Total Aviation System Risk Picture 2017

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Short abstract: Future Sky Safety is a Joint Research Programme (JRP) on Safety, initiated by EREA, the association of European Research Establishments in Aeronautics. The Programme contains two streams of activities: 1) coordination of the safety research programmes of the EREA institutes and 2) collaborative research projects on European safety priorities.

This deliverable is produced by the Project P4 "Total System Risk Assessment". The main objective is to provide a total aviation system risk picture for 2017 and provide ideas for future improvements of such a risk picture.

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Acronyms

Acronym	Definition
ASCOS	Aviation Safety and Certification of new Operations and Systems
ASIAS	Aviation Safety Information Analysis and Sharing (system)
CATS	Causal model for Air Transport Safety
CFIT	Controlled Flight Into Terrain
EASA	European Aviation Safety Agency
ECCAIRS	European Co-ordination Centre for Accident and Incident Reporting
EPAS	European Plan for Aviation Safety
ESD	Event Sequence Diagram
FSS	Future Sky Safety
ICAO	International Civil Aviation Organization
NLR	Netherlands Aerospace Centre
RO	Risk Observatory

EXECUTIVE SUMMARY

Problem Area

Future Sky Safety (FSS) P4 *Total system risk assessment* is to produce a prototype Risk Observatory (RO) that takes operational data from a variety of aviation sources with the intention to provide a clearer picture of risk for the European aviation transport system. Although commercial air transport in Europe is generally described as an 'ultra-safe system' the reality is that it is difficult to be sure of the level of safety with any degree of certainty. We do know that accidents are rare but that does not tell us how close we are to having an accident – that kind of knowledge is more the domain of the safety incident, where an unintended event has caused a safety concern but with what is generally considered as a limited consequence safety outcome. Extensive use is currently made of incident data for safety purposes but there still remains an unacceptable lack of clarity in our understanding of how safe we are. The RO will provide analyses from both incident data and risk information derived from models. Risk models are supported by incident and other data, adding an understanding of accident factors to provide a clearer view, potentially safety knowledge, of the potential for catastrophe.

Having a true knowledge of the level of safety is important in order that risks can be appropriately managed. Safety comes at a societal cost and cost versus safety benefit is a major (although not the only) driver in decisions by industry and regulators to protect the public. Clearly for safety to be improved, a key process is the monitoring of key parameters with the intention of improvement and this is the primary purpose of the RO. There will however be a time-lag in the process, and thus any short-term feedback in the benefits of the RO is likely to be difficult to assess. It is, however, the case that by attempting to even measure a parameter, the process of measuring tends to influence the process being measured. Thus early, probably unintentional influence on safety performance is likely when there is any significance of awareness of the initiative within industry. It is important to ensure that any unintended consequences to components of the safety system by measurement are not to the overall detriment of safety when considered as a holistic process.

Description of Work

The aim of this study is to produce a 'Total Aviation System Risk Picture 2017'. This contains quantified safety performance indicators that measure the actual progress with respect to main safety issues. This study is to 'Produce a safety indicators commentary at regular intervals with respect to the main safety issues in aviation (e.g. loss of control in-flight, mid-air collisions, runway safety, ground safety, controlled flight into terrain and fire, smoke and fumes).' Such risk picture has already been produced for 2016 [1] and is scheduled for 2017 and 2018. The first version of the risk picture (i.e. for 2016) focused on future Risk Observatory capabilities, enhanced by a separate numerical analysis forming part of that study. The current study further enhances the risk picture by further analysis and

visualisation of the main risks in the European aviation industry. This is necessary, because the Risk Observatory is still under further development. It should also be noted that an annual European high-level safety analysis is undertaken by EASA which also provides a comprehensive risk view.

Results & Conclusions

The Risk Observatory has continued to develop as a concept and practical tool during 2017. The 'Big Data' concept continues to be developed in aviation generally, noting the growing success of the North American Aviation Safety Information Analysis and Sharing system (ASIAS), an influence for the RO with related programmes such as the EASA initiative Data4Safety. A common theme is the 'Big Data' concept successfully applied commercially in other industries being applied to aviation safety. In 2017, much RO development time was given to the communication of safety information, a crucial consideration if the RO is to successfully effect safety change. It is essential to be able to accurately influence safety priorities for managers for improvement when traditional safety indicators can be notoriously weak in providing actionable intelligence.

Aviation is a 'system of systems', with the concern being that complexity of the multiple embedded systems within systems makes exploring root areas of safety concerns very challenging. The use of models, as used in the RO, to better explore such complexity is attractive, however limited by practical fidelity, often limited by fine structure in system processes that are not recognised, or at least not fully understood.

Identification of the potential safety priority areas in aviation for improvement is difficult - there have been many major accidents - even with the benefit of hindsight - having indicator antecedents that wouldn't have been sufficiently clear to highlight possible safety initiatives prior to the accident that then might have avoided it. Conversely, those antecedents tend to assume much greater visibility in post - 'high profile' accidents and can compete for resources with other possibly equal or potentially more important indicators. Thus it is the reality that accident data can be limited and incident data not sufficiently compelling in a safety-decision making environment where there are a multitude of known safety risks to be effectively managed (plus unknown risks). It is noteworthy within the unknown risks there are those resistant to logical analysis and incident analysis that remain a safety challenge. This is an important factor as aviation accident causal factors should, if safety management is to be effective, converge towards unique events or semi-unique chains of events.

A theoretically ideal RO would collect all information, which would be combined in a holistic manner in order to provide high-confidence priority areas for safety action. At the time of writing, the international consensus on priorities was that Loss of Control in flight remained a top area of concern, driven largely by major accident experience and supported by this analysis. It is interesting to note that technical 'solutions' can, relatively quickly in regulatory timescales, address safety issues. Thus

Controlled Flight into Terrain, a major risk area, has been considerably reduced by the application of technology monitoring the position of the aircraft against terrain. Potentially faster still, in terms of deployment and often at relatively lower costs are training or procedural changes. However, the performance effectiveness of any change can be difficult to assess in advance, leaving post-introduction monitoring being the major tool for determining objective deliverance. The 'Total Aviation System Risk Picture' is not expected to change significantly from year to year but our understanding of that picture and our collective ability to improve safety is should ultimately improve through the use of tools such as the RO.

Applicability

This document provides preliminary indications on the benefits that may be accrued from the application of the RO. They support the developing work of the system and can be expected to have greater detail and utility as the prototype RO matures to be a tool capable of exploring and influencing the use of the 'Big Data' concept in aviation safety.

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TABLE OF CONTENTS

Contributing partners 3
Document Change Log 3
Approval status 3
Acronyms 4

Executive Summary 5

Problem Area 5
Description of Work 5
Results & Conclusions 6
Applicability 7

Table of Contents 9

List of Figures 11

List of Tables 12

1 Introduction 13

1.1. The Programme 13
1.2. Project context 13
1.3. Research objectives 13
1.4. Approach 14
1.5. Structure of the document 14

2 Baseline risk picture 2017 15

2.1. Main safety issues in aviation 15
2.2. Causal model for Air Transport Safety 15
2.3. Data source and scope 17
2.4. Quantification process 18
2.5. Baseline risk levels 2017 derived from ESD scenarios 18
2.6. Baseline risk level progress 21
2.7. Baseline risk level severity 22

3 Risk Observatory look and feel prototype – updated 26

3.1. Introduction 26
3.2. Occurrence dashboard 27
3.3. Risk dashboard 32

3.4. What-if dashboard 36
3.5. Search dashboard 38

4 Conclusions and recommendations 41

4.1. Conclusions 41
4.2. Recommendations 43

5 References 44

Appendix A Number of occurrences and corresponding frequencies 45

Appendix B Accident and serious incident sample 55

LIST OF FIGURES

FIGURE 1: GENERIC REPRESENTATION OF AN EVENT SEQUENCE DIAGRAM. 16
FIGURE 2: FATAL/NON-FATAL FREQUENCY BY OPERATIONAL ISSUE. 20
FIGURE 3: PROGRESS OF ACCIDENT/SERIOUS INCIDENT FREQUENCY BY OPERATIONAL ISSUE AS RUNNING AVERAGE IN 3-YEAR INTERVALS 21
FIGURE 4: RISK MATRIX OF OPERATIONAL ISSUES. 24
FIGURE 5: SCREENSHOT OF OCCURRENCE DASHBOARD IN THE EARLY PROTOTYPE (BALSAMIQ). 27
FIGURE 6: SCREENSHOT OF OCCURRENCE DASHBOARD WITH OPTIONS FOR BENCHMARKING IN THE EARLY PROTOTYPE (BALSAMIQ). 28
FIGURE 7: SCREENSHOT OF OCCURRENCE DASHBOARD WITH ACCESS TO SOURCE DATA IN THE EARLY PROTOTYPE (BALSAMIQ). 29
FIGURE 8: SCREENSHOT OF THE OCCURRENCE DASHBOARD FOR UNSTABLE APPROACH (TABLEAU). 29
FIGURE 9: SCREENSHOT OF THE OCCURRENCE DASHBOARD FOR FIRE OCCURRENCES (TABLEAU) 30
FIGURE 10: SCREENSHOT OF THE OCCURRENCE DASHBOARD FOR LOSS OF SEPARATION OCCURRENCES (TABLEAU). 31
FIGURE 11: SCREENSHOT OF THE OCCURRENCE DASHBOARD FOR BIRD STRIKE OCCURRENCES (TABLEAU) 32
FIGURE 12: SCREENSHOT EXAMPLE OF A RISK DASHBOARD IN THE EARLY PROTOTYPE (BALSAMIQ). 33
FIGURE 13: SCREENSHOT EXAMPLE OF A RISK PICTURE IN THE EARLY PROTOTYPE (BALSAMIQ). 33
FIGURE 14: RISK DASHBOARD, SHOWING RISK TREND AND RISK PICTURE FOR IN-FLIGHT FIRE (TABLEAU). 34
FIGURE 15: RISK DASHBOARD, SHOWING RISK PROBABILITY PER YEAR AND RISK PICTURE FOR MID-AIR COLLISION (TABLEAU). 35
FIGURE 16: OCCURRENCE AND RISK DASHBOARD FOR RUNWAY EXCURSION RISK (TABLEAU) 36
FIGURE 17: SCREENSHOT OF THE WHAT-IF ANALYSIS DASHBOARD IN THE EARLY PROTOTYPE (BALSAMIQ) 37
FIGURE 18: WHAT-IF ANALYSIS DASHBOARD (TABLEAU). 38
FIGURE 19: SCREENSHOT OF THE SEARCH DASHBOARD IN THE EARLY PROTOTYPE (BALSAMIQ). 39

LIST OF TABLES

TABLE 1: BASIC DATA QUERY 17
TABLE 2: FREQUENCIES OF OPERATIONAL ISSUES 19
TABLE 3: ACCIDENT AND SERIOUS INCIDENT FREQUENCIES OF OPERATIONAL ISSUES 23

1 INTRODUCTION

1.1. The Programme

The Future Sky Safety (FSS) programme looks at areas of significant safety for Europe, with the intent of enhancing safety for European citizens. As a partnership between leading European industry and academic institutions it has the opportunity to make practical improvements by increasing knowledge in key areas of importance in the European aviation transport system. The programme is structured around four main themes with each theme consisting of a small set of projects. Theme 1 (New solutions for today's accidents) aims for breakthrough research with the purpose of enabling direct, specific, significant risk reduction for the two main accident categories. Theme 2 (Strengthening the capability to manage risk) conducts research on processes and technologies to enable the aviation system actors to achieve near-total control over the safety risk in the air transport system. Theme 3 (Building ultra-resilient systems and operators) conducts research on the improvement of organizations, systems and the human operator with the specific aim to improve safety performance under unanticipated circumstances. Theme 4 (Building ultra-resilient vehicles), aims at reducing the effect of external hazards on the aerial vehicle integrity, as well as improving the safety of the cabin environment.

1.2. Project context

The objective of FSS P4 "Total system risk assessment" is to develop a prototype Risk Observatory (RO). This innovative task will result in a clearer understanding of the level of risk in a European context and is set against a backdrop of the better use of 'Big Data' which has become an aspiration within the European aviation safety community, fuelled by notable successes in commercial areas outside of safety.

1.3. Research objectives

The aim of this study is to produce a 'Total Aviation System Risk Picture 2017'. This contains quantified safety performance indicators that measure the actual progress with respect to main safety issues. This study is to 'Produce a safety indicators commentary at regular intervals with respect to the main safety issues in aviation (e.g. loss of control in-flight, mid-air collisions, runway safety, ground safety, controlled flight into terrain and fire, smoke and fumes).'

The focus is on future Risk Observatory capabilities, enhanced by a separate numerical analysis forming part of this study. This implies that this risk picture 2017 indicates which sections of the RO should be the focus in future risk pictures. Input from risk model development tasks is used for possible outputs.

1.4. Approach

The approach has been to combine a risk assessment of key safety processes in the aviation safety system viewed in the 2017 timeframe with a commentary on RO aspiration for the future. The perspective has been regulatory in nature, although the intended user-base of the RO will be much wider. It is likely that regulatory use will prove to be the area where the most complete use of the integrated data will be refined to safety intelligence, then to safety knowledge or wisdom. The RO approach very much supports the concept of performance-based regulation, where regulatory resources are prioritised to be directed at organisations, sectors or processes of the aviation industry identified as being most likely to benefit from regulatory support. Key to performance-based regulation is the integrated collection and analysis of appropriate data.

The intention will be that as the RO gains in practical capability, future planned deliverables (in 2017 and 2018) on the annual safety commentary will include RO-derived content.

1.5. Structure of the document

Section 1 introduces the document, which then moves to the main content, Section 2 Baseline Risk Picture, which is a full analysis of the state-of-the-art in 2017 on major safety issues in aviation. Section 3 details work done on the Risk Observatory look-and-feel and functionality. Section 4 is Conclusions and Recommendations which are intended to influence ongoing RO development.

Future Sky Safety has received funding from the EU's Horizon 2020 Research and Innovation Programme, under Grant Agreement No. 640597.

2 BASELINE RISK PICTURE 2017

Accident scenarios are quantified to satisfy the objective to produce a safety indicators commentary at regular intervals with respect to main safety issues in aviation. This has been done according to the Event Sequence Diagram methodology used in the Causal model for Air Transport Safety (CATS) [2]. The quantification process to create the Baseline Risk Picture 2017 is built on previous work conducted by NLR in the ASCOS project [3].

2.1. Main safety issues in aviation

The European Plan for Aviation Safety (EPAS) 2016-2020 [4] of the European Aviation Safety Agency (EASA) identifies main risk areas of commercial air transport operations. These risk areas are classified according to the type of issues they highlight, amongst which are operational issues. Operational issues are brought to light by the reporting and analysis of safety occurrence data. Safety occurrences are events where the available safety margin towards accidents or serious incidents has been reduced. Accidents and serious incidents are unrecoverable and represent end states in a series of events that include safety occurrences.

The EPAS identifies the following operational issues in commercial air transport by aircraft:

- Loss of control in-flight
- Design and maintenance improvements
- Mid-air collisions
- Runway safety (runway excursions and incursions)
- Ground safety (ground collisions and ground handling)
- Controlled flight into terrain
- Fire, smoke and fumes (on ground and in the air)

2.2. Causal model for Air Transport Safety

The Causal model for Air Transport Safety (CATS) was initially developed as a result of an initiative by the Netherlands Ministry of Transport. The objective was to gain a thorough understanding of the causal factors underlying the risks of air transport and their relation to the different possible consequences. This understanding can be used to make efforts to improve safety as effective as possible.

The causal model uses a backbone structure of generic accident scenarios which have been defined based on the ICAO definition of an accident, in order to systematically develop accident scenarios: abrupt manoeuvre, cabin environment, uncontrolled collision with ground, controlled flight into

terrain, forced landing, mid-air collision, collision on ground, structural overload and fire/explosion. The accident scenarios are grouped by accident type and different flight phases. The Event Sequence Diagram (ESD) methodology is used for representing the accident scenarios.

An ESD consists of an initiating event, pivotal events and end states. A representation of a generic ESD is given in Figure 1.

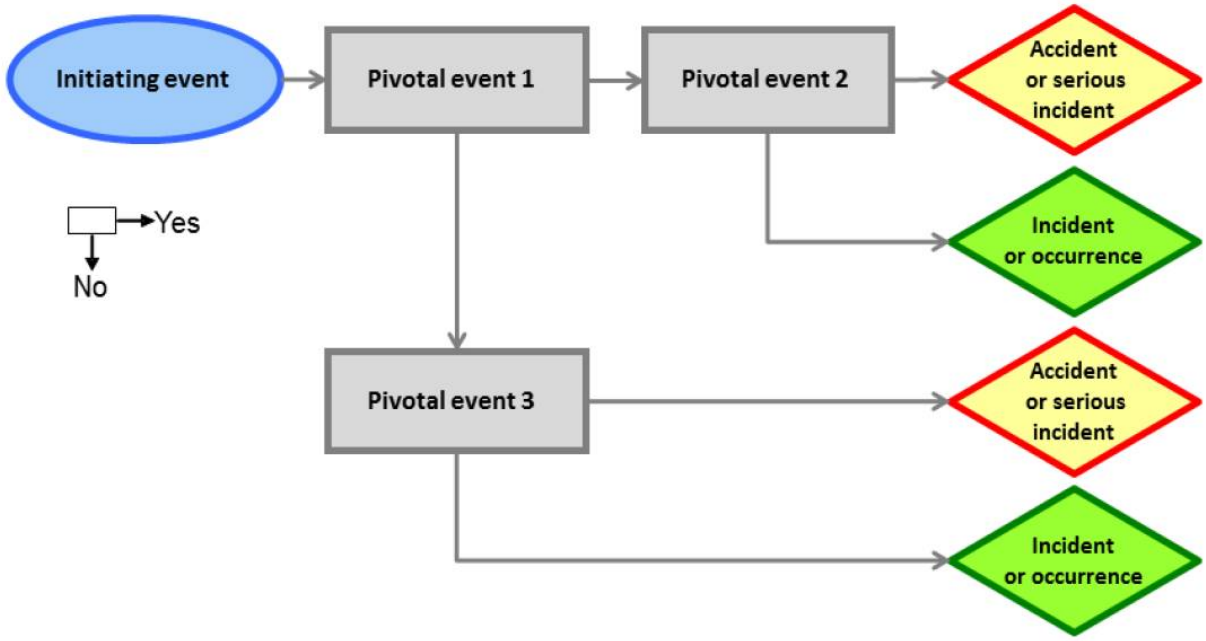

Figure 1: Generic representation of an Event Sequence Diagram.

ESDs provide a qualitative description of series of events leading to accidents. Because pivotal events can also cause avoidance of an accident, an ESD also models scenarios which lead to incidents and reportable occurrences. An initiating event represents the start of the main accident scenario. The initiating event of course also may have causes, and they are represented in a fault tree. Pivotal events also have fault trees. Each pivotal event represents a possibility for the safety occurrence to develop into an accident, or a possibility that the accident is avoided. If all pivotal events contribute towards an unwanted outcome, then the end state is an accident or serious incident. If a pivotal event causes avoidance of an accident, the end state is a safe continuation of the flight. A single ESD therefore can represent more than one accident scenario, and also represents accident avoidance scenarios. In case of the generic ESD of Figure 1, there are two accident scenarios and two accident avoidance scenarios.

In total 35 ESDs were developed based on a combination of retrospective and prospective analyses. These ESDs were subsequently quantified and allow the user to obtain a probability of occurrence for any given combination of events.

Note that an improved version of CATS, representing all possible accident scenarios in the current total aviation system, is used to establish a total aviation system baseline risk picture.

2.3. Data source and scope

The NLR Air Safety database, which is a large database with data related to aviation safety maintained by NLR, is used as data source. The database uses ECCAIRS to collect, store, and analyse detailed information on accidents, serious incidents and incidents of fixed wing aircraft and helicopters (covering commercial operations and General Aviation) from 1960 onwards. Currently, the Air Safety Database contains information on more than 200,000 accidents, serious incidents and incidents that occurred worldwide. Furthermore, the Air Safety Database contains a large collection of worldwide non-accident related data, flight exposure data, weather data, fleet data, and more. The Air Safety Database is updated frequently using reliable sources including data from official reporting systems, insurance claims, accident investigation boards, aircraft manufacturers, and civil aviation authorities. Table 1 defines the basic data query used to quantify the accident scenarios in EASA Member States by means of the Event Sequence Diagram methodology, which in turn are used to define the basic risk level in 2017.

Table 1: Basic data query

Data	Criteria
Time interval	Between 1-1-1995 to 31-12-2016
Occurrence class	Accidents and Serious incidents
Operation type	Scheduled revenue ops, Non-scheduled revenue ops
Aircraft category	Fixed wing
Aircraft mass group	> 5,701 kg maximum take-off weight
Aircraft propulsion type	Turboprop, Turbofan, Turbojet
State or area of occurrence	EASA Member States: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom, Iceland, Liechtenstein, Norway, Switzerland.

Future Sky Safety has received funding from the EU's Horizon 2020 Research and Innovation Programme, under Grant Agreement No. 640597.

The basic data query resulted in a total of 1521 relevant accidents and serious incidents. An additional check for empty fields in the NLR air safety database revealed additional relevant accidents and incidents, which were included in the final dataset. The final dataset on which the quantification of the main operational issues is based contains 1594 accidents and serious incidents. Appendix B contains a list of all 1594 accidents and incidents in the final dataset.

2.4. Quantification process

The basic principle of the quantification process is that each accident or serious incident has to be assigned to a single accident scenario. For example, the accident scenario ESD 13 'flight control system failure' is chosen when a flight control system failure leads to an unstable approach, which causes the aircraft to land long and fast, eventually resulting in a runway excursion.

The narratives of all 1594 accidents and serious incidents were reviewed by subject matter experts and each of the accidents and serious incidents has been assigned to one of the accident scenarios of the CATS model. When insufficient information was available, the original investigation report was retrieved or other sources on the internet were consulted. For eight runway excursions and one collision with ground the available information was insufficient to assign the accident to a specific scenario. These accidents and serious incidents were equally distributed over the accident end states of 'runway excursion' and 'collision with ground' respectively.

Of the 1594 accidents and serious incidents, 209 could not be assigned to one of the accident scenarios. There are two main reasons:

- The accident was considered out of scope, for instance because it had no significance for flight safety, like a tow truck that drove over a ramp worker's foot;
- The consequences of the initiating events did not progress beyond the level of the Fault Trees in the model, e.g. because existing safety barriers prevented the scenarios from developing into accidents, like a system failure that was solved during flight.

2.5. Baseline risk levels 2017 derived from ESD scenarios

To calculate the probability of occurrence of the main operational issues, the total number of accidents and serious incidents related to a specific operational issue has been divided by the exposure data corresponding to the data scope in Table 1. The exposure data of flights in EASA member states with commercially operated (scheduled and non-scheduled) turbine aircraft with a maximum take-off mass of 5700 kg or heavier has been calculated to be 150,470,286 flights. The exposure data has been derived from the NLR database and complemented with Eurostat data [5] for scheduled and unscheduled

flights in EASA Member States. Appendix A provides the number of occurrences and corresponding frequencies for each of the accident end states.

Based on the results shown in Appendix A, the frequencies of the operational issues as identified in the EPAS can be calculated. The results are presented in Table 2.

Table 2: Frequencies of operational issues

EPAS operational issues	Accident/serious incident frequency per flight	Fatal accident frequency per flight	# fatalities (1995-2016)
Loss of control in-flight	3.12E-07	1.86E-07	628
Design and maintenance improvements[1]	4.91E-07	1.21E-07	279
Mid-air collisions	2.66E-08	1.99E-08	86
Runway safety (runway excursions and incursions)	1.17E-06	3.99E-08	128
Ground safety (ground collisions and ground handling[2])	1.31E-06	4.65E-08	7
Controlled flight into terrain	2.69E-08	2.69E-08	249
Fire, smoke and fumes (on ground and in the air)	9.44E-07	3.32E-10	0

[1] Design or maintenance related accidents and serious incidents are derived from system-related accidents or serious incidents in the CATS model and therefore have been quantified separately. It should be noted that this is a subset from the frequency per flight of other accident/serious incident scenarios.

[2] Ground handling accidents and serious incidents are not included in the CATS model and therefore have been quantified separately and added to the number of ground collision accidents and serious incidents.

Figure 2 provides an indication of the share of fatal accidents in the total number of accidents and serious incidents for each operational issue.

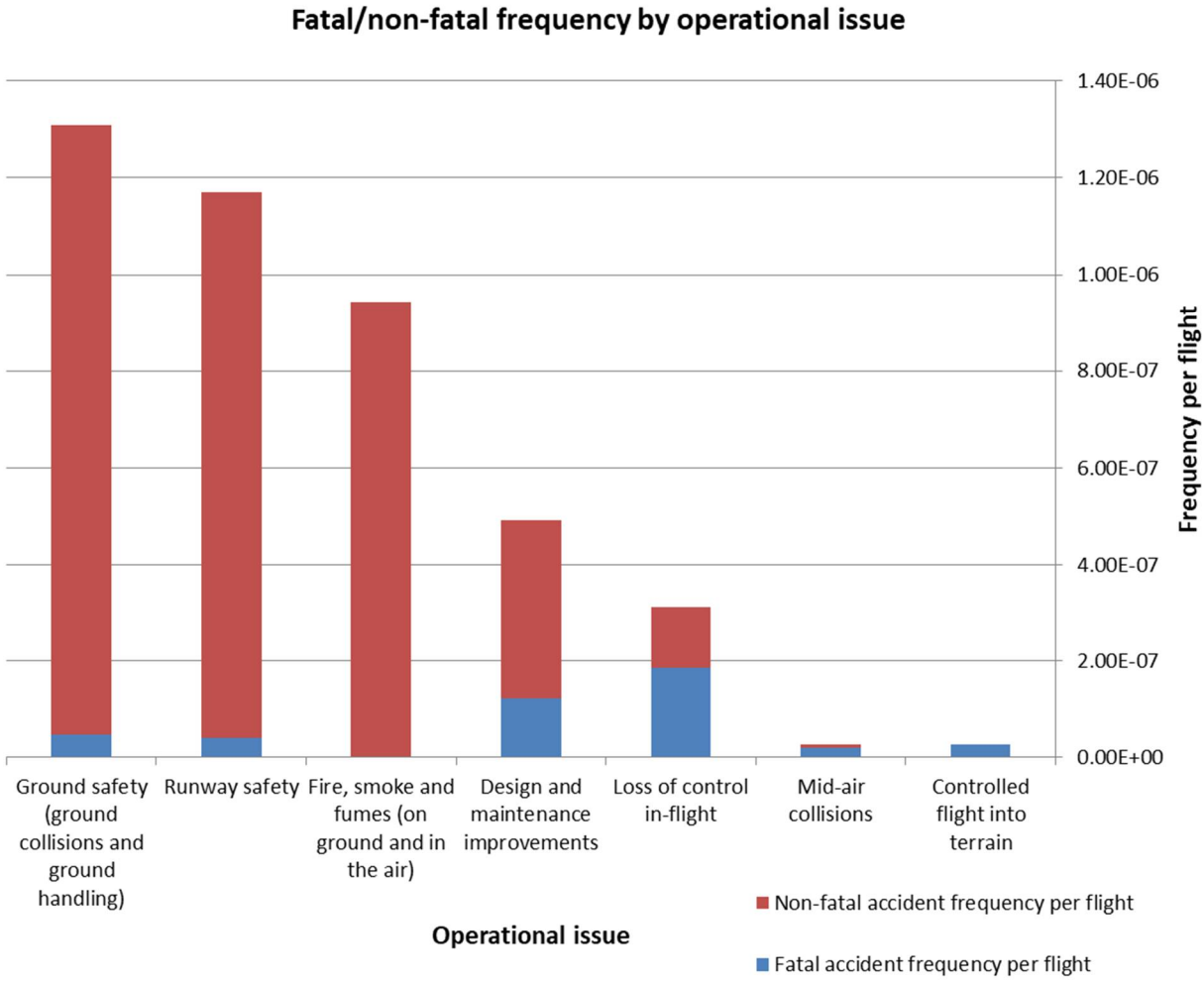

Figure 2: Fatal/non-fatal frequency by operational issue.

Figure 2 shows that all Controlled flight into terrain (CFIT) accidents are fatal and a large share of the Loss of control in-flight and Mid-air collisions have fatal consequences. The other operational issues occur with a higher frequency, but with less, or no, fatal consequences.

2.6. Baseline risk level progress

The baseline risk level 2017 defined in the previous paragraph has shown particular development in the past 20 years. Figure 3 shows the progress of accident/serious incident frequency by operational issue as running average over 3-year intervals.

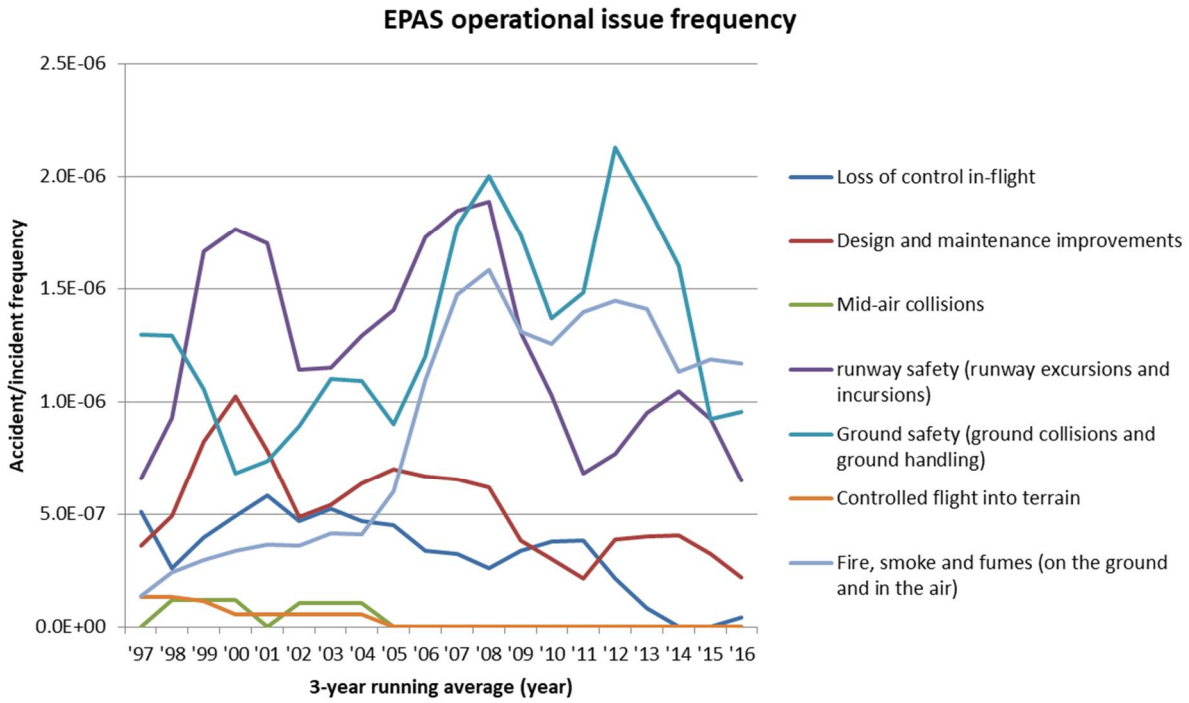

Figure 3: Progress of accident/serious incident frequency by operational issue as running average in 3-year intervals

Figure 3 shows downward trends for all operational issues in the last 8 years. Of note is the sharp rise in Ground safety and Fire, smoke and fumes accidents and serious incidents in the time interval 2001-2008. A likely cause for this sharp rise is the introduction of Directive 2003/42/EC on the reporting, analysis and follow-up of occurrences in civil aviation in 2003. The other operational issues were already subject to mandatory occurrence reporting schemes by Aviation Authorities due to their severity (fatalities or damage) or by manufacturers (failure of aircraft systems or parts). Ground safety and fire, smoke and fumes accidents or serious incidents may have been reported previously, but since it was not mandatory to forward such reports to the national Aviation Authority until 2003, they were mostly kept for internal reference and investigation by airlines, airports or Ground Service Providers.

Figure 3 also suggests a prioritisation of actions to lower the risk of operational issues identified in the EPAS. Purely based on accident/serious incident frequency in the time interval 2011-2016, the following prioritisation may be applied:

1. Ground safety
2. Runway safety
3. Fire, smoke and fumes
4. Design and maintenance improvements
5. Loss of control in-flight
6. Controlled flight into terrain
7. Mid-air collisions

However, when the risk of operational issues is based on the fatal accident rate since 1995, the following prioritisation is applied:

1. Loss of control in-flight (628 fatalities)
2. Design and maintenance improvements (279 fatalities)
3. Ground safety (7 fatalities)
4. Runway safety (128 fatalities)
5. Controlled flight into terrain (249 fatalities)
6. Mid-air collisions (86 fatalities)
7. Fire, smoke and fumes (0 fatalities)

To further put this prioritisation into perspective, it is of note that all Controlled flight into terrain accidents are fatal and a large share of the Loss of control in-flight and Mid-air collisions have fatal consequences. The reason why Ground safety accidents and serious incidents are listed as third priority is because each accident involves 1 fatality.

2.7. Baseline risk level severity

As shown in the previous paragraphs, a baseline risk level can be based on the occurrence frequency of specific issues, but this does not account for the occurrence severity. To include this dimension, a severity classification is added to the accident/serious incident frequency. This classification has been applied by the competent authorities of EASA member states. Since only accidents and serious incidents have been included in the dataset, it is convenient to distinguish between the severity classes of accidents and serious incidents. Within the ECCAIRS software, the following definitions are applied for accidents and serious incidents:

Accident:

An occurrence associated with the operation of an aircraft which, in the case of a manned aircraft, takes place between the time any person boards the aircraft with the intention of flight until such time as all such persons have disembarked, or in the case of an unmanned aircraft, takes place between the time the aircraft is ready to move with the purpose of flight until such time it comes to rest at the end of the flight and the primary propulsion system is shut down, in which:

a) a person is fatally or seriously injured as a result of:
    a. being in the aircraft, or,
    b. direct contact with any part of the aircraft, including parts which have become detached from the aircraft, or,
    c. direct exposure to jet blast, 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
b) 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 minor damages to main rotor blades, tail rotor blades, landing gear, and those resulting from hail or bird strike, (including holes in the radome); or
c) the aircraft is missing or is completely inaccessible;

Serious incident:

An incident involving circumstances indicating that an accident nearly occurred.

Both severity classes have been derived from the dataset and the resulting accident and serious incident frequencies of each operational issue are provided in Table 3.

Table 3: Accident and Serious incident frequencies of operational issues

EPAS operational issues	Accident frequency per flight	Serious incident frequency per flight
Loss of control in-flight	2.79E-07	2.66E-08
Design and maintenance improvements[1]	3.79E-07	9.30E-08

Mid-air collisions	2.66E-08	0.00E+00
Runway safety (runway excursions and incursions)	4.78E-07	6.38E-07
Ground safety (ground collisions and ground handling[2])	1.02E-06	2.92E-07
Controlled flight into terrain	2.66E-08	0.00E+00
Fire, smoke and fumes (on ground and in the air)	9.97E-08	8.44E-07

[1] *Design or maintenance related accidents and serious incidents are derived from system-related accidents or serious incidents in the CATS model and therefore have been quantified separately. It should be noted that this is a subset from the frequency per flight of other accident/serious incident scenarios.*

[2] *Ground handling accidents and serious incidents are not included in the CATS model and therefore have been quantified separately and added to the number of ground collision accidents and serious incidents.*

With these data, a risk matrix is compiled in Figure 4, which combines the severity and frequency of the EPAS operational issues.

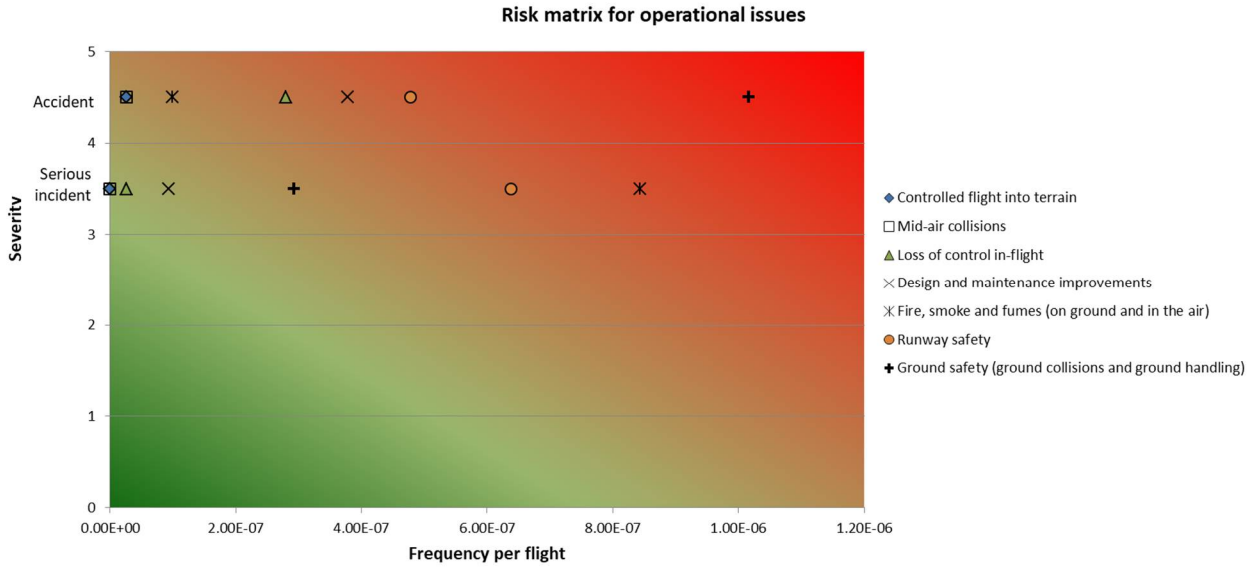

Figure 4: Risk matrix of operational issues.

It should be noted that different severity and frequency classifications are used within the aviation sector; e.g. ICAO [6] ESSAR 4 [7], etc., as well as different units; e.g. per flight, per flight hour, etc. The future Risk Observatory should follow the common European risk classification scheme that the European Commission should develop according to Regulation (EU) No 376/2014 on reporting, analysis and follow-up of occurrences in civil aviation.

Another remark worth noting is that the Basic Risk Picture provided in Figure 4 only contains the high risk levels; i.e. accidents and serious incidents. For organisations to derive actionable safety information from the Basic Risk Picture provided by the Risk Observatory, data should be included from occurrences with a higher frequency but with less severity. This way, organisations using the Risk Observatory are enabled to develop proactive interventions to prevent serious incidents and accidents.

Another advantage to include less-severity, high-frequency occurrences in the Basic Risk Picture is that trends are more easily detected when the Basic Risk Picture 2016 is compared with that of 2017 and onward. When only high-severity, low-frequency occurrences are monitored, it is unlikely that significant changes in the Basic Risk Picture will be detected over the years.

3 RISK OBSERVATORY LOOK AND FEEL PROTOTYPE – UPDATED

3.1. Introduction

In order for potential users to understand and gain experience with the RO, a 'Look and Feel' early prototype was constructed (described in detail in deliverable D4.2, 2016). It had a modest level of capability and sophistication compared with the ultimate RO deliverable. As the maturity of the RO concept has developed, so has the understanding of potential user interfaces.

At an early stage of the RO development, stakeholders were interviewed to derive the business, user and system requirements. From reviewing the requirements the team derived the following main dashboards for the early prototype, which will influence the final look-and-feel of the RO: the homepage, the occurrences dashboard, the risk dashboard, the search dashboard and the what-if analysis dashboard. The early prototype design was implemented in the software tool Balsamiq to be able to demonstrate functionalities and potential outputs of the Risk Observatory. The early prototype is available in the form of a mock-up of a webpage-format that can be shared as PDF file. Demonstration and evaluation sessions were organized with stakeholders to demonstrate the early prototype and to receive feedback on the prototype's functionalities and design.

Since then, the early prototype has been further developed into a set of interactive dashboards that can be shared and viewed in an internet browser (webpage). The software application Tableau is used to develop these dashboards to visualize and interact with data, demonstrating the functionalities of the prototype Risk Observatory in a realistic and practical manner. The visualisation techniques offer a route towards providing information in the form of actionable intelligence, i.e. the possibility of taking some safety action towards improving an area of concern as a result of the visualisation.

The difference between the Tableau dashboards and the Balsamiq early prototype is that the latter is a static display of dashboards or screenshots, which is basically an "artist impression" with little interaction and without data input and processing. Tableau on the other hand delivers dynamic, interactive dashboards that are based on actual data sources and allows real-time filtering and analysis of the underlying data. To populate the Tableau dashboards data from various sources were used, including occurrence reports (Air Safety Reports), accident and incident data, and exposure data. In addition, existing quantitative risk models were applied to develop risk pictures. Occurrence and risk dashboards were developed in Tableau for in-flight fire/smoke events and fire risk, for bird strike occurrences, for loss of separation/airprox occurrences and mid-air collision risk, and for unstable approach and overrun risk. A what-if dashboard was also developed in Tableau. The Search dashboard was not implemented in Tableau, but additional ideas on the content of the search dashboard are developed.

The next sections show the implementation of the occurrence, risk and what-if dashboards in Tableau software compared to Balsamiq. First the original designs of dashboards in the Balsamiq early prototype are presented, followed by screenshots of the dashboards developed with Tableau. The last section of this chapter addresses ideas on the search dashboard.

3.2. Occurrence dashboard

Occurrences naturally are individual events, for which safety information may be derived on an individual basis or aggregated to look for trends or some degree of commonality which may permit the identification of safety interventions. Regulators and aviation operating organisations already use a variety of analysis tools, so the added value of the work in this area much more relates to information visualisation. Information visualisation is a key aspect of ensuring that appropriate resources are allocated to safety management, an area also explored in the complementary study, Future Sky Safety P5 'Resolving the Organisational Accident'

Figure 5 shows a view of the occurrence dashboard in the early prototype where the user can monitor the frequency of a particular safety performance indicator or precursors, such as the unstable approach rate. The user has a few functionalities available, for example filtering settings, ability to access the underlying data (records) or link to the risk dashboard to view the risk associated with the occurrence type. The occurrences dashboard will present data from actual reported occurrences, observations, measured events etc.

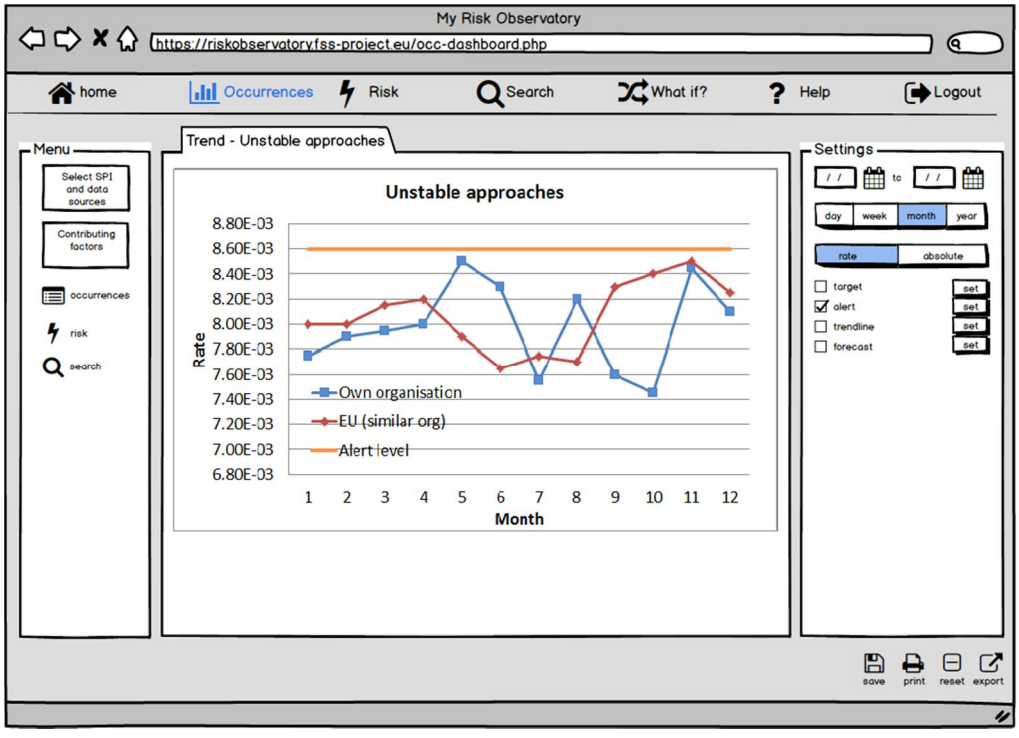

Figure 5: Screenshot of occurrence dashboard in the early prototype (Balsamiq).

Figure 6 shows the benchmark feature where the user can assess the organisation's own performance against the industry or geographical region for instance. Figure 7 shows an example in the early prototype of access to the source data presented in the charts.

Figure 6: Screenshot of occurrence dashboard with options for benchmarking in the early prototype (Balsamiq).

Figure 8 shows the occurrence dashboard developed in Tableau for unstable approach. In this example dashboard the user can observe the unstable approach rate per 1,000 flights in the window in the upper left corner. By moving the slider or using a pull down menu a particular month of interest can be selected. To the right the dashboard provides the unstable approach rate for the various combinations of aircraft types and destinations. The color code indicates the relative increase (red) or decrease (green) of the rate compared to the previous month. The square's size is a measure of the rate (the bigger the square, the higher the rate). The lower left chart in the dashboard shows the various causes for unstable approach per aircraft type with the corresponding rate. To the right, the spider plot illustrates the influencing factors in the selected month (i.e. March) for the various destinations. The user can interactively select and filter data. When this Tableaus dashboard is published on a website the user could download the dashboard charts and source data.

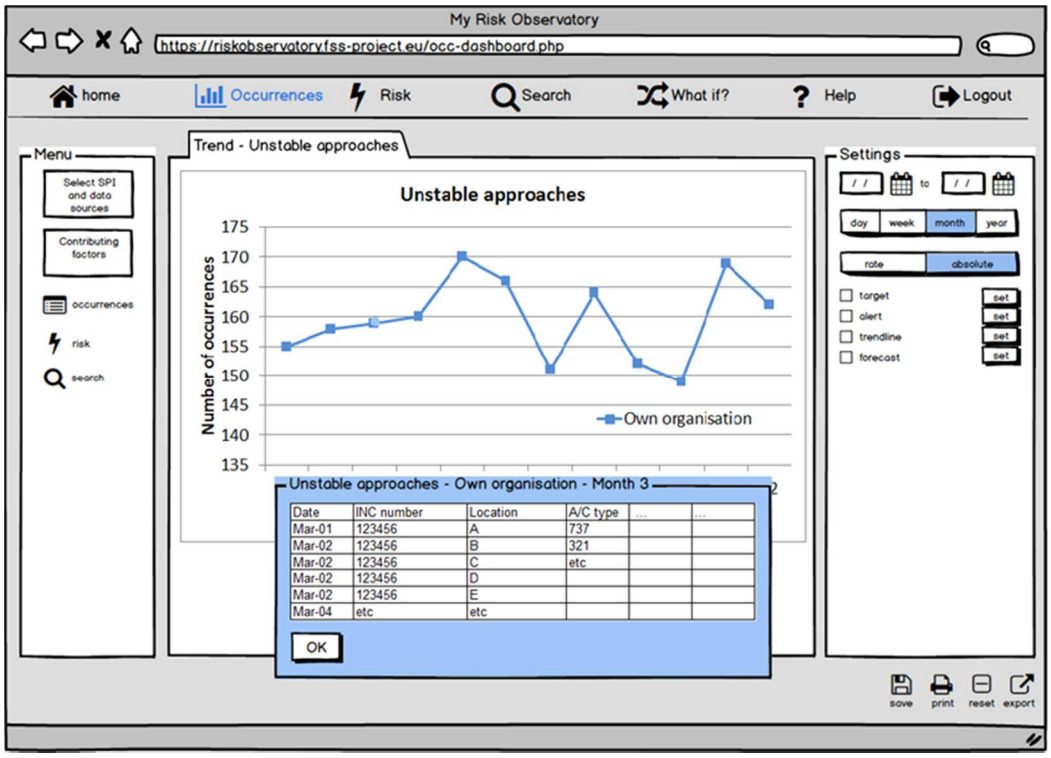

Figure 7: Screenshot of occurrence dashboard with access to source data in the early prototype (Balsamiq).

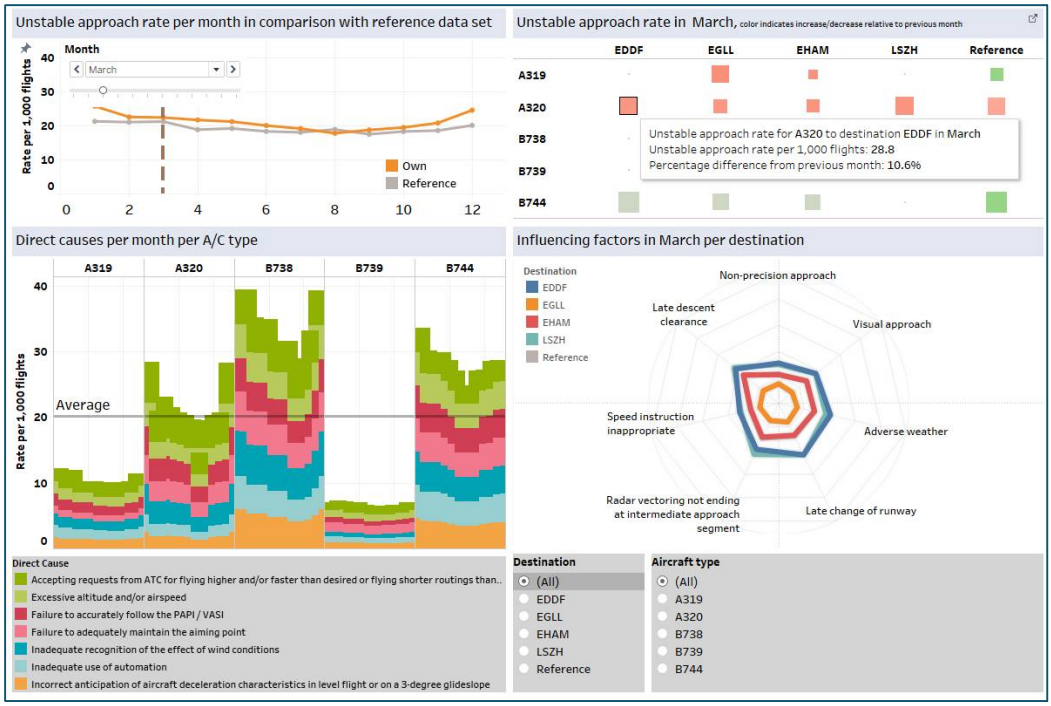

Figure 8: Screenshot of the occurrence dashboard for unstable approach (Tableau).

Figure 9 shows the occurrence dashboard for fire/smoke occurrences, implemented in Tableau. The source data are worldwide reported occurrences, incidents and accidents from NLR's Air Safety Database. The dashboard shows the flight phase and fire/smoke location distribution of events superimposed on an aircraft image. The world map indicates the geographical location of the fire/smoke event, while the diameter of the circle is a measure for the frequency. The example shown highlights the importance of context in visualisation, to ensure appropriate application of remedial resources. Although using fabricated data for just representative purposes it might be assumed that the major issues in fire are engine or cabin fires. In reality however a dominant concern is false warnings, which have associated safety concerns of their own. Thus there is a typical need to be able to drill-down to an appropriate level of detail, starting from a high level which preserves to the fullest extent possible the occurrence contextual information.

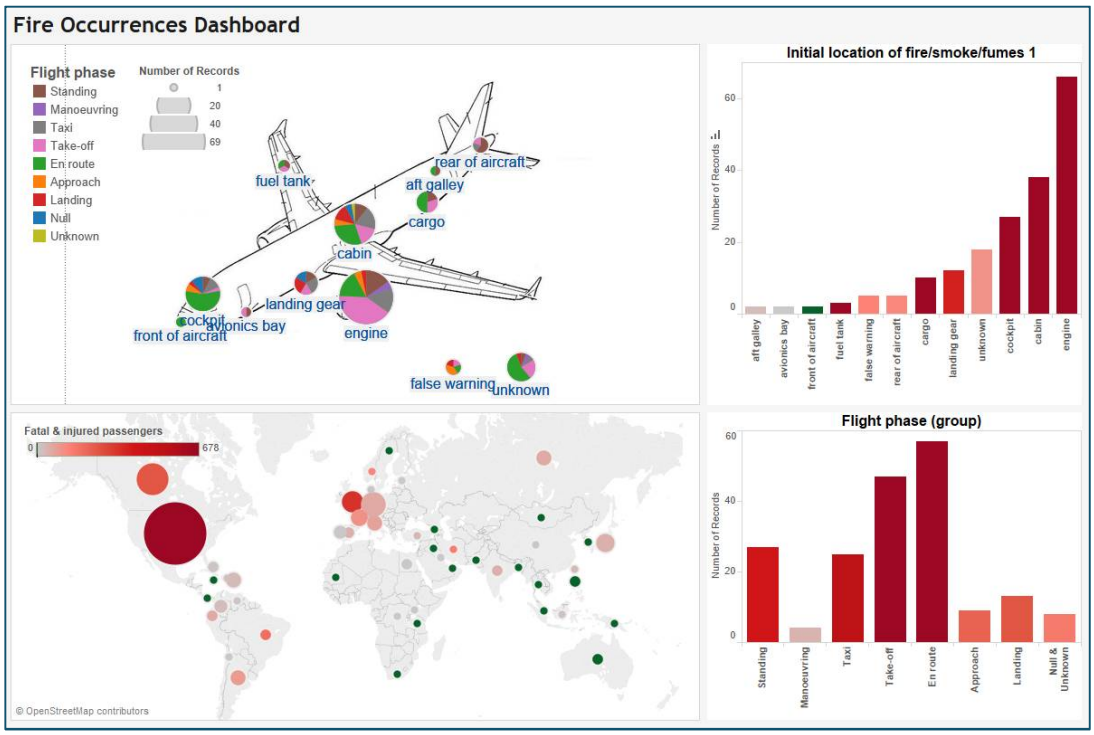

Figure 9: Screenshot of the occurrence dashboard for fire occurrences (Tableau).

Figure 10 shows the occurrence dashboard for loss of separation occurrences, implemented in Tableau. The source data are reported occurrences by airlines and Air Traffic Control of various types of events potentially leading to an airprox, e.g. level busts, loss of separation, airspace infringements. The dashboard shows statistics on location (airspace) of the event, the type of event, and occurrence of a TCAS warning by event type. Other charts or combinations of data can be developed easily in Tableau, so the dashboard can be expanded or adjusted to the analysis needs.

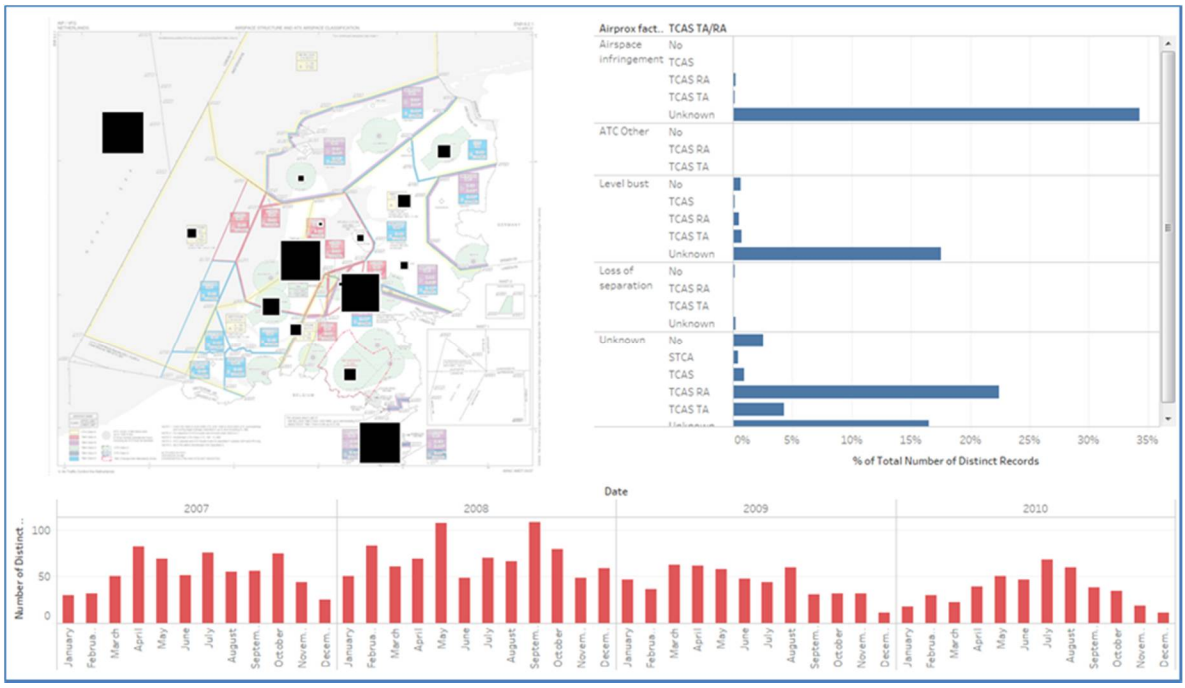

Figure 10: Screenshot of the occurrence dashboard for loss of separation occurrences (Tableau).

Figure 11 shows an example of a bird strike occurrence dashboard developed in Tableau. Occurrence reports from airlines, the airport and Air Traffic Controllers form the basis for the charts on the dashboard. It shows the frequency of bird strike occurrences over the year. The rate was calculated using exposure data (number of flights). Figure 11 shows the statistics for the month August due to interactive filtering by the user. The location of the bird strike events by runway is plotted on the Schiphol Airport layout while the reported impact locations of the bird strikes are superimposed on an aircraft image. On the right hand side of the dashboard the user can observe the bird strike data per flight phase, hit area and time of the day in comparison to reference data. In this example reference data was obtained from bird strike statistics in the USA (Source: FAA). A risk picture is also implemented in the occurrence dashboard. It shows the risk of an accident and engine failure as a result of a bird strike event. For comparison the risk of a bird strike event with minor damage is also plotted. The probability of engine failure and accident were estimated using an existing quantitative causal risk model. Based on the input probability of a bird strike, the risk model considers the probability of engine bird ingestion, followed by an engine failure, loss of control and accident.

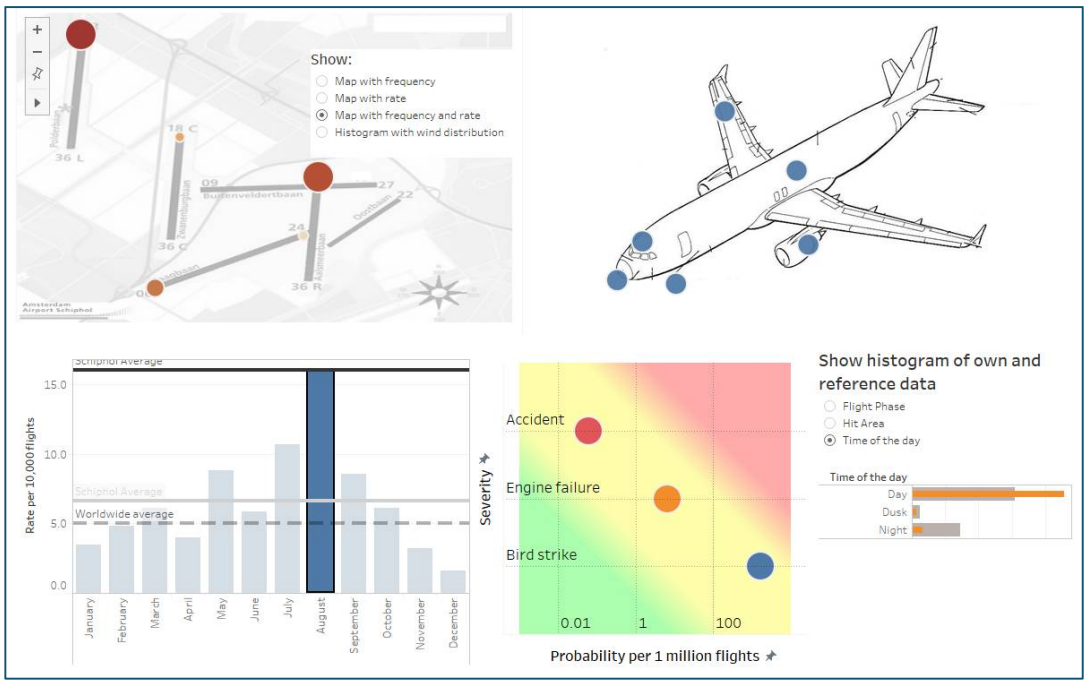

Figure 11: Screenshot of the occurrence dashboard for bird strike occurrences (Tableau).

3.3. Risk dashboard

Building from the Occurrence Dashboard, the Risk Observatory's significant innovative feature is the incorporation of risk models to build on the information supplied from occurrence data. This allows a better understanding of the potential for harm based on detailed sub models. A number of potential models have been considered from FSS partners, in particular NLR, TUM, Airbus, Thales Avionics, ONERA and Eurocontrol. The technical challenge has been to incorporate detailed domain models within the RO software and this has been achieved through the use of 'Backbone' models as an interface (as detailed in deilverable D4.4). Thus it will be possible to investigate a wide variety of safety issues with the RO through the addition of different domain specific models. On the risk dashboard the user can observe the accident risk probability and trend for a particular accident type for their own organization and compare that against for instance the EU safety level or an user defined alert level. The data shown in the dashboard are derived from combining actual reported occurrences, observations, and measured data with risk models to estimate an accident probability. In other words the risk dashboard combines data and risk model based information. An individual organization may have no or too few events to calculate directly an accident probability. Therefore, the risk models are used to estimate an accident probability using event data on precursors to feed the risk model. The following two figures show an example of a risk dashboard developed in the early prototype (Balsamiq). Figure 12 shows the probability of runway excursion over the year. Figure 13 shows an example risk picture where the consequence of an unstable approach and the probability of that consequence are depicted on a risk matrix, a so-called risk picture.

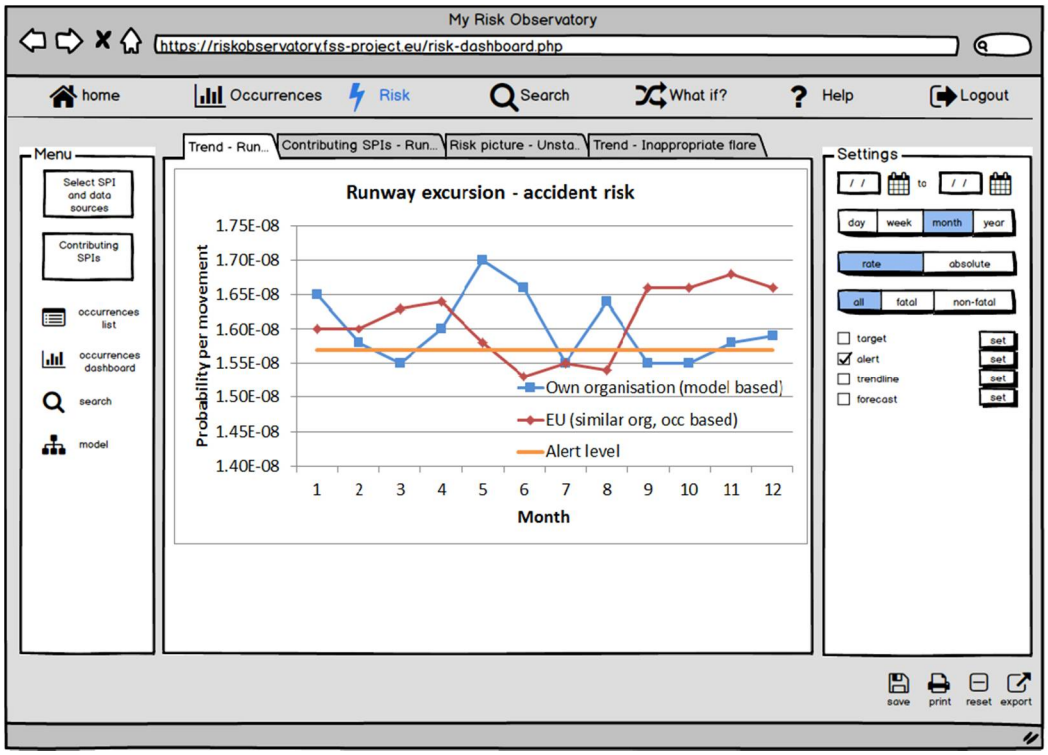

Figure 12: Screenshot example of a risk dashboard in the early prototype (Balsamiq).

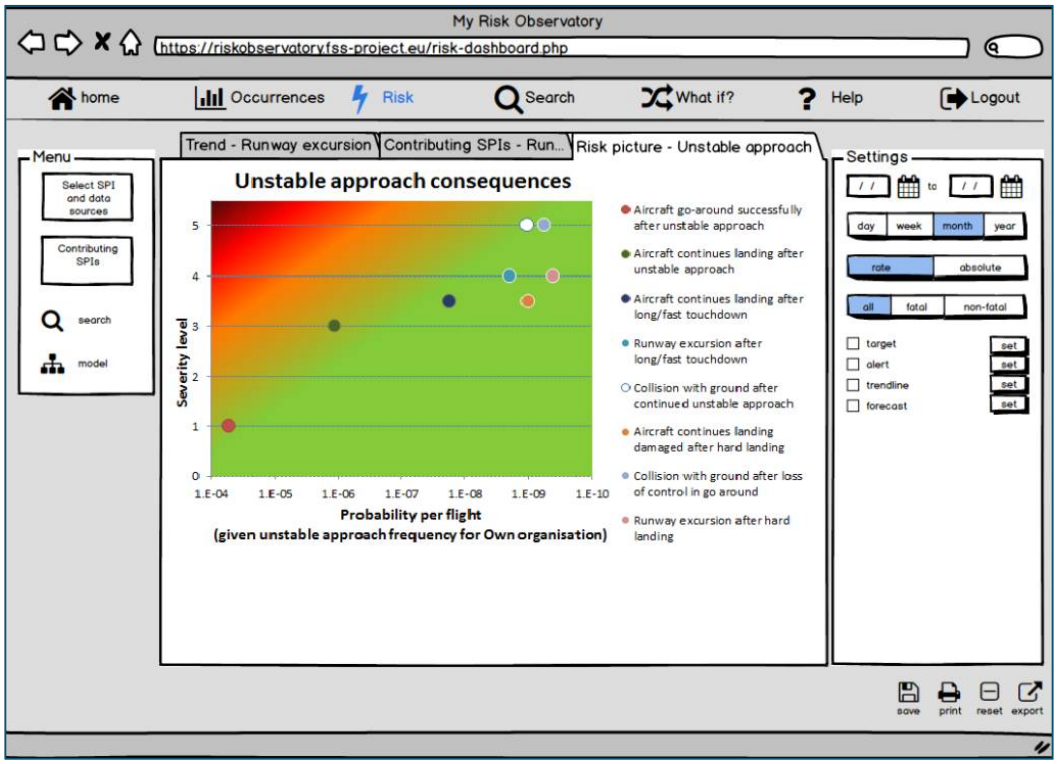

Figure 13: Screenshot example of a risk picture in the early prototype (Balsamiq).

Figure 14 shows the interactive risk picture developed for fire risk in Tableau. The source data are accident and incident statistics of in-flight fire/smoke events in combination with a risk model. The user can view the statistics by calendar year by adjusting the slider in the top right corner of the dashboard. By sliding through the calendar years one can observe changes in risk level over time. The lower portion of the risk dashboard shows the benchmarking capability: the frequency of a serious fire incident of "My Airline" is compared to the industry average rate "Reference Airlines".

Figure 15 illustrates a similar risk picture for mid-air collision risk. The data source is the data from the UK Airprox Board which collects airprox reports and classifies these events by risk level. In this case the Cat A, B and C risk level airproxes from 2006 until 2015 are plotted by year. The mid-air accident risk (probability) is based on the Total Aviation System Risk Picture 2016 (D4.3, 2016). The user can use the purple slider (now at "2013") to select a particular year for presentation of the four risk levels in the risk picture (upper part of the dashboard).

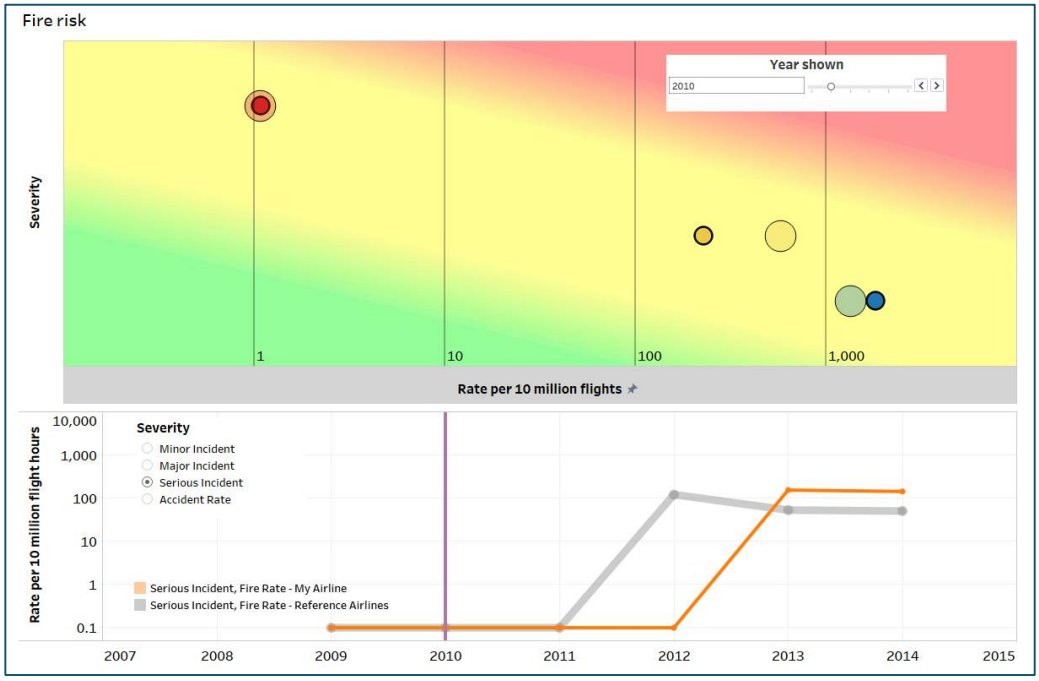

Figure 14: Risk dashboard, showing risk trend and risk picture for in-flight fire (Tableau).

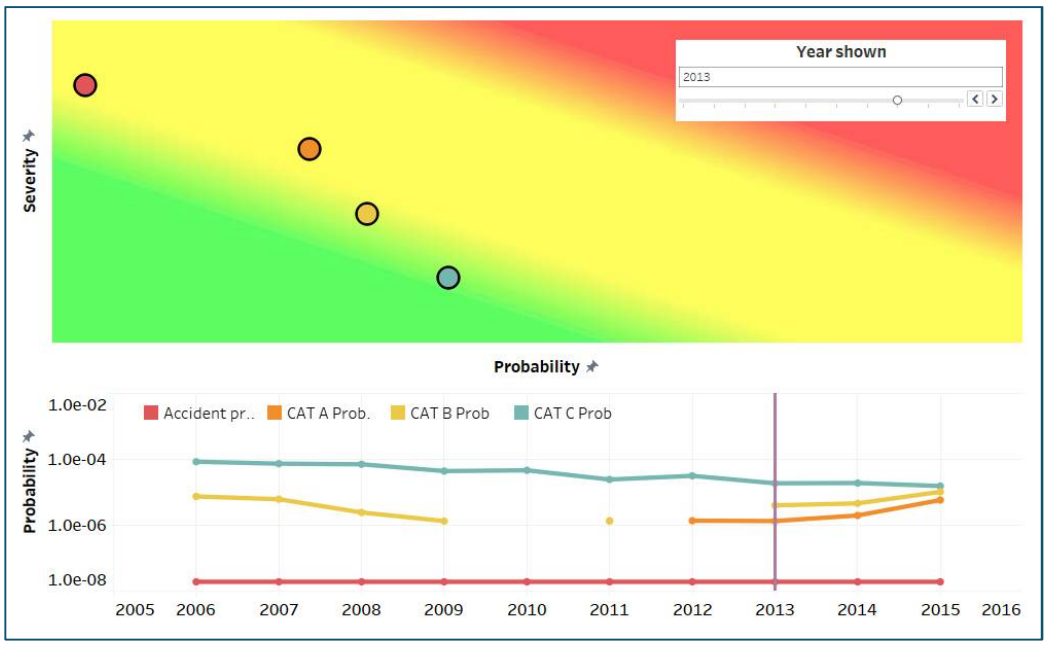

Figure 15: Risk dashboard, showing risk probability per year and risk picture for mid-air collision (Tableau).

Figure 16 shows an occurrence and risk dashboard representing landing performance and runway excursion risk information. The input distribution of the Final Approach Speed (FAS), weight and headwind can be obtained from on-board recorded data, which are usually available from an operator's Flight Data Monitoring program. Based on these actual flight data a landing distance model can be used to estimate the landing distance and probability of an overrun. The dashboard shows the output of the model calculations, i.e. the distribution of the distance to runway end superimposed on the airport map, and a distribution of the ground speed in case of a runway excursion. A risk matrix shows the overrun risk as a combination of overrun probability and a severity level based on ground speed when passing runway end.

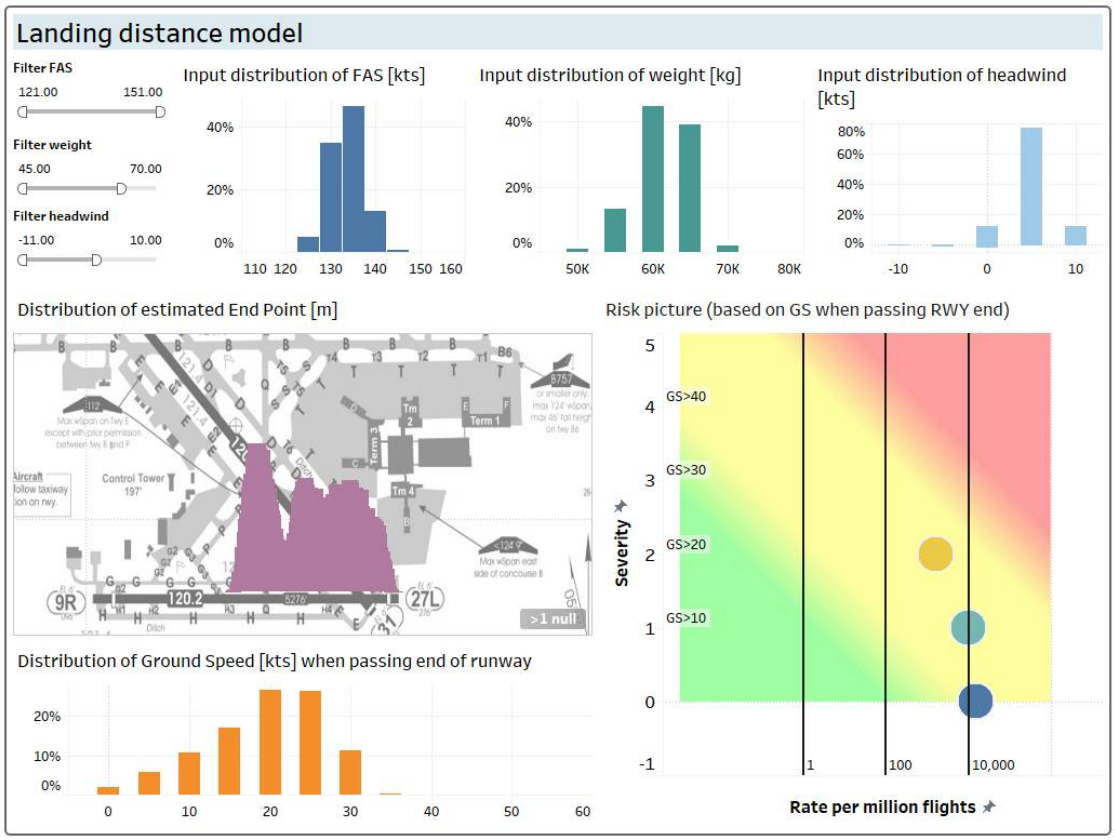

Figure 16: Occurrence and risk dashboard for runway excursion risk (Tableau).

3.4. What-if dashboard

A potentially attractive functionality of the RO is to be able to vary parameters in order to investigate their potential contribution to safety. The dashboard technique is a versatile way of portraying this information and thus it may be anticipated that users will particularly value this functionality. This will be fully explored with users at the concluding phase of the project when RO evaluation with appropriate sectors of the aviation industry will be conducted.

Figure 17 shows the what-if analysis dashboard in the early prototype where the user can perform comparative analysis of different safety performance indicators (SPIs) and their effect on accident risk. The what-if dashboard shows the effect of a change in the rate of a safety performance indicator on a specified risk. This functionality allows the user to evaluate the effectiveness of different (risk mitigation) measures to reduce risk.

The example in the early prototype shows the effect of a reduction in unstable approach rate compared to the effect of a reduction of inappropriate flare rate on runway excursion risk. The user can select various reduction levels for the contributing SPIs to evaluate their effectiveness. It helps creating awareness of the relative impact of those factors on risk. The example demonstrates that a small

reduction in unstable approach rate has a significantly higher effect than a larger reduction inappropriate flare rate. The example used fictive SPI rate input data in combination with a quantified risk model to assess the effect of the changes on runway excursion risk.

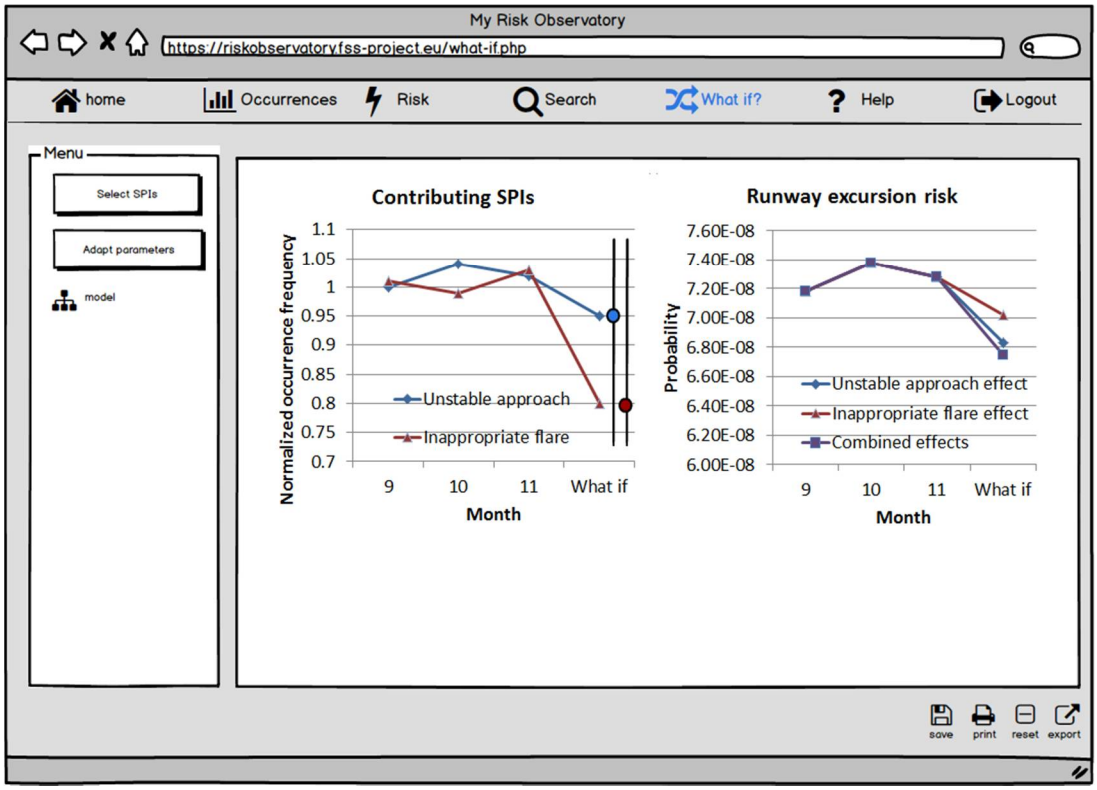

Figure 17: Screenshot of the what-if analysis dashboard in the early prototype (Balsamiq).

The same example of the what-if analysis dashboard was implemented in Tableau, see Figure 18. The effect of a change in unstable approach rate and inappropriate flare rate can interactively be evaluated by the user by moving the sliders horizontally (up to 25% improvement of the rate).

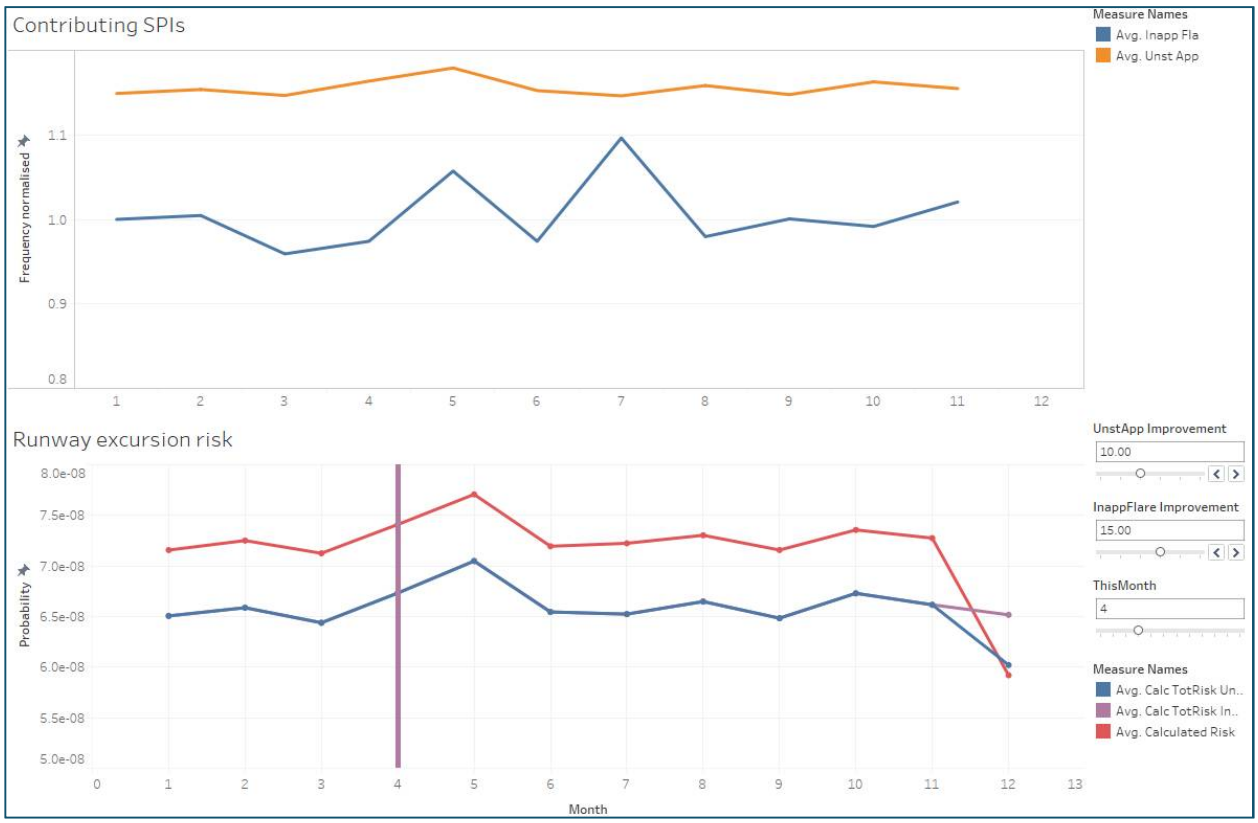

Figure 18: What-if analysis dashboard (Tableau).

3.5. Search dashboard

A Search Dashboard is planned to permit the access of information within the RO, such as particular occurrences, hazards, best practice or mitigation actions. As such, functionality will be closer to a search engine such as Google, with visualisation being of less importance than in the other dashboards. Nevertheless, there is still an opportunity to present information in formats that permit the greatest possible level of interaction and guidance in search. Figure 19 shows a screenshot of a dashboard that can be used for searching qualitative information stored in a database in the Risk Observatory.

One of the recommendations from stakeholder consultations (reported in D4.2, 2016) was to enable the sharing of safety studies or Safety Issue Risk Assessment reports (SIRA according to the ARMS methodology) that are the result of the operator's own analyses. It turns out that there is also value in sharing the outcomes of accident investigations of accident investigation boards. Although this is public information, the outcomes are not available from a single point and might not be directly relevant to all aviation organisations. The parties that were not directly involved in an accident or incident do not feel the urgency and necessity or do not have the time to actively examine all the accident investigation reports and implement the recommendations in their own organisations. Also,

the recommendations in accident reports are formulated in such a way that only the directly involved parties can learn from the accidents. This makes it difficult for other parties to apply potential relevant lessons to their own operation.

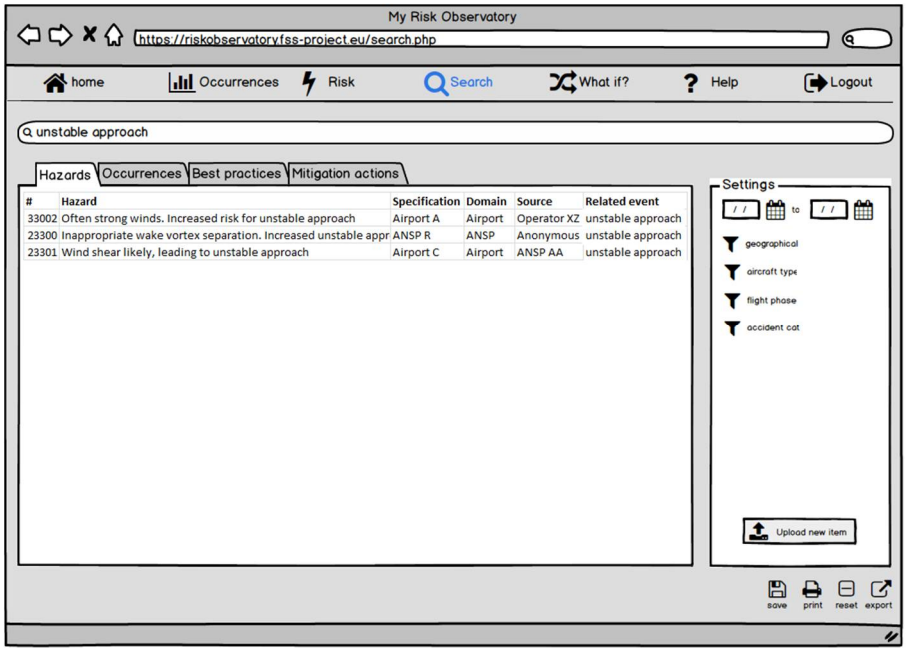

Figure 19: Screenshot of the search dashboard in the early prototype (Balsamiq).

With a structured list of lessons learned (a picklist) that is retrieved from accidents and incidents, the wider learning of accidents and incidents can be improved. These lessons individually describe certain weak spots that had a contributing cause to an accident or incident. Since the operators that will consult this list do not have an emotional connection with the accidents or incidents of the list, the lessons learned and recommendations can be easier followed and applied to the own operation. This ultimately contributes to the wider learning of accidents and incidents, and thus the proactive attitude, by making the whole process of identification simpler and less time-consuming [8].

The conceptual picklist has several elements. It is essential to get the attention of the reader. The picklist should immediately persuade the user to take note of the main message; this picklist includes accidents and incidents that user has not yet experienced themselves, but could happen to them at any time if they do not respond in the right way. First the user can choose a subject where they are interested in. Second, a small introduction of each subject is given, with numbers that accentuate the seriousness of the problem. Third, linked to each subject are a couple of specific lessons learned. These are meant to indicate weak spots and mistakes that contributed to an accident or serious incident. The fourth element shows means to verify if lessons are already applied to the own operation of the user. The final element contains a column that displays all the accidents/incidents related to that specific

lesson learned and the safety board that carried out the investigation, including a link to the final report.

Putting everything together leads to the following result. A lesson learned about unstable approaches has been taken as an example [8]:

1. Taxonomy	Procedures and Regulations Subject 10: Approach and Landing Procedures
2. Introduction	During the approach and landing, an aircraft is most vulnerable for an accident. 36% of the fatal accidents occur during the final approach and landing. Especially a combination of a non-precision and unstable approach proves to be extremely dangerous. A Flight Safety Foundation research concluded that 3.5% to 4% of approaches are unstable. Of these, 97% are continued to a landing, with only 3% resulting in a go-around. To put these figures in context, there were, in 2012, 24.4 million flights worldwide in a fleet of civilian, commercial, western-built jet airplanes heavier than 60,000 pounds. This means that between 854,000 and 976,000 of those flights terminated with an unstable approach, and approximately 828,000 to 945,000 continued to a landing. The potential negative consequences of continuing an unstable approach to a landing include controlled flight into terrain (CFIT), runway overruns, landing short of the runway, and tail-strike accidents. The lessons learned of this subject describe the (unintentional) mistakes that have been made in the field of approach and landing procedures which contributed to an accident or incident.
3. Lesson Learned	As soon as the approach is considered to be unstable and not in compliance with the operators operating procedures (not in the proper configuration to land, excessive airspeed and/or flight path angle or drifted off course), a go-around manoeuvre should be performed.
4. Verification	Check with FDM data to what extent the approach was unstable and whether this resulted in a go-around or not.
5. Related Accident/Incident	- Southwest Airlines flight 1455, National Transportation Safety Board (NTSB) - Garuda Indonesia Flight 200, National Transportation Safety Committee (KNKT) - First Air Flight 6560, Transportation Safety Board of Canada (TSB)

The search dashboard is suited to disseminate lessons learned from accidents and serious incidents in the manner explained above.

4 CONCLUSIONS AND RECOMMENDATIONS

4.1. Conclusions

This document provides a commentary on aviation safety in 2017 and the progress of the Risk Observatory. It builds on a related study previously performed to cover 2016 [1] and a further study will be performed at the conclusion of the programme to cover 2018. As the Risk Observatory does not yet have full functionality, to satisfy the objective to produce a safety indicators commentary at annual intervals with respect to the main safety issues in aviation, quantification of accident scenarios has been performed according to the Event Sequence Diagram methodology, which is also used in the Causal model for Air Transport Safety (CATS) developed for the Dutch Ministry of Transport [2].

The European Plan for Aviation Safety (EPAS), established by EASA, identifies the following operational issues in commercial air transport by aircraft [4]:

- Loss of control in-flight
- Design and maintenance improvements
- Mid-air collisions
- Runway safety (runway excursions and incursions)
- Ground safety (ground collisions and ground handling)
- Controlled flight into terrain
- Fire, smoke and fumes (on ground and in the air)

The data analysis performed assigns frequencies per flight to each operational issue and thereby provides the following prioritisation of actions, based on accident/incident frequency:

1. Ground safety
2. Runway safety
3. Fire, smoke and fumes
4. Design and maintenance improvements
5. Loss of control in-flight
6. Controlled flight into terrain
7. Mid-air collisions

Comparison with the Basic Risk Picture 2016 [1] shows that the operational issue of Runway safety moved from the third priority to the second and Controlled flight into terrain from the seventh to the sixth.

However, when only fatal accident rates are considered, the following prioritisation is made:

1. Loss of control in-flight

2. Design and maintenance improvements
3. Ground safety
4. Runway safety
5. Controlled flight into terrain
6. Mid-air collisions
7. Fire, smoke and fumes

This prioritisation is similar to the Basic Risk Picture 2016, which is to be expected as the aviation industry is relatively mature in terms of risk. That is not to say that risks remain static however and new operating practices, or technology can pose emerging threats that ideally a Risk Observatory will be able to identify. It is in areas that there are subtle safety changes that the aggregation of data may identify issues that are not well-recognised, providing that in the aggregation process contextual information is allowed to be retained. Bigger issues are more self-evident, e.g. a well-recognised, relatively recent industry change is the move to aircraft of largely composite construction such as the Airbus A350, a topic separately examined within the Future Sky Safety programme in P7 with regards to flammability management. The Risk Observatory's value would be in identifying safety issues (usually minor but still actionable) that may as yet be largely unrecognised.

A further emerging well-known safety risk receiving much publicity in 2017 has been the management of personal electronic devices containing lithium batteries, notably tablets and portable computers. Fire safety versus potential security threats has encouraged regulatory debate as to whether these products are better kept within the cabin, or removed from passengers and transported in the hold. In this case, the Risk Observatory process is likely to be off less value in identifying safety issues as they are more contained and better understood. It might be argued that the Risk Observatory in this case might be of more value in scoping the size of a problem for support in cost-benefit analyses for regulatory considerations, although in practice these are difficult to automate and rely heavily on manual investigations.

From a regulatory perspective, the 'ranking' analysis supports international safety improvement project directions. Of course, simple 'headline' based tables and small changes in position within a table (when recalculated on an annual basis) are not in themselves of significance. Mitigation actions tend to be focussed on perceived components of a headline item, ideally aimed at the components vulnerable to the most significant improvement in the shortest timescales at the most effective cost. The Risk Observatory approach is, of course, less effective in supporting analysis at fine granularity level through limitations on supporting data input. Nevertheless it adds to the justification for the benefits of the big data approach.

4.2. Recommendations

The recommendations below build on those made at the end of 2016 regarding the Risk Observatory developed in the Future Sky Safety programme. During 2017 there was increasing recognition of the value of the Risk Observatory as a research tool to support initiatives such as EASA's Data4Safety programme. The Risk Observatory is well-placed, with its substantial development investment though multi-sector aviation industry support to enable experimental evaluation of techniques to provide guidance on Big Data analysis for safety purposes.

- As the Risk Observatory matures in development, it will be important to verify that it has the capability to provide relevant risk pictures for now and in the future at both the European level and at the level of the individual EU Member States and other users. This work is planned as the concluding phase of the programme.
- The Risk Observatory output will be validated against the EPAS operational issues and the Basic Risk Picture provided in this document. Clearly there will be limitations based on the two use cases selected for detailed investigation within the RO, however it is a question of establishing confidence that the basic methodologies employed within the RO are consistent with expectations and if not, to investigate the reasons.
- Refine how risk levels will be defined in the Risk Observatory; e.g. based on accident/serious incident frequency, fatality rates, or a combination thereof;
- The Risk Observatory should follow the common European risk classification scheme that the European Commission should develop according to Regulation (EU) No 376/2014 on reporting, analysis and follow-up of occurrences in civil aviation.
- Provide for more granularity of data by including low-severity, high frequency occurrences to enable proactive interventions by organisations using the Risk Observatory and to increase the trend monitoring capability of the Risk Observatory.
- Use the Risk Observatory to obtain further insight in the EPAS operational issues at the European level and at the level of the individual EU Member States.

5 REFERENCES

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[8] D. de Bijl, Lessen uit Ongevallen (translation: Lessons from Accident), internship report, third-year internship at the Aviation program of the Amsterdam University of Applied Sciences, commissioned by the Netherlands Aerospace Centre (NLR), July 2017

Appendix A Number of occurrences and corresponding frequencies

ESD	ESD name	Accident/serious incident description	Number of occurrences[2]	Number of occurrences not assigned to accident scenarios and distributed over total number of end states[3]	Accident/serious accident frequency per flight	Number of fatal accidents	Number of fatal accidents not assigned to accident scenarios and distributed over total number of end states[3]	Fatal accident frequency per flight
1	Aircraft system failure during take-off	Runway excursion	2	0.44	1.62E-08	0	0.00	0.00E+00
2	ATC event during take-off	Runway excursion	1	0.44	9.60E-09	0	0.00	0.00E+00
3	Aircraft directional control by flight crew inappropriate	Runway excursion	6	0.44	4.28E-08	0	0.00	0.00E+00

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	during take-off							
3	Aircraft directional control by flight crew inappropriate during take-off	Runway excursion	3	0.44	2.29E-08	0	0.00	0.00E+00
4	Aircraft directional control related system failure during take-off	Runway excursion	4	0.44	2.95E-08	0	0.00	0.00E+00
4	Aircraft directional control related system failure during take-off	Runway excursion	1	0.44	9.60E-09	0	0.00	0.00E+00
5	Incorrect configuration during take-off	Runway excursion	1	0.44	9.60E-09	0	0.00	0.00E+00

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5	Incorrect configuration during take-off	Collision with ground	1	0.05	6.98E-09	1	0.05	6.98E-09
6	Aircraft takes off with contaminated wing	Collision with ground	2	0.05	1.36E-08	2	0.05	1.36E-08
8	Aircraft encounters windshear after rotation	Collision with ground	0	0.05	3.32E-10	0	0.05	3.32E-10
9	Single engine failure during take-off	Runway excursion	3	0.44	2.29E-08	0	0.00	0.00E+00
9	Single engine failure during take-off	Runway excursion	2	0.44	1.62E-08	0	0.00	0.00E+00
10	Pitch control problem during take-off	Runway excursion	2	0.44	1.62E-08	0	0.00	0.00E+00

10	Pitch control problem during take-off	Runway excursion	0	0.44	2.95E-09	0	0.00	0.00E+00
10	Pitch control problem during take-off	Collision with ground	0	0.05	3.32E-10	0	0.05	3.32E-10
11	Fire, smoke, fumes on board aircraft	Aircraft continues flight damaged	55	0.00	3.66E-07	0	0.00	0.00E+00
11	Fire, smoke, fumes on board aircraft	Collision with ground	0	0.05	3.32E-10	0	0.05	3.32E-10
11	Fire, smoke, fumes on board aircraft	Personal injury	6	0.00	3.99E-08	0	0.00	0.00E+00
11	Fire, smoke, fumes on board aircraft	Aircraft damaged	81	0.00	5.38E-07	0	0.00	0.00E+00
12	Flight crew member spatially	Collision with ground	1	0.05	6.98E-09	1	0.05	6.98E-09

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	disoriented							
13	Flight control system failure	Collision with ground	2	0.05	1.36E-08	1	0.05	6.98E-09
14	Flight crew incapacitation	Collision with ground	1	0.05	6.98E-09	2	0.05	1.36E-08
15	Ice accretion on aircraft in flight	Collision with ground	0	0.05	3.32E-10	0	0.05	3.32E-10
16	Airspeed, altitude or attitude display failure	Collision with ground	5	0.05	3.36E-08	5	0.05	3.36E-08
17	Aircraft encounters thunderstorm, turbulence or wake vortex	In-flight break-up	8	0.00	5.32E-08	0	0.00	0.00E+00
17	Aircraft encounters thunderstorm, turbulence or wake vortex	Collision with ground	1	0.05	6.98E-09	0	0.05	3.32E-10

17	Aircraft encounters thunderstorm, turbulence or wake vortex	Aircraft continues flight with injury	42	0.00	2.79E-07	0	0.00	0.00E+00
18	Single engine failure in flight	Collision with ground	1	0.05	6.98E-09	1	0.05	6.98E-09
18	Single engine failure in flight	Collision with ground	9	0.05	6.01E-08	6	0.05	4.02E-08
18	Single engine failure in flight	Aircraft lands off runway	6	0.00	3.99E-08	3	0.00	1.99E-08
19	Unstable approach	Collision with ground	11	0.05	7.34E-08	4	0.05	2.69E-08
19	Unstable approach	Collision with ground	6	0.05	4.02E-08	3	0.05	2.03E-08
19	Unstable approach	Runway excursion	27	0.44	1.82E-07	1	0.00	6.65E-09
19	Unstable approach	Runway excursion	5	0.44	3.62E-08	0	0.00	0.00E+00

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19	Unstable approach	Aircraft continues landing roll damaged	14	0.00	9.30E-08	0	0.00	0.00E+00
21	Aircraft weight and balance outside limits during approach	Collision with ground	1	0.05	6.98E-09	1	0.05	6.98E-09
23	Aircraft encounters windshear during approach or landing	Collision with ground	4	0.05	2.69E-08	0	0.05	3.32E-10
23	Aircraft encounters windshear during approach or landing	Collision with ground	1	0.05	6.98E-09	0	0.05	3.32E-10
23	Aircraft encounters windshear during approach or	Runway excursion	1	0.44	9.60E-09	0	0.00	0.00E+00

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	landing							
25	Aircraft handling by flight crew inappropriate during flare	Runway excursion	17	0.44	1.16E-07	0	0.00	0.00E+00
25	Aircraft handling by flight crew inappropriate during flare	Runway excursion	4	0.44	2.95E-08	0	0.00	0.00E+00
25	Aircraft handling by flight crew inappropriate during flare	Aircraft continues landing roll damaged	61	0.00	4.05E-07	0	0.00	0.00E+00
26	Aircraft handling by flight crew inappropriate during landing roll	Runway excursion	48	0.44	3.22E-07	0	0.00	0.00E+00
27	Aircraft directional control related	Runway excursion	35	0.44	2.36E-07	2	0.00	1.33E-08

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	system failure during landing roll							
31	Aircraft are positioned on collision course in flight	Collision in mid-air	4	0.00	2.66E-08	3	0.00	1.99E-08
32[1]	Runway incursion	Collision on runway	7	0.00	4.65E-08	3	0.00	1.99E-08
33	Cracks in aircraft pressure cabin	In-flight break-up	0	0.00	0.00E+00	0	0.00	0.00E+00
33	Cracks in aircraft pressure cabin	Aircraft damage	1	0.00	6.65E-09	0	0.00	0.00E+00
35	TAWS alert	Collision with ground	4	0.05	2.69E-08	4	0.05	2.69E-08
36[1]	Conflict on taxiway or apron	Collision on taxiway or apron	167	0.00	1.11E-06	2	0.00	1.33E-08
38	Loss of control due to poor	Collision with ground	0	0.05	3.32E-10	0	0.05	3.32E-10

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	airmanship							
		Ramp accident/serious incident[4]	30	0	1.99E-07	5	0.00	3.32E-08
		Design or maintenance related accident/serious incident[5]	71	2.87[5]	4.91E-07	18	0.2	1.21E-07

[1] *To ensure correct use of the exposure data, collisions between two aircraft are considered as two separate occurrences.*

[2] *Note that only 702 occurrences and 51 types of accident end states codes have been filed while 1594 occurrences corresponding to 84 types of end states codes have been identified in Appendix B. The reason for the difference is that only 702 occurrences actually led to 'accidents' (the other occurrences led to at most 'serious incidents'). Only occurrences with accident end state are used to quantify 'risk frequencies per flight'.*

[3] *One 'collision with ground' accident that could not be assigned to an accident scenario has been equally distributed over all 'collision with ground' end states. Eight 'runway excursion' accidents that could not be assigned to an accident scenario have been equally distributed over all 'runway excursion' end states.*

[4] *Ground handling accidents and serious incidents are not included in the CATS model and therefore have been quantified separately.*

[5] *Design or maintenance related accidents and serious incidents are derived from system-related accidents or serious incidents in the CATS model and therefore have been quantified separately. It should be noted that this is a subset from the frequency per flight of other accident/serious incident scenarios.*

Appendix B Accident and serious incident sample

ECCAIRS State file number	Local date	Manufacturer/model
95005170	05-01-1995	Fokker 50
95000630	10-01-1995	737-200
BFU 5X001-95	19-01-1995	A310
95000100	20-01-1995	FALCON 20
95000720	31-03-1995	A310
95001110	08-04-1995	747-100/200
95001340	22-04-1995	Fokker 50
95001090	27-04-1995	MD80 SERIES
95001310	24-05-1995	110 BANDEIRANTE
95002040	25-05-1995	BAE-ATP
BFU 5X003-95	14-07-1995	F27 FRIEND/FREIGHT SHIP
95002930	02-09-1995	MD80 SERIES
95003020	16-09-1995	767-300
95005490	16-10-1995	DC-9-30
95005000	23-11-1995	757-200
95003870	13-12-1995	AN-24
95004720	15-12-1995	ATR 42 - NO SERIES SPECIFIED
95003960	19-12-1995	DC-10
96001480	14-02-1996	Short SD 330
96000560	19-02-1996	550/551 SP CITATION II
96003260	19-05-1996	BAe 146-200
96002710	28-05-1996	TU-154M/TU-164
96001600	06-07-1996	HINDUSTAN HAL748
96003130	15-07-1996	L1011-1/L1011-100/200
96003230	30-07-1996	188 ELECTRA
96003050	13-08-1996	Learjet 25
BFU 5X002-96	13-08-1996	MD-11
96003390	29-08-1996	TU-154M/TU-164
96006302	27-09-1996	727-200

96006301	27-09-1996	FALCON 10
96004100	08-10-1996	AN-124
96005220	08-12-1996	F27 MK 500
96005280	12-12-1996	146-100
96001720	21-12-1996	DC-10-30
97000690	03-01-1997	Short SD 330
97004270	18-01-1997	737-300
97000400	08-02-1997	737-300
97000770	02-05-1997	Dornier 228 1/2
97001480	06-05-1997	F27 MK 500
97000910	14-05-1997	Saab 340
97012550	14-05-1997	777-200
97002450	18-05-1997	ATR 72 - NO SERIES SPECIFIED
97003180	24-06-1997	TU-154B
97002580	10-07-1997	747-100/200
97001320	30-07-1997	ATR 42 - NO SERIES SPECIFIED
97001770	31-07-1997	A320
97001890	12-08-1997	727-200
97002290	16-08-1997	FAIRCHILD FH227
97004970	24-08-1997	757-200
97001960	11-09-1997	BAe 146-300
97004550	20-10-1997	L1011-1/L1011-100/200
97002140	05-11-1997	A340-300
BFU EX003-97	06-11-1997	737-500
97005090	21-11-1997	BAe ONE-ELEVEN
97005120	06-12-1997	747-100/200
97003270	07-12-1997	F27 MK 500
97002830	17-12-1997	YAK-42
97005140	20-12-1997	737-300
97003140	24-12-1997	757-200
98010750	09-01-1998	767-300
98002660	16-01-1998	650 CITATION III

98000210	20-01-1998	ATR 42 - NO SERIES SPECIFIED
98000310	26-01-1998	31 JETSTREAM
98000230	09-02-1998	Short SD 360
98004820	09-02-1998	HAWKER SIDDELEY HS748/AVRO 748
98002670	15-02-1998	BAE-ATP
98001000	22-02-1998	ATR 72 - NO SERIES SPECIFIED
98004110	27-02-1998	Saab 340
98000610	17-03-1998	737-300
98000970	30-03-1998	HAWKER SIDDELEY HS748/AVRO 748
98000560	02-04-1998	FALCON 20
98002040	05-04-1998	747-400
98004510	07-04-1998	550/551 SP CITATION II
98003070	09-05-1998	BAE-ATP
98000640	21-05-1998	A320
98005170	25-05-1998	CONCORDE
98004680	31-05-1998	A310
98004860	21-06-1998	747 SP
98002540	19-07-1998	L1011-1/L1011-100/200
98002240	28-07-1998	MERLIN III
98002311	30-07-1998	BEECH 1900
98004980	14-08-1998	A321
98002800	27-08-1998	A340-200
2000000	03-09-1998	MU-2B-40 (SOLITAIRE)
98004770	11-09-1998	747-100/200
98005110	29-09-1998	Embraer 120 BRASILIA
98005320	14-10-1998	DC-9-40
98003300	14-11-1998	707-300
98003720	25-11-1998	MD80 SERIES
98004990	25-11-1998	L1011-500 SERIES
98005161	10-12-1998	767-300
99000020	12-01-1999	F27 FRIEND/FREIGHT SHIP
99000280	15-01-1999	767-300

99000260	20-01-1999	747-400
99008180	22-01-1999	737-200
99000300	28-01-1999	MD80 SERIES
BFU 5X001-99	05-02-1999	Boeing\ B737-46J - (not coded)
99000410	07-02-1999	707-300
BFU 5X002-99	10-02-1999	Israel Ind.\ IAI-1125 - (not coded)
99004080	13-02-1999	Saab 340
99006000	13-02-1999	Short SD 330
99000340	25-02-1999	Dornier 328
99000850	28-02-1999	DHC8
99000350	01-03-1999	Lockheed 188 ELECTRA
99001000	04-03-1999	737-200
99001040	24-03-1999	A300-600
BFU EX004-99	29-05-1999	C.A.S.A.\ CASA 352A3 - (not coded)
99004980	03-06-1999	A321
99002720	23-06-1999	DC-10-30F
99007520	27-06-1999	737-400
99008470	30-06-1999	Dornier 228 1/2
BFU 5X004-99	06-07-1999	ATR 42-300
99008280	13-07-1999	DC-8-62
99004020	20-07-1999	DC-8-62
99003641	25-07-1999	737-500
99001570	28-07-1999	SA227AC/METRO III
99004970	12-08-1999	DHC8
99005070	03-09-1999	737-800
991111100	11-09-1999	747-300
99003460	14-09-1999	757-200
99999999	19-09-1999	MD-11
99022990	01-10-1999	A310
99004680	07-11-1999	Fokker 100
BFU 5X009-99	11-11-1999	Swearingen\ SA227AT - (not coded)
99004700	19-11-1999	737-300

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99004560	30-11-1999	Canadair CL-600
99007640	04-12-1999	757-200
99004550	06-12-1999	DC-10-10
99004480	11-12-1999	BAE-ATP
99006470	13-12-1999	777-200
99004850	16-12-1999	A310
99006710	18-12-1999	DC-10-30F
99004720	22-12-1999	747-100/200
99008220	28-12-1999	ATR 42-300
20	10-01-2000	Saab 340
8000	11-01-2000	Saab 2000
7530	17-01-2000	Fokker 50
2530	20-01-2000	A320
7560	24-01-2000	A320
160	31-01-2000	AN-12
7181	01-02-2000	737-400
7510	21-02-2000	A321
550	27-03-2000	737-700
660	01-04-2000	737-800
7070	05-04-2000	Fokker 100
7500	15-04-2000	MD80 SERIES
930	22-04-2000	747-300
740	26-04-2000	DC-9-40
790	02-05-2000	Learjet 35 TRANSCONTINENTAL
850	16-05-2000	BAE-ATP
971	25-05-2000	Short SD 330
980	27-05-2000	DHC8
7490	05-06-2000	MD80 SERIES
BFU 5X005-00	27-06-2000	SA227AC/METRO III
2510	01-07-2000	F27 MK 500
2350	04-07-2000	TU-154B
1920	12-07-2000	A310

7520	13-07-2000	AVRO RJ100
2570	25-07-2000	DC-10
2970	17-08-2000	757-200
BFU EX004-00	27-08-2000	A300-B2/B4
7850	14-09-2000	MD90-30
5730	10-10-2000	DC-10-30
7030	10-10-2000	ATR 72-200
BFU 5X010-00	20-10-2000	Fokker\ F27,MK600 - (not coded)
4090	22-10-2000	DHC8
7630	29-10-2000	Fokker 50
4460	05-11-2000	747-100/200
7540	08-11-2000	Fokker 50
7590	13-11-2000	A319
7600	18-11-2000	DC-10-30F
4510	30-11-2000	737-800
1006550	14-01-2001	737-400
1004680	30-01-2001	146-300
1007750	01-02-2001	Saab 2000
1002430	02-02-2001	757-200
1004910	04-02-2001	Short SD 360
1000600	04-02-2001	747-300
1000180	07-02-2001	A320
1007890	11-02-2001	767-300
1007760	20-02-2001	A321
1000290	27-02-2001	Short SD 360
1000530	19-03-2001	DHC8-300
1121530	27-03-2001	767-300
1000720	18-04-2001	A321
1121550	23-04-2001	767-300
BFU EX001-01	28-04-2001	Junkers\ JU52 - (not coded)
1001090	30-04-2001	Cessna 560 CITATION V
1001100	10-05-2001	MD80 SERIES

1002560	29-05-2001	SA227AC/METRO III
1004100	07-06-2001	Beech 350 SUPER KING AIR
1002610	14-06-2001	DHC8
1002460	28-06-2001	757-200
1003020	06-07-2001	L1011-1/L1011-100/200
1121580	08-07-2001	A310
1007780	19-07-2001	A320
1004500	21-07-2001	MD80 SERIES
1007790	03-08-2001	Embraer 145 (145ER)
1003130	24-08-2001	A330-200
1004210	24-08-2001	A319
1002960	29-08-2001	CASA CN 235
BFU 5X016-01	27-09-2001	Swearingen\ SA227AT - (not coded)
1004871	08-10-2001	MD80 SERIES
1005130	18-10-2001	Canadair CL-600
1006700	22-11-2001	DHC8
1006330	23-11-2001	AN-28
1005580	24-11-2001	AVRO RJ100
1006390	30-11-2001	31 JETSTREAM
1008100	11-12-2001	737-300
1007820	18-12-2001	Saab 2000
1007800	24-12-2001	Embraer 145 (145ER)
BFU 5X001-02	02-01-2002	Fokker\ F27,MK600 - (not coded)
2000070	14-01-2002	Embraer 120 BRASILIA
2005740	22-01-2002	757-200
2000210	03-02-2002	MD-11
2006650	16-02-2002	Fokker 70
2006640	22-02-2002	BA 146-200
2005910	02-03-2002	A321
2000620	12-04-2002	SA227AC/METRO III
2001330	14-06-2002	A330-300
BFU 3X128-02	24-06-2002	717-200

2006570	28-06-2002	Embraer 145 (145ER)
BFU AX001-02	01-07-2002	757-200
2001870	06-07-2002	A320
2001810	10-07-2002	Saab 2000
2001880	27-07-2002	737-700
2005750	06-08-2002	737-700
2001910	17-08-2002	737-700
2007100	22-08-2002	DA 40 DIAMOND STAR
2006630	12-09-2002	31 JETSTREAM
2006590	13-09-2002	737-800
BFU 1X002-02	14-09-2002	Canadair CL-600
2004420	14-09-2002	747-300
2006560	17-09-2002	ATR 42-500
2005321	01-10-2002	Embraer 145 (145ER)
2006550	08-10-2002	ATR 42-500
2006540	09-10-2002	Fokker 100
2005440	16-10-2002	747-100/200
2004120	16-10-2002	Dornier 228 1/2
2004460	02-11-2002	F27 MK 500
2005191	05-11-2002	A320
2004330	06-11-2002	F27 MK 500
2006530	25-11-2002	A300-B2/B4
2005130	30-11-2002	Embraer 145 (145ER)
2005220	03-12-2002	A300-600
2006740	06-12-2002	Cessna 550/551 SP CITATION II
2005600	09-12-2002	737-700
2005850	12-12-2002	BAE 146-200
2005540	24-12-2002	Fairchild SA227 III
2006350	25-12-2002	ATR 72-200
3000230	06-01-2003	DHC8
3000840	12-01-2003	737-800
3004700	16-01-2003	747 SP

3000070	17-01-2003	Fokker 50
3004710	18-01-2003	747-400
3000280	20-01-2003	Cessna 550/551 SP CITATION II
3004780	04-02-2003	Embraer 135
3000190	10-02-2003	AN-28
3000610	15-02-2003	747-100/200
3004720	23-03-2003	A319
BFU 5X002-03	10-04-2003	BAE 146-200
3002561	27-04-2003	A321
3002760	28-05-2003	Cessna 560 CITATION V
3001980	02-06-2003	DHC8-300
3003780	14-06-2003	747-100/200
3002110	16-06-2003	A320
309999	16-06-2003	737-800
3002120	17-06-2003	MD80 SERIES
3002160	19-06-2003	AN-124
3002130	22-06-2003	Canadair CL-600
3002820	02-07-2003	737-800
3002411	12-07-2003	TU-154
3004730	13-07-2003	737-200
BFU 6X014-03	13-07-2003	A321
3002780	15-08-2003	737-700
3003130	17-09-2003	31 JETSTREAM
3003490	17-09-2003	31 JETSTREAM
3003260	23-09-2003	Embraer 145 (145ER)
3003520	01-10-2003	747-100/200
3048850	02-10-2003	747-100/200
3003420	07-10-2003	Embraer 145 (145ER)
3004670	17-11-2003	737-800
3004920	25-11-2003	Embraer 145 (145ER)
3003880	04-12-2003	Dornier 228 1/2
3051550	07-12-2003	737-800

3004180	13-12-2003	AVRO RJ100
3004510	22-12-2003	737-700
3004800	22-12-2003	737-300
4000110	02-01-2004	A320
4000050	05-01-2004	Fokker 70
4004320	12-01-2004	Cessna CITATION BRAVO
4000120	19-01-2004	A320
4000190	19-01-2004	DC-10
4001570	22-01-2004	A320
4000630	24-01-2004	757-300
4000160	26-01-2004	Dornier 328JET
4002470	27-01-2004	Embraer 145 (145ER)
4004410	31-01-2004	Embraer 120 BRASILIA
4004400	01-02-2004	A321
4004370	18-02-2004	A330-200
4003470	29-02-2004	A321
4000540	02-03-2004	737-400
4004010	13-03-2004	737-400
4000750	19-03-2004	REGIONAL JET SERIES 100/200
4000610	21-03-2004	737-800
4002370	21-03-2004	MD80 SERIES
4000910	23-03-2004	BOEING 747
4000910	23-03-2004	BOEING 747
4001580	29-03-2004	Canadair CL-600
4001270	15-04-2004	737-400
4001120	20-04-2004	MD80 SERIES
BFU EX005-04	22-04-2004	DC-10
4001280	26-04-2004	BAE 146-100
4000920	27-04-2004	737-300
BFU EX006-04	03-05-2004	ATR 42-500
4004280	04-05-2004	A320
4002170	11-05-2004	A320

4001070	19-05-2004	DHC8
4004340	08-06-2004	A300-600
4001420	12-06-2004	BAE 146-100
4001410	14-06-2004	A321
4001470	22-06-2004	IL-62M/IL-62K
4004150	22-06-2004	737-800
4001390	28-06-2004	A321
4001720	30-06-2004	BOEING 737
4001680	06-07-2004	L1011-1/L1011-100/200
4001710	16-07-2004	767-300
4001980	18-07-2004	Fokker 70
4001810	19-07-2004	A320
4002030	23-07-2004	A320
4002240	04-08-2004	Embraer 120 BRASILIA
4002090	09-08-2004	AVRO RJ100
4002390	20-08-2004	MD80 SERIES
4002230	20-08-2004	A310
4002580	03-09-2004	A320
4002670	16-09-2004	REGIONAL JET SERIES 100/200
4666666	21-09-2004	747-400
4002600	29-09-2004	Dornier 228 1/2
4002810	02-10-2004	A320
4002930	05-10-2004	BAE 748
4002820	06-10-2004	Embraer 120 BRASILIA
4002890	09-10-2004	A319
4002860	19-10-2004	737-300
4002960	31-10-2004	A330-200
4003550	04-11-2004	747-300
4003300	19-11-2004	A340-600
4003260	25-11-2004	Learjet 35 TRANSCONTINENTAL
4003630	28-11-2004	737-400
4003610	02-12-2004	BAE 146-200

4003640	06-12-2004	Gulfstream G IV
4029950	12-12-2004	747-100/200
4003800	21-12-2004	REGIONAL JET SERIES 100/200
4003720	22-12-2004	ATR 72-200
4004420	29-12-2004	737-500
4003830	30-12-2004	BAE 146-300
5004250	17-01-2005	Saab 2000
5100820	19-01-2005	767-300
5000170	20-01-2005	Canadair CL-600
5001280	23-01-2005	MD80 SERIES
5000130	24-01-2005	747-100/200
5000180	27-01-2005	Let L410VP-E
5000320	31-01-2005	ATR 42 - NO SERIES SPECIFIED
5000370	31-01-2005	737-600
5000290	01-02-2005	A319
5000600	08-02-2005	777-200
5000500	09-02-2005	F28 MK 1000
5000550	09-02-2005	A319
5000560	14-02-2005	TU-154M/TU-164
5100840	20-02-2005	747-400
5000720	28-02-2005	747-100/200
5000540	01-03-2005	777-200
5000790	01-03-2005	Embraer 170
5004260	01-03-2005	737-600
5000920	06-03-2005	BOEING 737
BFU 5X007-05	12-03-2005	BAE 146-300
5000890	13-03-2005	Fokker 50
5001240	30-03-2005	AVRO RJ85
BEA f-zd050401	01-04-2005	A321
BFU 5X009-05	01-04-2005	Cessna 172 RG
5002390	16-04-2005	Fokker 100
5001490	18-04-2005	ATR 72 - NO SERIES SPECIFIED

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5002550	18-04-2005	ATR 72-200
BFU 5X010-05	18-04-2005	DHC8-300
5001480	19-04-2005	BAE 146-100
5001590	22-04-2005	A320
5001470	23-04-2005	737-300
5001710	29-04-2005	Saab 2000
5002130	01-05-2005	DHC8
5005500	07-05-2005	A320
5108750	12-05-2005	757-200
5001840	13-05-2005	A300 - NO SERIES SPECIFIED
5002040	18-05-2005	A320
51111111	23-05-2005	BAE-ATP
5001890	26-05-2005	MD80 SERIES
5001880	27-05-2005	A320
5001900	29-05-2005	Fokker 100
5002180	01-06-2005	A321
5002370	18-06-2005	A320
5002240	18-06-2005	737-800
5002290	26-06-2005	757-200
5002780	29-06-2005	Canadair CL-600
5999901	29-06-2005	A300-B2/B4
5002620	30-06-2005	A321
5003840	01-07-2005	ATR 42-500
5003160	08-07-2005	737-400
5002480	11-07-2005	A321
5002610	16-07-2005	737-800
BFU EX005-05	18-07-2005	Embraer\ EMB145 - (not coded)
5002630	21-07-2005	737-700
5004280	25-07-2005	757
5002790	29-07-2005	737-500
5002880	06-08-2005	ATR 72-200
5002960	14-08-2005	737-300

BFU EX006-05	14-08-2005	Embraer 145 (145ER)
5003290	17-08-2005	Saab 2000
5004300	18-08-2005	737-800
5004290	18-08-2005	A300-B2/B4
5003300	19-08-2005	737-300
5004310	20-08-2005	A340-300
N2005-00001	21-08-2005	Fokker 50
5003100	22-08-2005	F28 MK 1000
5004320	22-08-2005	737-300
5003310	29-08-2005	ATR 42-500
5003320	01-09-2005	737-400
5004440	10-09-2005	BAE 146-100
5003610	11-09-2005	737-800
5004020	14-09-2005	ATR 42-300
5003410	14-09-2005	Gulfstream G V
5003450	19-09-2005	Fairchild SA227 III
5004470	29-09-2005	MCDONNELL DOUGLAS C-17
5003660	30-09-2005	Saab 340
5004240	07-10-2005	DHC8-300
5005440	15-10-2005	737-300
5003960	20-10-2005	747-100/200
5003970	30-10-2005	Let L410UVP
5004040	30-10-2005	A320
5004330	02-11-2005	737-800
5118410	06-11-2005	A340-300
5117050	06-11-2005	767-200
5004430	17-11-2005	Saab 2000
5004520	17-11-2005	ATR 42-300
5005200	20-11-2005	A340-300
5004840	24-11-2005	DHC8-400
5004610	27-11-2005	Fokker 70
5000340	05-12-2005	AVRO RJ100

5004870	06-12-2005	747-300
5004770	16-12-2005	737-800
BFU EX014-05	16-12-2005	Boeing\ B737-800 - (not coded)
5005050	28-12-2005	737-500
5005010	28-12-2005	767-300
6000040	05-01-2006	767-200
6000050	06-01-2006	737-600
6001420	07-01-2006	MD80 SERIES
6004630	09-01-2006	MD80 SERIES
6000190	10-01-2006	A321
6000240	12-01-2006	737-600
6000100	12-01-2006	747-100/200
2006-0041	13-01-2006	ATR 42-500
6000350	20-01-2006	Embraer 145 (145ER)
6001660	23-01-2006	F27 FRIEND/FREIGHT SHIP
6000330	24-01-2006	ATR 42-300
6000320	25-01-2006	737-400
6000390	26-01-2006	AVRO RJ100
6000300	26-01-2006	Embraer 145 (145ER)
6000540	30-01-2006	757-200
6000340	06-02-2006	737-800
6000630	09-02-2006	MD80 SERIES
6000530	11-02-2006	737-400
BFU AX001-06	15-02-2006	FALCON 20
6000520	21-02-2006	DHC8
6000780	21-02-2006	Embraer 145 (145ER)
6000550	21-02-2006	767
6000610	24-02-2006	FALCON 900
6000590	04-03-2006	A310
6002230	07-03-2006	757
6000650	08-03-2006	AVRO RJ85
6002260	08-03-2006	Hawker Siddeley HS748/AVRO 748

6000640	10-03-2006	AVRO RJ85
6000850	12-03-2006	737-600
6001160	18-03-2006	737-600
6000800	19-03-2006	AVRO RJ100
6000760	21-03-2006	Learjet 45
6000740	23-03-2006	BAE 146-200
6004580	23-03-2006	737-800
6000750	24-03-2006	ATR 42-300
6002350	25-03-2006	BAE-ATP
6000730	26-03-2006	DHC8
2006-0071	27-03-2006	Fokker 50
6000920	28-03-2006	737-400
6000790	29-03-2006	ATR 42-300
6000770	30-03-2006	BAE 146-300
6000990	06-04-2006	DHC8-400
6007500	07-04-2006	757
6001480	23-04-2006	DHC8-400
6002010	03-05-2006	A320
6001760	03-05-2006	BOEING 737
6002080	04-05-2006	BOEING 737
6001490	08-05-2006	Canadair CL-600
6001450	11-05-2006	737-700
6001440	15-05-2006	747-400
6001720	15-05-2006	Canadair CL-600
6055555	16-05-2006	Fokker 70
6001750	17-05-2006	Gulfstream G IV
6001730	19-05-2006	757-200
6999901	22-05-2006	MD80 SERIES
6001740	22-05-2006	737-400
6001990	22-05-2006	A320
6001580	28-05-2006	MD80 SERIES
6000000	28-05-2006	A320

6001770	01-06-2006	Fokker 50
6001640	04-06-2006	A320
6008170	05-06-2006	737-500
6001950	08-06-2006	737-400
6002540	13-06-2006	757
6002040	14-06-2006	Learjet 60
6002500	15-06-2006	737-300
6002620	17-06-2006	737-800
6002550	18-06-2006	A320
6001910	22-06-2006	A340-300
6002900	22-06-2006	Dornier 328
6002780	28-06-2006	Embraer 145 (145ER)
6002760	28-06-2006	BAE 146-300
6002790	30-06-2006	A319
6002680	03-07-2006	Embraer 145 (145ER)
6002690	03-07-2006	Fokker 100
2006100921	07-07-2006	737-300
6002890	13-07-2006	737-700
6003100	15-07-2006	747-400
6999903	17-07-2006	747-100/200
6000000	17-07-2006	747-100/200
2006-0190	18-07-2006	A321
6003570	24-07-2006	Cessna 560 CITATION V
6003030	26-07-2006	A320
6003090	27-07-2006	737-500
6006330	02-08-2006	737-300
6999902	12-08-2006	737-900
6003240	13-08-2006	Lockheed 382B/100 HERCULES
6003370	16-08-2006	737-500
6003350	17-08-2006	737-400
6003470	24-08-2006	MD80 SERIES
6007220	24-08-2006	737-300

6003700	24-08-2006	BOEING 737
6003560	01-09-2006	A320
6004230	07-09-2006	737-800
6003650	10-09-2006	737-500
6003740	11-09-2006	737-800
6003720	13-09-2006	Fokker 100
6003710	14-09-2006	Cessna 525 CITATIONJET
6003800	17-09-2006	767-300
6004070	19-09-2006	BAE-ATP
6003940	21-09-2006	A321
6003920	22-09-2006	777-200
6004150	23-09-2006	737-800
6003960	24-09-2006	737-800
6003950	10-10-2006	BAE 146-200
6004050	13-10-2006	A340-600
6004100	16-10-2006	737-800
6004220	20-10-2006	Embraer 170
6004290	30-10-2006	Embraer 145 (145ER)
6004320	06-11-2006	A321
6004420	06-11-2006	A319
6006820	07-11-2006	MD-11
2006101933	08-11-2006	767-200
6004600	08-11-2006	Saab 2000
6004370	13-11-2006	737-300
6004380	19-11-2006	F27 FRIEND/FREIGHT SHIP
6004840	05-12-2006	AN-124
6006710	05-12-2006	Saab 2000
2006101906	07-12-2006	747-400
6600000	11-12-2006	ATR 42-500
6006690	12-12-2006	AVRO RJ100
7100059	02-01-2007	DHC8-400
7003180	11-01-2007	41 JETSTREAM

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7000350	11-01-2007	757-200
7003190	12-01-2007	41 JETSTREAM
7000210	15-01-2007	TB 200 TOBAGO XL
7003200	17-01-2007	REGIONAL JET SERIES 100/200
7003330	18-01-2007	ATR 42-300
7000230	18-01-2007	BAE 146-300
7003210	20-01-2007	737-800
7000260	23-01-2007	Learjet 35 TRANSCONTINENTAL
7000770	24-01-2007	REGIONAL JET SERIES 100/200
7000330	24-01-2007	A320
7100020	25-01-2007	Fokker 100
7000340	25-01-2007	DHC8-400
7000410	28-01-2007	BAE 146-300
7000360	31-01-2007	Embraer 170
7000090	31-01-2007	A321
7000380	06-02-2007	BAE 146-300
7003340	06-02-2007	A319
7000810	07-02-2007	Canadair CL-600
7000420	08-02-2007	MD80 SERIES
7	08-02-2007	Fokker 50
7000080	08-02-2007	TU-154
70057	11-02-2007	AN-124
7000390	12-02-2007	Embraer 120 BRASILIA
7003220	12-02-2007	737-400
7002260	15-02-2007	777
7003350	19-02-2007	BAE 146-300
7003360	20-02-2007	BAE 146-200
7000530	23-02-2007	BAE 146-300
7100090	26-02-2007	777-200
7003370	26-02-2007	41 JETSTREAM
7000750	27-02-2007	737-600
7200180	03-03-2007	767-300

7001790	04-03-2007	A319
700002222	05-03-2007	A319
700	06-03-2007	737-800
7000520	08-03-2007	ATR 72 - NO SERIES SPECIFIED
7003230	09-03-2007	Fokker 70
7000550	12-03-2007	BAE 146-200
7003380	19-03-2007	188 ELECTRA
7002600	20-03-2007	747-400
7001410	22-03-2007	AVRO RJ100
7000630	28-03-2007	Embraer 145 (145ER)
7000620	04-04-2007	Cessna 560 CITATION V
7000660	09-04-2007	A321
7003250	10-04-2007	747-100/200
7000730	11-04-2007	A320
7000840	13-04-2007	747-400
7000820	13-04-2007	A320
7003390	18-04-2007	A319
7100101	22-04-2007	757-200
7003400	23-04-2007	A321
7000920	04-05-2007	737-800
7000720	05-05-2007	A320
7100147	10-05-2007	MD 83
7003410	10-05-2007	Embraer 145 (145ER)
7001020	10-05-2007	Canadair CL-600
7000990	10-05-2007	A321
7002420	11-05-2007	Short SD 360
7200494	13-05-2007	737-800
7001030	15-05-2007	A320
7003260	16-05-2007	A320
20073038	18-05-2007	Fokker 50
7001050	20-05-2007	747-100/200
7001100	22-05-2007	A320

7001340	29-05-2007	AN-26/AN-26B
7001180	03-06-2007	Cessna 560 CITATION V
7003420	04-06-2007	737-500
7001160	05-06-2007	Canadair CL-600
7003430	10-06-2007	737-500
7003580	11-06-2007	737-800
7001130	14-06-2007	747-400
7100383	17-06-2007	RJ-85 AVROLINER
7003280	22-06-2007	757-200
7001320	24-06-2007	BAE 146-200
7001330	25-06-2007	747-100/200
7001350	25-06-2007	737-500
7003440	25-06-2007	737-500
7100179	26-06-2007	41 JETSTREAM
7001310	26-06-2007	A320
7003450	27-06-2007	Learjet 45
7001290	30-06-2007	737-300
7001390	30-06-2007	Embraer 145 (145ER)
N2007-00042	01-07-2007	DHC8-400
7001370	03-07-2007	DHC8-300
N2007-00062	03-07-2007	DHC8-400
N2007-00069	05-07-2007	737-700
7003470	05-07-2007	A320
N2007-00067	05-07-2007	737-700
7001380	08-07-2007	BAE 146-300
7001550	09-07-2007	A320
7001480	09-07-2007	Cessna 404 TITAN
7003130	11-07-2007	737-400
7100226	13-07-2007	A320
7003290	14-07-2007	747-100/200
7001510	15-07-2007	BAE 146-200
7001630	15-07-2007	DHC8

7002090	16-07-2007	737-800
N2007-00189	17-07-2007	MD80 SERIES
7001570	18-07-2007	BAE 146-200
7001580	19-07-2007	767-300
7100195	27-07-2007	777-200
7001640	28-07-2007	A300-600
7003300	30-07-2007	737-700
7001660	31-07-2007	737-800
7100454	02-08-2007	T-6 HARVARD
7100245	04-08-2007	MD 83
7100247	10-08-2007	757-200
7100248	11-08-2007	737-300
7001850	13-08-2007	BOEING 737
7002010	16-08-2007	MD80 SERIES
7001750	17-08-2007	A330-200
7100214	18-08-2007	AVRO RJ100
N2007-00346	19-08-2007	BAE-3200 JETSREAM SUPER 31
7001740	20-08-2007	767-300
N2007-00169	21-08-2007	Fokker 50
7003140	28-08-2007	A321
N2007-00247	29-08-2007	737-300
7001930	09-09-2007	DHC8-400
N2007-00294	09-09-2007	737-600
7002080	09-09-2007	MD 83
7002050	10-09-2007	737-800
7002060	11-09-2007	A320
7003110	11-09-2007	737-300
7001950	12-09-2007	DHC8-400
N2007-00314	12-09-2007	DHC8
7002140	13-09-2007	BAE 146-100
7003310	14-09-2007	737-800
7002200	15-09-2007	ATR 72-200

N2007-00327	16-09-2007	737-300
7002240	16-09-2007	A320
7100268	21-09-2007	DHC8-400
7002150	21-09-2007	Cessna 500/501 CITATION
7201459	23-09-2007	737-300
70000000	27-09-2007	747-400
7002790	02-10-2007	737-800
7003150	03-10-2007	777-200
7003560	03-10-2007	Saab 340
7002610	04-10-2007	A330-300
7002270	04-10-2007	AN-26/AN-26B
7003500	15-10-2007	A340-300
7002510	23-10-2007	A319
7002630	23-10-2007	A321
7002530	24-10-2007	A320
7002470	27-10-2007	DHC8-400
7002460	28-10-2007	737-800
7100352	28-10-2007	717-200
7003510	28-10-2007	HAWKER SIDDELEY HS125 DOMINIE 1-600
7002740	30-10-2007	DASSAULT FALCON900
7003520	06-11-2007	737-800
7002660	09-11-2007	ATR 42-300
7002710	10-11-2007	REGIONAL JET SERIES 100/200
7002720	11-11-2007	AVRO RJ85
7002870	12-11-2007	A319
7002690	13-11-2007	A320
7002700	13-11-2007	737-500
7002820	15-11-2007	REGIONAL JET SERIES 100/200
7201789	22-11-2007	767-300
7002860	22-11-2007	Canadair CL-600
7002850	29-11-2007	A319
7002940	06-12-2007	737-900

7003020	07-12-2007	AVRO RJ85
70000011	10-12-2007	737-800
7100414	11-12-2007	Fairchild SA227AC/METRO III
7002930	11-12-2007	Fairchild SA227 III
BFU 5X028-07	11-12-2007	Fairchild SA227AC/METRO III
7003160	12-12-2007	757-300
7100354	12-12-2007	767-300
7003320	12-12-2007	A320
7003030	16-12-2007	BAE 146-200
7002970	17-12-2007	A 109 HIRUNDO SWALLOW
HCLJ510-000467	26-12-2007	A321
7100339	30-12-2007	737-300
8100004	03-01-2008	737-400
8000030	09-01-2008	BAE 146-200
8000020	09-01-2008	A340-300
BFU 5X001-08	14-01-2008	A300-B2/B4
8100015	15-01-2008	A300-600
8000110	17-01-2008	777-200
8100053	21-01-2008	Fokker 50
8000320	25-01-2008	737-600
8002540	28-01-2008	767-300
8000000	31-01-2008	Saab 340
8000180	31-01-2008	Canadair CL-600
8100065	01-02-2008	F27 MK 500
8002050	04-02-2008	737-600
8003690	04-02-2008	777-200
8000220	04-02-2008	A300-600
8200103	13-02-2008	737-500
8003740	17-02-2008	A321
8000490	01-03-2008	A319
8100100	01-03-2008	747-400
8100077	01-03-2008	A320

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8200279	14-03-2008	Cessna 550/551 SP CITATION II
8100099	19-03-2008	Dornier 328
BFU 1X001-08	19-03-2008	Dornier 328
8000770	19-03-2008	Saab 2000
8000610	21-03-2008	BAE 146-300
8100105	21-03-2008	737-800
8000620	21-03-2008	AVRO RJ85
8001950	07-04-2008	737-300
8000970	08-04-2008	Cessna 550/551 SP CITATION II
8100140	22-04-2008	BAE 146-200
8100514	28-04-2008	Let L410UVP
8001960	09-05-2008	Short SD 360
8000960	13-05-2008	A319
8001030	14-05-2008	A319
8001090	19-05-2008	REGIONAL JET SERIES 100/200
8100174	19-05-2008	ATR 72-200
8001170	21-05-2008	BAE 146-300
8100176	25-05-2008	747-100/200
8100180	27-05-2008	A319
8100703	28-05-2008	DHC8-400
8001230	05-06-2008	A319
8001140	09-06-2008	Canadair GLOBAL EXPRESS
8001300	16-06-2008	A340-300
8001370	22-06-2008	DHC8-400
8001350	23-06-2008	737-800
8001320	24-06-2008	757-200
8001340	24-06-2008	A340-300
8100513	28-06-2008	737-300
8001390	29-06-2008	REGIONAL JET SERIES 100/200
8001570	01-07-2008	A320
8100260	02-07-2008	777-200
8100258	02-07-2008	DHC8-400

8100364	12-07-2008	A320
8001610	18-07-2008	A321
8001580	19-07-2008	A319
8100322	20-07-2008	737-800
8003680	27-07-2008	Saab 2000
8003760	28-07-2008	A320
8003750	28-07-2008	A321
8001700	28-07-2008	Canadair CL-600
8001780	31-07-2008	Fairchild SA227AC/METRO III
8003770	06-08-2008	A319
8001670	13-08-2008	Dornier 228 1/2
XXXXXX	16-08-2008	737-800
BFU 5X014-08	16-08-2008	A320
8100704	19-08-2008	SHORT SD3-60 VARIANT 100 - (not coded)
8100375	20-08-2008	MD80 SERIES
8001880	22-08-2008	A320
8100397	24-08-2008	ATR 72-200
8001930	26-08-2008	A320
8001690	28-08-2008	RAYTHEON PREMIERE I
8001890	01-09-2008	Fokker 70
8100625	04-09-2008	Aérospatiale SN 601
8002120	26-09-2008	A321
BFU EX004-08	26-09-2008	A321
8002130	29-09-2008	Fokker 70
8002280	29-09-2008	737-800
8004040	30-09-2008	Cessna 172 RG
BEA ts-k081010	10-10-2008	737-600
8002360	15-10-2008	747-400
8002600	17-10-2008	737-300
8002320	22-10-2008	MD 83
8100566	27-10-2008	747-100/200
8003730	01-11-2008	Boeing\ B737-330 - (not coded)

8003780	03-11-2008	737-800
8002410	11-11-2008	737-500
8002670	19-11-2008	A320
8002590	21-11-2008	A320
8002680	05-12-2008	REGIONAL JET SERIES 100/200
8002710	09-12-2008	BOEING 757-236F - (not coded)
8002950	11-12-2008	Embraer 145 (145ER)
8002730	11-12-2008	Fairchild SA227 III
8002780	13-12-2008	757-200
8100793	31-12-2008	737-700
9000160	03-01-2009	A330-200
9000040	05-01-2009	Embraer 145 (145ER)
9000290	09-01-2009	737-400
9000120	15-01-2009	Fokker 50
9000140	17-01-2009	Saab 340
9000360	05-02-2009	737-800
9100469	06-02-2009	737-300
9000400	09-02-2009	A321
9000390	10-02-2009	A321
9100126	13-02-2009	AVRO RJ100
9100115	18-02-2009	737-400
9003270	18-02-2009	A319
9000340	21-02-2009	737-700
9100210	24-02-2009	REGIONAL JET SERIES 100/200
9100127	25-02-2009	737-800
9100725	25-02-2009	BAE 146-200
9001600	27-02-2009	PA-34 SENECA
9001530	27-02-2009	A320
9000410	28-02-2009	Saab 2000
9100355	02-03-2009	AVRO RJ85
9000500	08-03-2009	747-400
9000530	15-03-2009	A319

9000600	20-03-2009	A330-200
9000630	23-03-2009	Canadair CL-600 Regional Jet CRJ-1000
9000700	26-03-2009	747-400
9100892	27-03-2009	A320
9000740	29-03-2009	747-400
9003250	02-04-2009	Canadair CL-600
9001960	07-04-2009	A320
9000910	10-04-2009	Cessna 172 (T-41)
9000770	15-04-2009	ATR 72-200
9000960	08-05-2009	747-400
9003280	08-05-2009	DHC8
9100277	09-05-2009	A321
9000970	11-05-2009	767-300
9000980	12-05-2009	REGIONAL JET SERIES 100/200
9001060	12-05-2009	BAE 146-300
9003230	20-05-2009	A319
9003240	20-05-2009	A319
9003220	25-05-2009	ATR 42 - NO SERIES SPECIFIED
9001620	28-05-2009	MD80 SERIES
9001170	29-05-2009	757-200
9100339	04-06-2009	757-200
9001360	07-06-2009	737-800
9001210	08-06-2009	737-800
2009-06-13-02	13-06-2009	737-300
9201000	15-06-2009	757-200
9002910	22-06-2009	A340-300
9100959	25-06-2009	ATR 72-200
9001440	29-06-2009	767-300
BEAxxx	04-07-2009	737-800
9002000	09-07-2009	A320
9002540	11-07-2009	ATR 42-500
9001470	11-07-2009	BAE AVRO RJ100

9201394	17-07-2009	737-700
9001520	18-07-2009	737-700
9001500	20-07-2009	767-300
9100529	22-07-2009	737-800
9001700	24-07-2009	A319
9001680	27-07-2009	777-300
9001750	31-07-2009	737-800
9002750	01-08-2009	A320
9001710	01-08-2009	A320
9100581	01-08-2009	A320
9100737	04-08-2009	A320
9100603	05-08-2009	A320
9002130	07-08-2009	A320
9002250	18-08-2009	A320
9002240	27-08-2009	737-800
9002470	27-08-2009	777-200
9003210	28-08-2009	AN-12
9002160	29-08-2009	737-800
9003170	31-08-2009	777-300
9100704	01-09-2009	A320
9003200	01-09-2009	Embraer\ ERJ190 - (not coded)
9001980	02-09-2009	A321
9002010	14-09-2009	Fokker 100
9003190	20-09-2009	MD83
9003040	23-09-2009	A319
9002190	26-09-2009	757-200
9100793	29-09-2009	737-800
9002460	03-10-2009	MD80 SERIES
9100855	09-10-2009	REGIONAL JET SERIES 900
9002290	15-10-2009	737-500
9002360	18-10-2009	737-800
9002310	19-10-2009	737-700

9002350	22-10-2009	737-400
9100872	22-10-2009	DHC8-300
9100884	27-10-2009	AVRO RJ100
9002710	28-10-2009	747-400
9100930	30-10-2009	737-500
9002590	30-10-2009	Cessna 172 (T-41)
9100907	01-11-2009	DHC8
9003050	05-11-2009	757
9002960	06-11-2009	A330-200
N2009-02886	07-11-2009	Cessna F172
9002640	18-11-2009	FALCON 900
91000000	19-11-2009	737-800
9101020	19-11-2009	737-800
10000370	03-01-2010	MD80 SERIES
10100001	03-01-2010	737-800
10000030	04-01-2010	737-800
10100294	05-01-2010	DHC8-400
10000110	05-01-2010	A320
10100030	06-01-2010	Fokker 100
10000080	08-01-2010	737-800
10000180	11-01-2010	BAE-ATP
10000090	16-01-2010	A300-600
10000860	19-01-2010	A320
10000280	19-01-2010	REGIONAL JET SERIES 700
10100055	21-01-2010	747-400
10100064	23-01-2010	ATR 42-500
10000150	25-01-2010	Canadair CL-600
10000190	27-01-2010	ATR 72-200
10000970	27-01-2010	MD80 SERIES
10100143	28-01-2010	737-800
10000220	01-02-2010	A320
10000230	02-02-2010	AVRO RJ85

10100177	06-02-2010	MD 82
10000270	09-02-2010	A300-B2/B4
10100116	10-02-2010	MD80 SERIES
10100113	10-02-2010	737-300
1573521368	14-02-2010	A319
10100473	23-02-2010	DHC8-400
10000410	26-02-2010	747-100/200
10000430	28-02-2010	REGIONAL JET SERIES 700
10100181	01-03-2010	737-800
10000790	09-03-2010	A320
BEA hb-b100310	10-03-2010	A319
10100175	18-03-2010	AN-26/AN-26B
BEA hs-l100318	18-03-2010	B747-4D7 - (not coded)
10000880	19-03-2010	BAE 146-200
ANSV-10-266	26-03-2010	737-800
BEA m-og100329	29-03-2010	REGIONAL JET SERIES 100/200
10000700	30-03-2010	A320
BEA f-zk100331	31-03-2010	A319
10200258	08-04-2010	747-400
BEA b-ov100408	08-04-2010	747-400
10100448	09-04-2010	REGIONAL JET SERIES 700
10100424	10-04-2010	737-500
04/sum/2010	12-04-2010	A319
10100226	13-04-2010	Embraer 170
10000740	15-04-2010	A330-300
10000770	22-04-2010	DHC8-400
10000820	24-04-2010	DHC8
10001190	28-04-2010	A320
10001010	01-05-2010	DHC8-300
ANSV-10-413	02-05-2010	A319
ANSV-10-447	04-05-2010	A321
10201003	08-05-2010	737-800

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2020a and b	15-05-2010	A320
BEA f-jr100517	17-05-2010	CANADAIR (REGIONAL JET SERIES 100/200)
2033	21-05-2010	A320
10100337	22-05-2010	A319
ANSV-10-565	23-05-2010	A320
10001180	23-05-2010	A320
2036	23-05-2010	A320
BEA f-bf100524	24-05-2010	Embraer 145 (145ER)
10000940	31-05-2010	747-400LCF Dreamlifter
BEA f-nb100601	01-06-2010	ATR42-300
BEA f-gj100602	02-06-2010	A318
10001240	06-06-2010	737-400
2010/016	06-06-2010	RJ-100 AVROLINER
10001260	07-06-2010	Embraer 170
10001130	07-06-2010	737-800
10201188	12-06-2010	757-200
BEA -06100613	13-06-2010	A320
10100399	15-06-2010	777-200
782927635	16-06-2010	BAE 146-200
10200609	16-06-2010	767-300
10100585	18-06-2010	A320
795021138	20-06-2010	737-700
BFU EX007-10	27-06-2010	REGIONAL JET SERIES 100/200
BEA f-ha100629	29-06-2010	A319
BFU EX008-10	04-07-2010	A320
724951180	05-07-2010	ATR 72 - NO SERIES SPECIFIED
2010/024	08-07-2010	A319
ANSV-10-1030	10-07-2010	DH8C - (not coded)
BFU 5X011-10	17-07-2010	A340-600
BFU EX009-10	18-07-2010	737-800
ANSV-10-1085	18-07-2010	A320
ANSV-10-1118	19-07-2010	MD 82

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2010-185	21-07-2010	Embraer 170
ANSV-10-1149	23-07-2010	737-400
BFU EX010-10	06-08-2010	737-800
2010057	06-08-2010	RJ-85 AVROLINER
BFU 5X012-10	08-08-2010	Canadair CL-600
10100580	11-08-2010	DC-8-63
10100605	16-08-2010	A319
ANSV-10-1478	20-08-2010	747-400
BFU 5X013-10	20-08-2010	A340-300
ANSV-10-1488	20-08-2010	737-400
10100728	23-08-2010	737-600
1653510694	23-08-2010	PA-28
10100624	25-08-2010	AN-26/AN-26B
BEA tc-e100907	07-09-2010	737-400
ANSV-10-1687	09-09-2010	AN-124
2010/039	10-09-2010	PC-7
10100702	11-09-2010	DHC8-400
N2010-03334	15-09-2010	DHC8
10100707	15-09-2010	31 JETSTREAM
BEA n-fe100918	18-09-2010	777-200
1109617177	19-09-2010	Embraer 145 (145ER)
ANSV-10-1824	23-09-2010	737-800
ANSV-10-1836	24-09-2010	A319
BFU EX011-10	24-09-2010	747-100/200
10100850	30-09-2010	Cessna 680 CITATION SOVEREIGN
476109527	02-10-2010	737-400
10100746	03-10-2010	767-300
1963674619	05-10-2010	A321
BFU 5X015-10	12-10-2010	737-300
ANSV-10-1978	12-10-2010	A320
BEA f-qp101012	12-10-2010	777-300
BFU EX012-10	17-10-2010	A320

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ANSV-10-2001	18-10-2010	A321
1096897843	20-10-2010	737-600
2010/041	25-10-2010	A340-600
A-039/2010-010	27-10-2010	737-800
BEA f-jd101030	30-10-2010	A380
ANSV-10-2114	31-10-2010	MD 82
ANSV-10-2186	06-11-2010	FALCON 900
XXX0034	06-11-2010	737-800
BFU 5X014-10	09-11-2010	747-400
BFU EX013-10	16-11-2010	AVRO RJ100
ANSV-10-2233	21-11-2010	MD 82
516289115	26-11-2010	REGIONAL JET SERIES 100/200
BFU 5X016-10	26-11-2010	747-400
10100893	30-11-2010	747-400
BFU AX001-10	02-12-2010	A321
1692171438	06-12-2010	777-200
1069/UUB/LF/2010	11-12-2010	747-400
IN-040/2010-04	16-12-2010	A320
BEA od-a101217	17-12-2010	A330-200
10100923	19-12-2010	A319
1496192467	03-01-2011	Embraer 145 (145ER)
BFU EX001-11	04-01-2011	737-300
11100016	12-01-2011	A320
1958395328	14-01-2011	737-500
BEA f-pm110117	17-01-2011	777-200
AET/AC-2011/1	20-01-2011	DHC8-400
809993776	21-01-2011	REGIONAL JET SERIES 100/200
11100050	04-02-2011	41 JETSTREAM
L-08/11	05-02-2011	737-800
904610781	10-02-2011	Fairchild SA227AC/METRO III
EX004-11	10-02-2011	AN-124
11100067	13-02-2011	777-300

546486826	14-02-2011	A320
2081405821	14-02-2011	777-300
BEA f-gc110222	22-02-2011	A318
J2011007	24-02-2011	A320
11100140	24-02-2011	A320
1649942998	27-02-2011	A320
117383030	27-02-2011	737-800
BFU 5X001-11	27-02-2011	A320
2137224257	02-03-2011	Fairchild SA227 III
1824429385	05-03-2011	A320
BEA f-ae110310	10-03-2011	A321
BFU EX003-11	12-03-2011	737-800
92859381	13-03-2011	737-800
2011/011	15-03-2011	A320
11100264	15-03-2011	737-800
11100135	18-03-2011	Embraer 145 (145ER)
BFU TX002-11	24-03-2011	A380
BFU 6X001-11	27-03-2011	737-800
BFU 6X001-11	27-03-2011	737-800
ANSV-11-0437	28-03-2011	AVRO RJ85
03/31032011	31-03-2011	Let L410VP-E
ANSV-11-481	02-04-2011	MD 82
454740917	07-04-2011	737-800
IN-010/2011	09-04-2011	REGIONAL JET SERIES 100/200
BEA c-vm110410	10-04-2011	777-300
BFU EX005-11	13-04-2011	747-400
ANSV-11-539	13-04-2011	Cessna 550/551 SP CITATION II
IN-011/2011	14-04-2011	737-800
1476907110	17-04-2011	777-200
BEA ei-j110419	19-04-2011	ATR 72-200
BEA f-zg110424	24-04-2011	ATR 72-200
BFU 6X007-11	24-04-2011	MD-11

L-30/11	25-04-2011	737-800
BFU EX006-11	27-04-2011	Cessna 525 CITATIONJET
11100430	01-05-2011	737-800
N2011-01831	05-05-2011	737-800
11100676	12-05-2011	737-800
BEA oh-i110513	13-05-2011	A319
BFU 6X004-11	17-05-2011	DHC8-400
J2011028	20-05-2011	767
ANSV-11-0809	20-05-2011	737-800
ANSV-11-0815	25-05-2011	A320
2011-16-EBBR-SP-LLB	26-05-2011	Boeing B737-45D - (not coded)
XXXX	29-05-2011	A321
BFU EX007-11	02-06-2011	Embraer 145 (145ER)
11100299	04-06-2011	747-400
2011/024	10-06-2011	A319
BFU 6X006-11	10-06-2011	A319
2011-120-4 POL	17-06-2011	ATR 42-500
AAIASB/994	25-06-2011	737-800
BFU 5X008-11	01-07-2011	BAE 146-200
BFU 6X008-11	04-07-2011	737-800
ANSV-11-1205	05-07-2011	A320
IN-021/2011-1182	06-07-2011	737-800
11100619	08-07-2011	A320
L-7411	11-07-2011	BOEING 737
835/11	14-07-2011	ATR 72-200
IRL00911067	17-07-2011	ATR 72-200
BEA g-ld110723	23-07-2011	737-300
XXXX-212	26-07-2011	A300-B2/B4
A-029/2011-1361	30-07-2011	REGIONAL JET SERIES 100/200
BFU 5X005-11	31-07-2011	757-200
BEA f-yo110801	01-08-2011	ATR42-500
2011/037	06-08-2011	A321

BFU 5X006-11	08-08-2011	757-300
BEA f-zh110815	15-08-2011	REGIONAL JET SERIES 700
BFU 5X007-11	15-08-2011	A330-300
ANSV-11-1519	16-08-2011	A320
BFU 6X009-11	17-08-2011	A320
2011/036	17-08-2011	A320
BFU 6X010-11	26-08-2011	MD 82
ANSV-11-1580	26-08-2011	ATR 42-300
ANSV-11-1589	29-08-2011	737-800
ANSV-11-1647	05-09-2011	A300-B2/B4
AAIASB/1688	07-09-2011	757-200
L 96/11	08-09-2011	AVRO RJ85
BEA f-at110912	12-09-2011	A321
BFU 1X001-11	12-09-2011	737-700
11100547	13-09-2011	ATR 72-200
BFU EX008-11	14-09-2011	737-300
ANSV-11-1740	15-09-2011	MD82
BEA ec-j110917	17-09-2011	A320
BEA f-le110920	20-09-2011	Canadair CL-600 Regional Jet CRJ-1000
BEA - Italy I-MLHT	21-09-2011	F27 MK 500
IN-040/2011-1706	01-10-2011	737-800
ANSV-11-1826	03-10-2011	ATR 72-200
BFU 6X013-11	06-10-2011	CASA - C-101 Aviojet - (not coded)
BFU 1X002-11	07-10-2011	737-800
BFU 5X010-11	07-10-2011	A320
BFU 2X001-11	09-10-2011	A320
BFU EX009-11	16-10-2011	A380
BFU 5X011-11	20-10-2011	737-700
IRL00911095	24-10-2011	737-800
PKBWL/PL 1391/11	29-10-2011	AVRO RJ100
PKBWL/PL 1400/11	01-11-2011	767-300
BFU EX010-11	03-11-2011	777-300

BFU EX011-11	06-11-2011	MD80 SERIES
IN-046/2011-1977	12-11-2011	757-200
PL1465/11	15-11-2011	ATR 42-500
XX	16-11-2011	DHC8-400
BEA f-pp111116	16-11-2011	777-200
BFU 5X012-11	18-11-2011	737-700
11100750	18-11-2011	A319
2140/11	18-11-2011	A319
IN-050/2011-2133	20-11-2011	757-200
ANSV-11-2150	20-11-2011	A320
2011-272	23-11-2011	737-800
BEA f-he111124	24-11-2011	A319
BFU 1X003-11	07-12-2011	A320
BFU XXX	13-12-2011	A320
BEA f-hs111213	13-12-2011	A319
BFU 5X013-11	13-12-2011	A320
BFU AX001-11	14-12-2011	DHC8-300
2011/061	16-12-2011	CITATION MUSTANG
11100819	20-12-2011	A321
11100816	23-12-2011	A321
2011/062	26-12-2011	BAE 146-200
ANSV-11-2335	28-12-2011	DHC8-400
BFU EX012-11	29-12-2011	A320
11100823	29-12-2011	Saab 340
BEA ec-l111230	30-12-2011	737-800
ANSV-11-2351	30-12-2011	737-800
BEA e-18111230	30-12-2011	Canadair CL-600
12000408	2012	737
BFU 5X002-12	2012	767
16.15.01.6/12	2012	747
ANSV-12-1365	2012	A319
BFU 5X007-12	2012	737

12000181	2012	737
BFU FX003-12	2012	737
12000486	2012	A319
EW/C2012/02/02	2012	A340
HCLJ510-2012-86	2012	MD88
BFU 5X005-12	2012	A330
DCA12WA034	2012	737
12000243	2012	A321
IN-028-2012	2012	AVRO146RJ
DCA12WA036	2012	737
12000587	2012	A319
IN-036/2012	2012	737
12000058	2012	A320
IN-007/2010-400	2012	A319
12000106	2012	JETSTREAM3100
12000242	2012	737
L-37/12	2012	737
12000068	2012	AN12
12000281	2012	737
ENG12WA027	2012	747
12000540	2012	ATR72
ENG13RA002	2012	A330
BFU 2X003-12	2012	Cessna 750
BFU 5X001-12	2012	A319
BFU AX001-12	2012	737
12000197	2012	A320
BFU 6X005-12	2012	A320
12000625	2012	737
ANSV-12-2137	2012	A320
13000019	2012	A319
ANSV-2012-174	2012	Learjet 60
BFU 6X004-12	2012	A320

BFU 5X003-12	2012	A319
12000675	2012	A321
12000469	2012	Saab 340
BEA f-zu120313	2012	A340
12000261	2012	A340
IRL00912049	2012	ATR72
12000028	2012	A319
12000064	2012	Saab 340
12000074	2012	A319
IN-009/2012-583	2012	A320
12000191	2012	A300
12000200	2012	737
12000282	2012	A319
BFU 5X011-12	2012	A321
127/12	2012	MD82
BFU 1X001-12	2012	Canadair CL600 2D24
CZ-12-034	2012	ATR42
L-15/12	2012	AVRO146RJ
12000213	2012	DHC8
2012033	2012	777
ANSV-12-0188	2012	ATR42
185/12	2012	777
12000192	2012	A330
12000328	2012	ATR42
12000637	2012	A319
12000639	2012	Canadair CL600 2C10
12000688	2012	A300
02/17052012	2012	A320
BFU 1X002-12	2012	737
BFU AX002-12	2012	ATR72
ANSV-12-1377	2012	A320
12000436	2012	JETSTREAM4100

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12000205	2012	BAE (AVRO RJ100)
12000229	2012	F28
BFU BX001-12	2012	Dornier 328
HCLJ5210-2012-096	2012	Saab 2000
12000406	2012	JETSTREAM3100
12000638	2012	737
12000313	2012	Fokker 70
BFU 6X010-12	2012	737
BFU 6X013-12	2012	A321
HCLJ510-2012-172	2012	A319
12000095	2012	ATR42
2012/049	2012	Saab 2000
BFU 5X004-12	2012	737
BFU 6X008-12	2012	Embraer ERJ190
ANSV-12-2041	2012	767
12000054	2012	ATR72
2012/023	2012	F28
48/2015	2012	737
12000250	2012	A320
12000407	2012	ATR42
13000017	2012	737
BFU 6X002-12	2012	757
12000405	2012	737
ANSV-12-0602	2012	ATR72
12000466	2012	JETSTREAM4100
ANSV-12-0789	2012	Saab 2000
12000446	2012	757
BFU 6X016-12	2012	Dornier 328
ANSV-12-2245	2012	737
12/218-7	2012	737
2012/025	2012	A320
BFU EX001-12	2012	A320

12000756	2012	A320
ANSV-12-1383	2012	A320
ANSV-12-1946	2012	777
CZ-12-514	2012	ATR42
12000471	2012	FANJET FALCON
2013/057	2013	A320
ANSV-13-0132	2013	ATR72
13000095	2013	A310
13000295	2013	737
BEA f-ni130802	2013	A320
BEA ok-t131002	2013	ATR72
L-46/13	2013	JETSTREAM3100
13000352	2013	A320
A-028-2013	2013	ATR72
BFU EX010-13	2013	A320
BEA f-zl130305	2013	ATR72
13000499	2013	767
L2013-02	2013	A320
13000318	2013	A320
BEA f-qj130107	2013	777
IRL00913022	2013	Fairchild SA227
13000273	2013	777
2013/034	2013	BAE (AVRO RJ100)
ANSV-13-1052	2013	A320
BEA f-ne130311	2013	A320
2013/56	2013	737
DCA13WA067	2013	737
ANSV-13-1656	2013	A320
2013/051	2013	A320
ANSV-13-2237	2013	737
201304063	2013	JETSTREAM3100
BFU 1X001-13	2013	A320

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HCLJ510-2013-190	2013	Fokker 70
AAIASB/930	2013	737
2013/028	2013	F28
ANSV-13-2979	2013	Canadair CL600 1A11
DCA13WA092	2013	767
BFU AX001-13	2013	BAE-ATP
IN-015/2013-1326	2013	757
BFU 5X007-13	2013	Canadair CL600 1A11
BFU EX007-13	2013	A320
2013-06-20-03	2013	A319
BFU 5X006-13	2013	A320
34/2016	2013	757
13000050	2013	A330
AAIASB/1202	2013	A330
13000144	2013	ATR72
13000310	2013	737
13000142	2013	AVRO146RJ
BFU 6X003-13	2013	A319
03/24052013	2013	A320
13000235	2013	A319
BFU EX005-13	2013	737-800
BFU EX009-13	2013	GULFSTREAM150
13000331	2013	737
13000424	2013	Canadair CL600 2D24
13000092	2013	757
BFU 5X004-13	2013	CANADAIR (REGIONAL JET SERIES 900)
BEA tc-z130926	2013	A321
13000374	2013	DHC8
13000549	2013	A321
13000049	2013	737
BFU 5X001-13	2013	A330
BEA f-qa130728	2013	777

2013/059	2013	Saab 2000
BEA sx-s130329	2013	A321
AAIASB/835	2013	737
ANSV-13-2385	2013	A320
ANSV-13-2778	2013	737
201301144	2013	FALCON7X
13000172	2013	BAE-ATP
13000249	2013	737
13000338	2013	A320
201306643	2013	747
BFU EX003-13	2013	Bombardier BD100 1A10
201311970	2013	BAE146
BFU12345	2013	777
ANSV-13-0302	2013	MD82
201313388	2013	ATR72
201300501	2013	A321
BFU6	2013	A330
DENMARK	2013	MD88
BFU2	2013	Embraer ERJ170
201307441	2013	A330
201314981	2013	737
201315939	2013	Gulfstream GV
201310418	2013	757
201306006	2013	A319
201311719	2013	767
201310703	2013	757
201308040	2013	A320
201308425	2013	787
201312247	2013	JETSTREAM4100
DENMARK1	2013	ATR72
201302228	2013	737
Germany-M-YBZI	2014	Canadair CL600 2A12

BEA g-im140901	2014	A319
38/2016	2014	Embraer ERJ190
BEA ei-l140102	2014	ATR72
BEA g-td140602	2014	A320
BFU AX001-14	2014	A320
14/047	2014	ATR72
14000441	2014	Canadair CL600 2C10
BEA lv-v140705	2014	A340
D-AIDP	2014	A321
36/2015	2014	737
14/046	2014	A320
EW/C2014/10/01	2014	BAE-ATP
EX007-14	2014	747
ANSV-14-0050	2014	Embraer ERJ170
L-0004/14	2014	F27
14000654	2014	ATR72
ANSV-14-1899	2014	A319
1863/14	2014	Canadair CL600 2D24
EW/G2014/05/08	2014	ATR72
EW/C2014/08/02	2014	JETSTREAM3100
EW/C2014/12/01	2014	Saab 2000
BEA ei-v140116	2014	A320
14/044	2014	A319
2014-4-EBCI-EI-DYS	2014	737
BEA ok-s140818	2014	ATR72
BEA2014-0049	2014	A320
HCLJ510-2014-273	2014	737
D-CPWF	2014	Dornier 328
ES-PJA	2014	BAE JETSTREAM3100
1752/14	2014	737
IN-028/2014 - 1475	2014	A319
14000029	2014	Canadair CL600 2C10

12/2015	2014	A330
04/ACCID/2014	2014	737
2014-093	2014	A320
BEA oy-v140722	2014	ATR72
Germany, N-120UA	2014	747
A-022/2014-1603	2014	737
14/687-7	2014	737
2014000	2014	A380
BEA cs-p140425	2014	A320
14/650-3	2014	BAE-ATP
Germany, OE-LBM	2014	A320
Portugal, OY-EBW	2014	ATR72
HB-IZG	2014	Saab 2000
EW/ C2014/06/04	2014	737
EW/ G2014/08/13	2014	A320
BEA lz-b140129	2014	A319
EW/C2014/04/03	2014	737
EW/G2014/07/31	2014	737
I953/14	2014	DHC8
24/2015	2014	747
BEA ec-u141030	2014	737
L-148-14	2014	ATR72
Sweden ES-PJR	2014	JETSTREAM3100
14/2015	2014	A320
Italy, F-GTAZ	2014	A321
IRL00914024	2014	737
EW/ C2014/11/01	2014	Gulfstream G1159A
EW/G2014/04/11	2014	Bombardier BD700 1A10
EASA-2015001008	2015	A320
EASA-2015003008	2015	A320
EASA-2015000075	2015	JETSTREAM4100
EASA-2015002004	2015	550

EASA-2015000345	2015	L410
EASA-2015002348	2015	ATR72
EASA-2015002463	2015	737
24/2016	2015	2000
EASA-2015000117	2015	A320
EASA-2015000311	2015	737
EASA-2015000353	2015	A320
EASA-2015000483	2015	A320
EASA-2015000841	2015	737
EASA-2015000842	2015	737
EASA-2015000984	2015	A319
EASA-2015001164	2015	737
EASA-2015001196	2015	767
EASA-2015001200	2015	400
EASA-2015001236	2015	A321
EASA-2015001249	2015	DHC8
EASA-2015001265	2015	737
EASA-2015001366	2015	737
EASA-2015001489	2015	737
EASA-2015001598	2015	ERJ195
EASA-2015001737	2015	A319
EASA-2015001742	2015	A319
EASA-2015001800	2015	737
EASA-2015001801	2015	DHC8
EASA-2015001810	2015	ATR72
EASA-2015001854	2015	757
EASA-2015001908	2015	A319
EASA-2015001986	2015	CL600 2D24
EASA-2015002152	2015	DHC8
EASA-2015002165	2015	A319
EASA-2015002190	2015	ATR72
EASA-2015002288	2015	DHC8

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EASA-2015002451	2015	A320
EASA-2015002491	2015	A320
EASA-2015002617	2015	AVRO146RJ
EASA-2015002685	2015	737
EASA-2015002999	2015	A330
EASA-2015003003	2015	737
EASA-2015003005	2015	A321
EASA-2015003023	2015	ERJ190
EASA-2015003088	2015	737
IRL00915022	01-04-2015	BOEING - 737
BEA2016-0378	01-07-2016	EMBRAER - ERJ170
BEA2016-0410	01-07-2016	BAE - AVRO146RJ
BEA2016-0693	01-10-2016	AIRBUS - A319
15/054	01-11-2015	AIRBUS - A340
BEA2016-0593	02-09-2016	ATR - ATR72
15/031	03-06-2015	BAE - AVRO146RJ
16/067	03-08-2016	AIRBUS - A320
16/057	03-09-2016	BAE - AVRO146RJ
HCLJ510-2016-320	03-12-2016	ATR - ATR72
BEA2016-0124	04-03-2016	ATR - ATR72
BEA2016-0339	04-06-2016	AIRBUS - A320
20161004	04-10-2016	AIRBUS - A319
17/ACCID/2016	04-12-2016	BOEING - 777
LFH 2016-0816	05-02-2016	SAAB - 340
BEA2016-0643	05-10-2016	AIRBUS - A320
LFH 2016-1995	06-04-2016	FOKKER - F28
ANSV-16-0023	07-01-2016	AIRBUS - A319
0002/2016	07-01-2016	BOEING - 737
2015052	07-04-2015	AIRBUS - A330
16/066	07-08-2016	AIRBUS - A320
BEA2016-0583	07-09-2016	ATR - ATR42
16/082	07-11-2016	AIRBUS - A319

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15/061	07-12-2015	DORNIER - 328
LFH 2016-0128	08-01-2016	BOMBARDIER - CL600 2B19
16/005	08-03-2016	AIRBUS - A319
BEA2016-0238	08-04-2016	AIRBUS - A320
BEA2016-0332	08-06-2016	AIRBUS - A320
BEA2016-0619	08-09-2016	AIRBUS - A321
16/062	09-10-2016	AIRBUS - A330
16/006	10-03-2016	BAE - AVRO146RJ
16/061	10-10-2016	BAE - AVRO146RJ
15/063	10-12-2015	BOMBARDIER - CL600 2D24
16/007	12-03-2016	BOMBARDIER - CL600 2B19
16/030	12-07-2016	BAE - AVRO146RJ
1406/2016	13-10-2016	ATR - ATR72
2015006	14-01-2015	Gulfstream G200
1411/2016	14-10-2016	SAAB - 340
16/059	15-09-2016	BAE - AVRO146RJ
20151203 PH-HSG	15-12-2015	BOEING - 737
BEA2016-0100	16-02-2016	AIRBUS - A319
16/026	16-07-2016	LINDSTRAND - LBL150A
BEA2015-0642	16-10-2015	AIRBUS - A319
HCLJ510-2016-300	17-03-2016	ATR - ATR42
CZ-15-626	17-09-2015	ATR - ATR72
1422/2016	17-10-2016	ANTONOV - AN26
2015019	18-01-2015	AIRBUS - A320
20160118 EC-JBD	18-01-2016	EMBRAER - EMB120
ANSV-16-1027	18-05-2016	ATR - ATR72
HCLJ510-2016-319	18-11-2016	BOEING - 737
16/086	19-06-2016	BAE - AVRO146RJ
ITAEIIML	19-08-2015	
BEA2016-0590	19-09-2016	AIRBUS - A330
BEA2016-0731	19-11-2016	BOEING - 777
20160120 EC-LVD	20-01-2016	AIRBUS - A320

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BEA2016-0104	21-02-2016	AIRBUS - A320
BEA2016-0313	21-05-2016	AIRBUS - A320
BEA2016-0685	21-10-2016	AIRBUS - A319
BEA2016-0779	21-12-2016	ATR - ATR72
16/001	22-01-2016	AIRBUS - A319
EASA-2016002700	22-10-2016	ATR - ATR72
BEA2015-0480	23-07-2015	ATR - ATR72
20160923	23-09-2016	BOEING - 737
EASA-2016003258	23-12-2016	BOEING - 737
BEA2016-0107	24-02-2016	AIRBUS - A320
15/030	24-07-2015	AIRBUS - A320
BEA2016-0530	24-08-2016	ATR - ATR72
LTAYLBBL	24-11-2015	BOEING - 737
HCLJ510-2016-299	25-01-2016	ATR - ATR72
BEA2016-0161	25-03-2016	AIRBUS - A320
BEA2016-0466	25-07-2016	AIRBUS - A319
16/063	25-08-2016	AIRBUS - A330
BEA2016-0366	26-06-2016	AIRBUS - A330
15/060	26-11-2015	AIRBUS - A330
EASA-2015003180	26-12-2015	BOEING - 737
HCLJ510-2016-322	26-12-2016	AIRBUS - A340
BEA2016-0451	27-07-2016	AIRBUS - A320
BEA2016-0782	27-12-2016	ATR - ATR72
BEA2016-0746	28-11-2016	AIRBUS - A320
160104	29-04-2016	EMBRAER - EMB145
1688/2016	29-12-2016	BOEING - 737
BEA2016-0620	30-06-2016	AIRBUS - A319
48/2016	30-09-2015	SAAB - 340
HCLJ510-2016-309	31-07-2016	ATR - ATR72
BEA2017-0013	31-12-2016	AIRBUS - A319

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