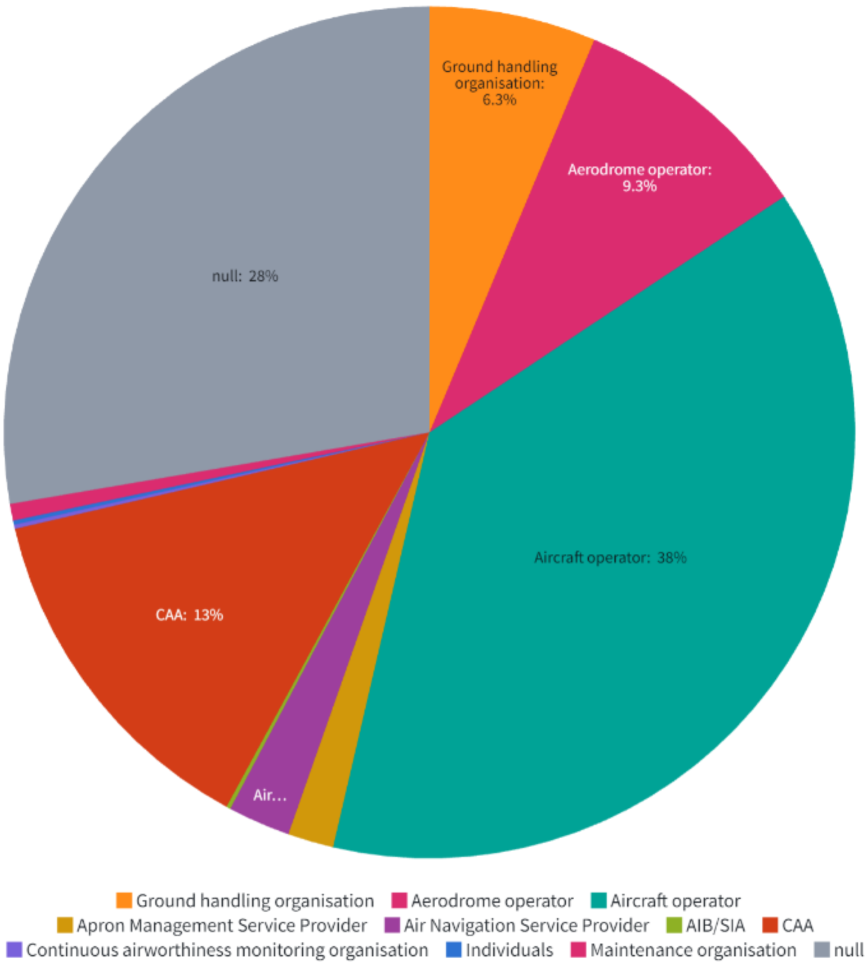
Figure 48: Detailed types of events reported in the category 'aircraft ground de-icing//anti-icing'



Detailed type of events — de-icing/anti-icing	Number of ECR occurrences	% of total
Null	260	38.98 %
De-icing procedures not followed	194	29.09 %
De-icing incomplete	138	20.69 %
De-icing not carried out	33	4.95 %
Wrong De-icing agent/fluid used	22	3.30 %
De-icing agent/fluid spill	20	3.00 %
TOTAL	667	

This is another safety-critical GH operation, and the areas with a high percentage of reports ('procedures not followed', 'incomplete de-icing') will require further investigation in the future to better understand the causes and to propose proper mitigations, through either amendment to the rules or safety promotion activities.

Figure 49: Entities reporting the events related to aircraft ground de-icing/anti-icing



Type of reporting entity — de-icing	Number of ECR occurrences	% of total
Aircraft operator	241	37.95 %
Null	175	27.56 %

NCA	85	13.39 %
Aerodrome operator	59	9.29 %
GHSP	40	6.30 %
Air navigation service provider	17	2.68 %
Apron management services provider	11	1.73 %
Maintenance organisation	4	0.63 %
AIB/SIA	1	0.16 %
Individuals	1	0.16 %
Continuing airworthiness maintenance organisation	1	0.16 %
TOTAL	635	

2.1.14Additional elements to the safety data analysis

The first conclusions that can be drawn from the high-level statistical information provided by the ECR data are the following:

1. There is a clear upward trend of the reporting level since the implementation of the Occurrence Reporting Regulation (EU) No 376/2014 in the GH domain. However, more information would be useful to better identify the reporting entities and reduce the grey sections of the pie charts as indicated in Section 2.1.4.
2. A more consistent approach towards the analysis of reports should clarify whether the percentage of reporting per Member State is relevant to the number of aerodromes within the scope of the Basic Regulation in each Member State. It is also helpful to establish a connection between the level of reporting in each Member State and the level of involvement of the competent authority in supporting the reporting culture of their GH industry.
3. On the graphs on the injury level and the aircraft damage level, EASA will need to analyse the reports to identify which were the GH activities during which most of the injuries and aircraft damage occurred and whether the narratives of those reports provide more details to understand the causes and possible contributing factors. This will determine the necessary action for EASA and better directing the safety promotion, communications or regulatory actions. Also, a better reporting culture of the GH personnel is expected to improve the quality of reports to include relevant data. The lack of information about the GH activity in which the event occurred limits significantly the accuracy of interpretation of that data.
4. The data related to ground damage only contains events that resulted in damage to the aircraft, as the reported events are linked to the definition of accident and serious incident (ICAO Annex 13). However, it would also be relevant for the safety assessment of GH operations to have information about the damage occurring to other ground support equipment or vehicles, even when no aircraft damage has been produced. It is likely that this data already exists in the database of GH organisations and airlines for their own safety analysis. The analysis of causes of such events can be used to further improve the safety elements, be it in training, ramp resource management, operational procedures, etc. At the same time, an analysis of individual reports would more easily identify occurrences linked to aerodrome operations versus GH and would provide more accurate information about their potential causes.

5. The analysis of reports is necessary also to identify the types of events recorded as ‘steps (i.e. passenger stairs) and airbridges’, ‘passenger boarding’, or ‘passenger reconciliation/verification’ (which is likely to refer to the identification of undeclared or misdeclared dangerous goods in passenger baggage).
6. A deeper analysis of individual reports in the EASA database of occurrences will provide more accurate information about the causes and contributing factors that generated those events. As an example, in 2021 EASA developed a report named ‘Safety issue “Baggage and Cargo Loading in Passenger Aircraft I-1004”’ together with the members of the EASA Aerodromes and Ground Handling CAG[14]. The report was drafted in response to the high safety risk index score allocated to the safety issue of baggage and cargo loading. This category of GH services was one of those with the highest number of reported ECR occurrences among all the safety issues in the ADR and GH data risk portfolio as published in the 2019 edition of the EASA Annual Safety Review. Similarly, a deeper analysis of the reports by GH activity as already identified in the data risk portfolio will have to be carried on. The current GH area bearing the highest safety risk index score is turnaround coordination. Consequently, EASA will put a higher priority on the analysis of occurrences in turnaround coordination to identify the causes, the key risk areas and the possible mitigation measures. The turnaround coordination has already been included in the proposed GH regulation with minimum safety objectives.
7. The above remarks should be compared and cumulated with other available data and analyses of GH occurrences (from the airline and GH industry) to identify the optimal solutions for an improvement of safety and a reduction of costs in GH operations.

To compare the scope of the GH regulation with the IATA results published in its annual safety report, the main concerns identified through the industry audit programme for ground operations (ISAGO) are the following:

‘Top 10 - 2022 findings No ISAGO Audit Top 10 Findings

1. SMS – integrated and implemented throughout the organization to manage ground ops safety risks.
2. Management and control of external and internal documentation
3. Training programme – Initial training prior to operational duties
4. SMS – Safety risk assessment and mitigation programme throughout the organization
5. Training programme – ensure that trained and competent staff performs basic, advanced, and specific SMS duties
6. SMS – Safety assurance programme
7. Training programme – recurrent training for operationally critical functions
8. QMS and Oversight programme to evaluate management system and operations at all stations
9. GSE Maintenance programme
10. Application of water quality standards’.[15]

[14] CAG = Collaborative Analysis Group.

[15] IATA Annual Safety Report – 2022. Executive Summary and Safety Overview. Edition 59, page 13.

2.2. Oversight

So far safety of GH has not been directly regulated at the European level. Some Member States have national regulations that cover some safety aspects of GH, but the majority of safety aspects are subject to voluntary compliance with industry standards.

The responsibility for safety of GH is partly and indirectly regulated through Regulation (EU) No 965/2012[16] applicable to aircraft operators. Aircraft operators, including those providing self-handling, must include the GH activities under their management system. The audits of competent authorities indicate that many GHSPs have processes in place to manage safety-related issues, but the effectiveness and efficiency of the implementation of these management systems vary substantially.

This situation has led to an inconsistent and non-harmonised approach among the EASA Member States. In many cases, the NCAs do not oversee the activities or the management system of the GHSP directly. The lack of a regulatory framework to define the responsibility for NCAs to oversee GHSPs makes it difficult to improve the system, even when shortcomings have been observed. In addition, any promotion of a good management system or best practices is hindered by this uncoordinated oversight.

2.3. Competition and commercial pressure

Currently, the provision of GH services at European aerodromes is regulated at national level through the transposition of Council Directive 96/67/EC[17] into the national regulatory frameworks of the Member States. This Directive has stimulated a liberalisation and facilitated greater market access. It has resulted in an increased number of third-party independent GHSPs.

Since the liberalisation of the GH market at EU airports, price competition between GHSPs has had a huge impact on the turnover and profit margins. Currently, airline operating costs are under pressure, in turn automatically influencing prices for GH services. To remain competitive, GHSPs have to offer lower prices and shorter handling/operation times, while still applying the same standards and agreements as before[18].

2.4. Staff turnover and staff shortages

High staff turnover is an issue that has been raised by many stakeholders. For various reasons, including seasonality, wages, working conditions, just culture and business pressure, GHSPs are often unable to attract staff for longer periods, leading to a high staff turnover. This leads to constant hiring and re-training of new and often unexperienced staff, which is costly, creates an additional strain on the more experienced staff, and ultimately has a negative impact on safety.

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[16] Commission Regulation (EU) No 965/2012 of 5 October 2012 laying down technical requirements and administrative procedures related to air operations pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council, (OJ L 296, 25.10.2012, p. 1)

[17] Council Directive 96/67/EC of 15 October 1996 on access to the groundhandling market at Community airports (OJ L 272, 25.10.1996, p. 36) (https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A31996L0067).

[18] ACI Europe, ASA and ETF (2018), Market Access, Social Conditions, Training, Qualifications and Quality Standards in the Ground Handling Industry, February 2018.

The COVID-19 pandemic has intensified this problem, with over 60 % of GH personnel either furloughed or let go during 2020. Today, GHSPs are having difficulties in replacing missing staff lost during the pandemic with qualified and competent people[19].

2.5. GHSPs in Europe

A GHSP[20] can be:

— an entity being part of an aerodrome operator,

— an entity being part of an aircraft operator (self-handling); or

— a separate entity independent from an aerodrome or an aircraft operator.

In the past, GH was provided by locally based airlines or airports, but with the introduction of Council Directive 96/67/EC, the so-called Ground Handling Directive, the market access for GH services was liberalised. Council Directive 96/67/EC opens access to the market for GH services at aerodromes with more than two million passengers per year. At the same time, the Directive allows Member States to limit the number of providers for certain categories at these airports, however, to no less than two GHSPs. One of these providers needs to be an independent handler (not the airport operator or airline with more than 25 % of traffic at the airport). As a consequence, there has been an increase in third-party independent GHSPs. At Amsterdam Airport Schiphol, for example, there are 9 GHSPs active, while at Dublin airport there are 12 GHSPs active.

This impact assessment focuses on GHSPs operating on one (or more) aerodromes falling within the scope of Regulation (EU) 2018/1139 that are not exempted in accordance with Article 2(7). There are in total 542 aerodromes falling within the scope of Regulation (EU) 2018/1139 of which 127 are exempted[21], which means that 415 aerodromes are relevant for this study.

Some of the GHSPs are international organisations operating across EASA Member States and/or other parts of the world. Table 2.3 shows for five independent GHSPs the number of EASA Member States and the number of non-exempted aerodromes in the EASA Member States where they operate.

Table 2.1: For five of the largest independent GHSPs, the number of EASA Member States and the number of non-exempted aerodromes where they operate

Organisation	Number of EASA MS	Number of aerodromes
Swissport	14	45
dnata	5	6
Menzies Aviation	9	33
Worldwide Flight Services	10	25
Aviapartner	6	35

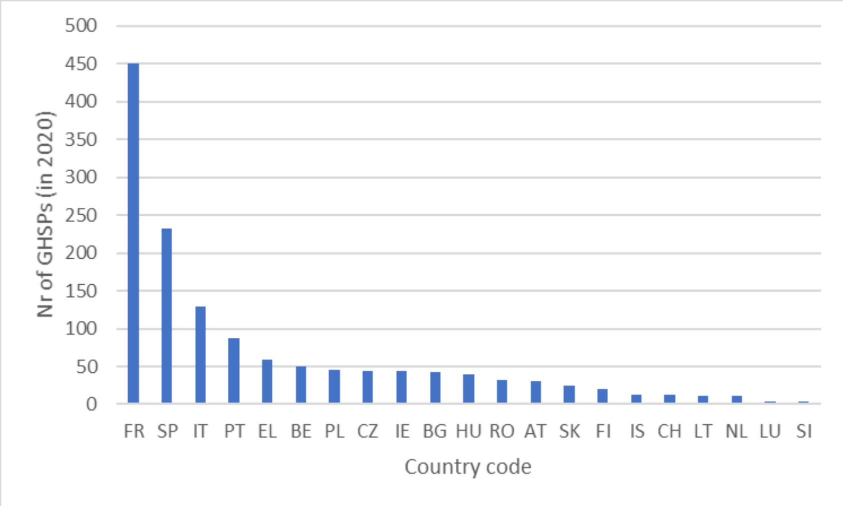
[19] See among others Financial Time (7 June 2022). Airports race to fill thousands of jobs cut during pandemic; ASA (2022). Statement from Europe's airports and ground handlers on current operational disruptions & staffing challenges. Press release 6 May 2022; And ACI, ASA, ETF (2018). Market Access, Social Conditions, Training, Qualifications and Quality Standards in the Ground Handling Industry, February 2018.

[20] A complete definition of ground handling services is provided in the proposed regulation, see Annex 1 to this Opinion.

[21] European Union Aviation Safety Agency, List of aerodromes falling within the scope of Regulation (EU) 2018/1139, last update 3 January 2022.

Figure 2.3 shows the number of GHSPs per EASA Member State for the year 2020 (sorted from large to small) for 21 EASA Member States of which data was obtained.

Figure 2.1: The number of GHSPs per EASA Member State in 2020 for 21 EASA Member States

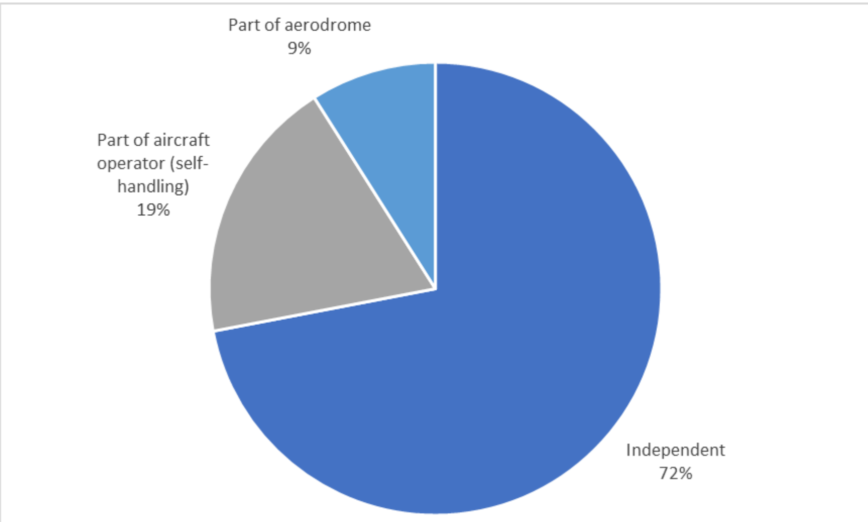


Source: Survey results Task 2

There were 1 385 GHSPs in 21 EASA Member States reported in a dedicated survey conducted in 2022 (See Attachment E). A GHSP that operates in multiple countries is regarded as a multiple organisation, one for each country. It is unclear to what extent cascaded subcontracting is represented in these numbers. Cascaded subcontracting is a complicating factor in determining the number of organisations, but this does not seem to be widespread, although it does exist in France and Belgium[22].

Figure 2.4 shows the distribution of GHSPs per type of organisation, i.e. being part of an aerodrome operator, being part of an aircraft operator (self-handling), or third-party handlers being independent from an aerodrome or an air operator.

Figure 2.2: Distribution of GHSPs per type of organisation (independent, as part of aircraft operator (self-handling) or as part of aerodrome operator)



Source: Task 2 survey (21 Member States)

[22] See ACI, ASA, ETF (2018). Market Access, Social Conditions, Training, Qualifications and Quality Standards in the Ground Handling Industry, February 2018. Also confirmed in interviews.

Number of GH employees

The number of employees varies greatly across GHSPs. There are GHSPs with less than 10 employees according to the survey results (see Chapter 5), but there are also some large organisations. For example, Alyzia employs about 5 000 people on eight aerodromes in France[23], Fraport Ground handling employs approximately 4 000 people at Frankfurt airport[24] and Aviapartner employs nearly 6 000 people while operating at 35 aerodromes in six EASA Member States[25].

For this impact assessment, the GH market was split into small, medium and large organisations based on the data collected (more details in Attachment E). Table 2.2 shows the estimates of the number of employees per type of organisation and the number of organisations in each organisation type. In this categorisation, a GHSP that operates in multiple EASA MS is regarded as multiple organisations, one for each EASA MS where they operate. Details on the computation of the estimates in this table are provided in Attachment E.

Table 2.2: Categorisation of GHSPs based on the number of employees

	Average number of employees	Number of organisations	
Organisation type		Lower bound	Upper bound
Small organisations	25	595	1 784
Medium organisations	150	119	238
Large organisations	2 900	42	42
Total		**755**	**2 063**

Based on Attachment E information, it was estimated that by mid-2022 there were approximately 298 000 GH employees in the EASA Member States.

In addition to these employees, GHSPs may use flexible workers, i.e. temporary agency workers hired via an employment agency. In some Member States, e.g. Romania, the use of temporary workers hired via temporary work agencies is prohibited while in some other Member States, e.g. the Netherlands, the number of temporary agency workers is subject to agreements with labour unions. According to one of the interviewees, the workforce may be made up of up to 30-40 % temporary agency workers in the summer period.

Distribution of costs

More than half of the total costs for GHSPs are related to staff. It is estimated that personnel costs are 60 % of the total costs[26]. In a study in 2010[27] on the possible revision of Directive 96/67/EC it was estimated that staff costs represent 66 % of the total costs. In this study, the costs associated with GSE were estimated to be around 10 %, about half of which represents the maintenance of GSE.

23 Alyzia annual report 2018.

24 Fraport annual report 2020.

25 Aviapartner website https://www.aviapartner.aero/about.

26 The total costs have been estimated by taking the total revenue minus the profit.

27 Steer Davies Gleave (2010). Possible revision of Directive 96/67/EC on access to the groundhandling market at Community airports, Framework Contract for impact assessment and evaluations (TREN/A1/143-2007). Final Report, 16 June 2010

2.6. How could the issue evolve?

Within the GH domain, the following developments or trends are identified that are relevant for this impact assessment.

Liberalisation and consolidation

Traditionally, GH was provided by locally based entities, particularly aerodromes and aircraft operators, but Council Directive 96/67/EC has stimulated a liberalisation and facilitated greater market access. It has resulted in an increase of the third-party independent GHSPs. A number of them operate at multiple aerodromes and also internationally. There has been a trend of consolidation in the industry[28].

SMS implementation and the application of industry standards

Currently, some GHSPs have already implemented a safety management system (SMS). This could be either voluntary (as a recommended practice described in ICAO Doc 10121 Manual on Ground Handling) or because it is required by the client (aircraft operator), the aerodrome operator, or required by national law. Also, accreditation by ISAGO and IS-BAH require GHSPs to have an SMS. Within the EASA Member States, there are 38 GHSPs (with their main headquarters in an EASA Member State) accredited according to the ISAGO programme and 53 GHSPs accredited according to the IS-BAH programme.

It is expected that in the 'no change in the current policy' option (Option 0), the number of GHSPs that have implemented an SMS will remain the same over the time horizon under consideration.

Sustainable GSE

In recent years GHSPs have been faced with expectations from stakeholders and the global community in general to increase their sustainability towards net-zero carbon emissions. Therefore, GHSPs are transitioning from diesel to electric ground support equipment (e-GSE). Making the transition from diesel-powered GSE to e-GSE improves the respiratory health of airside workers and reduces noise pollution, providing a healthier and quieter work environment.

Centralised infrastructure and equipment pooling

To meet the sustainability goals and for efficiency reasons, some aerodromes operate a centralised infrastructure (such as baggage systems, passenger boarding bridges, fuelling systems and de-icing facilities) and put this at the availability of the GHSPs.

Conventionally, GSE is owned or leased by individual ground handlers, which could lead to space capacity issues. The pooling of GSE, such as passenger stairs, belt loaders and also buses, is a trend in recent years but generally not widely implemented yet. Some safety benefits can be attributed to pooling of equipment, notably related to the prevention of cluttering of GSE at the aerodrome which creates a safety risk.

Traffic forecast

In the period 2014 to 2019 there was an annual growth of +3 % in IFR movements in the EASA Member States[29]. After the year 2020 when air transport experienced a crisis as a consequence of the COVID-

[28] See, for example, the SDG report of 2016. These trends were also confirmed in interviews.

[29] EUROCONTROL Forecast Update 2022-2024 (3 June 2022)

19 pandemic, air transport activities are gradually recovered and the prospects for the near future are that this trend will continue. Flight forecasts in terms of aviation developments as provided by EUROCONTROL on 3 June 2022 predict the expected recovery of flights in Europe to 2019 levels will take place during 2024[30]. According to the Eurocontrol Outlook 2050, the most-likely scenario shows +1.2 % growth annually from 2024 until 2050[31]. This growth is based on the argument that, while airport capacity in Europe still constrains growth to some degree, sustainability is expected to become a more significant factor influencing the future of the aviation market.

Staff shortage

The COVID-19 crisis led to some bankruptcies and an overall reduction of staff in the GH industry. The sector employed less than 50 % of its staff in July 2020 compared to the previous year (i.e. before the pandemic)[32]. In 2022 the aviation industry rapidly recovered from the impact of the COVID-19 pandemic and as a result also GHSPs faced steep challenges in retaining and recruiting staff[33,34]. Even in 2023 there was a 'severe shortage of ground handlers' after thousands left the industry during the pandemic[35].

According to data from annual reports and interviewees, most GH organisations have a relatively high staff turnover rate of between 30 % and 60 %[36]. Ground handlers are therefore currently having to find staff not only to meet increasing demand but also replace large numbers of employees each year due to turnover.

The staff shortages in GH could become larger in the near future due to ageing. Figure 2.3 shows that currently almost 40 % of the GH employees are over 50 years old, whereas about 14 % are less than 30 years old.

Figure 2.3: Age profile (in %) of employees of GHSPs in 2019. Source: Ecorys & NLR (2022), obtained from various sources. Number of respondents (n) is 23 GHSPs (representing approx. 40 000 employees)

30 EUROCONTROL Forecast Update 2022-2024 (3 June 2022)

31 Eurocontrol (2022). EUROCONTROL Aviation Outlook 2050. https://www.eurocontrol.int/publication/eurocontrol-aviation-outlook-2050, 13 April 2022.

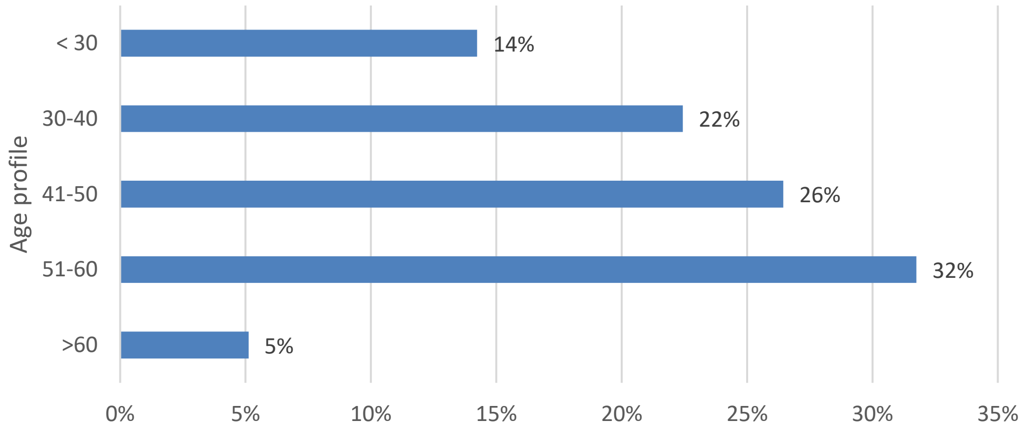
32 https://asaworld.aero/media/1272/asa-open-letter-3-july-2020.pdf

33 See for example IATA Ground Handling Priorities Post Pandemic: Tackling Labor Shortages, Modernization https://www.iata.org/en/pressroom/2021-releases/2021-11-16-01/ (16 November 2021).

34 See for example ACI Statement from Europe's airports and ground handlers on current operational disruptions & staffing challenges. https://www.aci-europe.org/media-room/389-statement-from-europe-s-airports-and-ground-handlers-on-current-operational-disruptions-staffing-challenges.html (6 May 2022)

35 Financial Times, Airports race to fill thousands of jobs cut during pandemic (7 June 2022).

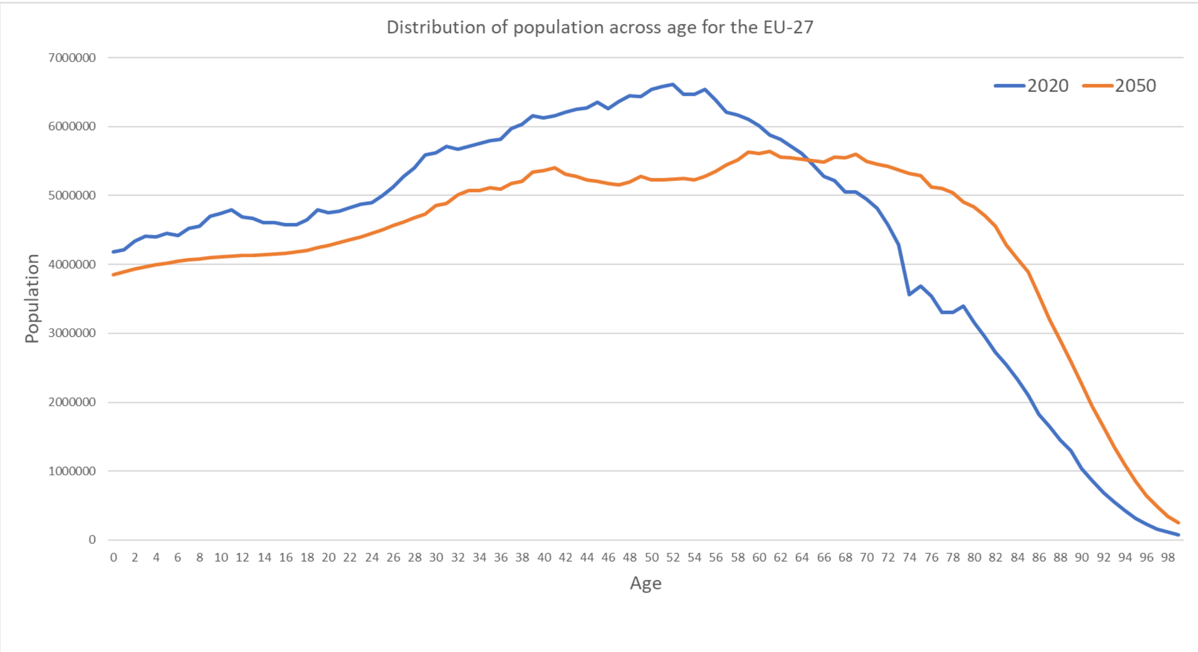
36 See also IATA Ground Handling Report 2019.



Although the total population of the EU Member States is projected to increase by approximately 2.5 % from 2018 to 2050, the number of people aged less than 55 years is projected to decrease by 9.6 % in that same period. Figure 2.6 presents the distribution of population across age for the 27 EU Member States (EU-27) for the year 2020 and the projection for the year 2050[37]. The graph shows a shrinking size of the working-age population and a growing number of older people in society. Hence, it is expected that the staff shortages in GH will increase over time.

In light of these challenges, automation of GSEE and more ergonomic designs of aircraft may facilitate the GH process and allow potentially safer and more efficient GH operations with less staff.

Figure 2.4: Distribution of population across age for the EU-27 in 2020 (actual) and 2050 (projected)



Source: Eurostat (https://ec.europa.eu/eurostat/)

[37] Eurostat (2019). Ageing Europe-looking at the lives of older people in the EU.

3. Options

In this regulatory impact assessment, the proposed GH regulation (Option 1) is compared to Option 0: 'no change in the current policy'.

Option 0: no change in the current policy

In Option 0, no requirements for the safe provision of GH services are laid down by the EU. Option 0 is the baseline scenario for this impact assessment.

In Option 0, industry will continue to regulate itself through industry standards and Member States will continue to apply national legislation — where it exists — resulting in a lack of harmonisation across the EU and non-compliance with the Basic Regulation.

Option 0 in this case is theoretical as there is an obligation from the Basic Regulation to regulate the safety aspects of GH domain. However, the impacts attributed to Option 1 have to be understood in comparison with the baseline scenario: no policy change.

Option 0 is not static over the time horizon under scope (see Section 1.2), but it will develop according to the trends and developments as described in Chapter 2.

Option 1: Proposed GH regulation

The proposed GH regulation consists of a cover regulation document '*DRAFT Commission Delegated Regulation (EU) xx laying down requirements and administrative procedures related to ground handling services pursuant to Regulation (EU) 2018/1139 of the European Parliament and of the Council*' with four annexes:

— Annex I Definitions of terms used in Annexes II to III;

— Annex II Authority requirements for ground handling services (ARGH);

— Annex III Organisation requirements for ground handling service providers (ORGH);

— Annex IV Operational requirements for ground handling services (GH.OPS).

The first draft proposal, published in 2022, is available on the EASA website[38] except for Annex I which was not published. At the time it was considered that the annex containing the definitions could be drafted at a later stage, once the draft regulatory material would be more mature and stabilised.

[38] The draft regulation and the working paper containing the explanatory note for the rulemaking proposal are available at the EASA website: https://www.easa.europa.eu/en/newsroom-and-events/events/webinar-eu-ground-handling-regulation.

4. Methodology and data

The methodology to determine the impacts of the proposed GH regulation consists of the following three steps:

1. Development of an influence model to identify all possible impacts of the proposed GH regulation. The model describes relevant factors and how they influence each other. Through this model, the elements of the proposed GH regulation are linked to the four impact areas.
2. Data gathering from literature, a specific collection of social and economic data, safety occurrence data obtained from EASA, interviews with stakeholder representatives and a dedicated survey.
3. Assessment of the safety, economic, social and environmental impacts using a scale ranging from a very high positive impact (score: +10) to a very high negative impact (score: - 10). A specific methodology is applied to determine the social impact score.

Overall methodology

The overall methodology to determine the impacts of the proposed regulation consists of the following three steps: (1) Identification of possible impacts; (2) data collection and (3) impact analysis, The first two steps are elaborated below, while the third one is included in the relevant parts of Chapter 5 of this document.

Because economic, social and environmental impacts cannot be directly compared, a multi-criteria analysis is used to represent the different impacts. To align with other EASA impact assessments, a scoring from -10 to +10 is used for each impact, i.e. safety, economic, social and environmental.

A scoring between -10 and +10 might give the impression of an accurate assessment of the impacts. It is emphasised that the assessment of the impacts has many uncertainties and is based on several assumptions.

4.1. Identification of possible impacts of the main elements proposed by the GH Regulation

To identify all possible impacts of the proposed GH regulation in a systematic manner, the study team developed an influence model, see Figure 4.1. An influence model is a graphical representation of relevant factors and how they influence each other[39]. The factors are presented by boxes and the influences are presented by arrows. This model details how the proposed measures in the GH regulation potentially affect the different impact areas (safety, economic, social and environmental).

The model is based on the assumption that the proposed measures influence the air transport system via the management systems of the organisations in aviation. Management can be considered as the process of delivering the necessary resources and criteria for the front-line workforce at the task

[39] Sometimes the name cause-and-effect models is used. Examples of similar models are provided in Carriger, John F., Brian E. Dyson, and William H. Benson. (2018). “Representing Causal Knowledge in Environmental Policy Interventions: Advantages and Opportunities for Qualitative Influence Diagram Applications.” Integrated environmental assessment and management 14(3): 381–94. And Jansson, Roland et al. (2015). “Future Changes in the Supply of Goods and Services from Natural Ecosystems: Prospects for the European North.” Ecology and Society 20(3): art32

execution level to operate. Six delivery systems are defined to describe the process of providing the resources and criteria[40]:

— communication;

— procedures;

— commitment;

— availability;

— competence;

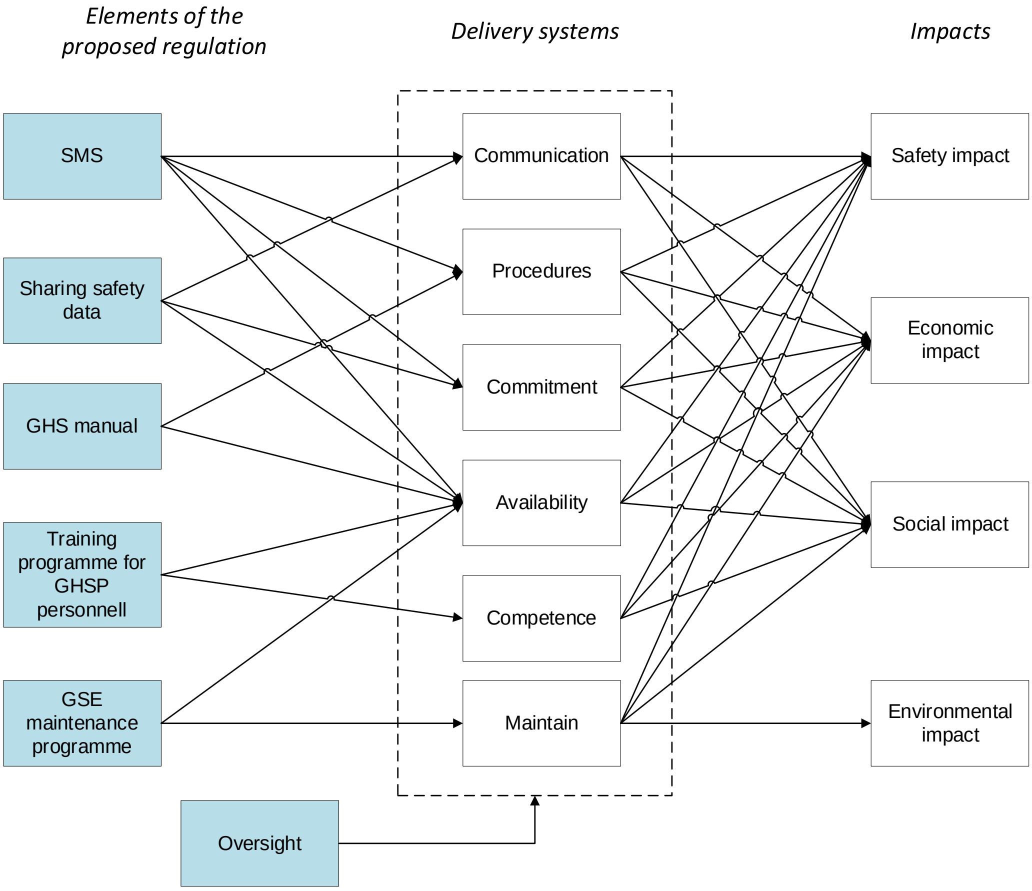
— maintenance.

Attachment B contains the detailed description of the delivery systems. The delivery systems link management activities to the system performance. The performance of the air transport system is described by the four impact areas: safety, economic, social and environmental.

Arrows are drawn from the proposed measures via the delivery systems to the impact areas, indicating that the proposed measures influence the delivery systems and that the delivery systems influence the impact areas. The delivery systems also influence each other, which implies that arrows can be drawn between the delivery systems too. However, these influences are handled implicitly in the model.

[40] Li, Y., Guldenmund, F.W., Aneziris, O.N. (2020). Delivery Systems: A systematic approach for barrier management. Safety Science 121, p. 679-694. The definition of each delivery system is provided in Attachment B. There are eight delivery systems, but two of them, ‘interface’ and ‘design’, are not impacted by the proposed GH regulation and are discarded in the impact assessment.

Figure 4.1: Influence model describing how the impact areas on the right side of the model are affected by the elements of the proposed regulation on the left side of the model via the delivery systems



The proposed regulation influences the management systems of the organisations. The impacts on the management system elements (SMS, sharing of safety data, GH manual, training programme, GSE maintenance programme) are characterised by the impacts on the delivery systems (communication, procedures, commitment, availability, competence and maintenance). The description of the delivery systems is provided in Attachment B. The impacts described in this section serve as a basis for the quantification of the impacts in terms of safety, environment, society and economy.

4.1.1 SMS

The proposed regulation requires GHSPs to implement and maintain an integrated management system including a safety management system (SMS). An SMS is a systematic approach to managing aviation safety including the necessary organisational structures, accountabilities, policies and procedures[41]. An SMS contains the following four main elements (or pillars): safety policy and objectives, safety risk management, safety assurance and safety promotion. A functional SMS will identify and mitigate safety risks by amending existing operational procedures, will support a strong safety culture and improve the safety communication. Safety management practices are associated

[41] ICAO Annex 19, Safety Management, Second Edition, July 2016.

with better safety performance[42,43]. The maturity[44] of the SMS processes is decisive[45] for the amount of safety improvement that can be achieved with an SMS.

As confirmed by interviews, national regulation in some Member States already mandates the implementation of SMS for GHSPs.

According to the proposed GH regulation, the organisations providing GH services may continue to apply existing industry standards.

Based on the results in the survey and the interviews, it is assessed that 80 % of the large-sized GHSPs, see Table 4.1, already have the elements of the regulation in place, including an SMS. Small and medium-sized organisations will require more work to introduce the required elements of the proposed regulation. Based on the experience of the study team with the required introduction of SMS in other parts of the aviation industry (maintenance, aircraft operations, continued airworthiness and air navigation services), the numbers shown in Table 4.1 are expected to be a proper estimate of the level of implementation.

Table 4.1: Level of SMS implementation per GHSP category[46]

Category	Adequate SMS	Partially adequate SMS	No SMS
Small organisations	10 %	50 %	40 %
Medium organisations	50 %	30 %	20 %
Large organisations	80 %	20 %	0 %

For the GHSPs that do not yet have an SMS that meets the requirements, the following effects are expected:

— According to ORGH.MGMT.200, the SMS should contain a process to promote safety within the organisation, with the purpose of fostering a safety culture within the organisation. This safety promotion shall include means for safety communication that ensures that personnel are fully aware of the safety management system components and convey safety-critical information. Hence, additional communication could be necessary due to the implementation of the proposed regulation. This impacts the delivery system ‘communication’ directly after the implementation.

— Procedures related to the SMS activities are implemented or amended. This impacts the delivery system ‘procedures’ directly after implementation of the SMS.

— As a result of safety risk management, the operational procedures may be amended. A functional SMS will identify and mitigate safety risks in the operation. This has an impact on the

42 Shannon, H.S., Mayr, J., Haines, T. (1997). Overview of relationships between organisational and workplace factors and injury rates. Safety Science 26, pp. 202-217.

43 Mearns, K., Whitaker, S., Flin, R. (2003). Safety climate, safety management practices and safety performance in offshore environments. Safety Science 41, pp. 641-680.

44 EASA distinguishes four SMS maturity levels: Present, Suitable, Operational, and Effective.

45 Kaspers, S., Karanikas, N., Piric, S., Van Aalst, R., De Boer, R.J., Roelen, A.L.C. (2017) Measuring safety in aviation: Empirical results about the relation between safety outcomes and safety management system processes, operational activities and demographic data. In procedures of the seventh international conference on performance, safety and robustness in complex systems and applications, pp. 9-16.

46 Adequate means that the SMS meets all the requirements of the proposed regulation.

delivery system 'procedures' provided that these safety risks exist. The impact on 'procedures' will be obtained some time after the implementation.

— It is expected that the SMS will have a positive effect on the delivery system 'commitment'. When the organisation is able to internalise the safety policy such that it is understood and supported by all personnel, a positive effect of the SMS on the safety commitment is expected. Negative effects of SMS on commitment are not foreseen. The impact on commitment will occur some time after the implementation.

— In order to operate a functional SMS, the proposed GH regulation requires a number of additional managerial and administrative activities that need to be executed: a person responsible for safety management, a safety reporting system for its personnel, analysis and feedback on safety reports and documentation activities. These additional activities affect the delivery system 'availability'. These additional activities will be performed directly after implementation of the SMS.

4.1.2 GH manual

According to the proposed GH regulation, the GHSP shall develop a GH manual and operate in accordance with that manual. Such manual shall contain all necessary instructions, information and procedures for the service personnel to perform their duties. The aircraft operator remains responsible for developing the standard operational procedures (SOPs) for its aircraft. The GHSP must apply those procedures. This results in the GHSP having several sets of different SOPs, one for each aircraft operator to which it provides services. The GHSP may include all these different elements into a single document — a comprehensive GH manual — or decide to have separate volumes, with individual SOPs for each aircraft operator, all being part of the GH manual.

According to the proposed GH regulation, the GH manual content may be based on, or refer to, industry standards. Hence, it is most likely that the GHSPs that apply industry standards (developed by IATA or IBAC) already meet the requirements related to the GH manual. Based on the results from the survey and the interviews, it is estimated that all GHSPs have a manual in some form, but it may not necessarily meet all the requirements of the proposed GH regulation. From the interviews and survey the percentages shown in Table 4.2 are the proper estimates of the level of implementation of the requirements for the GH manual.

Table 4.2: Level of GH manual implementation per GHSP category[47]

Category	Adequate GH manual	Partially adequate GH manual	No GH manual
Small organisations	80 %	20 %	0 %
Medium organisations	90 %	10 %	0 %
Large organisations	100 %	0 %	0 %

For the GHSPs that do not meet the requirements of the proposed GH regulation, the implementation of a GH manual will likely result in the following effects:

— An extended set of procedures, including procedures for more activities and providing more details. It can also be expected that the proposed regulation will result in increased

[47] Adequate means that the GH manual meets all the requirements of the proposed GH regulation.

harmonisation of the procedures of the GHSPs, because the requirements for the manuals are explicitly described. Because of the increased harmonisation, adherence to procedures is expected to improve. This impacts the delivery system 'procedures'. This effect will be visible over time.

— The proposed regulation requires that the GH manuals shall be kept up to date and records shall be kept of the GH manual and procedures, for as long as they are used by the GHSP at that station, and of the air operator instructions and procedures of that particular aircraft operator. This is an additional administrative task that impacts the delivery system 'availability' and the effect will be visible directly after implementation.

4.1.3 Training programme for GH personnel

According to the proposed GH regulation, the GHSP shall use only trained and qualified personnel and shall ensure the implementation and maintenance of a training and assessment programme based on the development of competencies.

Based on the results from the survey and the interviews, it is expected that all GHSPs ensure that their personnel are properly trained and the GHSPs have therefore some sort of training programme, but it may not necessarily be meeting the requirements of the proposed regulation. From the interviews and survey the percentages shown in Table 4. are the proper estimates of the level of implementation of the requirements for the training programme.

Table 4.3: Level of training programme implementation per GHSP category[48]

Category	Adequate training programme	Partially adequate training programme	No training programme
Small organisations	80 %	20 %	0 %
Medium organisations	90 %	10 %	0 %
Large organisations	100 %	0 %	0 %

For the GHSPs that do not have a training programme that will meet the requirements of the proposed GH regulation, the implementation of such a training programme will have the following effects:

— A training programme will have a direct effect on the competence of personnel (delivery system 'competence'). Although many GHSPs will already have some sort of training programme for personnel, it is expected that this part of the proposed regulation will result in the need for GHSPs to provide additional training (initial and/or recurrent) for (a part of) their employees. This effect will be visible over time.

— Additional tasks need to be performed with regard to the development, provision and record-keeping of training. Additionally, every personnel that is undergoing training (other than on-the-job training) is temporarily not operationally available.

This has an impact on the delivery system 'availability' and the effect will be visible directly after implementation.

[48] Adequate means that the training programme meets all the requirements of the proposed regulation.

4.1.4 Ground support equipment (GSE) maintenance programme

Servicing of aircraft on the ground involves the use of different types of GSE, motorised and non-motorised. The proposed regulation requires the GHSP to have a process to ensure that the GSE used for the provision of GH services is serviceable and in good condition. Therefore, the GHSP shall establish and implement a maintenance programme, which includes preventive maintenance where appropriate, to maintain the systems and equipment necessary for the provision of GH services in a state of operation that does not impair the safety, regularity of efficiency of operations.

From the interviews and survey the percentages shown in Table 4.4 are the proper estimates of the level of implementation of the requirements for the GSE maintenance programme.

Table 4.4: Level of GSE maintenance programme implementation per GHSP category[49]

Category	Adequate GSE maintenance programme	Partially adequate GSE maintenance programme	No GSE maintenance programme
Small organisations	80 %	20 %	0 %
Medium organisations	90 %	10 %	0 %
Large organisations	100 %	0 %	0 %

For the GHSPs for which a GSE maintenance programme is going to be established, the following effects can be identified:

— The maintenance programme can impact the serviceability and improper functioning of the GSE. Hence, it impacts the delivery system 'maintenance'. The effect will occur over time.

— In order to implement a GSE maintenance programme, the proposed regulation describes a number of managerial and administrative activities that need to be executed, which impacts the delivery system 'availability', and the effect will be visible directly after implementation. Within the GHSP a person shall be responsible for the monitoring of the GSE operation and maintenance. Records shall be kept regarding the vehicle authorisations and vehicle maintenance records, for at least 4 years after a vehicle is removed from operations.

4.1.5 Oversight

According to the proposed GH regulation, the NCA designated by the Member State in which the aerodrome is located shall be responsible for the oversight of the organisations providing GH services at that/those aerodrome(s) and for receiving declarations from those organisations. With the application of the cooperative oversight principles, the competent authorities will cooperate and share some tasks to ensure that GH organisations operating in more than one Member State will be overseen in an efficient manner and to avoid multiplying the audits and inspections of the same management system elements in each country.

Oversight of GH activities is currently organised differently across EASA Member States. In some Member States, oversight is performed indirectly by the competent authority under Regulation (EU) No 965/2012 on air operations, namely using ORO.GEN.205 *Contracted activities*, and ORO.GEN.110 *Operator responsibilities*, particularly points (b), (e), (f), (j). In other Member States, approval and

[49] Adequate means that the GSE maintenance programme meets all the requirements of the proposed GH regulation.

oversight of GHSPs by the NCA is laid down in national legislation. In 2 of 30 EASA Member States the NCA already performs direct safety oversight of the GHSPs.

The function of oversight is to verify that safety regulatory objectives and requirements are actually met. Organisations may be intrinsically motivated to meet regulatory objectives and requirements but this cannot be taken for granted, and even if organisations are willing to be compliant, they may not always perform as per the established requirements.

According to the proposed GH regulation, the NCA of the state where an aerodrome is located shall be responsible to perform oversight of the GHSPs that provide services on the aerodrome in order to verify that the requirements from the proposed regulation are actually met. Hence, the NCA must perform oversight tasks and associated administration. Additionally, participating in the oversight activities requires time for the GHSP. Hence, oversight has an effect on the delivery system 'availability'. These activities will be performed once the proposed GH regulation becomes applicable.

Today, aircraft operators are required to exercise a significant amount of control over GHSP under the requirements of Regulation (EU) No 965/2012 (namely ORO.GEN.205) for contracted services. The purpose of this rule was to ensure that those organisations that were not regulated under another regulation would be subject to a certain degree of control, placing them under the responsibility and 'approval' of air operators.

RMT.0728 proposes some clarifications to this rule to enable aircraft operators to reduce the number of audits to GHSPs and take into account the results of audits and inspections performed to GHSPs by their competent authorities. It is expected that in time the number of audits to GHSPs will reduce and the oversight will rely on a risk-based approach.

The effect of oversight by the NCA on the behaviour of organisations is virtually impossible to measure and there is a lack of empirical evidence on the effect of oversight on the functioning of organisations[50,51]. Although there are multiple examples of undesirable organisational behaviour despite or even because of the way safety oversight was conducted, there are hardly any documented examples of organisations that perform exemplarily because of safety oversight. Nevertheless, it can be expected that declaration and oversight will improve the process of implementation of the regulatory requirements at the GHSP. The rate of implementation as well as the thoroughness of the implementation will benefit from oversight. Therefore, the effect of oversight (except for the effect on the delivery system 'availability') is directly incorporated in the impacts of the other elements of the regulation, i.e. SMS, training programme, GH manual, sharing of safety data and GSE maintenance programme.

4.2. Data collection

The quantification of impacts is done following an iterative process deepening the analysis of the most relevant impacts and with data gathered via several sources of information:

— literature containing data and information on the potential impacts;

[50] Hansen, M., McAndrews, C., Berkeley, E. (2008). History of aviation oversight in the United States. DOT/FAA/AR-08/39, Federal Aviation Administration.

[51] Van Erp, J., Huisman, W. Van der Bunt, H., Ponsaers, P. (2008). Toezicht en compliance. Tijdschift voor Criminologie (50) 2, pp. 83-95.

— data collected for the purpose of this study (see Attachment E);

— information obtained through in-depth interviews;

— information obtained through a survey.

Literature

Over the course of this study, literature was collected consisting of regulations, industry standards, scientific publications, (contract) research reports, annual reports, position papers and newspaper articles that were regarded as being relevant for this study. Attachment A provides a list of the references used.

Data collected for the purpose of this study (see Attachment E)

Social and economic indicators were collected for various stakeholder groups in aviation. The following results are used in this impact assessment:

— number of GHSPs;

— number of GHSP employees and their age profile;

— average wage of GHSP employees;

— total revenue of GHSPs;

— profit margin of GHSPs;

— number of NCA employees;

— average wage of NCA employees;

— total budget of NCAs.

Interviews

The stakeholders listed in Table 4.5 were consulted via interviews. In total 14 interviews were conducted. The interviews were semi-structured interviews conducted with one, two or three representatives of the organisations presented in Table 4.5 and two members of the study team. The interviews were held via Microsoft Teams and took between 1 and 1.5 hours. Minutes were taken of each interview and shared with the interviewees for review.

Table 4.5: List of organisations that were interviewed

Organisation	Date of interview
KLM ground services	30 March 2022
IAA (NCA Ireland)	13 June 2022
Airport Services Association (ASA)	22 June 2022
Air Dispatch[52]	4 July 2022
RCAA (NCA Romania)	5 July 2022
IBAC	7 July 2022
Airlines for Europe	15 July 2022
ULC (NCA Poland)	19 July 2022
Swissport	25 July 2022

[52] This interview was held via an email exchange.

Organisation	Date of interview
DGAC (NCA France)	28 July 2022
LGS Handling Ltd	29 July 2022
IATA	9 August 2022
Employment agency Werk&Ik (Netherlands)	16 August 2022
ACI Europe	23 August 2022

Survey

The data for Attachment E was mainly obtained via a survey among the GHSPs and NCAs. To obtain additional information for this impact assessment, supplementary questions were sent to the GHSPs that responded to the survey and provided contact details.

Social impact validation session

To assess the social impacts, the social impact assessment methodology was prescribed by EASA.

Attachment C provides additional information on the stakeholder consultation that was performed during this study.

5. Assessment of the impacts

In this chapter, the impacts of Option 1 (the proposed GH regulation) relative to Option 0 ('no change in the current policy') are assessed in terms of safety, economy, society and environment.

As a result of the proposed GH regulation, it is expected that the GHSPs will be regarded as an aviation stakeholder rather than as a contractor. This is welcomed by many organisations including the European social partners[53].The proposed GH regulation could create the first steps towards building an improved social status of GH personnel[54].

The proposed GH regulation puts safety-related requirements on a number of activities of the GHSPs, including safety management and the training of personnel. The NCAs provide oversight to ensure that the requirements of the proposed GH regulation are complied with. This combination means that GHSPs cannot endlessly cut costs in order to stay competitive. Therefore, the proposed GH regulation is expected to put a brake on the 'race to the bottom'.

The requirements of the proposed GH regulation alone are not sufficient to achieve safety improvements. Whether safety improvements are actually achieved largely depends on the responsibility of the GHSPs and the interaction between the GHSPs and the NCAs. The proposed GH regulation is a facilitator for safety improvements. Standardisation audits conducted by EASA to the NCAs can play an important role in ensuring that the interpretation and implementation of the proposed GH regulation meets the overall objectives.

5.1. Safety impact assessment

According to the ICAO definition, safety is the state in which risks associated with aviation activities, related to, or in direct support of the operation of aircraft, are reduced and controlled to an acceptable level. In this definition, risk is the predicted probability and severity of the consequences or outcomes of a hazard, where a hazard is a condition or an object with the potential to cause or contribute to an aircraft incident or accident.

An accident is defined[55] as an occurrence associated with the operation of an aircraft which takes place between the time any person boards the aircraft with the intention of flight until such time as all such persons have disembarked, in which:

*1. **a person is fatally or seriously injured** as a result of:*

- *being in the aircraft, or*
- ***direct contact with any part of the aircraft**, including parts which have become detached from the aircraft, or*
- ***direct exposure to jet blast**,*

[53] See interviews and ACI Europe, ASA and ETF (2018), Market Access, Social Conditions, Training, Qualifications and Quality Standards in the Ground Handling Industry, February 2018.

[54] See the Concept Papers and the GH Roadmap published by EASA in 2019 for the first GH Conference organised by EASA on the GH topic..

[55] See ICAO Annex 13.

- *except when the injuries are from natural causes, self-inflicted or inflicted by other persons, or when the injuries are to stowaways hiding outside the areas normally available to the passengers and crew; or*

2. the ***aircraft sustains damage or structural failure*** *which:*

- *adversely affects the structural strength, performance or flight characteristics of the aircraft, and*
- *would normally require major repair or replacement of the affected component,*
- *except for engine failure or damage, when the damage is limited to a single engine, (including its cowlings or accessories), to propellers, wing tips, antennas, probes, vanes, tires, brakes, wheels, fairings, panels, landing gear doors, windscreens, the aircraft skin (such as small dents or puncture holes), or for minor damages to main rotor blades, tail rotor blades, landing gear, and those resulting from hail or bird strike (including holes in the radome);*

3. the aircraft is missing or is completely inaccessible.

Based on these definitions, the indicator of safety is the probability of an aircraft accident. To make the indicator of safety independent from the total number of flights, the indicator is normalised by calculating the rate, i.e. the probability of an aircraft accident per flight.

Some publications use the number of reported occurrences as an indicator of safety, but this is problematic because an increase in the number of reported occurrences can be a result of an increase of the actual number of occurrences (suggesting a safety reduction) or an increase of the reporting rate (suggesting an improved reporting culture, which is positive for safety).

GH services and safety

Aviation safety is the result of all actions taken to prevent accidents, errors or unintentional defects in the design, construction, maintenance and operation of aircraft.

Aviation safety is influenced through the following five delivery systems:

— **Communication.** The rules propose that GH organisations will be required to have a (safety) management system. The SMS must contain a process to promote safety within the organisation, with the purpose of fostering a safety culture within the organisation. Consequently, safety communication raises personnel awareness of safety risks and what role and responsibilities they have with regard to the safety of their own activities. The raised awareness will lead to improved detection, reporting and resolution of hazards.

— **Procedures.** Procedures mitigate hazards and reduce safety risks. Non-adherence to procedures is often mentioned in accident investigation reports as part of the accident sequence of events. In a risk identification conducted with GHSPs at Amsterdam Airport Schiphol[56], non-adherence to procedures was listed as the top hazard (in terms of associated level of risk) with the highest risk at Schiphol[57]. However, there is sufficient anecdotal evidence that personnel sometimes deviate from procedures because the operating procedures are perceived to be too rigid or

[56] NLR (2008). Smeltink, J.W., Balk, A.D., Roelen, A.L.C. Risk assessment Ground Handling Schiphol for the Expert Group Ground Safety of the Safety Platform Schiphol, CR-2008-169.

[57] NLR (2021). Balk, A.D., Roelen, A.L.C., Smeltink, J.W., Heerma van Voss, G.J.J., Tanis, J.W.J. Study on social conditions and safety in ground handling at Amsterdam Airport Schiphol, CR-2021-067.

impractical[58]. The lack of harmonisation of operating procedures for GH across aircraft operators is frequently mentioned by GH organisations as problematic and a cause of error.

— **Commitment.** Commitment to safety is the foundation for an organisation to have or build a healthy safety culture[59]. Safety culture generally contributes to aviation safety[60,61]. It is considered a prerequisite for safety knowledge and awareness, which in turn influences safety-related behaviour and the safety performance of an organisation[62,63,64]. Literature links safety culture to the safety performance of GH activities[65,66]. Interviewees for the NLR/ECORYS study, as well as interviews conducted in the context of a study on social conditions and safety at Amsterdam Airport Schiphol[67] confirm that the pursuit of a just culture as part of the safety culture is seen as one of the most important factors to prevent incidents that are a risk to flight safety.

— **Competence.** A GH employee should have sufficient knowledge and skills and appropriate attitude to perform the required tasks. Lack of competence due to lack of training has been identified as a cause of or a contributing factor in safety-related occurrences.

— **Maintenance.** Servicing of aircraft on the ground involves the use of different types of GSE, motorised and non-motorised, which either operate in close proximity to persons or the aircraft or in direct contact with it. Maintenance deficiencies with the potential to inflict aircraft damage include defects of brakes, couplings, proximity sensors, protective covers/bumpers, safety stops, etc. Defective GSE (due to lack of or incorrect maintenance) can lead to aircraft damage. When the aircraft damage is not detected and not repaired before flight this can lead to an aviation safety event. In any case, aircraft damage is regarded as a cost. Analysis of the European Risk Classification Scheme (ERCS) score of occurrences in the 2021 EASA Annual Safety Review[68] shows that 'serviceability of vehicles (motorised GSE)' is in the top fifteen causes of occurrences related to aerodrome operations and GH. According to a study among seven GHSPs in the Netherlands[69], issues with equipment, tools or safety equipment is the third highest factor that

58 Dekker, S. (2001) The field guide to human error. Cambridge University Press.

59 NLR (2016). Balk, A.D., ASC-IT: Seven steps to improve your safety culture, CR-2016-228.

60 Sexton, J.B. & Klinect, J.R. (2001). The link between safety attitudes and observed performance in flight operations. In: Proceedings of the Eleventh International Symposium on Aviation Psychology, Columbus, OH, Ohio State University.

61 Harvey, J., Erdos, G., Bolam, H., Cox, M. A. A., Kennedy, J. N. P., and Gregory, D. T. (2002). An Analysis of Safety Culture Attitudes in a Highly Regulated Environment, Work and Stress, 16, 1, 18-36.

62 Neal, A. & Griffin, M.A. (2004). Safety climate and safety at work. In Barling, J. & Fone. N.R. (Eds). The psychology of workplace safety. American Psychological Association, Washington, DC.

63 Christian, M.F., Bradley, J.C., Wallace, J.C., Burke, M.J. (2009). Workplace safety: a meta-analysis of the roles of person and situation factors. Journal of Applied Psychology, Vol. 94, No. 5, 1103–1127.

64 Clarke, S. (2010) An Integrative Model of Safety Climate: Linking Psychological Climate and Work Attitudes to Individual Safety Outcomes Using Meta-Analysis, Journal of Occupational and Organisational Psychology, 83, 553-578.

65 Government Accountability Office (2007). Aviation Runway and Ramp Safety. Sustained Efforts to Address Leadership, Technology, and Other Challenges Needed to Reduce Accidents and Incidents. GAO-08-29. United States Government Accountability Office, Washington, DC.

66 NLR (2010). Balk, A.D., Bossenbroek, J.W. Aircraft ground handling and human factors, A comparative study of the perceptions by ramp staff and management, CR-2010-125.

67 NLR (2021). Balk, A.D., Roelen, A.L.C., Smeltink, J.W., Heerma van Voss, G.J.J., Tanis, J.W.J. Study on social conditions and safety in ground handling at Amsterdam Airport Schiphol, CR-2021-067.

68 EASA Annual Safety Review 2021: https://www.easa.europa.eu/downloads/130515/en

69 NLR (2010). Balk, A.D., Bossenbroek, J.W. Aircraft ground handling and human factors, A comparative study of the perceptions by ramp staff and management, CR-2010-125.

contributes to accidents, incidents and human errors on the ramp. In this study, deficient maintenance, unreliable or unsafe equipment, tools or safety equipment are considered by both management and operational personnel factors that may contribute to errors.

Sharing of safety data between GH organisations, aircraft operators and aerodrome operators

The reporting of occurrences and the establishment of a safety reporting system are relevant in the context of GH. The requirements associated with occurrence reporting and the safety reporting system are mainly specified in ORGH.GEN.160 and ORGH.GEN.165. The mirroring rule in Regulation (EU) No 965/2012 is now in NPA 2022-11 under ORO.GEN.160 and in a proposed amendment under this rulemaking task (RMT.0728) to ORO.GEN.150. The aerodrome rules are also proposed to be aligned in that regard.

According to the proposed rules, GH organisations, aerodrome operators, and aircraft operators to which the GHSP provides services at that aerodrome shall ensure close coordination and communication of safety relevant information to improve and maintain safe operations. The GH organisations shall participate in the safety programmes established by the aerodrome operator as per ADR.OR.D.027 and contribute to the exchange of safety relevant information and safety promotion activities implemented at the aerodrome where they provide services.

During the interviews conducted by NLR/ECORYS for the impact assessment, it was emphasised that aircraft operators and GH organisations periodically have meetings in which the performance of the GH organisations is discussed as part of the service level agreement. In these discussions, safety issues are also addressed. The Luton Safety Stack[70] and the Integral Safety Management System (ISMS) at the Schiphol airport[71] are examples of more extensive collaboration between the parties at an aerodrome with the purpose of improving safety. However, sharing of safety data and the discussion of safety issues it not systematically done at all aerodromes. Based on the results of the interviews and the survey, it is assessed that the percentages shown in the table below are a proper estimate of the level of implementation of the requirements for the sharing of safety data.

Table 5.1: Level of sharing of safety data per GHSP category

Category	Adequate sharing of safety data	Partially adequate sharing of safety data	No sharing of safety data
Small organisations	0 %	60 %	40 %
Medium organisations	0 %	80 %	20 %
Large organisations	0 %	100 %	0 %

It is expected that the sharing of safety relevant information between GH organisations, the aerodrome operator and the aircraft operators will result in:

— additional communications about safety relevant issues and more attention given to safety assessments from GHSPs. This has an effect on the delivery system ‘communication’ and the effect will occur over time;

70 See, for example, EASA’s ‘Working Paper on draft Ground Handling Regulation’.

71 See the ISMS website: https://integralsafetyschiphol.com/

— more attention paid to safety which will improve the commitment towards safety (delivery system 'commitment'). The effect will occur over time;

— sharing of safety data. This can be done, besides distribution of written material and written communication, in periodic meetings in which safety data is shared and discussed. The aerodrome operator, the GHSPs and the aircraft operators on that aerodrome are expected to participate in these meetings. This has an effect on the delivery system 'availability', and the effect will occur directly after implementation.

SMS implementation

Mandatory SMS requirements, training to GH personnel, and no-touch policy or equipage with proximity sensors of the GSE to prevent aircraft damage are expected to increase the safety awareness of GH personnel, enhance the understanding of their role in the whole aviation safety chain, and highlight the importance of using safety reporting to improve safety in daily operations. The important just culture component of the safety culture developed within the SMS is expected to improve the reporting culture and encourage individuals to report unsafe situations without the fear of retribution from the organisation.

Conclusion

It is expected that the level of safety will increase as a consequence of the elements described above. However, providing a quantitative estimate of how much safety improvement is expected to be achieved with the implementation of the new GH Regulation is difficult due to lack of analysis of the ECR occurrence reports. A better assessment of the safety impact will be obtained after a thorough analysis of the safety data provided in Section 2.1 as well as the monitoring of indicators for the implementation of the GH regulation in the first 5 years after its implementation.

Therefore, a conservative qualitative assessment is provided instead.

A low positive impact on safety is expected as an effect of the implementation of the new GH regulation with the safety elements and mitigations described above.

Main contributors to safety proposed by the draft GH Regulation	**Score**
1. SMS implementation. This includes: — SMS training; — safety culture with the just culture component; — reporting culture. 2. Sharing of safety relevant information among GHSPs, aerodrome operators and aircraft operators 3. Training based on the development of competencies 4. No-touch policy or equipage of GSE with proximity sensors	**+2 (low positive)**

5.2. Economic impact

The economic impact is measured on a scale relative to change in the total turnover per stakeholder group. A change of 1.5 % of the total turnover for a stakeholder group is regarded as a very high impact.

To assess the economic impact for GHSPs and NCAs, a total annual turnover has to be determined for both stakeholder groups. Based on the results of Task 2 (see Attachment E), it is estimated that for 2019 the total annual turnover for the GHSPs was approximately EUR 19 billion and the total annual budget for the NCAs was EUR 2.5 billion. The values for 2019 are chosen to represent the normal situation (i.e. excluding the COVID-19 years).

The scale used for the economic impact assessment ranges from -10 to +10 as presented in Table 5.2. A decrease in costs (or increase in benefits) is indicated by a plus sign. An increase in costs (or decrease in benefits) is indicated by a minus sign.

Table 5.2: Scale for the economic impact on GHSPs and NCAs. The impact can be a positive impact (+) or a negative impact (-). The total annual turnover for the GHSPs is EUR 19 billion and the total annual budget for the NCAs is EUR 2.5 billion

Score	Qualitative description	Relative change to total annual turnover/budget	GHSP impact (in million €)	NCA impact (in million €)
10	Extremely high impact	>1.50 %	> 527.3	> 40.4
9	Very high impact	1.50 %	527.3	40.4
8		1.00 %	351.5	26.9
7	High impact	0.80 %	281.2	21.6
6		0.60 %	210.9	16.2
5	Medium impact	0.40 %	140.6	10.8
4		0.20 %	70.3	5.4
3	Low impact	0.10 %	35.2	2.7
2		0.05 %	17.6	1.3
1	Very low impact	0.02 %	7.0	0.5
0	Neutral impact	0.01 %	3.5	0.3

Note:

This scale is based on an economic scale developed with the EASA Stakeholder Advisory Body (SAB) before the COVID-19 pandemic. Therefore, the scale is used as guidance and has to be put into context. This Opinion proposes a transition period of 3 years to enable affected stakeholders to prepare for the full implementation of the new GH regulation. It is assumed that by that time the stakeholders in the scope of this regulation will have recovered from the economic losses caused by the COVID-19 pandemic in terms of flights and financial situation.

The economic impact consists of changes in costs and benefits for the various organisations in order to comply with the proposed GH regulation. This includes:

— the development (one-off) costs for compliance with the proposed GH regulation;

(*EASA intends to monitor the implementation of the GH Regulation and collect data related to the costs of implementation.)*

— the operating (yearly) costs and benefits resulting from changed operation as a result of the proposed GH regulation;

— the level playing field that is related to the concept that each organisation is required to operate under the same set of rules;

— the proportionality issues.

The economic costs and benefits are influenced via the following six delivery systems:

— **Communication.** According to the proposed GH regulation, the GHSP will be required to have a (safety) management system (see ORGH.MGMT.200). The SMS must contain a process to promote safety within the organisation, with the purpose of fostering a safety culture within the organisation. As a consequence, safety communication raises personnel awareness of safety risks and what role and responsibilities they have with regard to the safety of their own activities. The raised awareness will lead to improved detection, reporting and resolution of issues in order to prevent occurrences such as aircraft damage.

— **Procedures.** Procedures mitigate hazards and reduce the safety risks. Procedures are especially useful for predictable processes. The lack of harmonisation of operating procedures for GH across aircraft operators is frequently mentioned by GHSPs as problematic and a cause for error which could result in aircraft damage or a reduction in punctuality.

— **Commitment.** Commitment to safety is the foundation for an organisation to have or to build a healthy safety culture. Safety culture is considered a prerequisite for safety knowledge and awareness, which in turn influences safety-related behaviour and an organisation’s safety performance. Better safety performance can result in a reduction of aircraft damage.

— **Availability.** The additional managerial and administrative activities caused by the proposed GH regulation have an impact on the costs of supporting personnel because additional employees need to be hired to execute these activities. There is no change in operational personnel expected.

— **Competence.** Every GH employee will be subject to a safety training programme. A change in the training programme can result in a change in training costs. Additionally, better trained personnel can improve the (safety) performance resulting in a reduction of aircraft damage or an increased punctuality.

— **Maintenance.** Servicing of aircraft on the ground involves the use of different types of GSE, motorised and non-motorised, which either operate in close proximity to persons or the aircraft or in direct contact with it. Maintenance deficiencies with the potential to inflict aircraft damage include defects of brakes, couplings, proximity sensors, protective covers/ bumpers, safety stops, etc. Defective GSE (due to lack of or incorrect maintenance) can lead to aircraft damage and, potentially, delays.

To calculate the personnel costs (compliance and operating costs) caused by the proposed GH regulation, the following two-step approach is used for each activity.

Step 1: Market size and distribution

The market size is estimated based on statistics, which are referred to in Attachment E, and the resulting number of GH organisations per size class (small, medium and large) in the EASA Member States as presented below in Table 5.3 (and also in Table 2.2).

Table 5.3: Number of GH organisations in Europe

Organisation type	Average number of employees	Number of organisations	
		Lower bound	Upper bound
Small organisations	25	595	1 784
Medium organisations	150	119	238
Large organisations	2 900	42	42
Total		**755**	**2 063**

This table is used as the basis for estimating the different economic impacts and is therefore similar for every impact category. Attachments E and F contain more detailed explanations of the information being used.

Step 2: Estimating the impact of the requirements

The impacts of the required activities are estimated or described. For instance, the change in personnel effort (in FTEs or man-days), training requirements, reduction of aircraft damage or level playing field are assessed.

Some of the GH organisations already have elements of the requirements in place. Therefore, a distinction is made between organisations that are adequately equipped, partially equipped or have no system/mechanism in place. For organisations that are estimated to already meet the proposed requirements, it is assumed that limited additional financial effort is needed. For organisations that do not yet meet the proposed requirements, the impacts of the requirements are estimated from the findings of the stakeholder consultation. For organisations that are estimated to partially meet the proposed requirements, the additional effort is assumed to be one third of the effort for organisations that do not meet the proposed requirements at all.

5.2.1 Development costs

The development costs are related to developing the necessary elements to meet the proposed requirements**. These costs are only incurred during the proposed 3-year transition period.** The different cost components are borne by different stakeholders.

For the GHSP:

— personnel costs for developing and implementing the SMS;

— personnel costs for developing and setting up the GH manual;

— personnel costs for developing and implementing the training programme;

— personnel costs for developing and implementing the GSE maintenance programme.

For the NCA:

— personnel costs for developing and implementing the oversight programme on GHSPs;

— costs incurred by the training of inspectors to perform the oversight.

The costs are based on stakeholder consultation findings (both interviews and survey results) and are incurred during the proposed 3-year transition period.

For the NCAs it is estimated that on average 1.0 FTE is needed to develop and implement an adequate oversight programme. Currently, about 2 out of 31 NCAs already perform safety oversight on GHSPs, which is assumed to be adequate with the proposed requirements. In Table the yearly impact is presented.

Table 5.4: Yearly effort (in FTE) for developing and implementing the proposed requirements

Type/size of the organisation	Not adequate	Partially adequate	Adequate
GHSP			
Small	1.0 FTE	0.3 FTE	0.0 FTE
Medium	2.0 FTE	0.7 FTE	0.0 FTE
Large	3.0 FTE	1.0 FTE	0.0 FTE
NCA			
No size differentiation	1.0 FTE	n/a	0.0 FTE

To calculate the total development costs during the proposed transition period, the FTEs in Table are multiplied with the number of organisations of the different sizes and the personnel costs per FTE as determined in Task 2. The results are presented in Table 5.5. **While the time horizon for the impact assessment is 10 years, the development costs only incur during the proposed transition period of 3 years.** In Table 5.5 the yearly impact per organisation and the total yearly impact are presented.

Table 5.5: Total yearly development costs for GHSPs and NCAs in EASA Member States

	Annual impact (during proposed transition period)	
(Sub) indicator	Per organisation (+/-)	Total for all EASA Member States
Economic impact for GHSPs	€23 000	€17 – €47 million
Economic impact for NCAs	€45 000 - €85 000	€1 - €2 million
Total economic impact	€50 000 - €102 000	€18 – €50 million

5.2.2 Operating costs and benefits

Several possible changes are foreseen in operation, which could lead to a change in recurring (yearly) costs. The different cost components are split between stakeholders.

For the GHSP:

— change in personnel costs due to the implementation of SMS;

— change in personnel costs due to the implementation of the training programme;

— change in personnel costs due to the implementation of the GSE maintenance programme;

— change in personnel costs due to preparation of and participation in audits (this was not qualified in the impact assessment because of lack of information);

— change in personnel costs due to lost time injury reduction.

For the aircraft operator:

— change in costs as a result of aircraft damage;

— change in costs as a result of fewer audits to the contracted GHSPs;

— change in costs as a result of change in punctuality.

For aerodrome operator:

— nil

For the NCA:

— change in personnel costs due to performing oversight on the GHSPs;

— change in personnel costs for training of NCA employees to perform oversight of GH.

The economic impacts are described in more detail below.

It is to note, however, that there could be significant differences between competent authorities in the estimated costs listed above and the effective costs, as these depend on the number of aerodromes in the scope of the regulation and the number of GH organisations to be overseen in each Member State, as well as the size of their operation and the type of GH services they provide. This difference can be noticed in the estimated number of inspectors in the case studies provided below. It should be kept in mind that at the time when the impact assessment was performed, there was limited information available for competent authorities in terms of GH organisations operating in their States. Also, the different estimations provided in the case studies could result from the current oversight of the GH domain performed in the studied cases. Moreover, the earlier version of the draft GH regulation had not been consulted with the affected stakeholders yet and therefore did not yet incorporate their feedback received during the consultation sessions in 2022 and 2023.

EASA review of the NLR/ECORYS on the point 'change in personnel costs due to preparation of and participation in audits'

The decrease of audits is not quantified in this impact assessment due to the lack of information. However, this is one of the specific objectives of the proposed new GH regulation. The decrease of audits will be measured through monitoring indicators.

Implementation of the SMS (GHSP)

The estimation of the impact of the SMS implementation is based on the stakeholder consultation findings (both interviews and survey results). The FTEs presented in Table 5.6 are incurred after the transition period, when the SMS is operational.

Table 5.6: Yearly impact (in FTEs) of the SMS implementation per organisation

Size of the organisation	Not adequate	Partially adequate	Adequate
Small	1.0 FTE	0.3 FTE	0 FTE
Medium	1.5 FTE	0.5 FTE	0 FTE
Large	2.0 FTE	0.7 FTE	0 FTE

To calculate the total operating costs, the FTEs in Table 5.6 are multiplied with the number of organisations of the different sizes and the personnel costs per FTE as determined in Task 2. The results are presented in Table 5.7, which shows the yearly impact per organisation and the total yearly impact.

Table 5.7: Annual economic impact of execution of the SMS

	Annual impact	
(Sub) indicator	**Per organisation (+/-)**	**Total for all EASA Member States**
Execution of the SMS	€10 000	€7 – €20 million

However, it must be kept in mind that the proposed rules require an SMS that is scalable to the size of an organisation and complexity of the GH service. It is therefore not expected that a GH organisation providing, for example, only ground transportation of passengers for non-commercial flights using a regular car or an organisation providing only aircraft cleaning services or providing only ground supervision to have the same costs for SMS implementation as a large organisation providing multiple and complex GH services.

Implementation of the training programme (GHSP)

According to the proposed regulation, each GH employee will be subject to a safety training programme. In case the GHSP has no existing training programme, the required GH training will take approximately 4 man-days per employee. Because of the high turnover rate of employees, this is considered a yearly recurrent effort. In case the GHSP has an existing training programme that does not meet the requirements of the proposed regulation, 1 man-day per employee is assumed. This translates in the following effort per organisation:

Table 5.8: Yearly impact (in man-days) to implement the training programme

Size of the organisation	Not adequate	Partially adequate	Adequate
Small (average 25 employees)	100 man-days	100 man-days	0 man-days
Medium (average 150 employees)	600 man-days	750 man-days	0 man-days
Large (average 4 500 employees)	22 500 man-days	18 000 man-days	0 man-days

To calculate the total operating costs, the efforts in Table 5.8 are multiplied with the number of organisations of the different sizes and the personnel costs per man-day as determined in Task 2 (see Attachment E). The results are presented in Table 5.9, which shows the yearly impact per organisation and the total yearly impact.

Table 5.9: Annual economic impact of the implementation of the training programme

	Annual impact	
(Sub) indicator	**Per organisation (+/-)**	**Total for all EASA Member States**
Change in costs of GHSP due to the implementation of the training programme	€5 000	€3 – €9 million

Implementation of the GSE maintenance programme (GHSP)

The implementation of a maintenance programme is expected to result in more effort required for preventive maintenance on the one hand, but in less effort required for unscheduled maintenance on the other hand. Overall, it is expected that these effects cancel each other out, so there is no net effect (see Table 5.10).

Table 5.10: Annual economic impact of the implementation of the GSE maintenance programme

	Annual impact	
(Sub) indicator	**Per organisation**	**Total for all EASA Member States**
Change in costs of GHSP due to the implementation of the GSE maintenance programme	Negligible	Negligible

Oversight (NCA and GHSPs)

According to the proposed GH regulation, the NCA designated by the Member State in which the aerodrome is located shall be responsible for performing oversight of the GHSPs in order to verify that the safety regulatory objectives and requirements are actually met.

The GHSPs expect that oversight audits from the NCA will come on top of the audits from the aircraft operator. In the future the audits performed by aircraft operators may reduce as a result of the audits from the NCAs and because Regulation (EU) No 965/2012 will also be amended under RMT.0728 to reduce the control/supervision of aircraft operators over the GH organisations that operate under a declaration regime. However, a reduction in the number of audits will not be felt immediately. It will happen gradually, if there is sufficient trust from aircraft operators in the quality and timeliness of the oversight performed by the NCA on the GHSPs. For this to fully materialise, it is necessary that mutual trust be built up among the relevant stakeholders, which will take time. Therefore, it is expected that a reduction in the number of audits to GH organisations will first be visible approximately 5 years after the entry into force of the regulation and will have a positive effect that will increase gradually. This effect was quantified.

From the interviews and survey results it was concluded that one audit takes about 2 days for the GHSP.

The interviewees estimated the required additional effort for the NCA to perform oversight on GHSPs to range between 0 and 20 FTEs. For this impact assessment it is assumed that on average 5 FTEs per NCA are needed (see Table 5.11).

However, it was not possible during the development of the impact assessment to define categories for different sizes of NCAs (e.g. small, medium, large). Chapter 6 showing the case studies indicates examples of different sizes of NCAs and the impact depending on the configuration of the GH sector in the country and the number of aerodromes in the scope.

Table 5.11: Yearly impact (in FTEs/man-days) of performing oversight (NCAs) and of oversight requirements (GHSPs)

Size of the organisation	Without existing oversight by NCA	With existing oversight by NCA
GHSP		
Small	2 man-days	0 man-days
Medium	4 man-days	0 man-days
Large	6 man-days	0 man-days
NCA		
No size differentiation	5 FTE	0 FTE

Table 5.12 slows the yearly impact per organisation and the total yearly impact for this requirement.

Table 5.12: Annual economic impact of performing oversight (NCAs) and of oversight requirements (GHSPs)

	Annual impact	
(Sub)indicator	Per organisation (+/-)	Total impact for all EASA Member States
NCA: Costs for oversight of the GHSPs	€200 000 - €400 000 for a proposed oversight cycle of 24 months. Or €100 000 – €200 000 for a proposed oversight cycle of 48 months.	€6 – €12 million Or €3 – €6 million
GHSP: Costs for oversight by the NCA	Negligible	€0 – €1 million

The initial cost estimation was based on the initial draft rules published in 2022 that proposed an oversight cycle of 24 months. Following the comments received on the first draft, the updated draft rules published in this Opinion propose an oversight cycle of 48 months, with the possibility to extend or reduce this cycle, based on the safety performance of the GH organisation. Consequently, the annual implementation costs of oversight for NCA would be reduced by half compared to the initial estimation.

As mentioned before, the reduction of costs generated by a reduction of the number of audits performed by aircraft operators to GHSPs (as a result of the proposed amendments to Regulation (EU) No 965/2012 and oversight responsibilities being taken over by NCAs) is not included in this assessment as there was insufficient data for this analysis.

Aircraft damage reduction

The Flight Safety Foundation estimated in 2004 that losses from aircraft damage inflicted during the provision of GH services cost USD 4 billion per year[72]. Using an annual inflation rate of 2.3 %, this is equivalent to USD 5.7 billion or EUR 5.1 billion (with an average dollar-euro exchange rate for 2019 of 0.9). In 2004, commercial airlines conducted 23.8 million flights globally, compared to 38.9 million

[72] Vandel, B. (2004). Equipment damage and human injury on the apron. Is it a cost of doing business? Paper presented at the 2004 annual seminar of the International Society of Air Safety Investigators, Australia

flights in 2019[73]. Correcting for the increased number of flights, the **estimated costs of aircraft damage** inflicted during the provision of GH services **in 2019 were EUR 8.3 billion**. This number is a combination of the **direct costs (costs for repair) and indirect costs (costs generated by aircraft unavailability during repairs).** According to the Flight Safety Foundation, indirect costs of aircraft damage typically run from 3 to 5 times the direct costs.

Based on an analysis of 500 occurrences of aircraft damage caused by GH activities between 2014 and 2020 at Amsterdam Airport Schiphol, the rate of aircraft damage in Europe was estimated at **1.6 occurrences per 10 000 aircraft movements**[74]. The order of magnitude of this rate was confirmed during an i**nterview with a GHSP where a maximum target of 3.3 occurrences per 10 000 aircraft movements** was mentioned.

In 2019, commercial airlines conducted 38.9 million flights globally[75]. This equals 77.8 million movements because a flight involves two movements (departure and arrival). With an average of 1.6 occurrences of aircraft damage per 10,= 000 movements, an **estimated 12 448 occurrences of aircraft damage happened in 2019**. With the overall estimated cost of aircraft damage due to GH of EUR 8.3 billion, this means that in 2019 the average cost of a single event of aircraft damage due to GH activities was EUR 667 000. This includes direct and indirect costs of aircraft damage.

In 2019, there were 7 million commercial passenger aircraft departures in Europe, and 200 000 cargo aircraft departures[76]. This corresponds to a total of 14 400 000 aircraft movements. With an average of 1.6 occurrences of aircraft damage per 10 000 movements, the total number of aircraft damage events in Europe in 2019 is estimated at 2 304. Using the average cost of EUR 667 000 per damage event, the total yearly damage costs are estimated at EUR 1.54 billion.

Due to the lack of information from the GH occurrence reports in the EASA Member States, it is not possible to estimate how much the costs of aircraft damage will be reduced due to the implementation of the GH regulation.

Table 5.13: Annual economic impact of aircraft damage reduction

(Sub) indicator	Impact per year
Reduction of cost due to reduction of aircraft damage	Conservative estimate: €3 million

A very conservative approach indicates a minimum benefit of EUR 3 million per year, however considering the high total costs of aircraft damage, it is also expected that the benefits will be much higher than EUR 3 million.

In December 2022, IATA published a report on ground damage[77], advocating for the transitioning to enhanced GSE to prevent aircraft damage and reduce the costs of these events. The ‘Enhanced GSE

[73] IATA. (2022). Industry statistics factsheet, June 2022. https://www.iata.org/en/iata-repository/pressroom/fact-sheets/industry-statistics/

[74] NLR (2021). Balk, A.D., Roelen, A.L.C., Smeltink, J.W., Heerma van Voss, G.J.J., Tanis, J.W.J. Study on social conditions and safety in ground handling at Amsterdam Airport Schiphol, CR-2021-067.

[75] IATA. (2022). Industry statistics factsheet, June 2022. https://www.iata.org/en/iata-repository/pressroom/fact-sheets/industry-statistics/

[76] https://ec.europa.eu/eurostat/web/transport/data/database

[77] Press release of 6 December 2022: IATA Calls for Transition to Enhanced Ground Support Equipment: https://www.iata.org/en/pressroom/2022-releases/2022-12-06-04/. The ground damage report can be downloaded at: https://www.iata.org/en/programs/ops-infra/ground-operations/ground-damage-report/.

solution' consists of fitting GSE with anti-collision systems that prevent GSE from getting too close to the aircraft to produce damage. The IATA report was published after the NLR/ECORYS study.

The study estimates that the current annual total ground damage costs 'could double to nearly $10 billion by 2035 unless preventive action is taken.' 15 years is taken as a measurement unit because 'that is a reasonable timespan over which it can be expected that the enhanced GSE can be introduced in significant numbers'.

IATA further details the cost forecast for ground aircraft damage being based on 'direct costs (including labor and material costs, temporary leasing costs, logistical expenses, and administrative costs) and indirect costs (lost revenue, crew and passenger repositioning costs, compensation costs for delayed services etc.).' The study concludes that 'transitioning 75% of the global fleet of belt-loaders, cargo-loaders, passenger stairs and PBB to Enhanced GSE, would reduce the current expected ground damage cost per turn rate by 42% (IATA estimate).'

The IATA study provides estimations of costs per incident and also per flight basis (pp. 29-30), as well as a forecast of costs in the next 15 years based on the estimated forecast traffic.

The yearly damage cost produced by the 4 types of GSE most frequently involved in damage (passenger stairs, cargo loader, belt loader and passenger boarding bridge) raises at USD 2.07 billion worldwide. Furthermore, the analysis of costs attributable to these four types of GSE indicates that they 'are responsible for 44% of the direct costs and 42.5% of the indirect costs. This makes them responsible for 43.5 of the total ground damage costs – slightly more than the 38% of all the other GSE combined.' (p. 35). Knowing from the IATA estimates that the current annual total ground damage costs 'could double to nearly $10 billion worldwide by 2035 unless preventive action is taken', this means that the approximate cost of damage is estimated at USD 5 billion (EUR 4.6 billion) in 2022 worldwide. The share of this cost for the EASA Member States cannot be defined from the IATA study.

Compared to these figures, the NLR/ECORYS estimate costs of EUR 1.54 billion for aircraft damage due to GH in Europe, representing one third of the IATA estimate costs worldwide, seem plausible.

The IATA study also provides an estimated cost reduction of aircraft ground damage through the implementation of enhanced GSE. While the GH regulation must remain technology neutral, as technology evolves at a faster pace than updates to the regulation, the trend of encouraging organisations to use enhanced GSE should be promoted outside the regulatory framework. In such cases, the resulted benefits could be significantly above the conservative estimate presented in this RIA.

Lost time injury[78] reduction (GHSP)

An indicator that is commonly used for quantifying occupational health and safety performance is the lost time injury rate (abbreviated as LTIR, LTIF or LTIFR). This is calculated by dividing the total number of lost time injury occurrences in a given time period by the total number of hours worked. Various studies report that currently the LTIR in GH varies between 13 and 19 lost time incidents per million

[78] For a definition of LTI, please see the Acronyms under Chapter 1.

man-hours worked due to workplace accidents, with estimates of lost days due to workplace accidents from 0.42 to 1.44 lost days per 1 000 man-hours[79].

As shown in Attachment E, it was estimated that there are approximately 298 000 GH employees in the EASA Member States. These people produce together approximately 620 million working hours per year (assuming 2 080 working hours per FTE, which is much higher than average per year). With 0.42 to 1.44 lost days per 1 000 man-hours, this results in 260 000 to 890 000 lost days per year for the GH sector in the EASA Member States.

An overall LTIR improvement of 3 % per year for the industry equals 7 800 to 27 000 lost days less per year. When direct costs of wages are considered (i.e. ignoring the impact of absence on productivity and the cost of training other employees to cover for those absent) and taking an average wage of EUR 20 per workhour (as per the Task 1 report), the estimated reduction of costs for lost time injuries ranges between EUR 1 and EUR 4 million per year.

Table 5.14: Annual economic impact of lost time injury reduction

(Sub) indicator	Impact
Lost time injury reduction	€1 - €4 million

Punctuality (aircraft operator)

When the GH services are not performed as planned, there are delayed departures and reduction in punctuality, which could result in costs for the GHSP or the aircraft operator, depending on their service level agreement. GH is said to be among the three primary flight delay contributors[80].

The proposed regulation could impact the punctuality of GH services via three (opposing) mechanisms:

— The improved awareness of the procedures and an improved safety commitment may result in GHSPs prioritising safety over punctuality. This could lead to a reduction in punctuality.

— The expected reduction in aviation safety occurrences, aircraft damage events and health and safety incidents will result in less disruptions of the GH processes, which will lead to improved punctuality.

— A GSE maintenance programme may result in improved GSE serviceability, which can improve punctuality if availability of GSE is a bottleneck.

The mechanisms described above are expected to affect punctuality in both directions. It is expected that the effect on punctuality in the short term will be relatively small. In the longer term, the indirect effect on punctuality through fewer incidents and improved serviceability is expected to outweigh the reduction in punctuality. For this reason, a small positive (net) impact on punctuality is assumed, but because this is an indirect effect, the economic impact is not quantified.

[79] https://www.goldair-handling.com/Reports/2017/EN/mobile/index.html#p=73 and https://www.ana.pt/en/system/files/documents/annual_report_2021.pdf

[80] https://assaia.com/blog/top-three-turnaround-issues

5.2.3 Level playing field

The proposed GH regulation aims to harmonise the requirements of the wide range of GH services provided to aircraft operators and thereby enhance safety in the aviation domain. Setting the requirements at a European level is expected to improve the level playing field between EASA Member States.

From the fact-finding phase in 2018 in preparation of the GH Roadmap[81], it can be concluded that today the regulatory status of GH is not harmonised. Several Member States indicated that there are no national safety requirements in place. Other Member States perform oversight of GHSPs according to national legislation which requires an SMS.

The proposed GH regulation will be directly applicable to all EASA Member States and therefore positively affects the level playing field for the safe provision of GH services in Europe.

5.2.4 Proportionality issues

In the interviews it was indicated that most of the large GHSPs already apply the management system elements that are proposed in the GH regulation and that the smaller ones will be faced with organisational changes involving additional managerial and administrative tasks. For smaller organisations this can be a significant burden as they cannot benefit from economies of scale. Since the profit margins for GHSPs are small[82], there is a possibility that these additional costs will be incorporated in the pricing of the GH services. This could put the smaller GHSPs at a competitive disadvantage.

5.2.5 Total economic impact

The total economic impact is obtained from the various impact areas above. The annual development costs are presented for the first year of implementation (T+1). In Figure 5.1 the economic impact during the time horizon of 10 years is presented. As the transition period will incur development costs, these first couple of years will have the largest economic impact on the sector. The average annual economic impact is equal to roughly EUR 15 million for the industry and NCAs.

The usual EASA forecast for monitoring of rulemaking is up to 10 years. The trend will likely stabilise after this interval.

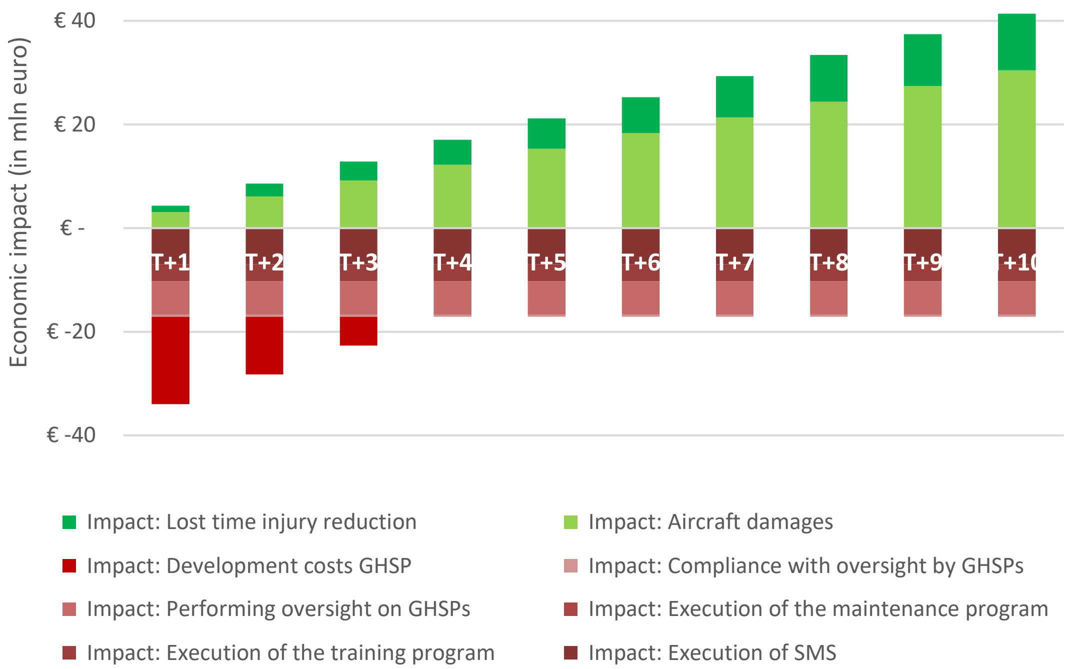
The rulemaking proposal includes alleviations for small GH organisations, which will enable an easier implementation of the GH Regulation. Small GH organisations may adapt their administrative tasks to ensure compliance with the rules without affecting the safety of their operation.

EASA also proposes to monitor the costs of implementation of the GH regulation both for industry and the NCAs.

[81] See EASA Groundhandling conference, March 2019.

[82] See NLR & Ecorys (2022b). Task 2 Aviation economic data. Final Report, 12 October 2022 and ACI Europe, ASA and ETF (2018), Market Access, Social Conditions, Training, Qualifications and Quality Standards in the Ground Handling Industry, February 2018.

Figure 5.1: Economic impact over a 10-year time horizon*



* The figure above shows the economic impact for the lower bound of the bandwidth. Note that these numbers are not discounted.

In Table 5.15, the average economic impact for GHSPs and NCAs is presented. Based on statistics on the average turnover for GHSP and average budget for NCAs (see Attachment E), the impact and score are allocated.

Table 5.15: Estimate economic impact in totals for GHSPs and NCAs (in the EASA Member States) (*) and (**)

Economic impacts per type of stakeholder	Estimated total annual impact	Estimated total turnover for all GHSPs and budget for all NCAs	Estimated impact in % of total turnover / budget	Score
Economic impact GHSP	€-8 million	€19 billion[83]	-0,04 %	Very low impact (-1)
Economic impact NCA[84]	€-3.5 million	€2.5 billion[85]	-0.13 %	Low impact (-3)

* Excluding aircraft damage reduction impact
** The table above shows the economic impact for the lower bound of the bandwidth.

83 The average turnover for one GHSP is EUR 26 million. Multiplied by 736 GHSPs in Europe = approx. EUR 19 billion. See above in the introduction to Section 5.2. The figures may be overrated.

84 These impacts are estimated to be divided by 2 compared to the initial estimates made by NLR/ECORYS. This is based on the fact that NLR/ECORYS consulted the stakeholders in 2022 on a cost impact with an oversight cycle of 24 months. After review of these cost impacts and further assessment on how this estimated cost could be decreased, it is now proposed to have an oversight cycle of 48 months in 2023 for a smoother implementation of the draft GH regulation. By doubling the oversight cycle, it is estimated that the cost could decrease by 2.

85 86 million are multiplied by 30 NCAs (without Liechtenstein). See the introduction to Section 5.2. The figures may be overrated.

The total **economic impact is estimated to be between very low (for GHSPs) and low (NCAs**). NCAs are economically impacted slightly more than the GHSPs when comparing the cost impact with their revenues/budgets.

However, there is wide uncertainty on the costs gathered by NLR/ECORYS due to the significant difference across the NCAs on their current oversight programmes based on national regulations. Furthermore, the conservative approach in the calculation of benefits generated by the reduction of aircraft ground damage could prove to be much underrated.

5.3. Social impact

To determine the social impact, the social impact assessment methodology[86] is applied. A validation session was held with four stakeholders regarding the weights as well as the scoring of each of the ten criteria. More details of the social impact assessment methodology are provided in Attachment D.

According to the social impact assessment methodology, the social impact is based on ten criteria:

Table 5.16: The criteria for social impact and their weights

Criteria	Weight
Employment and labour markets	
Effect on total employment	3
Effect on turnover of workers	4
Working conditions	
Effect on wages, wage-setting mechanisms or labour costs	4
Effect on employment protection	4
Effect on work organisation	4
Effect on access to vocational training and/or advice on career development	3
Effect on occupational health and safety	4
Effect on 'just culture'	3
Access to and effects on social protection, health and educational systems	
Effect on the level of education	2
Effect on the mobility of workers	3

The score of each criterion is determined by one or more indicators defined in the methodology. The methodology provides qualitative or quantitative descriptors to determine the score for each indicator ranging from a very high positive impact (score: +5) to a very high negative impact (score: - 5). The score for a criterion is obtained by combining the scores for each indicator associated with a criterion. For each criterion a score is obtained, ranging from a very high positive impact (score: +5) to a very high negative impact (score: - 5).

86 Ecorys (2019). Methodological Impact Assessment Support on Social Impacts and Circular Economy Indicators, Final report Task 1 for EASA, 26 June 2019.

The scores per criterion are subsequently used to calculate the overall score for the social impact by taking the weighted average over all criteria using the weights presented in Table 5.16. The weights presented in this table are obtained from the validation session with stakeholders[87].

In order to get a scoring from -10 to +10, each score is multiplied by 2.

According to the social impact assessment methodology[88], the social impact is determined based on the following ten social criteria:

Employment and labour markets

— effect on total employment;

— effect on turnover of workers.

Working conditions

— effect on wages, wage-setting mechanisms or labour costs;

— effect on employment protection;

— effect on work organisation;

— effect on access to vocational training and/or advice on career development;

— effect on occupational health and safety;

— effect on 'just culture'.

Access to and effects on social protection, health and educational systems

— effect on the level of education;

— effect on the mobility of workers.

The social criteria are influenced via the following six delivery systems:

— **Communication.** According to the proposed GH regulation, the GHSP will be required to have a (safety) management system (see ORGH.MGMT.200). The SMS must contain a process to promote safety within the organisation, with the purpose of fostering a safety culture within the organisation. As a consequence, safety communication raises personnel awareness of safety risks and what role and responsibilities they have with regard to the safety of their own activities. The raised safety awareness will lead to improved detection, reporting ('just culture') and resolution of issues preventing occupational health and safety occurrences.

— **Procedures.** Procedures mitigate hazards and reduce safety risks. Non-adherence to procedures is often mentioned in accident investigation reports as part of the accident sequence of events. In a risk identification conducted with GHSPs at Amsterdam Airport Schiphol, non-adherence to procedures was listed as the top hazard (in terms of associated level of risk) with the highest

87 The report on the methodology provides 'default' weights. For three criteria, the weights from the validation differ from the 'default' weights.

88 Ecorys (2019). Methodological Impact Assessment Support on Social Impacts and Circular Economy Indicators, Final report Task 1 for EASA, 26 June 2019. Attachment D provides the details of this method.

risk at Schiphol[89]. However, there is sufficient anecdotal evidence that personnel sometimes deviate from procedures because the operating procedures are perceived to be too rigid or impractical. The lack of harmonisation of operating procedures for GH across aircraft operators is frequently mentioned by GHSPs as problematic and a cause for error which could result in occupational health and safety occurrences.

— **Commitment.** Commitment to safety is the foundation for an organisation to have or to build a healthy safety culture. Safety culture is considered a prerequisite for safety knowledge and awareness, which in turn influences safety-related behaviour and an organisation's safety performance. It is expected that this will result in fewer occupational health and safety occurrences as well as an improved 'just culture'.

— **Availability.** The availability of operational personnel and supporting staff has an effect on the total employment and also on the workload, as part of work organisation. For the proposed GH organisation only a change in supporting staff is foreseen.

— **Competence**. A change in competence has an influence on 'access to vocational training and/or advice on career development vocational training'. Additionally, increased competence could prevent occupational health and safety occurrences.

— **Maintain.** Servicing of aircraft on the ground involves the use of different types of GSE, motorised and non-motorised, which either operate in close proximity to persons or the aircraft or in direct contact with it. Maintenance deficiencies with the potential to inflict aircraft damage include defects of brakes, couplings, proximity sensors, protective covers/ bumpers, safety stops, etc. Defective GSE (due to lack of or incorrect maintenance) can lead to occupational health and safety occurrences.

The social impacts affect GHSPs and their personnel. There is also an effect on total employment for the NCA.

5.3.1 Employment and labour markets

According to the Better Regulation Toolbox[90], impacts on the level of employment can be expected 'whenever demand or supply of a product changes or where relative prices change (e.g., between different producers)'. This could then result in more or less jobs or more or less hours worked, which gives an indication on whether a larger or smaller workforce will be needed and/or whether redistribution of labour is to be expected. As such, the main criteria for this impact are the effect on employment levels and the effect on the turnover of workers.

Below, the two criteria for the group 'Employment and labour markets' are discussed.

Effect on total employment

The effect on total employment can be measured from the change in number of employees due to the proposed GH regulation.

[89] NLR (2021). Study on social conditions and safety in ground handling at Amsterdam Airport Schiphol (in Dutch), NLR Contract Report NLR-CR-2021-067, July 2021.

[90] EC (2022), Better Regulation Toolbox, available at https://ec.europa.eu/info/law/law-making-process/planning-and-proposing-law/better-regulation-why-and-how/better-regulation-guidelines-and-toolbox/better-regulation-toolbox-0_en.

In Section 5.2 on the economic impact, the total change in personnel costs per year has been calculated for both NCAs and GHSPs. When divided by the average personnel costs of an NCA employee and respectively of a GHSP employee, an estimate is obtained of the total change of employees due to all activities imposed by the proposed GH regulation.

It has been assessed that annually an additional increase of 77 FTEs for the NCAs is required and an increase of 257-726s FTE for the GHSPs. For the NCAs a total of 2 730 technical FTEs are working for the NCAs, hence an increase of 2.8 % is expected. For the GHSPs a total of 298,000 employees work in the EASA Member States in 2019. Hence, the increase in number of employees corresponds to 0.09 % - 0.24 %. The total increase is presented in Table 5.17.

Table 5.17: Effect on total employment

(Sub)indicator	Impact (FTE)	Impact (% of change)	Score
Change in number of employees (NCA)	77 FTEs	2.8 %	+5 (Very high positive)
Change in number of employees (GHSP)	257 FTEs – 726 FTEs	0.09 % - 0.24 %	+2 (Low positive)
Change in number of employees (Total)	334 FTEs – 803 FTEs	0.11 % - 0.27 %	+2 (Low positive)

Effect on turnover of employees

Employee turnover is the rate at which employees leave a company and are replaced by new employees. The change in employee turnover can be measured by the yearly percentage of employees leaving or joining the organisation as compared to total employment.

The employee turnover rate in GH is significant. Ground handlers do not only have to adapt the number of staff (by recruiting new personnel or laying off existing personnel) to meet changing demand, but also to replace huge numbers of employees each year due to voluntary turnover. According to IATA[91], most ground handlers have an annual staff turnover rate of between 30 % and 50 %. One large GHSP recorded a staff turnover of 56 % in 2021, according to its annual report, compared with 65 % and 58 % in the previous 2 years. From the interviews it appears that similar figures are valid for other larger GHSPs. The high turnover rate is often mentioned in the interviews as a potential threat to safety due to a lack of commitment amongst other things. The impact on the turnover rate in itself by the regulation is hardly recognised by the interviewees, yet during the validation workshop the general view was that the regulation will hold the GHSPs more ‘accountable’ for the quality and safety, thus improving their social status.

The main indicator for the impact on turnover of employees is the degree to which function levels change due to change in tasks. Although the implementation and the management of the SMS will change the tasks of some employees or attract new employees with appropriate skills, it is not expected that this will significantly impact the function levels in GH organisations.

[91] IATA Ground Handling Report 2019.

Table 5.18: Effect on turnover of employees

(Sub) indicator	Impact (% of change)	Score
Degree to which function levels change due to change in tasks (% of jobs affected)	None	0 (Neutral impact)

5.3.2 Working conditions

Working conditions comprise several criteria, i.e. wages, wage-setting mechanisms or labour costs, employment protection, work organisation, exercise of labour standards, access to vocational training and career development advice, occupational health and safety, social dialogue and just culture.

Effect on wages, wage-setting mechanisms or labour costs

Whereas wages comprise net income, labour costs comprise the employers' total employee wages plus the cost of benefits and (payroll) taxes and negatively affect the competitiveness of firms. The impact on this social criterion is measured by the change of the net income per FTE and the change in the maximum retirement age.

The net income per FTE and the maximum retirement age are not affected by the proposed GH regulation.

Table 5.19: Effect on wages, wage setting mechanisms or labour costs

(Sub)indicator	Impact (% of change)	Score
Change in the net income per FTE (GHSP)	None	0 (Neutral impact)
Change in the maximum retirement age (GHSP)	None	0 (Neutral impact)

Effect on employment protection

The level of employment protection is most often related to the type of work contract employees have. Flexibility of working hours and reduction in job security will negatively affect the employees' income and subsequently their living conditions, whereas highly protective employment protection legislation may lead to large differences in costs and rights between employees with permanent and atypical contracts. Atypical contracts are often used by employers to increase flexibility, reduce costs and support business growth.

Investing in employees could potentially lead up to better (i.e. fixed) employment contracts. But even with a fixed contract, employees may still need to work in split shifts (i.e. several shorter shifts during the same day). Overall, a neutral impact on this criterion is expected, as further corroborated during the validation session.

Table 5.20: Effect on employment protection

(Sub) indicator	Impact (% of change)	Score
Change in percentage of employees on atypical contracts	Negligible	0 (Neutral impact)

Effect on work organisation

Work organisation can be described as the level of work autonomy, teamwork, job rotation, pace of work and work intensity and can be influenced by, for instance, the introduction of new technology or industrial restructuring.

The proposed GH regulation will lead to additional management and administrative tasks. No changes in tasks or on the number of available operational staff is expected. Obviously, the work organisation could be affected by a change in procedures, competence and communication. It is expected that these changes are accommodated within the current work. Hence, it is expected that the workload and the average number of hours worked will not change.

Table 5.21: Effect on work organisation

(Sub) indicator	Impact (% of change)	Score
Change in the average number of hours worked	None	0 (Neutral impact)
Change in the workload	None	0 (Neutral impact)

Effect on access to vocational training and/or advice on career development

As stated in the Better Regulation Toolbox, training and lifelong learning opportunities can influence career perspectives and security. This criterion is measured by the percentage of workers receiving training on the job or career development advice within their organisation.

The total amount of additional training effort is calculated by multiplying the additional training effort needed for persons that do not fully meet the training requirements of the proposed GH regulation, by the implementation percentages from Table 5.9 and the number of personnel per organisation from Table 5.3. According to this calculation, the total amount of additional training effort is approximately 8 000 man-days. The current (no change in the current policy, Option 0) total amount of training per employee is assumed to be 4 training days per year which equals a total of 1 180 000 man-days. Therefore, the amount of vocational training increases by approximately 1 %, which corresponds to a very low positive impact. This effect was corroborated during the validation workshop.

Table 5.22: Effect on access to vocational training and/or advice on career development

(Sub) indicator	Impact (% of change)	Score
Change in the percentage of employees receiving training or career development advice	1 %	+1 (Low positive impact)

This indicator only involves the access to vocational training and does not cover the quality or effectivity of the training. The current training is very different from one GHSP to another GHSP. The mandatory training under the proposed GH regulation will assure a minimum quality. Also the training will be properly evaluated and continuously improved as imposed by the proposed regulation, which will increase the effectivity of the training. This impact is addressed as part of the safety impacts (aviation safety as well as occupational health and safety).

Effect on occupational health and safety

Occupational health and safety concerns the safety and health of workers at work. The Better Regulation Toolbox recommends measuring the effect on occupational health and safety by changes in the number of work-related safety incidents, sickness absence and occurrence of provisional inability. An indicator that is commonly used to quantify occupational health and safety performance is the lost time injury rate (abbreviated by LTIR, LTIF or LTIFR), which is calculated by dividing the total number of lost time injury occurrences in a certain time period by the total number of hours worked. Various studies report that currently the LTIR in GH varies between 13 to 19 lost time injury incidents per million person hours worked due to workplace accidents[92].

According to ORGH.MGMT.200 of the proposed regulation, the SMS should contain a process to promote safety within the organisation, with the purpose of fostering a safety culture within the organisation. As a consequence, safety communication raises personnel awareness of safety risks and what role and responsibilities they have with regard to the safety of their own activities. The raised awareness should lead to a more proactive action of detection, reporting and resolution of hazards. The research clearly indicates a desire to improve occupational health and safety in GH. Accidents such as falls, slips and trips remain some of the most common hazards for ground handlers. Electrocution, vehicle accidents, falling objects, the risk of fires and explosions, and working with inadequate lighting can also lead to injuries or even death of workers. The interviews expressed a mixed view regarding the effectiveness of the new regulation on occupational health and safety. Some interviewees feel that the regulation is not going to make a difference regarding the actual commitment to personal safety. One of the interviewees stated that the main cause of injuries is manual loading. Technologies that facilitate loading and prevent injuries could improve occupational health and safety of GH workers. The proposed regulation does not directly influence the introduction of such technologies. Other interviewees expect that raising awareness and mandatory procedures and maintenance programme as proposed by the regulation will have a positive impact.

Occupational health and safety in the oil and gas industry has improved significantly since safety management systems were introduced. Up to the mid-1980s, the oil and gas industry was commonly regarded as a dangerous business where workers took risks. The Piper Alpha disaster[93] and subsequent investigation[94] resulted in the introduction of SMS in the oil and gas industry from 1989 onwards. In the following 10 years, the LTIR gradually reduced at an average rate of 10 % per year[95].

It is expected that for GHSPs that do not yet have an operational safety management system, a similar LTIR improvement of 10 % per year can be achieved. The results of interviews and surveys conducted indicate that approximately 70 % of the European GHSP workforce is employed by organisations that have the elements that are described by the proposed regulation in place (10 % of the small organisations, 50 % of the middle-sized organisations and 80 % of the large organisations). This means

[92] https://www.goldair-handling.com/Reports/2017/EN/mobile/index.html#p=73 and https://www.ana.pt/en/system/files/documents/annual_report_2021.pdf

[93] On 6 July 1988, the Piper Alpha oil platform, located in the North Sea, exploded. Of the 288 persons on board the platform, 165 were killed.

[94] Cullen, W.C. (1990). The public inquiry into the Piper Alpha disaster, HSMO, London.

[95] Hudson, P. (2001). Safety management and safety culture; the long, hard and winding road. In Proceedings of the First National Conference on Occupational Health & Safety Management Systems, Australia.

that the 10 % annual LTIR improvement is to be achieved by 30 % of the GHSP workforce, which results in an overall LTIR improvement of 3 % per year for the industry.

There is no mechanism in the proposed GH regulation that would change the occurrences of 'provisional inability'.

During the validation workshop, the participants agreed that a substantial impact is expected on occupational health and safety.

Table 5.23: Effect on occupational health and safety

(Sub)indicator	Impact (% of change)	Score
Change in work-related safety incidents	-3 %	+3 (Medium positive impact)
Change in the occurrence of 'provisional inability'	None	0 (Neutral impact)

Taking into account the scoring for both indicators, it is computed that the impact on the criterion (occupational health and safety) yields a score of +2 (medium positive impact).

Effect on 'just culture'

Just culture means a culture in which front-line operators or other persons are not punished for actions, omissions or decisions taken by them that are commensurate with their experience and training, but in which gross negligence, wilful violations and destructive acts are not tolerated. It also includes the way organisations use the information from accidents and incidents to learn for future occasions.

The willingness to report safety occurrences is seen as an indicator for just culture. All else being equal, a higher number of reported occurrences is an indication of a stronger just culture.

The UK's Civil Aviation Authority estimated that only about 50 % of GH errors actually get reported because of a blame culture[96]. One interviewee pointed out that GHSPs and GH employees are not willing to report aircraft damage because they fear that the airline involved will cancel the contract with the GHSP. Another interviewee mentioned that personnel with temporary contracts and personnel hired via temporary work agencies rarely report occurrences.

An obligation to report will not be a strong incentive according to some interviewees. They state that a mind shift is needed and an improvement of just culture through communication, commitment and competence. Some interviewees feel that the current occurrence-reporting systems are too complex and not suitable for GH.

When Regulation (EU) No 376/2014 on the reporting, analysis and follow-up of occurrences entered into force at the end of 2015, the occurrence rate (number of occurrence reports per flight) increased by approximately 17.5 % per year. The occurrence rate had been constant in the years before the Regulation came into force[97].

[96] https://www.caa.co.uk/Safety-initiatives-and-resources/Safety-projects/GHOST/Human-Factors-Subgroup/

[97] European Commission. (2020). Ex-post evaluation of Regulation (EU) No 376/2014 on the reporting, analysis and follow-up of occurrences in civil aviation.

According to the ex post evaluation of Regulation (EU) No 376/2014, the impact of the Regulation on reporting numbers was less in domains that already had occurrence-reporting systems in place prior to the adoption of Regulation (EU) No 376/2014, as required by the relevant implementing rules to the EASA Basic Regulation and related SMS requirements. Based on this information, it is expected that a yearly 17.5 % improvement in the occurrence-reporting rate is achievable for GHSPs that do not yet have an SMS. The results of interviews and surveys conducted indicate that approximately 70 % of the GHSP workforce is employed by organisations that already implement the elements that are described by the proposed regulation (including an SMS): 10 % of the small organisations, 50 % of the medium-sized organisations and 80 % of the large organisations. This means that the 17.5 % annual safety improvement is achievable for 30 % of the GHSP workforce, which results in an overall occurrence-reporting rate improvement of 5 % per year for the GH industry.

The likelihood of actions following the reporting of occurrences depends on the quality of the occurrence reports, the effectiveness of the SMSs of the individual GHSPs, and the extent to which the organisations involved in the GH process (GHSPs, aircraft operators and aerodrome operators) are able to share data, analyse shared data to identify systemic issues and are willing to take action. Because the proposed regulation includes the requirement to have an SMS and to share safety data, it is expected that the likelihood of actions following the reporting of occurrences will improve to a similar degree as the expected improvement of occurrence reporting, i.e. 5 % improvement per year.

The level of privacy protection is not affected by the new regulation. The current occurrence-reporting procedures already involve privacy protection and there is no requirement in the proposed regulation to make amendments.

Since the methodology does not provide a scoring for these indicators, it is assumed that the scoring is identical to the scoring for the criterion ‘change in work related safety incidents’.

Table 5.24: Effect on ‘just culture’

(Sub)indicator	Impact	Score
Change in the likelihood of occurrences being reported	5 %	+4 (High positive impact)
Change in the likelihood of actions following the reporting of occurrences	5 %	+4 (High positive impact)
Change in the level of privacy protection	None	0 (Neutral impact)

Based on the scoring of the three indicators, the scoring for the criterion ‘just culture’ yields a score of +3 (high positive impact).

5.3.3 Access to and effects on social protection, health and educational systems

Effect on the level of education

This impact indicator takes into account whether changes occur in degrees required or entry levels for specific professions, as opposed to the previous indicator ‘effect on access to vocational training and /or advice on career development’ during the job. No impact on the level of education is expected.

Table 5.25: Effect on the level of education

(Sub) indicator	Score
Change in the education level requirements for functions	0 (Neutral impact)

Effect on the mobility of workers

Mobility of workers (across and within countries and administrative regions) is important to take into account because access to social protection may differ between countries/regions, and in that way it affects life of workers in important ways. For example, changes in the workplace may have a detrimental effect on family life and well-being. Access to social protection in some cases differs between administrative regions, making it relevant to take into account not only countries, but also mobility between administrative regions.

Standardisation of training across Member States can support the mobility of workers. The proposed GH regulation proposes a minimum standardisation of training. The mobility of workers is supported by an implementing rule proposing the recognition of common training elements and sharing of an individual's training certificates from the previous employer to the next.

Table 5.26: Effect on mobility of workers

(Sub) indicator	Score
Change in the barriers to voluntary mobility across borders within the EU	+2 (low positive)

5.3.4 Overall scoring

All relevant social criteria and their scores on a 5-point scale are summarised in Table 5.27. Also the qualitative description of the score has been added. The last column contains the weights for each criterion as established during the validation session.

Table 5.27: Social impact per criterion

Social criteria	Score [-5, +5]	Qualitative description	Weight (%)
Employment and labour markets			
Effect on total employment	+2	Medium positive	9 %
Effect on turnover of employees	0	Neutral	12 %
Woking conditions			
Effect on wages, wage-setting mechanisms or labour costs	0	Neutral	12 %
Effect on employment protection	0	Neutral	12 %
Effect on work organisation	0	Neutral	12 %
Effect on access to vocational training and/or advice on career development	+1	Low positive	9 %
Effect on occupational health and safety	+2	Medium positive	12 %
Effect on 'just culture'	+3	High positive	9 %
Social protection, health and educational systems			
Effect on the level of education	0	Neutral	6%
Effect on the mobility of workers	+2	Low positive	9%
Total			**100%**

A weighted score is obtained by multiplying the scores with the weights. The overall social impact is obtained by adding the weighted scores of all criteria. The overall social impact of the proposed GH regulation compared to Option 0 is computed to be +1 on a 5-point scale and +2 on a 10-point scale. This corresponds to a ‘low positive’ impact.

5.4. Environmental impact

The environmental impact analysis consists of two criteria: air quality emissions and noise emissions. To assess the environmental impact, a qualitative scale is used ranging from -10 to +10, see Table 5.28.

Table 5.28 Scale for the environmental impact. The impact can be a positive impact (+) or a negative impact (-)

<table>
<tr><th>Score</th><th>Qualitative description</th></tr>
<tr><td>10</td><td>Extremely high impact</td></tr>
<tr><td>9</td><td rowspan="2">Very high impact</td></tr>
<tr><td>8</td></tr>
<tr><td>7</td><td rowspan="2">High impact</td></tr>
<tr><td>6</td></tr>
<tr><td>5</td><td rowspan="2">Medium impact</td></tr>
<tr><td>4</td></tr>
<tr><td>3</td><td rowspan="2">Low impact</td></tr>
<tr><td>2</td></tr>
<tr><td>1</td><td>Very low impact</td></tr>
<tr><td>0</td><td>Neutral impact</td></tr>
</table>

Types of motorised GSE have been recognised to emit a variety of air pollutants such as SO_2, NOx, COVNM, CO, CO_2, N_2O, and PM[98] as well as produce noise.

There is a trend that GSE is becoming more sustainable. Types of motorised GSE are being replaced by electrical GSE. This trend, however, is not related to the proposed GH regulation.

A lack of maintenance of GSE can impact the environment:

— Maintenance can result in improper functioning of the motorised vehicles leading to air quality emissions and noise emissions.

— Maintenance can potentially impact the lifetime of GSE. When existing older types of GSE are better maintained, this could result in them having a longer lifetime and not being replaced by newer types of GSE that most likely have a smaller impact on the environment.

Based on the two described mechanisms, it is concluded that in the context of this study the impact of the delivery system ‘maintenance’ on environment is negligible. Hence, the environmental impact of the proposed GH regulation is assessed to be ‘neutral’.

Table 5.29: Environmental impact

Impact area	Impact	Score
Environmental impact	None	0 (Neutral impact)

98 Airport Ground Support Equipment (GSE): Emission Reduction Strategies, Inventory, and Tutorial, ACRP report 78 (2012).

6. Case studies

In addition to the impact assessment on the EASA Member State level (i.e. EU27 Member States, Switzerland, Liechtenstein, Iceland, and Norway), the impacts of the proposed regulation relative to the baseline are illustrated by three case studies. Three different EASA Member States are the subject of the cases, representing the variability across the EASA Member States. The cases are selected based on geographical location and the national legislation resulting from different transpositions of Council Directive 96/67/EC.

Case 1: Ireland

In Ireland, there were 136 740 aircraft movements in 2019.

Eight Irish aerodromes are within the scope of the Basic Regulation. The main aerodromes are Dublin, Shannon and Cork. On the aerodromes in Ireland, the number of GHSPs is not restricted. In total 35 third-party handlers and 9 self-handlers have access to the GH market (EC Directive 96/67/EC). As estimated in Task 1, there are around 6 500 – 8 000 GH employees in Ireland. Based on the computations made in Tasks 1 and 2[99] (see Attachment E), it is estimated that the total annual revenue of the GH market in Ireland is between EUR 342 million and EUR 409 million.

The GH industry in Ireland is regulated via the transposition of Council Directive 96/67/EC into Irish Law by the European Communities (Access to the Groundhandling Market at Community airports) Regulations, 1998 (S.I. No. 505 of 1998). This transposition into the Irish Law covers some safety elements and training. The Guidance Note on applying for a Groundhandling Approval[100] states that the GHSP must be ‘competent as respects experience, financial resources, equipment, organisation, staffing, maintenance and operating procedures to ensure the security and safety of installations, of aircraft, of equipment and of persons’. Additionally, the GHSPs need to have details on the number of staff to be engaged in the GH activities proposed and their role. The skills level and corresponding training required for each role should be set out in a training programme/plan which is examined in detail (includes details on recurrent training).

At the time of the study, the Commission for Aviation Regulation (CAR) is the competent authority in Ireland for the purposes of Council Directive 96/67/EC. The IAA is the NCA and performs oversight via Commission Regulation (EU) No 965/2012 on air operations (ORO.GEN.205 *Contracted activities*).

Based on the expected increase in number of GH employees (0.09 % - 0.24 %) due to the requirements of the proposed GH regulation and assuming that these values would also be applicable for Ireland, an additional 6-19 FTEs will be employed by the GHSPs in Ireland. This implies a cost of EUR 250 000 – EUR 750 000 annually.

Based on the number of annual aircraft movements in Ireland, it is estimated there will be an annual benefit of EUR 58 000 due to a reduction in aircraft damage as a consequence of the proposed regulation. The reduction in lost time injuries for Ireland will be between EUR 20 000 and EUR 80 000 based on the estimated number of GH employees.

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99 See NLR & Ecorys (2022a). Task 1 Aviation social data. Final Report, 12 October 2022. and NLR & Ecorys (2022b). Task 2 Aviation economic data. Final Report, 12 October 2022.

100 See https://www.aviationreg.ie/groundhandling-the-commissions-role/apply-for-an-approval.147.html

The NCA of Ireland, IAA, employed 58.05 technical FTEs in 2019. Based on the number of technical FTEs, the total budget of the IAA is estimated to be EUR 12 million[101].

There is currently one ground operations inspector who performs oversight (safety) on approximately five GHSPs as a subcontractor audit (based on ORO.GEN.205 of Commission Regulation (EU) No 965/2012). In an interview it was indicated that after the implementation of the proposed GH regulation no additional inspectors are expected to be employed for oversight on the ground operations.

Case 2: France

France was the third largest EASA Member State in terms of number of flights per year: In 2019 there were 800 071 aircraft movements[102].

At the Paris Charles de Gaulle aerodrome, there are up to six GHSPs allowed. Currently, only four of them are active[103]: Air France, Alyzia Airport Services, Groupe Europe Handling, and Worldwide Flight Services. There are 54 aerodromes within the scope of the Basic Regulation.

The number of GHSP employees in 2019 was estimated (see Attachment E) to be approximately 30 000 – 35 000[104]. The total annual revenue for the GH organisations in France is estimated to be between EUR 1.6 and EUR 1.9 billion.

The GH industry in France is regulated via the transposition of Council Directive 96/67/EC into the French Civil Aviation Code via two decrees amending the Civil Aviation Code (Decrees No. 98-7 of 5 January 1998 and Decree No. 98-211 of 23 March 1998)[105]. Apart from this transposition, the French Civil Aviation Code contains no additional requirements for the GHSPs. DGAC is the NCA and performs oversight via Commission Regulation (EU) No 965/2012 on air operations (ORO.GEN.205 *Contracted activities*).

According to the survey performed within the context of Task 1 and confirmed in an interview, there are **approximately 450 entities involved in GH in France**. This involves ground handlers that have access to the GH market in accordance with EC Directive 96/67/EC. In France, a system of cascading subcontracting exists. As an illustration at Paris CDG and Orly, Alyzia has 13 subsidiaries[106].

Based on the expected increase in number of GH employees (0.09 % - 0.24 %) due to the requirements of the proposed GH regulation and assuming that this average would also be applicable for France, an additional 27 to 88 FTEs will be employed by the GHSPs in France in order to meet the requirements of the proposed GH regulation. This implies a cost of EUR 1 - EUR 3 million annually.

Based on the number of annual aircraft movements for France, the estimated reduction in aircraft damage would yield an estimated benefit of EUR 343 000 annually. Based on the estimated number

[101] See NLR & Ecorys (2022b). Task 2 Aviation economic data. Final Report, 12 October 2022.

[102] Only Germany and Spain had more movements in 2019: 1 048 959 and 985 654 annual departures, respectively.

[103] https://www.businessairnews.com/hb_airportpage.html?recnum=422

[104] See NLR & Ecorys (2022a). Task 1 Aviation social data. Final Report, 12 October 2022.

[105] Subsequently, these were supplemented by two Ministerial decrees (Decree of 18 March 1998 and Decree of 28 May 1998).

[106] Alyzis annual report 2018.

of GH employees in France, the reduction in lost time injuries yields a benefit of EUR 90 000 - EUR 365 000 annually.

The NCA in France, DGAC, employs 416.7 technical FTEs. As a result, the budget of DGAC is estimated to be around EUR 105 million. In an interview it was estimated that an additional 15 to 20 FTEs are required to comply with the proposed GH regulation. This is an increase of 3.6 %-4.8 %.

Case 3: Poland

In Poland there were 203 258 aircraft movements in 2019.

Currently there are 14 aerodromes within the scope of the Basic Regulation. According to an interviewee from the NCA, there are 46 GHSPs operating in Poland. At the Frederic Chopin Airport (Warsaw) in Poland, only three GHSPs are active[107]: Baltic Ground Services, LS Airport Services and Welcome Airport Services.

Based on estimates obtained in the other studies performed by NLR/ECORYS on the social-economic factor in aviation safety, there are 5 000 – 6 000 GH employees resulting in an estimate of the total annual revenue for the GH organisations in Poland between EUR 253 million and EUR 301 million.

In Poland certain GH activities are subject to certification, namely fuelling and dangerous goods. In accordance with The Act of 3rd July 2002 – Aviation Law, Regulation of the Minister of Infrastructure of 30 September 2020 on the certification of activities in civil aviation, Regulation of Minister for Transport, Construction and Maritime Economy of 19 November 2012 on groundhandling at airports, handling of dangerous goods and supply of fuel are subject to certification. Certificates are valid for 2 years. In a 2-year period, there will be at least one inspection audit. The ULC, the Polish NCA, performs direct oversight of the certified ground handlers. The ULC also performs indirect oversight via Commission Regulation (EU) No 965/2012 on air operations (ORO.GEN.205 *Contracted activities*) and via Commission Regulation (EU) No 139/2014 on aerodromes (ADR.AR.C.010 and related AMC).

Based on the expected increase in number of GH employees (0.0 9% - 0.24 %) due to the requirements of the proposed GH regulation and assuming that this average is also applicable for Poland, an additional 4-14s FTE will be employed by the GHSPs in Poland in order to meet the requirements of the proposed GH regulation. This implies a cost of EUR 150 000 - EUR 550 000 annually.

Based on the number of annual aircraft movements for Poland, the estimated reduction in aircraft damage yields an estimated benefit of EUR 90 000 annually. Based on the estimated number of GH employees in Poland, the reduction in lost time injuries yields a benefit of approximately EUR 15 000 – EUR 60 000 annually.

The NCA of Poland, the ULC, employed 133.5 technical FTE in 2019. The total budget of the NCA is estimated to be approximately EUR 35 million.

Currently there are 6 employees involved in the direct (on dangerous goods and fuelling) and indirect (aerodromes) oversight of GHSPs. In an interview it was estimated that due to the proposed GH regulation an additional 9s FTE will be necessary. This is an increase of 6.7 %.

[107] See https://www.businessairnews.com/hb_airportpage.html?recnum=1235.

7. Overall conclusions

The impacts of the proposed GH regulation (Option 1) are presented relative to the 'no change in the current policy' option (Option 0). For safety, economic, social and environmental impacts, the impacts are scored on a scale from -10 to +10.

The proposed GH regulation will have the following general impacts:

It is expected that the GHSPs will be regarded as an aviation stakeholder rather than merely a service provider. The proposed GH regulation could create the first steps towards building an improved social status of GH personnel.

The proposed GH regulation puts safety-related requirements on a number of activities of the GHSPs, including safety management and the training of personnel. The NCAs provide oversight to ensure that the requirements of the proposed GH regulation are complied with. This combination means that GHSPs cannot endlessly cut costs in order to stay competitive. Therefore, the proposed GH regulation is expected to bound the 'race to the bottom'.

The proposed GH regulation is a facilitator for safety improvements. Whether safety improvements are actually achieved largely depends on the actions taken by the GHSPs and the interaction between the GHSPs and the NCAs.

Overall, the RIA of RMT.0728 has adopted a conservative approach. That is why some of the estimated costs and benefits are underrated, particularly with regard to the reduction of costs generated by aircraft ground damage. EASA intends to monitor the implementation of the future GH regulation with a view to obtaining more realistic data in this regard.

The estimated figures may also change considering that this RIA does not include an assessment of cost reduction expected to occur with the decrease of the number of audits to GH organisations.

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Attachment B — Delivery systems

To systematically analyse the safety, economic, social and environmental impacts of the proposed GH regulation, the study team developed an influence model. An influence model is a graphical representation of relevant factors and how they influence each other. The factors are presented by boxes and the influences are presented by arrows. This model details how the proposed measures in the GH regulation potentially affect the different impact areas using a logical thread of influences.

The proposed measures influence the air transport system by influencing the principal management systems of the organisations in aviation. Management can be considered as the process of delivering the necessary resources and criteria for the front-line workforce at the task execution level to operate. The operational functions are controlled by allocating suitable resources to them and by imposing suitable criteria and controls on the way in which they are carried out. The supply of these resources and controls is governed by secondary management processes, which are called delivery systems. They have been grouped into eight generic delivery systems, six related to human performance, two related to hardware.

The six delivery systems related to human performance are Competence, Availability, Commitment, Interfaces, Communication and Procedures. In addition to these human delivery systems, there are two technology delivery systems: Design and Maintenance.

Communication

Communication refers to online communication necessary for performing the tasks. It occurs implicitly or explicitly within any task when it involves more than one person. Proper communication ensures that the tasks are coordinated and everyone knows who is doing what.

This delivery system includes the operational communication between the GH employees as well as the safety communication to ensure that personnel are aware of safety-critical information.

Procedures

Rules and procedures are specific performance criteria which specify in detail, often in written form, a formalised ‘normative’ behaviour or method for carrying out an activity. They may also cover informal ‘good practice’.

For the GH employees one or more manuals are available that contain the operational procedures. The lack of harmonisation of operating procedures for GH across aircraft operators is frequently mentioned by GHSPs as problematic and a cause for error.

This delivery system includes the procedures as well adherence to the procedures.

Commitment

The incentives and motivation which personnel have in order to carry out their tasks and activities with suitable care and alertness, and according to the appropriate safety criteria and procedures specified by the organisation or by the workforce themselves for unexpected situations. This delivery system deals with the incentives of individuals carrying out the primary business activities not to choose other criteria above safety, such as ease of working, time saving, social approval, etc. Safety culture is included in this delivery system. A safety culture consists[108] of an informed culture, a reporting culture, a learning culture, a just culture and a flexible culture.

Availability

The delivery system 'availability' refers to allocating the necessary time (or number) of competent personnel to the tasks which have to be carried out. It refers to the operational staff as well as to support staff.

The proposed GH regulation does not affect operational staff but only support staff.

Competence

The delivery system 'competence' includes the knowledge, skills and attitude of first-line and/or back-up personnel who have been selected and trained for the safe execution of the critical tasks and activities in the organisation. This system covers the selection and training function of the company, which delivers sufficient competent staff for overall manpower planning. Competence should be seen as not only cognitive, but also physiological, i.e. it includes factors such as health and physiology.

For this assessment, competence refers to the competence of the operational GH personnel.

Maintenance

Maintenance deals with the management processes for ensuring that the hardware and software in use are kept in an effective state as specified by design or as modified to take account of improvements.

In the GH domain, servicing of aircraft on the ground involves the use of different types of GSE, motorised and non-motorised, which either operate in close proximity to persons or the aircraft or in direct contact with it. For this impact assessment, this delivery system refers to the maintenance of GSE. GSE that is not properly maintained has the potential to inflict aircraft damage or injuries to personnel, e.g. due to defects of brakes, couplings, proximity sensors, protective covers/bumpers, safety stops, etc.

Design

This delivery system deals with the process for ensuring that the hardware/software risk control measures and risk control measure elements which have been specified are acquired or designed, either by purchase from outside or by construction on site, are put in place and adjusted, and that the spare parts or replacements purchased and stored for the maintenance phase of their life cycle are the correct ones and are in good condition when used.

The proposed GH regulation does not affect the design of hardware/software.

Interfaces

This covers the ergonomics of the interfaces which are used/operated by operations, inspection or maintenance. Included are both the appropriateness of the interface for the activity and the user-

[108] https://www.airsafety.aero/Safety-Information-and-Reporting/Safety-Management-Systems/Safety-Culture.aspx

friendliness needed to carry out the activities. It is emphasised that this delivery system does not include the interfaces between organisations.

The proposed GH regulation includes the delivery system ‘interface’ within procedures.

Attachment C — Stakeholder consultation

For this impact assessment the following interactions with the stakeholders have been taken place.

Working paper

A working paper was developed and distributed to inform the Stakeholder Advisory Body (SAB) and the Member State Advisory Body (MAB) about the study and its purpose.

Data requests to industry associations

During the inception phase three interviews were conducted on the phone with the following associations: ASA (06/01/2022); ACI Europe (10/01/2022); and AIRE (13/01/2022).

Discussion with the RMT.0728 experts

On 10 February 2022 the study team participated in the RMT.0728 expert meeting. The meeting gave the study team the opportunity to hear the progress of RMT.0728, to get to learn the participants and to introduce the study.

Webinar

On 30 June 2022, the study team attended the webinar organised by EASA as part of the first consultation of the proposed GH draft rules. The purpose of the webinar was to clarify the approach taken in developing the draft regulation and to invite participants to ask questions and provide suggestions for improvement.

Survey

The collection of data for the studies on the socio-economic factors in relation to Article 89 of Regulation (EU) 2018/1139 was performed among others via a survey among the GHSPs. This resulted in 27 responses of which 2 terminated the survey before reaching the end. In order to obtain additional information for this impact assessment, additional questions were sent to the respondents that provided an email address. This resulted in 6 additional responses.

Interviews

The stakeholders listed in table below were consulted via interviews. In total 14 interviews were conducted with the following stakeholder groups as follows:

— GHSPs;

— one employment agency;

— NCAs;

— industry associations (ASA, IATA, IBAC, ACI Europe and Airline4Europe).

The interviews were conducted with one or more representatives of the organisations as presented in Table C.1. The interviews were held via Microsoft Teams and took between 1 and 1.5 hours. The interviews were held by two members of the study team. For each interview, minutes were taken and shared with the interviewees for review.

Table C.1: List of interviews

Organisation	Date of interview
KLM ground services	30 March 2022

Organisation	Date of interview
IAA (NCA Ireland)	13 June 2022
Airport Services Association (ASA)	22 June 2022
Air Dispatch[109]	4 July 2022
RCAA (NCA Romania)	5 July 2022
IBAC	7 July 2022
Airlines for Europe	15 July 2022
ULC (NCA Poland)	19 July 2022
Swissport	25 July 2022
DGAC (NCA France)	28 July 2022
LGS Handling Ltd	29 July 2022
IATA	9 August 2022
Employment agency Werk&Ik (Netherlands)	16 August 2022
ACI Europe	23 August 2022

Social impact validation

On 30 September 2022 a validation session was organised with ACI Europe, ASA, ETF and Airlines for Europe in order to validate the social impact assessment. In this 2-hour session feedback was obtained on the applied methodology related to:

— the applied weighing of the 10 social criteria for an impact assessment;

— the obtained scoring per social criterion.

In general, the results from the validation session corroborated the assessment made by the study team. For the weights some minor adjustments were proposed compared to the 'default' weights presented in the methodology. The study team used the weights proposed in the validation session.

The following difficulties were identified:

— The participants of the validation session and also the study team had difficulties to interpret and assess the weight of the criteria.

— The scoring for a particular criterion is based on the scoring for one or more associated indicators. In several cases the indicators do not cover all the elements of the criterion.

— The scoring scales are not present for all indicators and criteria, and the correctness is in some cases debated.

— In the criteria and indicators, a distinction is made between the relevance for an impact assessment and the relevance for monitoring and evaluation. This distinction is not very clear.

[109] This interview was held via an email exchange.

Attachment D — Social impact assessment methodology

Introduction

In order to determine the social impact, the social impact assessment methodology is applied[110]. Because it is the first time that this methodology is applied and because the methodology is rather extensive, this Attachment explains the methodology in more detail. Additionally, a validation session was held with stakeholders to cross-check the assessment of the social impacts and the weighting of the social criteria. More details on the validation session are provided in Attachment C.

Steps of the methodology

The methodology consists of the following steps:

1. scoping (selection of criteria);
2. selecting the relevant indicators;
3. defining the relative weights;
4. assessing the direction and size of the impact;
5. calculating the overall score.

Criteria and relative weights

This Attachment presents the long list of 16 criteria that are relevant for assessing the social impact with their level of importance (high, medium, low). In the social impact assessment methodology, the relative importance is presented, which was obtained from stakeholder consultations. Additionally, the social impact assessment methodology states that 6 of the 16 identified social criteria are deemed more relevant for monitoring than for ex ante impact assessment. For this reason, it is recommended by the methodology to exclude these from the following steps. This is done by setting their importance at 'None'. It concerns Criteria 6 (labour standards), 9 (social dialogue), 11 (autonomy social partners), 12 (information and consultation rights), 15 (lifestyle related determinants of health) and 16 (position of specific groups).

The 10 resulting criteria and their importance is presented in Table D.1. The importance for the criteria is obtained from the validation session with stakeholders (see Attachment C). The report on the methodology provides 'default' weights. For Criteria 1 (total employment), 7 (access to vocational training and/or advice on career development) and 14 (mobility of workers), the weights obtained from the validation session differ from the 'default' weights.

Table D.1: Social criteria and relative importance.

Nr	Criteria	Importance
Employment and labour markets		
1	Effect on total employment	Medium
2	Effect on turnover of workers	High

[110] Ecorys (2019). Methodological Impact Assessment Support on Social Impacts and Circular Economy Indicators, Final report Task 1 for EASA, 26 June 2019.

Nr	Criteria	Importance
Working conditions		
3	Effect on wages, wage-setting mechanisms or labour costs	High
4	Effect on employment protection	High
5	Effect on work organisation	High
6	*Effect on the exercise of labour standards*	*None*
7	Effect on access to vocational training and/or advice on career development	Medium
8	Effect on occupational health and safety	High
9	*Effect on social dialogue*	*None*
10	Effect on 'just culture'	Medium
Governance, participation and good administration		
11	*Effect on the autonomy of social partners in the areas for which they are competent*	*None*
12	*Effects on information and consultation rights*	*None*
Access to and effects on social protection, health and educational systems		
13	Effect on the level of education	Low
14	Effect on the mobility of workers	Medium
Public health & safety		
15	*Effect on lifestyle-related determinants of health such as diet, physical activity or use of tobacco, alcohol, or drugs*	*None*
16	*Effect on position of specific groups of works*	*None*

Table D.2 presents the 4-point scale used for the relative weights of the criteria (and also of the indicators).

Table D.2: Relative weights per importance

Assessment of importance/relevance	Relative weight
High	4
Medium	3
Low	2
None	0

Indicators

Table D.3 presents the indicators per criterion. According to the social impact assessment methodology, not all indicators are suitable for an impact assessment. The 15 indicators that are suitable for an impact assessment are indicated by a checkmark in the table below. Only these indicators will be used in the assessment of the social impact. Observe that only for Criteria 3, 5, 8 and 10, more than one indicator is suitable.

Table D.3: Long list of indicators for the social impact assessment

Nr	Indicator	Suitable for impact assessment
Employment and labour markets		
1A	Change in the number of employees	✓
1B	Change in the FTE/employee ratio	

Nr	Indicator	Suitable for impact assessment
2A	Degree to which function levels change due to a change in the tasks of the function (% of jobs affected)	✓
2B	Change in the employee turnover rate (% of employees leaving the firm/total employment)	
Working conditions		
3A	Change in the net income per FTE	✓
3B	Change in the maximum retirement age	✓
4A	Change in the percentage of employees on atypical ('flexible') contracts	✓
5A	Change in the average number of hours worked	✓
5B	Change in the workload	✓
6A	Change in the use of non-national labour contracts	
7A	Change in the % of workers receiving vocational training/career development advice	✓
8A	Change in the number of work-related safety incidents	✓
8B	Change in the absence rate due to sickness	
8C	Change in the occurrence of 'provisional inability'	✓
9A	Change in the union representation	
10A	Change in the likelihood of occurrences being reported	✓
10B	Change in the likelihood of actions following the reporting of just culture	✓
10C	Change in the level of privacy protection	✓
Governance, participation and good administration		
11A	Change in the existence of the social impact mitigation system (similar to the safety management system)	
11B	Change in the rights of unions to organise actions (e.g. strikes)	
12A	Change in the level of right of information and/or consultation in organisations, companies	
Access to and effects on social protection, health and educational systems		
13A	Change in education level requirements for functions	✓
14A	% of workers for which the principal place of employment changes within country/administrative region	
14B	% of workers for which the principal country/administrative region of employment changes	
14C	Change in the cross-border mobility within the EU	✓
Public health & safety		
15A	Change in the use of support programmes to combat addictions (alcohol, drugs other)	
16A	Change in the access to jobs for specific groups of workers groups (disability, gender, age)	

Scoring scales for each indicator

For each of the relevant 15 indicators, the following scoring scales, as presented in the social impact assessment methodology, are used.

1A. Change in the number of employees

Table D.4: Scoring scale for change in the number of employees

Qualitative description	Score	Quantitative impact
Very high positive impact	+5	>2.5 %
High positive impact	+4	1 to 2.5 %
Medium positive impact	+3	0.5 to 1 %
Low positive impact	+2	0.05 to 0.5 %
Very low positive impact	+1	0 to 0.05 %
None	0	0
Very low negative impact	-1	-0.05 % to 0
Low negative impact	-2	-0.5 to -0.05 %
Medium negative impact	-3	-1 to -0.5 %
High negative impact	-4	-2.5 to -1 %
Very high negative impact	-5	<2.5 %

2A. Degree to which function levels change due to a change in the tasks of the function (% of jobs affected)

No scale is provided for this indicator.

3A. Change in the net income per FTE

Table D.5: Scoring scale for change in the net income per FTE

Qualitative description	Score	Quantitative impact
Very high positive impact	+5	>3.5 %
High positive impact	+4	2.63 to 3.5 %
Medium positive impact	+3	1.75 to 2.63 %
Low positive impact	+2	0.88 to 1.75 %
Very low positive impact	+1	0 to 0.88 %
None	0	0
Very low negative impact	-1	0 to -0.88 %
Low negative impact	-2	-0.88 to -1.75 %
Medium negative impact	-3	-1.75 to -2.63 %
High negative impact	-4	-2.63 to -3.5 %
Very high negative impact	-5	<3.5 %

3B. Change in the maximum retirement age

Table D.6: Scoring scale for change in the maximum retirement age

Qualitative description	Score	Quantitative impact
Very high positive impact	+5	<-0.54%
High positive impact	+4	-0.40 to -0.54%
Medium positive impact	+3	-0.27 to -0.40%
Low positive impact	+2	-0.13 to -0.27%
Very low positive impact	+1	0 to -0.13%
None	0	0
Very low negative impact	-1	0 to 0.13%
Low negative impact	-2	0.13 to 0.27%
Medium negative impact	-3	0.27 to 0.40%
High negative impact	-4	0.40 to 0.54%
Very high negative impact	-5	>0.54%

4A. Change in the percentage of employees on atypical ('flexible') contracts

Table D.7: Scoring scale for change in the percentage of employees on atypical ('flexible') contracts

Qualitative description	Score	Quantitative impact
Very high positive impact	+5	>-0.4%
High positive impact	+4	-0.3 to -0.4%
Medium positive impact	+3	-0.2 to -0.3%
Low positive impact	+2	-0.1 to -0.2%
Very low positive impact	+1	0 to -0.1%
None	0	0
Very low negative impact	-1	0 to 0.1%
Low negative impact	-2	0.1 to 0.2%
Medium negative impact	-3	0.2 to 0.3%
High negative impact	-4	0.3 to 0.4%
Very high negative impact	-5	>0.4%

5A. Change in the average number of hours worked

Table D.8: Scoring scale for change in the average number of hours worked

Qualitative description	Score	Quantitative impact
Very high positive impact	+5	>-10.1%
High positive impact	+4	-7.7 to -10.1%
Medium positive impact	+3	-5.2 to -7.7%
Low positive impact	+2	-2.6 to -5.2%
Very low positive impact	+1	0 to -2.6%
None	0	0
Very low negative impact	-1	0 to 2.6%
Low negative impact	-2	2.6 to 5.2%
Medium negative impact	-3	5.2 to 7.7%
High negative impact	-4	7.7 to 10.1%
Very high negative impact	-5	>10.1%

5B. Change in the workload

Table D.9: Scoring scale for change in the workload

Qualitative description	Score	Quantitative impact
Very high positive impact	+5	>-50% decrease of workload/complexity
High positive impact	+4	40–50 % decrease of workload/complexity
Medium positive impact	+3	30–40% decrease of workload/complexity
Low positive impact	+2	20–30% decrease of workload/complexity
Very low positive impact	+1	Less than 20 % decrease of workload/complexity
None	0	0
Very low negative impact	-1	Less than 20 % increase of workload/complexity
Low negative impact	-2	20–30 % increase of workload/complexity
Medium negative impact	-3	30–40 % increase of workload/complexity
High negative impact	-4	40–50 % increase of workload/complexity
Very high negative impact	-5	More than 50 % increase of workload/complexity

7A. Change in the % of workers receiving vocational training/career development advice

Table D.10: Scoring scale for change in the percentage of workers receiving vocational training/career development advice

Qualitative description	Score	Quantitative impact
Very high positive impact	+5	>50%
High positive impact	+4	37.5 to 50%
Medium positive impact	+3	25 to 37.5%
Low positive impact	+2	12.5 to 25%
Very low positive impact	+1	0 to 12.5%
None	0	0
Very low negative impact	-1	0 to -12.5%
Low negative impact	-2	-12.5 to 25%
Medium negative impact	-3	-25 to -37.5%
High negative impact	-4	-37.5 to -50%
Very high negative impact	-5	>50%

8A. Change in the number of work-related safety incidents

Table D.11: Scoring scale for change in the number of work-related safety incidents

Qualitative description	Score	Quantitative impact
Very high positive impact	+5	>-5.2%
High positive impact	+4	-3.9 to -5.2%
Medium positive impact	+3	-2.6 to -3.9%
Low positive impact	+2	-1.3 to -2.6%
Very low positive impact	+1	0 to -1.3%
None	0	0
Very low negative impact	-1	0 to 0.7%
Low negative impact	-2	0.7 to 1.3%
Medium negative impact	-3	1.3 to 2.0%
High negative impact	-4	2.0 to 2.6%
Very high negative impact	-5	>2.6%

8C. Change in the occurrence of 'provisional inability'

Provisional inability is defined in Regulation (EU) 2015/340 as 'a temporary state in which the licence holder is prevented from exercising the privileges of the licence when ratings, endorsements and his/her medical certificate are valid'.

For an impact assessment this indicator refers to showing up at work while not fully healthy or feeling well in order to perform the job. The extent to which this is prevalent should be assessed by means of surveys, and monitored to disentangle a trend.

No scale is provided for this indicator.

10A. Change in the likelihood of occurrences being reported

This indicator can be assessed by monitoring the occurrences that are being reported over time. Furthermore, surveys can be administered including the following items:

— Employees who report safety-related occurrences are treated in a just and fair manner.

— Voicing concerns about safety is encouraged.

— I am prepared to speak to my direct manager when unsafe situations are developing.

No scale is provided for this indicator.

10B. Change in the likelihood of actions following the reporting of just culture

This indicator should be qualitatively assessed. Furthermore, it is important to pay attention to the way in which impacts are interpreted. Actions can be positive in terms of learning from incidents and improving procedures. However, actions can also imply sanctioning of individual employees, which have an opposite effect on social safety.

No scale is provided for this indicator.

10C. Change in the level of privacy protection

This indicator should be assessed qualitatively; for example, using interviews and surveys.

No scale is provided for this indicator.

13A. Change in the education level requirements for functions

The change in the education level requirements for specific functions can be used as an indicator. This indicator may be assessed qualitatively; for example, by studying vacancy texts over time. It should be assessed per rule whether this indicator is perceived as positive or negative. For example, higher requirements could be perceived as a positive effect as this may reflect higher quality. However, it may also be regarded negative, as it may raise barriers to enter a certain profession or job.

No scale is provided for this indicator.

14C. Change in the cross-border mobility within the EU

This indicator may be measured by assessing the number of legal or regulatory changes during a certain time period, regarding free movement of labour.

No scale is provided for this indicator.

Calculating the overall score

To calculate the overall score for the social impact, first a score per criterion is calculated. The score per criterion is the weighted average of the score for the suitable indicators. In this way, the overall score is made independent of the number of indicators identified for each criterion. Since only for Criteria 3, 5, 8 and 10 more than one indicator is suitable, for these indicators the relative weights for the indicators are relevant. In the assessment equal weights are used in these indicators.

The social impact assessment results in a score between -5 and +5, for each criterion.

The overall score for the social impact is computed by taking the weighted average score over all criteria, where the relative weights are determined using the importance as provided in Table D.1.

Attachment E — Results from Tasks 1 and 2

For the impact assessment, the study team used several indicators and statistics from Tasks 1 and 2 of this study. In this Attachment, a methodological section is included on how the figures used in Task 1 and Task 2 for the elements listed below were obtained. This is followed by a description of the indicators that were used to estimate the impacts in Chapter 6. The following indicators are presented:

— Number of employees (both NCAs and GHSPs);

— Budget of NCAs;

— Turnover/operating revenue of GHSPs;

— Age profile of employees of GHSPs;

— Average wage of employees of NCAs and GHSPs.

Methodology

Data collection process

Starting point of the data collection was the construction of a list of GHSPs and NCAs. For the NCAs a complete list of organisations for each EASA Member State was made. For the GHSPs a representative list is constructed based on the following criteria:

— about 50 organisations;

— covering smaller and larger organisations in terms of number of employees;

— organisations geographically spread across Europe with emphasis on the case studies for Task 3, Ireland, France and Poland;

— covering GHSPs that are (1) independent entities, (2) entities that are part of an airline, (3) entities that are part of the aerodrome operator;

— Contact details available (email and telephone number).

For the selected organisations, the data was collected for 2019 (representing 'business as usual') and 2020 (representing a crisis scenario like the COVID-19 pandemic).

The following step-by-step data collection approach was used for collecting aviation data.

Table E.1: Step-by-step data collection approach

Step	GHSPs	NCAs
A. Literature and research studies	✓	✓
B. European wide stored data	✓	✓
C. National statistics	✓	✓
D. Associations and trade unions	✓	
E. Annual reports	✓	✓
F. Survey	✓	✓

A. Literature and research studies

Literature and research studies that contained relevant data for the economic indicators were identified through contacts with EASA and associations, as well as contacts within the NLR and ECORYS consortium's network. Additionally, a search was conducted using different search engines such as PubMed and Google Scholar, using different combinations of relevant search terms.

B. European wide stored data

A second source of information is centrally stored European data. Data was collected from the following sources:

— EUROSTAT;

— ORBIS database;

— EASA SIS database.

Eurostat is the statistical office of the European Union. Eurostat produces European statistics in partnership with national statistical institutes and other national authorities in the EU Member States. This partnership is known as the European Statistical System (ESS). It also includes the statistical authorities of the European Economic Area (EEA) countries and Switzerland.

Eurostat covers multiple themes that relate to this study, such as:

— labour market;

— equality (gender and age);

— business statistics.

A major limitation of EUROSTAT is the high-level definition of business activities (NACE-code up to 4 digits), which does not allow for any further specification of aviation activities (such as GH).

The ORBIS database (also known as Amadeus) contains financial information on a company level, which is deducted from financial reports. The database offers detailed financial information on the balance sheet and profit and loss account for over 400 million companies worldwide (covering more than 80 % of the European companies).

In the ORBIS database the following financial indicators are available:

— operating revenue (turnover) in the years 2019, 2020 and 2021;

— personnel costs in the years 2019, 2020 and 2021;

— number of employees in the years 2019, 2020 and 2021;

— Earnings before interest, taxes, depreciation and amortisation (EBITDA) in 2019, 2020 and 2021;

— Operating profit/loss (earnings before interest and taxes (EBIT)) in 2019, 2020 and 2021.

The ORBIS database was used to collect the turnover, the profit margin and the number of employees for the GHSPs.

The EASA SIS database provides budget (Y2Y change %) information and number of FTEs for NCAs.

C. National statistics

The next step was the use of data that is nationally collected data and/or stored by each EASA Member State. The survey sent to the NCAs contained questions on the economic indicators for the NCAs as well as questions regarding the availability of economic data for GHSPs such as the number of GHSPs in their country.

On a sectoral level, the National Bureaus of Statistics in Europe were contacted to investigate what relevant economic data could be made available within the time frame of this study.

D. Associations and trade unions

In this step, it was investigated which economic data can be obtained from international industry associations and trade unions by contacting them directly. Associations and trade unions sometimes publish the socio-economic impact of certain sectors.

E. Annual reports

The annual reports for 2019 and 2020 were collected for the NCAs and the selected GHSPs. For some organisations, relevant information is provided in a different report such as an annual 'sustainability report' which is also collected. In some countries no annual reports are published on the level of the NCA, but annual reports on a ministry level are published. In that situation, these annual reports on a ministry level were collected too.

F. Survey

Data was also collected via a survey directly targeting the individual organisations. For the NCAs and GHSPs a dedicated survey was developed.

All NCAs in the EASA Member States were contacted to provide economic data. For the GHSPs, the survey was sent initially to the representative selection of GHSPs. Additionally, when sending the invitation for the survey to the NCAs, the NCAs were requested to forward the survey for the GHSPs to the GHSPs in their country.

Approach to estimate the indicators

Data selection

For each indicator, data was collected from various sources. To select the data from the most reliable source, the following hierarchy was applied:

1. Specific data obtained from the survey;
2. Specific data obtained from the annual reports;
3. Specific data obtained from European-wide databases;
4. Specific data obtained from literature and research studies.

Data validation

All available information was collected and used, regardless of completeness and/or overlap with data that has already been collected. Overlapping data was used for data validation. The overlapping data in combination with publications in newspapers, (trade) journals and websites was used as input for a data validation session with experts.

European average

In order to obtain an average for all EASA Member States (such as operating revenue), the basis of the analysis is the number of employees in EASA Member States. To obtain an average for a specific country, a correction was made for the size of the organisations in each country in terms of employees.

If the data was available for n countries $i = 1, \ldots, n$ l, p_i denotes the number of employees for a specific job in country i and $p = \sum_{i=1}^{n} p_i$. When f_i denotes the estimate for country i, then the estimate f for all EASA countries is then given by

$$f = \sum_{i=1}^{n} w_i f_i, \text{ with } w_i = \frac{p_i}{p}$$

To obtain an estimate for a specific country when no data was available, the European average can be taken.

NCAs (applied indicators)

Number of employees

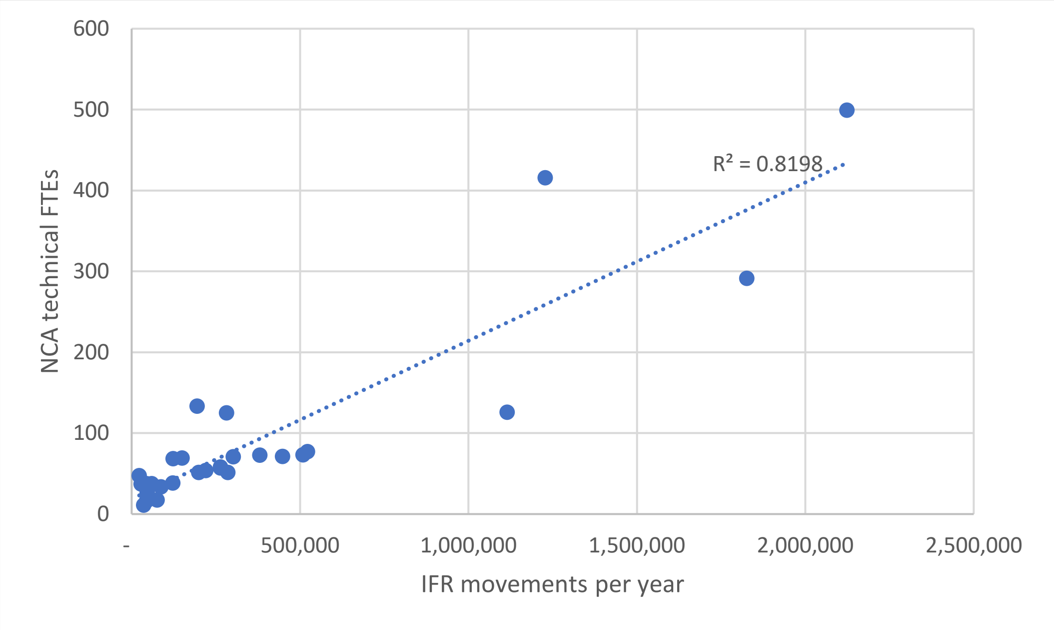
This section describes how the number of FTEs per EASA Member State was collected. The number of FTEs per Member State is used to calculate the European average for the different types of social data in the next sections of this section.

During the research, different sources were used that provide information regarding the number of employees and/or the number of FTEs working at the NCAs of EASA Member States. These sources are categorised as follows: organisational reports (i.e. annual reports and social reports), the survey, the EASA SIS database and miscellaneous data sets (e.g. governmental statistical services).

The collected data was found to be inconsistent. For example, not all the respondents of the survey actually answered the questions related to the number of employees and/or FTEs. Moreover, some only answered part of those questions. Also, some organisations reported the total number of employees in the entire overarching organisation of the NCA, mostly referring to some Ministry of Transport of the given Member State. Due to the lack of consistent data from both the survey and the collected annual reports, the decision was made to use data from the EASA SIS database. This database supplied the number of technical FTEs per EASA Member State NCA for the year of 2020. The drawback of this dataset was that this data only included technical FTEs, meaning that other types of staff were not included in the data. However, using this data set was still deemed most appropriate, as the number of technical FTEs in an NCA is considered a proxy for the relative size of the NCA compared to other Member States. This number was used to calculate a relative weight of the NCA. The study team only received the 2020 data from the SIS database. Therefore, the 2019 data that was collected was normalised with EASA SIS data from 2020.

Figure E.1 shows the correlation between the EASA SIS number of technical FTEs per EASA Member State and the number of IFR arrivals and departures per EASA Member State (Eurocontrol). As indicated in the figure, R^2 is calculated as 0.8198, showing a strong correlation.

Figure E.1: Scatter plot between number of IFR movements and technical FTE working at the NCA per EASA Member State for 2019



Budget and source of budget

This section describes the budget and sources of the budget per NCA. The data presented in Table E.2 is a collection of data from both the survey and collected annual reports of the NCAs. Some survey results included comments that mentioned that the supplied data was for the entire ministry and not only for the NCA. Also, some survey results mentioned a very large number of FTEs working at the organisation (i.e. 700 or more for a small country). Those results are not included in this indicator, as data has been used only where there was enough certainty that the information that was provided only included NCA budget.

Table E.2 shows also the three different types of sources of budget, namely: funding by both fees and grants, funding by fees and funding by grants. When an NCA only receives funding by fees, their budget comes solely from collecting fees from service providers, such as operators. When the funding comes from grants, the NCA receives all of its budget from subsidiaries from the government.

For the year 2019, 15 data points were collected. For the year 2020, 14 data points were collected. Budgets were included only where it could be verified that only NCA-related budgets were provided in the survey and/or annual report.

For the year 2019, 2 out 15 (13 %) receive a funding only from grants, while 3 out of 15 (20 %) receive their funding only from fees. The other 10 NCAs (67 %) receive their funding from both fees and grants.

Two studies were identified in which data on sources of the budget was collected. It involved data from 2009 and 2013. For both studies the sources of budget were distributed equally: 1/3 received a funding only from grants; 1/3 receive their funding from fees; and 1/3 receive their funding from both grants and fees. Table E.2 shows a less evenly distribution of budget sources. This difference might be caused by the limited set of respondents to this particular survey question (15 and 14 NCAs).

Table E.2: Size and sources of the budget per country (anonymised) for 2019 and 2020

Country	Budget and Source	
	2019 (n=15)	2020 (n=14)
Funding by fees and grants (in €)		
A	14 528 648	
B	35 893 548	40 167 363
C	128 000 000	127 000 000
D	93 530 000	88 181 000
E	4 326 226	4 210 000
F	5 558 000	3 978 000
G	22 990 000	24 550 000
H	2 020 646	2 111 267
I	4 116 098	3 672 177
Funding by fees		
J	8 003 000	5 658 000
K	81 315 451	81 824 320
L	86 841 566	93 507 892
Funding by grants		
M	139 438 305	162 001 355
N	5 731 065	6 265 035

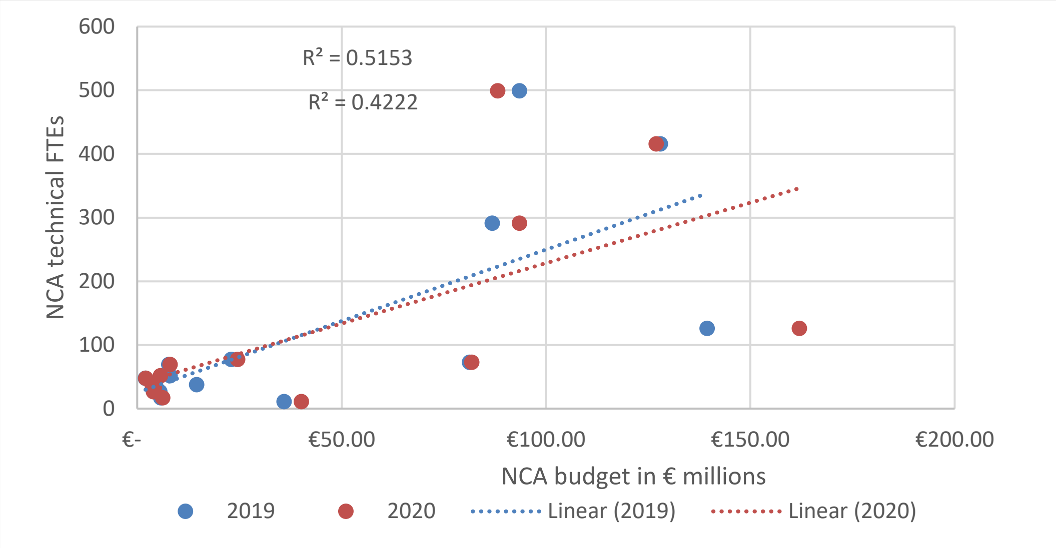
Table E.3 presents the European average budget as well as the range in the budget (minimum and maximum budget) for 2019 and 2020. The European average annual budget for NCAs was calculated to be EUR 84 345 728 for 2019 and EUR 86 816 739 for 2020. The average European NCA budget increased by 2.9 % in 2020 compared to 2019.

Table E.3: Average EASA Member State NCA budget with the range (minimum and maximum) for 2019 and 2020

	2019	2020
Average	€84 345 728	€86 816 739
Minimum	Min: €2 020 646	Min: €2 111 267
Maximum	Max: €139 438 305	Max: €162 001 355

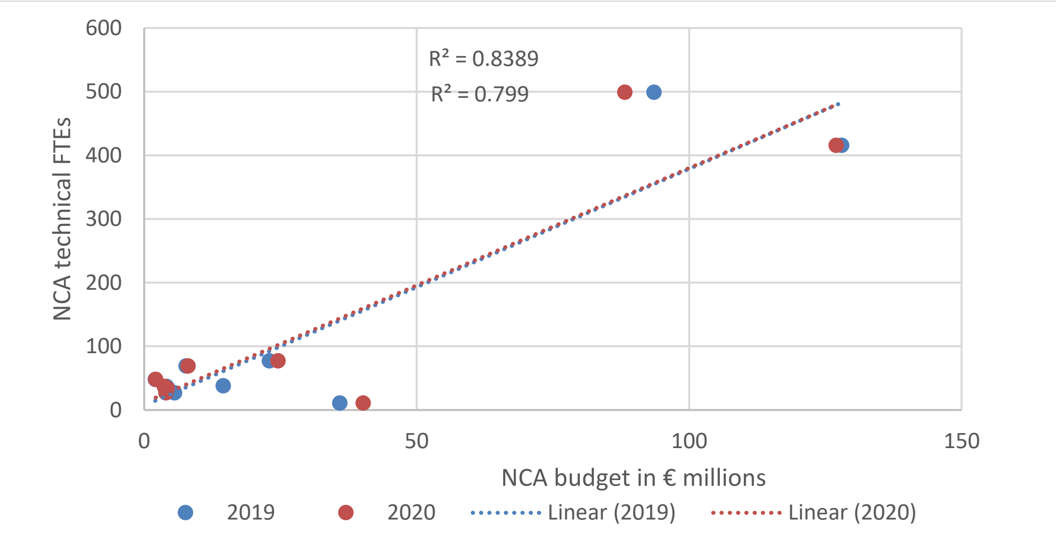
It has been suggested that the majority of the budget of the NCA is spent on personnel costs. To test this suggestion, a regression fit was done between the provided budgets and the technical FTEs, as provided in the EASA SIS database. The number of technical FTEs is based on the 2020 EASA SIS data.

Figure E.4: Regression fit between the number of technical FTE at the NCA and the NCA budget for 2019 and 2020



As the type of budget source can influence the size of the budget, another correlation plot was made, see Figure E.5. This correlation plot only includes NCAs that receive funding from both fees and grants. The budget of 10 NCAs is included in this figure. The correlation between the number of technical FTEs and the NCA budget is far stronger in this plot, with an R^2 of 0.8389 and 0.799 for 2019 and 2020 respectively.

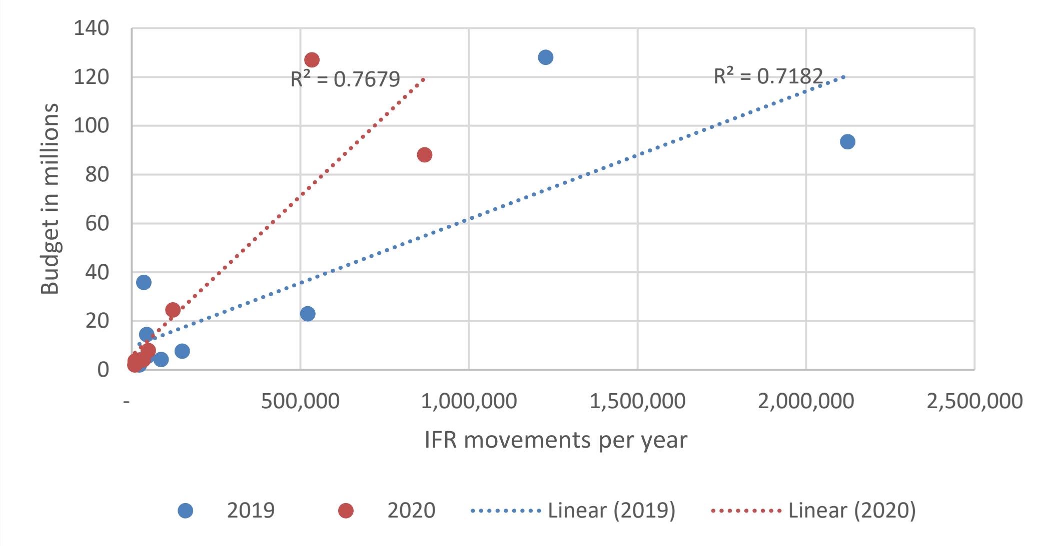
Figure E.5: Regression fit between the number of technical FTEs at the NCA and the NCA budget only for the NCAs that receive funding from both fees and grants for 2019 and 2020



Another correlation that is made is between the NCA budget and the number of IFR movements per year. Here, the hypothesis is that the more movements in a Member State, the more budget is required from the NCA. Also, more movements can result in more travel costs for an NCA, as there are relatively more audits that need to be conducted. The correlation between the number of IFR movements per year and the NCA budget was made as shown in Figure E.6. The influence of the COVID-19 pandemic on the number of IFR movements is clearly visible. However, as most Member

States have a similar reduction in IFR movements, the strong correlation between budget and IFR movements remains, as is reflected in the R^2 value.

Figure E.6: Regression fit between the number of IFR movements per year and the NCA budget for 2019 and 2020



Average wage

This section describes the average annual wage of employees of EASA Member State NCAs. The statistics represent a European average which is normalised with the total FTEs per Member State according to the EASA SIS data.

The European average annual wage was calculated with data of 13 and 14 NCAs for the years 2019 and 2020 respectively. As stated in the previous section, not all data is based solely on wages from employees working at the NCA. For 2019 and 2020, 12 data points were collected by means of the survey. The year 2019 also features a single data point that was acquired via an annual financial report. The year 2020 features two data points that were collected via financial annual reports.

Table E-4: Average annual wage of employees of NCAs for 2019 and 2020

Annual wage	2019 (n=13)	2020 (n=14)
European average	€53 764	€53 953
Range (min, max)	Min: €23 436 Max: €147 000	Min: €23 988 Max: €147 500

The European average annual wage for employees working at an NCA was calculated to be EUR 53 764 and EUR 53 953 in 2019 and 2020 respectively: an increase of only EUR 189. The variation between the different NCAs is quite large. For both years there is a single data point from the same Member State that represents the maximum annual wage. To indicate the influence of this outlier, the European average annual wage was also calculated without this outlier in the data set. This resulted in a European average annual wage of EUR 46 515 (-13.4 %) and EUR 46 969 (-12.9 %) and a European maximum average wage of EUR 89 444 (-39.2 %) and EUR 94 589 (-35.9 %) for the years 2019 and 2020 respectively.

The outlier was discussed with the NCA that submitted this data, during which the NCA declared that the relatively high average wage was due to the high cost of living in that particular Member State and that data that was provided still seemed to be correct. However, to determine how much the differences in average annual wage are associated with differences in economic productivity and standards of living, the data was corrected with the purchasing power parity (PPP). The results show a significant difference in the minimum and maximum average annual wage.

For the year 2019 the minimum changed from EUR 23 436 to EUR 27 672 (+18 %), the average from EUR 53 764 to EUR 45 906 (-14 %) and the maximum from EUR 147 000 to EUR 84 000 (-43 %). For the year 2020 the minimum changed from EUR 23 988 to EUR 29 112 (+21 %), the average from EUR 53 953 to EUR 46 896 (-13 %) and the maximum from EUR 147 500 to EUR 81 808 (-45 %).

GHSPs (applied indicators)

Number of employees

This section describes the number of employees that are involved in GH activities in the EASA Member States. There are no statistics readily available on the number of employees in EU that are involved in GH activities in the EASA Member States. Based on data found in different annual reports, it was possible to do a statistical analysis of the correlation between handled cargo and passengers on the one hand, and the number of ground handlers on the other hand.

An initial regression showed that, as expected, cargo (tonnes) and passengers are positively and strongly correlated to the number of measured flight movements, R2 =0.9956 (p <.001). As such, it was concluded that flight movements can be used as a proxy for the number of handled passengers and cargo.

The available data comes from the annual reports of Globalia, Stuttgart airport, Fraport, SAS, Vienna Airport and Swissport between 2017 and 2020. Considering the exceptional nature of the year 2020, care was taken regarding this year's data. It was noted that while the number of flight movements handled by GHSPs decreased substantially with roughly 60 % between 2019 and 2020, the impact on employees decreased to a less extent (varying between 10 % and 30 %). As such, 2020 is not deemed representative for a linear regression statistical analysis and is therefore excluded from further analysis.

Two linear regressions were tested. The first model did not assume a set intercept of the y-axis, meaning that the number of ground handlers present when there are no flight movements will depend on the final regression rather than theory. This led to the following model:

$$Y = -3974 + 0{,}02945\,X \qquad \text{(Model 1)}$$

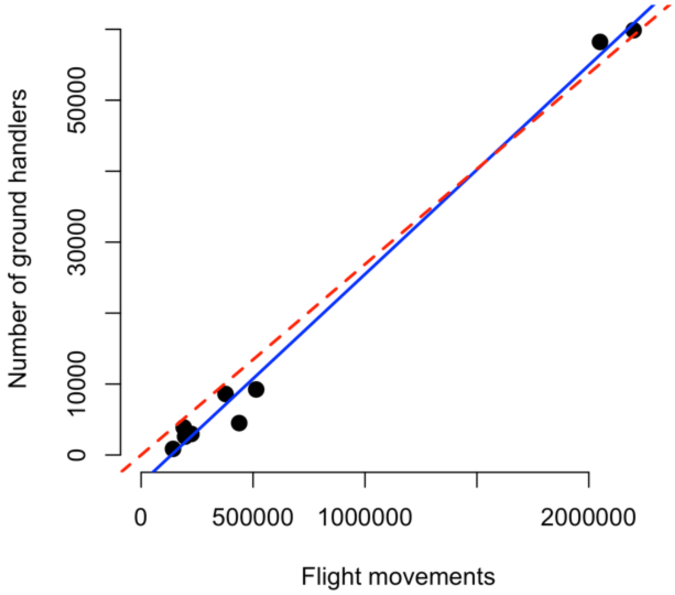
where Y is the expected number of ground handlers and X is the number of flight movements. This model was significant and could explain a large part of the variation in the number of ground handling workers, R2 =0.9912 (p <.001). However, when applying this model to the flight movement data available at the EU level, it underestimated the number of ground handling workers at smaller locations, i.e. airports with a comparably small number of flights per year. As such, a second model was created.

For this model, a regression through the origin was used. In other words, it was assumed that in the theoretical scenario that a country/airport has no flights, there will also be no ground handling workers. This led to the following model:

$$Y = 0.026879\, X \qquad \text{(Model 2)}$$

where Y is the expected number of ground handlers and X is the number of flight movements. This model, too, could significantly explain a large part of the variation in ground handling workers, R2 = 0.982, (p <.0001). In addition, as the model is forced through the origin, the predicted number of ground handling workers will always be positive.

Figure E.8: Regression fit of model 1 (blue straight line) and model 2 (red dotted line)



Source: Eurocontrol (2022), Flight movements; Ecorys & NLR (2022), statistical analysis on ground handling employees.

Using this model, a prediction was made regarding the number of GH employees in Europe, based on the Eurocontrol IFR movements data set. The prediction contains a lower and an upper bound, based on a 95 % confidence interval.

Table E.5: Predicted number of GH employees in 2019 and 2020

	2019	2020
Flight movements	11 059 359	5 339 699
Average number of employees	297 000	144 000
Min:	267 000	129 000
Max:	328 000	158 000

The number of flight movements was reduced by more than 50 % in 2020, as a direct result of the COVID-19 pandemic. It is estimated that the number of GH employees dropped accordingly, but not as much since organisations tend to have more employees as a buffer.

Although the selected cases are deemed representative of the relation between flight movements and the number of ground handling workers, it is still a small sample with its related drawbacks. For instance, not all data sources mentioned clearly what operations they categorise as GH and whether the number of employees was reported in FTEs or not. In addition, there was some indication that the number of ground handling workers per flight movement differed between the analysed GH companies. Because of this, a mixed model approach with the inclusion of the allocation of the share of GH to different companies would likely be more accurate. However, due to a lack of available data, this was not feasible.

Gender balance

The gender balance is expressed by the distribution of males and females working for a GHSP. The two main sources of data for gender balance figures at GHSPs are:

— survey for GHSPs: 20 GHSPs responded to the gender balance survey question[111];

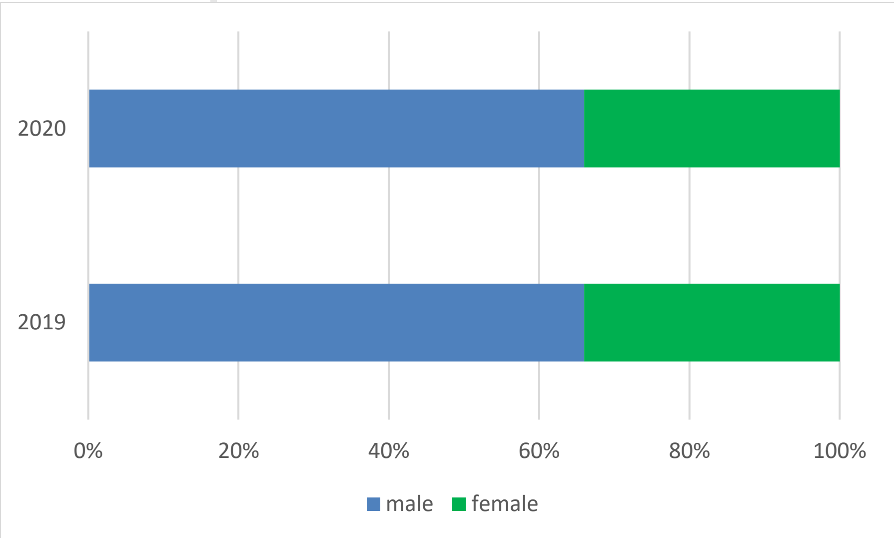
— company annual reports: for 16 GHSPs the gender balance is retrieved from annual reports.

The survey for GHSPs is seen as an accurate source of information when it comes to gender balance as the information comes directly from the GHSP. Information on gender balance is complemented with data retrieved from the company's annual report. This is considered to be a representative proxy for the gender balance within a GHSP.

Gender balance figures are retrieved for both 2019 and 2020. For 2021, the collected information was very incomplete. Therefore, the most actual data between 2019 and 2021 is used to determine the current gender balance in GHSPs in Europe. These percentages are calculated by using a normalised approach, which includes the number of employees in the respective companies. Due to the lack of data, it is not possible to show how the gender balance has developed in recent years.

The calculated gender balance is depicted in Figure 3.19.

Figure 0.1 Gender balance (in %) regarding employees of GHSPs



Source: Ecorys & NLR (2022), obtained from various sources.
Number of respondents (n) = 36 companies, representing +/- 120 000 employees.

[111] Based on question 8 of the survey for GHSPs (Annex II.4).

The gender balance of GHSP is about 1/3 females against 2/3 males. This is perceived as not surprising. Employment in transport is by far male dominated compared to the rest of the economy. A 2018 study showed that the share of women working in the EU transport sector is only 22 % while the share of female employees in the entire European Union is 46 %[112].

Several limitations to the chosen method are perceived during the study, that is:

— Further narrowing down the gender balance of different departments within a GHSP would be interesting. In several interviews, it was suggested to further distinguish between, for instance:
  - baggage handling: where the vast majority is expected to be male;
  - passenger services: where the majority is expected to be female;
  - apron services (such as platform services and specialised services): where the majority is expected to be male[113] .

— Another study limitation is that quantitative information on the share of flexible workforce is missing. According to several interviews and a study performed for the Dutch Ministry of Transport, there is a reason to believe that the share of flexible workforce is ranging between 20 % and 30 % in the Netherlands. At airports where seasonality plays a large(r) role, this share could even be larger (ranging up to +/- 70 %). The majority of the flexible workforce works at baggage handling and apron services and is expected to be male. The implication of the lack of quantitative information on the share of the flexible workforce is that the share of males could be underestimated.

Age profile

The age profile is expressed by the distribution of the age intervals in percentages. The following intervals (of 10 years) are used: ≤ 30; 31-40; 41-50; 51-60 and > 60. In this section, the method to estimate age profile for employees working at GHSPs is presented. The two main sources of data are:

— survey for GHSPs: 17 GHSPs responded to the age profile survey question;

— company annual reports: for 6 GHSPs the age distribution is retrieved from annual reports.

Again, the survey for GHSPs is seen as an accurate source of information when it comes to age distribution. When information from the survey is lacking, the gender balance presented in the company's annual report is considered to be a representative proxy for gender balance within the respective company.

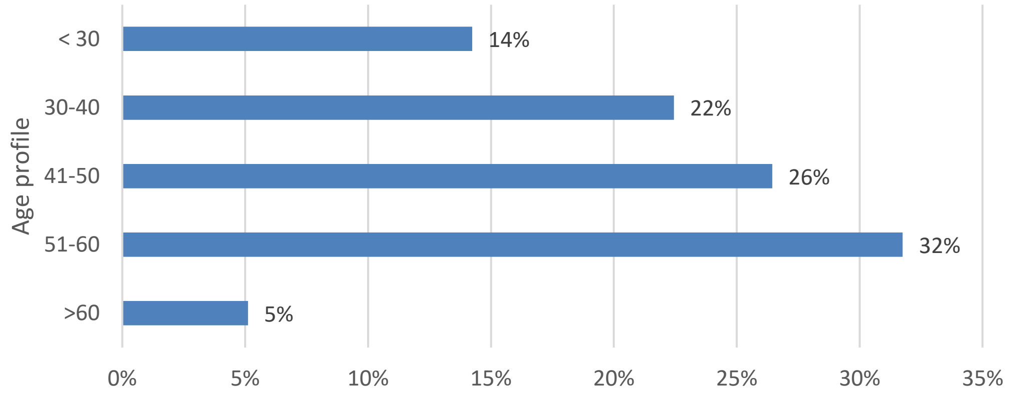
In total, information was collected for 23 GHSPs. The most actual data between 2019 and 2021 was used to determine a robust figure on age profile. These percentages were calculated using a

[112] European Commission. (2018). Business case to increase female employment in transport, 2018.Report prepared for Directorate for Transport and Mobility - DG MOVE, Unit B.5 – Social aspects, passenger rights & equal opportunities.

[113] This possible categorisation would be in line with the definition of GH services according to the Basic Regulation, which include 'any service provided at aerodromes comprising safety-related activities in the areas of ground supervision, flight dispatch and load control, passenger handling, baggage handling, freight and mail handling, apron handling of aircraft, aircraft services, fuel and oil handling, and loading of catering; including the case where aircraft operators provide those ground handling services to themselves (self-handling)'.

normalised approach, which includes the number of employees in the respective companies. The calculated age profile is depicted in Figure E.10.

Figure E.10: Age profile (in %) regarding employees of GHSPs



Source: Ecorys & NLR (2022), obtained from various sources.
Number of respondents (n) = 23 companies, representing +/- 40 000 employees.

Figure E.10 shows that about 14 % of the GH employees is less than 30 years old, whereas almost 40 % is over 50 years old.

The major limitation of the applied method is the lacking information on the flexible workforce. Missing quantitative information on the share of flexible workforce has implications for the age distribution. According to several interviews, there is a reason to believe that the (average) age of the flexible workforce is significantly lower than the average age within the organisation. The implication of not having quantitative information available on the share of the flexible workforce is that the age profile is somewhat skewed towards the older age intervals.

Turnover/operating revenue

Turnover is the total amount of money an organisation receives from the sales of goods and/or services and/or funding, sometimes referred to as ‘gross or total revenue’ or ‘operating revenue’.

Four steps are taken in order to calculate the operating revenue for GHSPs:

Step 1: determine the key figures from the representative sample of GHSPs across Europe;

Step 2: calculate the weighted average operating revenue per employee;

Step 3: estimate the number of employees;

Step 4: estimate the total operating revenue in Europe;

These steps are elaborated upon below.

Step 1: determine the key figures from the representative sample

A representative sample of roughly 50 GHSPs across Europe was established on the basis of several characteristics (i.e. size of the organisation, type of activities, etc)[114]. Subsequently, financial figures of

[114] Company characteristics: (1) covering smaller and larger organisations in terms of number of employees; (2) organisations geographically spread across Europe; (3) different types of GHSPs, such as independent entities, entities that are part of the aircraft operator and entities that are part of the aerodrome operator.

these entities were retrieved from the ORBIS database. Both operating revenue (in euro) and the number of employees of each organisation that responded to the survey were retrieved in order to calculate the average operating revenue per employee (step 2). Table E.6 presents these key figures.

Table E.6: Key figures retrieved from sample of companies (in euro)

Key figures	2019	2020
Operating revenue	€5.2 billion	€2.1 billion
Employees	+/- 149 000	+/- 146 000
Number of GHSPs	46	40

Source: ORBIS (2022) (modified by the authors).

Step 2: calculate operating revenue per employee

In step 2, the operating revenue per company was divided by the number of employees of the same company. The calculation formula is presented below:

$$Operating\ revenue\ per\ employee = \sum_{i=1}^{n} \frac{operating\ revenue_i}{Number\ of\ employees_i}$$

Where:

$$i\ =\ ground\ handling\ service\ provider$$

The estimated revenue per employee is presented in a bandwidth (including minimum, mean and maximum). Information for both 2019 and 2020 is presented in Table E.7. However, the estimated bandwidth in 2019 is perceived to be more robust for further analysis (considering 2020 being impacted by the COVID-19 pandemic).

Table E.7: Operating revenue per employee (in euro)

	2019	2020
European average	52 130	45 432
Minimum	Min: 26 929	Min: 13 783
Maximum	Max: 133 123	Max: 133 918
Number of respondents	32	30

Source: ORBIS (2022) (modified by the authors).
Number of respondents (n) = +/- 32 companies in 2019, representing +/- 125 000 employees; +/- 30 companies in 2020, representing +/- 142 000 employees.

Step 3: Estimate the number of employees

The analysis and prediction of the number of employees can be found in Table E.5 and is repeated in Table E.8.

Table E.8: Predicted number of GH employees in 2019 and 2020

	2019	2020
Flight movements	11 059 359	5 339 699
Number of employees	267 000 – 328 000	129 000 – 158 000

Source: Eurocontrol (2022), Flight movements; Ecorys & NLR (2022), statistical analysis on ground handling employees.

Step 4: estimate the total operating revenue in EASA Member States

In the fourth step, the total operating revenue in Europe was estimated. The estimation is based on the results of step 2 and the predicted number of GH employees in Europe.

$$Operating\ revenue\ Europe = Revenue\ per\ \ employee\ (step\ 2) * Number\ of\ employees\ (step\ 3)$$

The bandwidth shows the combination of the lower prediction of employees against the lowest weight revenue per employee (minimum scenario), whereas the maximum scenario presents the other way around. These scenarios are rather extreme and indicate the absolute boundaries in terms of operating revenue. A more likely scenario is the point estimation of the predicted number of employees against the average weighted revenue per employee (average scenario).

Table E.9: Total operating revenue in EASA Member States (in euro)

Operating revenue	2019	2020
Average	15.5 billion	6.5 billion
Minimum	7.2 billion	1.8 billion
Maximum	43.7 billion	21.2 billion

Source: Ecorys & NLR (2022).

With this relatively simple method, there are plenty of limitations (with possible implications on the bandwidth). The main limitation is that this method builds onto the rough prediction of the number of employees. Obviously, the large decrease in the operating revenue is in line with the decrease of employees but showing a much larger bandwidth due to the added uncertainties. Further analysis would be needed to specify the revenue of GHSPs per Member State.

Average wage

The average wage is defined as the annual gross wage paid by the GHSP. The average wage is calculated per employee and excludes the social security tax that is imposed on the employer. The two main sources of data for average wage figures of GHSPs were:

— Survey for GHSPs: 7 GHSPs responded to the average-wage-related survey question;

— ORBIS financial database: for 37 GHSPs the average wage is retrieved from annual reports.

The survey for GHSPs is seen as an accurate source of information as wages are directly retrieved from employers. Several respondents provided average monthly wages, which are corrected to an annual figure by multiplying with 12 months. Other corrections — such as the social security tax, vacation fees or others — are not deemed necessary.

The information was complemented with information from the ORBIS financial database about the costs of employees per GHSP. In order to estimate the average annual gross wage, the total costs of employees per GHSP were divided by the number of employees. The financial database contains a coverage for the year 2019, which functions as a reference year. In order to estimate a robust average yearly wage, a normalised approach was used, which includes the number of employees in the respective companies.

Table E.10: Estimated average annual gross wage (in euro) of GHSP employees per FTE

Annual wage	2019	2020
European average	25 564	21 520
Minimum	Min: 9 700	Min: 7 402
Maximum	Max: 52 685	Max: 49 804

Source: Ecorys & NLR (2022), obtained from various sources.
Number of respondents (n) = 44 companies, representing +/- 150 000 employees.

The estimated average annual gross wage of GHSP employees was about EUR 41 000 in 2019 as well as 2020. In addition, Table E.11 shows that the collective agreement wages found vary significantly. Whereas the minimum in Italy is just over EUR 1 000 a month, in Germany this is more than double that amount.

Table E.11: Monthly wages per collective sector agreement (in euro)

	Monthly wage		Annual wage	
Country	Min	Max	Min	Max
Netherlands	2 272	4 071	27 264	48 852
Spain	1 231	1 563	14 772	18 756
Italy	1 128	2 205	13 536	26 460
France	1 672	3 682	20 064	44 184
Germany	2 325	3 809	27 900	45 708

Source: Collective agreements in the respective countries.

The following limitations and related implications to this estimate should be noted:

— The survey response rate to the wage-related question is rather limited (especially compared to other social indicators). The sole usage of survey responses would provide insufficient basis to provide a robust bandwidth on average wages.

— Despite the combination of various data sources, the difference in annual wages between European countries, but also between function profiles of employees within a GH organisation are relatively large. When correcting for the purchasing power in EASA Member States, the average annual wage tends to decrease slightly and the bandwidth (especially towards the maximum average wage) decreases.

Attachment F — Economic impact assessment methodology

For the purpose of this study, the study team made use of several methodological assumptions and calculations that are further described in this Attachment. The following indicators are separately presented:

— General calculations such as the distribution of the total employment to the number of organisations (per size);

— Specific economic impact calculations for the quantified economic impacts in Section 5.2.

Step 1: The total number of employees in the ground handling sector

The information was retrieved from Attachment E. For the purpose of this impact assessment, the predicted average value of employees in 2019 (equal to 298 000) was used.

Step 2: Average number of employees per GHSP

In order to improve the robustness of the results, the impacts are specified for three types of organisations:

— Small-sized organisations: from 0 to 50 employees (average 25 employees)

— Medium-sized organisations: from 50 to 250 employees (average 150 employees)

— Large-sized organisations: above 250 employees (average 400 employees based upon the survey results).

This classification is based upon the European definition of SMEs[115].

Step 3: Allocation of employees to the type of organisation

In step 3, the distribution of employees to organisation size classes is made on the basis of information from Eurostat. Eurostat presents the distribution of size class for different sectors (NACE codes). Unfortunately, GH is not separately presented in the Eurostat NACE classification. For the purpose of this study, two NACE codes are therefore specifically looked at (1) air transport; (2) other supporting aviation activities[116].

For these two sectors, the average number of employees was calculated for the different organisation size classes. On the basis of these statistics, the share of employees working for small- and medium-sized organisations was estimated, see Table F.1.

Result

By combining steps 1 to 3, the number of organisations in the European GH sector is estimated (within a bandwidth). This estimation is validated by survey information directly retrieved the from NCAs. The total number of organisations provided by 21 NCAs in the survey is equal to 1 385 GHSPs.

[115] https://single-market-economy.ec.europa.eu/smes/sme-definition_en

[116] https://ec.europa.eu/eurostat/databrowser/view/SBS_SC_1B_SE02__custom_3414121/default/table?lang=en

Table F.1: Estimation of the number of GHSPs in Europe and their organisation size

Type of organisation	Size class (step 2)	Number of employees (step 3)		Employees (step 1)		Number of organisations	
		Lower bound	Upper bound	Lower bound	Upper bound	Lower bound	Upper bound
Small size	0 to 50 employees	5 %	15 %	14 864	44 591	595	1 784
Medium size	50 to 250 employees	5 %	10 %	14 864	29 727	99	198
Large size	> 250 employees	90 %	75 %	267 544	222 953	42	42
Total		**100 %**	**100 %**	**297 271**	**297 271**	**736**	**2 024**

Economic impacts

In Table F.2, the main assumptions are presented.

Table F.2: Main assumptions for the economic impacts

Economic impact/Steps	Unit	Assumption
Operating costs: implementation of the SMS		
Implementation of the SMS in the GH sector		
Organisations with existing SMS		
Small organisations	Percentage	60 %
Medium organisations	Percentage	80 %
Large organisations	Percentage	90 %
Organisations with partial SMS		
Small organisations	Percentage	20 %
Medium organisations	Percentage	20 %
Large organisations	Percentage	10 %
Organisation without existing SMS		
Small organisations	Percentage	20 %
Medium organisations	Percentage	0 %
Large organisations	Percentage	0 %
Estimated time effort for GHSPs to implement/maintain the SMS		
Organisations with existing SMS		
Small organisations	FTE	0
Medium organisations	FTE	0
Large organisations	FTE	0
Organisations with partial SMS		
Small organisations	FTE	0.3
Medium organisations	FTE	0.5
Large organisations	FTE	0.7
Organisation without existing SMS		
Small organisations	FTE	1.0
Medium organisations	FTE	1.5
Large organisations	FTE	20.0
Operating costs: i of the training programme		

Economic impact/Steps	Unit	Assumption
Implementation of the training programme in the GH sector		
Organisations with existing training programme		
Small organisations	Percentage	80 %
Medium organisations	Percentage	90 %
Large organisations	Percentage	100 %
Organisations with partial existing training programme		
Small organisations	Percentage	20 %
Medium organisations	Percentage	10 %
Large organisations	Percentage	0 %
Organisation without existing training programme		
Small organisations	Percentage	0 %
Medium organisations	Percentage	0 %
Large organisations	Percentage	0 %
Estimated time effort for GHSPs to implement/maintain the training programme		
Effort for GHSP with partial training programme in place	FTE	4
Effort for GHSP without partial training programme	FTE	5
Operating costs: implementation of the GSE maintenance programme		
Implementation of the GSE maintenance programme in the GH sector		
Organisations with existing GSE maintenance programme		
Small organisations	Percentage	80 %
Medium organisations	Percentage	90 %
Large organisations	Percentage	100 %
Organisations with partial GSE maintenance programme		
Small organisations	Percentage	20 %
Medium organisations	Percentage	10 %
Large organisations	Percentage	0 %
Organisation without existing GSE maintenance programme		
Small organisations	Percentage	0 %
Medium organisations	Percentage	0 %
Large organisations	Percentage	0 %
Estimated time effort for GHSPs to implement the GSE maintenance programme		
Organisations with existing GSE maintenance programme		
Small organisations	Man-days	0
Medium organisations	Man-days	0
Large organisations	Man-days	0
Organisations with partial GSE maintenance programme		
Small organisations	Man-days	3
Medium organisations	Man-days	8
Large organisations	Man-days	17
Organisation without existing GSE maintenance programme		
Small organisations	Man-days	10
Medium organisations	Man-days	25
Large organisations	Man-days	50
Operating costs: performing oversight by NCAs and oversight requirements for GHSPs		
Estimated time effort for GHSPs and NCAs		

Economic impact/Steps	Unit	Assumption
GHSPs		
Small organisations	Man-days	2
Medium organisations	Man-days	4
Large organisations	Man-days	6
NCAs	FTE	5
Aircraft damage reduction		
Risk profile	Occurrences per 10 000 movements	1.6
Aircraft damage	Euro	410 000
Safety impact	Percentage	-0.2%
Development costs		
Implementation of requirements in the GH sector		
Organisations — adequate		
Small organisations	Percentage	10 %
Medium organisations	Percentage	50 %
Large organisations	Percentage	80 %
Organisations — partially adequate		
Small organisations	Percentage	50 %
Medium organisations	Percentage	30 %
Large organisations	Percentage	20 %
Organisation — not adequate		
Small organisations	Percentage	40 %
Medium organisations	Percentage	20 %
Large organisations	Percentage	0 %
Estimated time effort for GHSPs		
Organisations — adequate		
Small organisations	FTE	0
Medium organisations	FTE	0
Large organisations	FTE	0
Organisations — partially adequate		
Small organisations	FTE	0.3
Medium organisations	FTE	0.7
Large organisations	FTE	1.0
Organisation — not adequate		
Small organisations	FTE	1.0
Medium organisations	FTE	2.0
Large organisations	FTE	3.0