CIAIAC

Comisión de
Investigación de
Accidentes e
Incidentes de
Aviación
Civil

2013-2014 Positive Taxonomy Report

GOBIERNO DE ESPAÑA
MINISTERIO DE FOMENTO

CIAIAC

2013-2014
POSITIVE TAXONOMY
REPORT

Edita: Centro de Publicaciones
Secretaría General Técnica
Ministerio de Fomento ©

NIPO: 161-16-387-5

Diseño y maquetación: treceocho edición, S. L.

COMISIÓN DE INVESTIGACIÓN DE ACCIDENTES E INCIDENTES DE AVIACIÓN CIVIL

Tel. : +34 91 597 89 63
Fax: +34 91 463 55 35

E-mail: ciaiac@fomento. es
http://www. ciaiac. es

C/ Fruela, 6
28011 Madrid (España)

1. INTRODUCTION 7

2. EXECUTIVE SUMMARY 8

3. POSITIVE TAXONOMY 12
3. 1. ICAO Positive Taxonomy 13
3. 2. Positive taxonomy expanded by CIAIAC 15

4. SAFETY EVENTS WITH POSITIVE FACTORS 16

5. CLASSIFICATION / LESSONS LEARNED 118
5. 1. Avoidance maneuver 120
5. 2. Decision to go around 120
5. 3. Decision to land as precaution 121
5. 4. Decision to land on an unexpected runway 121
5. 5. Decision to reject takeoff 122
5. 6. Decision to return to departing point or to divert 122
5. 7. Use of training instructions / standard operating procedures 123
5. 8. Visual Detection / Anticipation 124
5. 9. Pre-flight preparations and precautions 124
5. 10. Threat identification 124
5. 11. Good cockpit practices 125
5. 12. Airmanship or flight skills 125
5. 13. Logical problem solving 126
5. 14. Environment observation 126
5. 15. Assistance from an instructor or supervisor 127
5. 16. ATC intervention / assistance 127
5. 17. Communications 127
5. 18. Aerodrome intervention / Assistance 128
5. 19. Hardware safety net 128
5. 20. Third-party intervention 129

6. CONCLUSIONS 130

ANNEX A. USE MANUAL A.1
ANNEX B. LIST OF EVENTS B.1
ANNEX C. DEFINITIONS AND ABBREVIATIONS C.1
ANNEX D. LIST OF FIGURES D.1
ANNEX E. LIST OF TABLES E.1

1. Introduction

Spain's Civil Aviation Accident and Incident Investigation Commission (CIAIAC) is pleased to present its first Positive Taxonomy Report.

CIAIAC is a specialized collegial body within the Ministry of Development that is fully independent from aeronautic, airport, air traffic and other authorities whose interests could conflict with its own mission. Said mission is to make civil aviation safer by conducting studies, by investigating accidents and serious incidents that occur in Spain and by collaborating in investigations that take place in other States whenever these involve aircraft registered in Spain, operated by Spanish companies or built by a Spanish company. The analysis is not punitive in nature; instead, it is preventive and aims to learn from the findings of the investigation so that similar aviation accidents can be avoided in the future.

An accident is generally the result of a chain of events, many or all of which are preventable. The work and experience of CIAIAC, gathered in the investigation reports through the analysis of and findings from the events, highlight how, in general, events are limited in their severity thanks to the good practices of the parties involved in air transport. If at some point in the chain one of the actors, or the system as a whole, works as expected (good practices), the failure chain is broken and an accident is avoided or its consequences are minimized.

The vast majority of flights conclude uneventfully and provide a clear example of professional know-how. This report, however, focuses on those flights in which something out of the ordinary occurred that turned them into serious incidents or accidents; however, they still yield positive factors that are worth studying.

These good practices identified in the investigation reports, once categorized and thoroughly explained, can provide valuable information to everyone involved in air transport. They also serve as a reminder of what to do if they find themselves in situations similar to those discussed in this study.

As a result of this, CIAIAC has decided to invest the time and effort to develop this Positive Taxonomy Report, which will be published every two years and analyze the tools available to aviation professionals to break the failure chain, or at the very least to mitigate the consequences of these failures.

CIAIAC has relied on the catalogue of positive factors developed by the ICAO, which it has expanded based on its own criteria and experience.

This is a pioneering report that is fully in keeping with the Commission's purpose to encourage a culture of safety among aviation professionals and organizations.

2. Executive Summary

This study was created in an effort to contribute to improving the operational safety of civil aviation after analyzing the events investigated by CIAIAC.

Historically, published safety studies have focused on the element that failed (badly designed procedures, people that do not perform them correctly, systems that malfunction), the goal being to provide the aviation community and the public in general with examples of what things to avoid. In an attempt to avoid repeated mistakes, investigation commissions issue Safety Recommendations. This report, however, aims to disseminate the idea that through their actions (during or prior to the event), professionals, organizations and systems avoid events of greater severity, even on those flights that involve an accident or incident.

The information contained in this report was taken from an analysis of technical reports published by the Commission in 2013 and 2014. In 2013, a total of 45 final reports were published (41 involving events from previous years), while the year 2014 saw the publication of 30 final reports (27 involving events from previous years).

Most of these reports, 57 to be specific, identified actions that helped to minimize the severity of the events. Only 18 reports failed to yield a specific action that helped to reduce the negative consequences of the events. Of these, 17 involved accidents and one a serious incident in which the pilot was not injured.

Figure 1 shows that positive actions were identified in over half of the accident reports and practically all of the serious incident reports studied.

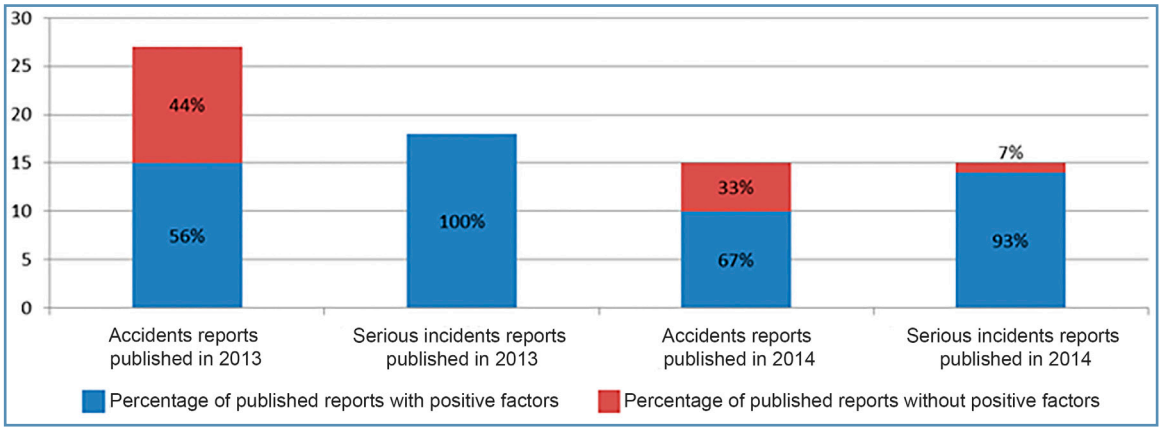

Figure 1. Reports published in 2013-2014 that identified positive factors

The study revealed two general findings that are worth noting. One is the existence of multiple factors that could contribute to causing a serious incident or an accident, and another is the fact that in most events, the possibility exists of correcting the situation by taking proper actions. It is these actions that are called "positive factors" over the course of this study.

The International Civil Aviation Organization (ICAO), in concert with the Commercial Aviation Safety Team (CAST), which includes government officials and leaders from the international aviation industry, have created the CAST/ICAO Common Taxonomy Team (CICTT). This team has created common taxonomies and definitions for aviation accident and incident reporting systems, which include the Positive Taxonomy and the 20 positive factors it has identified.

The ICAO taxonomy was used as a reference and basis for the search of positive factors in the final accident and serious incident reports published by CIAIAC in 2013 and 2014. However, after analyzing all of the reports from this two-year period, CIAIAC found positive factors that do not fit into any of the ICAO's definitions. As a result, CIAIAC has decided to expand the positive taxonomy to include all of the best practices mentioned by the investigators in their technical reports. The result is a classification that features 25 different positive factors.

The reports published by CIAIAC in 2013 and 2014 were analyzed one by one, with each positive action described in the reports being related to a positive factor in the expanded taxonomy.

The more often a positive factor is repeated in the reports, the easier it is to extrapolate a general lesson learned. Of the 25 positive factors that comprise the positive taxonomy, 20 were identified that appear in the events on one or more occasions.

The positive factors that stand out above the rest by the number of times they helped to reduce the consequences of an event are "Use of training instructions/SOPs" (34 times) and "Threat identification" (24 times).

Also appearing a significant number of times were the positive factors "Decision to land as precaution" (13 times), "Hardware safety net" (12 times) and "Airmanship or flight skills" (11 times).

Since this is CIAIAC's first positive taxonomy study, one based on relatively few historical events, it is logical for the remaining positive lessons learned to be low in frequency. We hope that by analyzing a large number of investigation reports in future studies, we can draw

sound conclusions in terms of which positive factors matter most and which are merely anecdotal in statistical terms.

Another interesting finding despite the small number of reports analyzed is the distribution of positive factors by the type of operation.

Specifically, of the 57 reports in which positive factors were found, 23 involve commercial air transport events, 19 involve general aviation and 15 concern events in which the aircraft in question was doing aerial work. Figure 2 shows the frequency for each positive factor in the reports for the various operations.

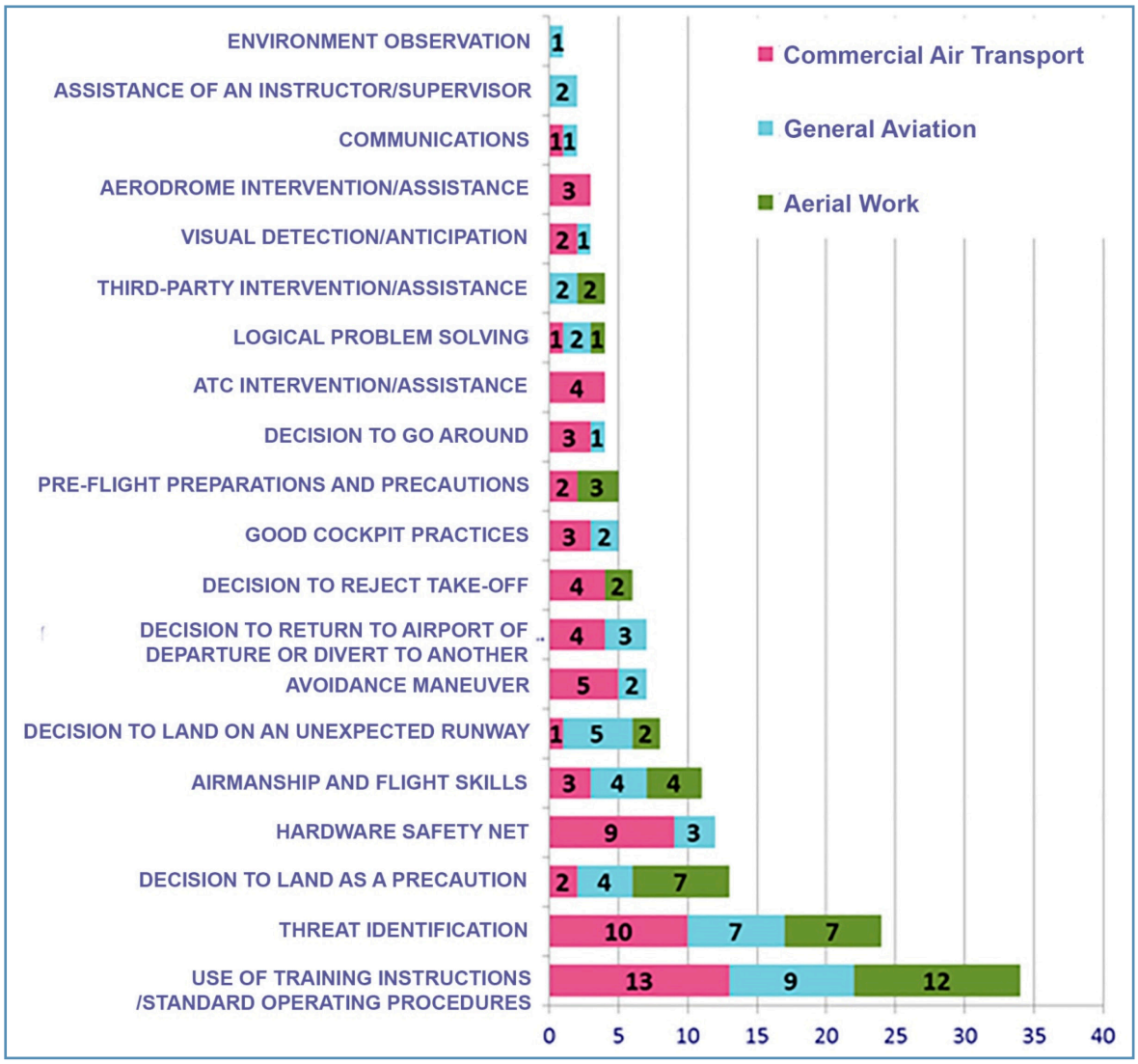

Figure 2. Positive factors classified by the type of flight operation

Analyzing each of these operations separately shows that:

- In approximately 50% of the reports involving commercial air transport events, the positive factors "Use of training instructions/SOPs" and "Threat identification" stand out.
- As concerns general aviation, around 50% of the reports involve the same factors, "Use of training instructions" and "Threat identification".
- In the case of aerial work, the most important positive factors were "Use of training instructions", "Threat identification" and "Decision to land as precaution".

The "Use of training instructions/SOPs" is without a doubt the positive factor that comes up most often for the three operation types. Adhering to procedures always ensures that the severity of events will be minimized, and failing to adhere to procedures by not putting into practice what aviation professionals have learned is one of the causes that has led the Commission to propose Safety Recommendations that enhance the training of the actors involved. Not every factor, however, has been shown to affect all operation types equally, and it is likely that some positive factors will not appear in any of the operations.

The "Hardware safety net" factor is obviously present more often in commercial aviation operations than in the two other operation types, since commercial aircraft are more dependent on auxiliary safety systems (TCAS, GPWS, etc.), while crews of general aviation aircraft can afford to "Land on an unexpected runway" to minimize potential damage. Aerial work aircraft can also land ahead of time as a precautionary measure. Every operation type will thus have its prevailing positive factors.

It is possible that as more events become available for study, positive factors that are of little overall consequence will end up being critical for a specific type of operation.

CIAIAC plans to expand its Positive Taxonomy study and publish reports every two years in an effort to bring attention to those things that are done satisfactorily.

In conclusion, we note that beyond the statistical data and the frequencies with which the positive factors defined in the taxonomy appear, every time that one of these factors is identified it is because of the professionalism, training, ability, proper design or imagination needed to face unforeseen circumstances. It also offers an opportunity for individuals and professionals to continue striving for operational safety.

The Positive Taxonomy provides a useful tool for encouraging a safety culture through positive actions and outcomes, while setting aside the image of failure and mistakes.

3. Positive Taxonomy

A Positive Taxonomy is a high-level classification of positive concepts. When analyzing an event, the Positive Factors are used to record those actions that were effective in minimizing the damage of such event. Multiple positive factors may be identified within the same event.

Below are the definitions of each of the positive factors that comprise the ICAO Positive Taxonomy, and of each of the positive factors included by CIAIAC.

It should be noted that CIAIAC has assigned an icon to each of the factors so they are easily recognizable in Section 4 "Safety Events with Positive Factors".

Moreover, in Annex A, CIAIAC presents a manual for using this taxonomy that explains CIAIAC's interpretation of each of the positive factors included in the taxonomy.

Figure 3. Diagram of the positive taxonomy employed in this report

Lastly, it is important to note that once each of the positive factors is defined, no distinction will be made over the course of the study between the positive factors in the ICAO taxonomy factors and those defined by CIAIAC.

3.1. ICAO Positive Taxonomy

Avoidance Maneuver

Decision to carry out an avoidance maneuver on the ground or in flight after detecting another aircraft visually or on ACAS. For example, this category includes the decision to exit the taxiway to avoid another aircraft.

Decision to go around

The pilot decides to go around and land safely.

Decision to land as a precaution

This factor includes decisions to land beyond the limits of the aerodrome as a precaution, with or without an emergency condition. An example would be interrupting a flight due to adverse environmental conditions.

Decision to land on an unexpected runway

This factor includes decisions to land on unexpected runways, such as a secondary runway, a grass runway or some other surface within the limits of the aerodrome.

Decision to reject takeoff

This factor includes decisions to reject a takeoff either before or after starting the takeoff run. It also applies to flights that are canceled, postponed or delayed for safety reasons.

Decision to return to airport of departure or divert to another

This factor includes the decision to interrupt the planned flight (often during the initial climb) and return to the departure airport or divert to an alternate.

Aerodrome intervention/assistance

Application of the aerodrome's emergency plan. Information provided by the aerodrome's Rescue and Firefighting Service to the crew by radio, verbally or using visual signals to help the aircraft's occupants during an emergency on the ground.

ATC intervention/assistance

Information from an ATS station (tower, AFIS, etc.) received via radio that increases the level of safety for the rest of the flight.

Assistance of an instructor/Supervisor

The instructor or supervisor intervenes to give key information to the trainee. This may take place using radio communications when the individuals are not physically in the same place.

Passenger intervention/assistance

A person onboard who is not part of the crew spontaneously helps the pilot with an action or decision so that the flight can continue safely.

Third-party intervention/assistance

A person outside the aircraft spontaneously helps the pilot with an action or decision so that the flight can continue safely.

Hardware safety net

The activation of a notification system onboard the aircraft or on the ground alerts the flight crew or ATC personnel of a possible safety violation (e.g. TAWS or ACAS warnings in aircraft or MSAW warning for ATC).

Accurate usage of documentation

Reading, and especially interpreting the documents (such as maps or charts) helps the pilots improve their situational awareness.

Communications

Radio messages are transmitted that help break a chain of events that would probably have led to an accident, with or without standard phraseology.

Design requirements

Design requirements such that the relevant part of the aviation system (aerodrome, aircraft, ATC, ground equipment, etc.) is able to work as planned, thus preventing a worse outcome.

Engine failure anticipation

The pilot takes actions to land safely in the event of an engine failure, especially during takeoff. By extension, this factor is used to include the risk of an in-flight engine failure (e.g. uncertified aircraft) or an approach with engine problems.

Environment observation

Observing and interpreting the surroundings (such as marks on the ground) helps the operator on the front line to improve his situational awareness.

Logical problem solving

Applying empirical reasoning that is not necessarily based on an aviation context or on specific instructions. An example of this atypical thinking would be calling on the previous frequency to deal with a radiocommunications problem

Use of training instructions/Standard operating procedures

In unusual conditions, the operator on the front line acts automatically and follows the standard operating procedures learned during initial or refresher training.

Visual detection/anticipation

Scanning the environment helps the pilot avoid another aircraft, an obstacle, elevated terrain, clouds, etc.

The ICAO also regards providence as a positive factor, though that will not be considered in the analysis contained in this report.

3.2. Positive Taxonomy Expanded by CIAIAC

Pre-flight preparations and precautions

Includes checking the flight plan, weather, equipment for the planned operation, etc.

Threat identification

Awareness by the crew or the controller of the threats that could affect flight safety.

Good cockpit practises

Include those factors that demonstrate coordination within the cockpit.

Airmanship and flight skills

Good pilot practices while flying the aircraft in non-standard situations.

Third-party intervention

Person inside or outside the aircraft who witnesses the event or is aware of it, and whose intervention is important to the survival of the crew. This intervention must never jeopardize the physical integrity of the person doing it.

4. Safety Events with Positive Factors

This section provides a summary of serious incidents and accidents investigated and published in 2013 and 2014 by CIAIAC. Each one underscores the positive factors employed by some party involved in the event.

IN-027/2009 Incident involving a De Havilland DHC-8-315, registration PH-DXB, operated by Denim Air for Air Nostrum, on runway 25R at the Barcelona-El Prat Airport on 22 October 2009. Report approved on 19 December 2012.

About three minutes after taking off normally from the Barcelona Airport en route to the San Sebastian Airport, the crew noticed that the three red gear lights were on, indicating either that the three landing gear legs were not locked or they were in a position that did not match that selected with the lever in the cockpit.

The crew asked the FA to visually check the main gear. She confirmed that the left and right legs were still down. The crew decided to return to Barcelona while they attempted to configure the gear for landing, deploying it using the alternate, or emergency system, and informed ATC about the problem with the gear. On final approach they interrupted the procedure and noticed they had two green lights for the main gear legs, a red light for the nose leg and three amber lights for the open doors. On short final, the crew declared an emergency.

Figure 4. IN 027/2009 – Airplane landing

The airplane landed on runway 25R with the main gear down and locked and the nose gear up. The gear unsafe alarm sounded constantly during the landing and they received several GPWS warnings. During the landing, on a wet runway, the nose scraped along the asphalt until the aircraft came to a stop. The passengers were evacuated, aided by the firefighting service.

The investigation resulted in four safety recommendations (REC 90/12 – REC 93/12), three of them for the operator, involving enhancing crew training, and one for the operator and manufacturer of the aircraft, to have them implement an operating procedure for a gear unsafe situation.

The risk situation was produced by the failure of the landing gear, and overcome using the following chain of positive factors.

	1. HARDWARE SAFETY NET The red gear unsafe lights in the aircraft turned on.
	2. THREAT IDENTIFICATION The crew noticed the indicating lights.
	3. DECISION TO RETURN TO DEPARTING POINT OR TO DIVERT The crew decided to return to Barcelona when they were unable to resolve the situation in flight
	4. USE OF TRAINING INSTRUCTIONS The crew declared an emergency when unable to resolve the situation on final approach.
	5. AIRMANSHIP OR FLIGHT SKILLS The crew made a soft landing that helped minimize the damage to the aircraft.
	6. AERODROME INTERVENTION/ASSISTANCE The passengers were evacuated with help from the airport's firefighting service.

IN-010/2010 Incident involving a Boeing 737-800 aircraft, registration EI-DXY, operated by Ryanair, in the vicinity of the Valencia Airport on 14 May 2010, And four similar incidents. Report approved on 30 March 2013.

The B737-800 aircraft operated by Ryanair was on a flight from the Stansted Airport to the Alicante airport. After being cleared to land on runway 10 at the Alicante Airport, the crew did a go-around due to adverse weather conditions (changes in wind speed and direction).

The crew requested a second approach, this time to runway 28, which ATC accepted. But the crew used additional time to hold the briefing and prepare the maneuver. By the time the approach maneuver was approved by Alicante Control, the aircraft did not have sufficient fuel to divert to the alternate. Finally, faced with wind conditions similar to those of the first go around, the crew went around again and decided to divert to the Valencia airport. Minutes after the second go-around, the crew declared an urgency (PAN-PAN) upon realizing they were at fuel minimums, and while on approach to runway 12 at Valencia, they declared an emergency (MAYDAY), landing without further incident at the Valencia Airport at 18:50 UTC. Once there, the fuel amount was verified to be below the required final reserve. The aircraft was refueled and proceeded to Alicante.

Figure 5. IN-010/2010 - Ryanair B737

CIAIAC began an investigation (IN-010/2010), after which it was discovered that the airplane was carrying the minimum amount of fuel required, a normal practice on Ryanair flights to save fuel.

The final report contained six safety recommendations (REC 18/13 - REC 23/13): one was for AENA and involved updating the ATIS to have it provide information on sudden changes in weather conditions at the aerodrome; three were for the operator, Ryanair, and dealt with a revision of its Operations Manual and Operational Flight Plan in terms of the procedures for declaring urgency and emergency, with real time and fuel data and with the use of "operational" English; and the last two recommendations were for the ICAO to have it standardize urgency and emergency declarations in its regulations.

The positive factors involved when faced with the adverse landing conditions at Alicante were:

	1. DECISION TO GO AROUND The crew decided to go around at both runways in Alicante due to wind conditions.
	2. USE OF TRAINING INSTRUCTIONS The crew declared an emergency since the amount of fuel remaining had fallen below final reserve fuel.

IN-019/2010 Incident involving an AEROSPATIALE/ALENIA ATR-72-500 (212A) aircraft, registration EC-HJI, operated by Air Nostrum L.A.M., at the Madrid-Barajas Airport (Madrid, Spain) on 30 June 2010. Report approved on 27 March 2014.

The aircraft took off at 07:53:11 from runway 36L at the Madrid-Barajas airport on flight ANE-8790 en route to the Melilla airport.

As the aircraft approached an altitude of 9,000 ft, a light mist appeared in the cockpit and passenger cabin. Almost simultaneously the fire warning for the no. 1 engine was activated. The crew then carried out the relevant emergency procedure and the warning cleared after the second extinguisher bottle was discharged.

Once the emergency was resolved, the crew requested priority to return to the airfield, describing the problem they had encountered and requesting the presence of firefighters. The aircraft made the approach on a single engine, landed without further incident at 08:12:00 on runway 33L and taxied to parking, escorted by the firefighting vehicles.

Once the aircraft stopped, and after verifying the passengers were not at risk, they were disembarked using the normal methods and the firefighters returned to the station.

No recommendations were issued with CIAIAC report. It was determined that the incident had occurred as a result of the fatigue fracture of a blade in the no. 1 engine, which triggered a series of failures that ended up igniting a fire in the engine.

The event was resolved satisfactorily thanks to the following positive factors:

	1. THREAT IDENTIFICATION The crew noticed a slight mist in the cockpit and passenger cabin.
	2. HARDWARE SAFETY NET The fire warning was activated a little over 7 minutes after takeoff.
	3. USE OF TRAINING INSTRUCTIONS The crew performed the emergency procedure for the warning, which cleared after the second extinguisher bottle was discharged.
	4. DECISION TO RETURN TO DEPARTING POINT OR TO DIVERT After the fire was out, the crew decided to return to the airfield.
	5. USE OF TRAINING INSTRUCTIONS The crew requested priority to return to the airport, described the problem they had encountered and requested that firefighters be standing by when they landed.
	6. AERODROME INTERVENTION/ASSISTANCE After the aircraft stopped, it taxied to parking under its own power, escorted by firefighting vehicles, and the passengers were disembarked using the normal method.

A-035/2010 Accident involving a Piper PA-36 Brave 375 aircraft, registration EC-EJR, in the town of Alcora (Castellón) on 14 October 2010. Report approved on 24 October 2012.

The aircraft, belonging to the operator Trabajos Aéreos Espejo, S.L., had taken off from the Castellon aerodrome to do aerial spraying work. It was the second flight of the day and it was over an orange grove near Alcora (Castellon).

According to the pilot, he had made an initial pass and as he was turning, he noticed that the airplane was losing power and speed, so he accelerated to the maximum and released the load using the emergency lever. Since he was unable to maintain altitude, he decided to make an emergency landing but he did not have time to select the most suitable field.

During the emergency landing the aircraft reached the ground flying too fast and with an attitude that was not sufficiently level, which impeded the pilot's ability to control it. The airplane fell down a hillside before coming to a stop. It was destroyed but the pilot was not injured and was able to exit the aircraft under his own power.

CIAIAC's investigation revealed that the accident was caused by the faulty execution of the emergency landing maneuver after a possible loss of engine power at low altitude. The reason for the loss of engine power during the flight could not be determined. Two safety recommendations were issued (REC 59/12 and REC 60/12), the former for the operator to have it revise its Operations Manual, to include emergency procedures specific to the aerial work it does and to train its pilots on said procedures. The second was assigned to AESA to have it monitor compliance with the first recommendation.

Figure 6. A-035/2010 - Aircraft at the crash site

The positive factors that avoided more significant consequences were:

	1. THREAT IDENTIFICATION The pilot noticed that the aircraft was losing power and speed.
	2. USE OF TRAINING INSTRUCTIONS The pilot released the load using the emergency lever.
	3. DECISION TO LAND AS PRECAUTION The pilot decided to land when he was unable to maintain the necessary altitude.

A-039/2010 Accident involving a Boeing 737-800, registration EI-EBR, operated by Ryanair, at the Seville Airport on 27 October 2010. Report approved on 19 December 2012.

The aircraft was parked at stand 10 in the Seville Airport. Its engines were running and the crew requested clearance to start taxiing. The flight dispatcher was coordinating the operation from the platform.

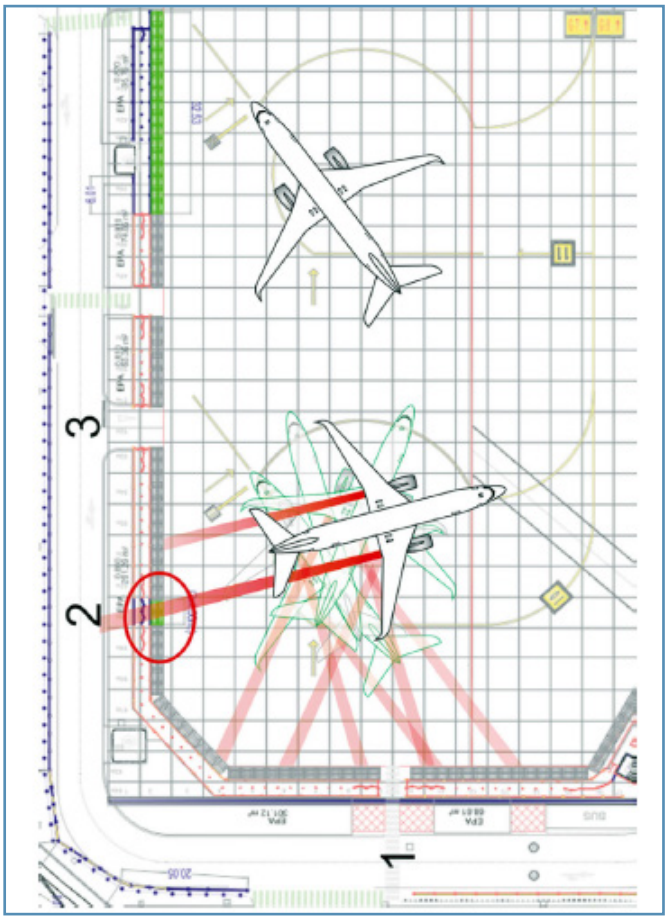

Figure 7. A-039/2010 - Aircraft's position and jet blast area

In the meantime, a group of passengers was being escorted by two staff toward another aircraft parked at stand 11. The aircraft was accessed through a part of the apron protected by jet blast barriers. There were gaps in these barriers to allow passengers to access airplanes parked there.

When the aircraft started its engines and taxied, boarding of the second aircraft was interrupted. The passengers remained behind the barriers (point 2 in Figure 7), but the

jet blast from the aircraft hit some of the passengers who did not follow the marshallers' instructions, throwing them to the ground.

The investigation determined that the airline's boarding procedure did not take into account how the angle of the jet blast would affect passengers when the aircraft turned. This effect is now considered following the modifications made in the last revision to the procedure. The airport has also closed off the gap in the barrier and is writing boarding procedures that are specific to each stand.

The pilots did not notice the risk situation created by the jet blast, which meant that the actions of ground service personnel were essential.

One positive factor was identified:

1. USE OF TRAINING INSTRUCTIONS

The two operators who were escorting the passengers to the airplane stopped them and kept them behind the barriers when the aircraft began to taxi.

IN-040/2010 Incident involving an Airbus A320-214 aricraft, registration EC-HDK, operated by Iberia, and a Cessna T-210-M aircraft, registration EC-FAN, on approach to the madrid-barajas airport on 16 December 2010. Report approved on 28 November 2012.

Aircraft EC-FAN had taken off from Sabadell on a VFR flight en route to Cuatro Vientos. At the same time, aircraft EC-HDK was making an approach to RWY 33L at Madrid-Barajas under vector guidance provided by the Madrid ACC. During the turn to intercept the ILS localizer, the controller informed the crew of EC-HDK about an unknown aircraft (EC-FAN) that at that time was 3 NM away horizontally at an altitude of 4600 ft. This allowed the crew to locate the aircraft and keep it in visual contact. The TCAS on aircraft EC-HDK then issued a resolution advisory with a descend indication, to which the crew reacted immediately by performing the indicated maneuver.

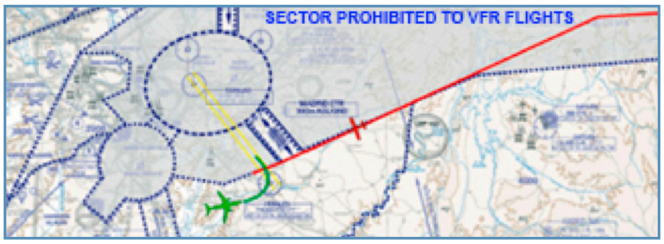

Figure 8. IN-040/2010 - Flightpaths of EC-FAN (red) and EC-HDK (green)

When the flightpaths crossed, EC-HDK was at an altitude of 3800 ft and EC-FAN at 4400 ft, meaning the vertical distance between them was 600 ft. The Airbus continued with its approach to the runway, landing normally, while the Cessna continued to the Madrid-Cuatro Vientos Airport.

The investigation revealed that the Cessna pilot altered his route to avoid mountainous terrain, which tool him to the north and into the Madrid TMA. Even though he was alerted by his GPS, he did not realize that he was entering a sector that was prohibited to VFR flights. A recommendation in this regard was issued to AESA (REC 82/12) to have it apply Eurocontrol's plan to reduce the risk of airspace violations.

The positive factors that helped reduce the severity of this incident were:

	1. THREAT IDENTIFICATION The controller detected the Cessna when it entered the sector off limits to VFR flights.
	2. ATC INTERVENTION/ASSISTANCE The controller informed the Airbus crew of the presence of the other aircraft.
	3. HARDWARE SAFETY NET The TCAS system on EC-HDK issued a resolution advisory (RA) with an instruction to descend.
	4. AVOIDANCE MANEUVER The crew of the Airbus reacted immediately as indicated by the TCAS.
	5. VISUAL DETECTION/ANTICIPATION The crew of the Airbus maintained visual contact with the other aircraft during the event.

A-008/2011 Accident involving a Bell 407 helicopter, registration EC-KTA, in the town of Villastar (Teruel) on 19 March 2011. Report approved on 27 March 2014.

On 19 March 2011, a Bell 407 helicopter took off from its base in Alcorisa (Teruel) at 12:09 en route to a fire zone in the Los Olmos mountain, near the town of Alcorisa.

The purpose of the flight was to pick up a firefighting team and transport it to a fire that had broken out between the towns of Villel and Cascante.

While en route to the fire, the pilot reported his position at around 12:30, past the town of Cedrillas, and a few minutes later he impacted the ground in a clearing free from obstacles.

Figure 9. A-008/2011 - Accident helicopter

Of the aircraft's seven occupants, six were killed and one was seriously injured. The aircraft was destroyed.

The accident was likely the result of a loss of control of the aircraft that occurred when the piston for the hydraulic servo that controls the cyclic pitch, located on the left side of the helicopter in the direction of motion, became stuck in the extended position.

The investigation revealed that the pilot started the emergency maneuver specified for a failure of the hydraulic system. This maneuver started about six minutes before the crash in an area that was suitable for a landing, and had been practiced by the pilot, as stated by the surviving passenger. This was subsequently confirmed by the operator, which requires its pilots to perform this maneuver annually. The passenger also recalled hearing the pilot mention the stiffness of the controls before initiating the emergency descent.

CIAIAC issued four safety recommendations (REC 12/14 - REC 15/14) involving the manufacturer's production and quality systems on the one hand, and the relevant Civil Aviation Authority's criteria for evaluating and issuing Airworthiness Directives on the other.

The analysis of the accident identified the following positive factors:

	1. THREAT IDENTIFICATION The pilot detected and properly interpreted the signs of an improperly functioning left-hand servoactuator (stiff controls according to the eyewitness).
	2. USE OF TRAINING INSTRUCTIONS The pilot used what he learned during his training and decided to perform an emergency landing.

EXT-Andorra/2011 Accident involving a Eurocopter AS 350 B3 helicopter, registration EC-LHP, in Canillo (Principality of Andorra) on 15 June 2011. Report approved on 25 September 2013.

The helicopter was on a flight to transfer personnel from a staging area near Pont d'Incles to the Juclar shelter, located next to Estany Primer de Juclar (Canillo, Principality of Andorra). Weather conditions were good and onboard were the pilot, a maintenance technician, four operators and a dog belonging to one of them.

Shortly before reaching the shelter, the 10-meter long sling used to carry the load, and which was still attached to the helicopter's hook, became entangled in the branches of a pine tree, breaking shortly thereafter and detaching from the helicopter. The helicopter then crashed into another pine tree, fell to the ground and caught fire. Five of the six occupants were killed and the sixth, who was thrown from the helicopter, was seriously injured with burns over 70% of his body. The animal was also injured and the aircraft was destroyed.

Figure 10. EXT-ANDORRA/2011 - Helicopter

A hiker who saw the accident reached the crash site a few minutes later and helped the survivor. Two forest rangers who saw the accident also proceeded to the site, which they reached some 20 minutes later. After calling emergency services, they verified that the fire had gone out and attended to the wounded individual while they looked for more survivors. Emergency, firefighting and police personnel arrived a short time later.

The investigation concluded that the crew were unaware of the presence of the sling, and flew faster and lower than was necessary. Two safety recommendations were issued (REC 48/13 and 49/13), for for the operator, CAT HELICOPTERS/HELIAND, to have it implement the necessary procedures involving the transport of external loads, and to have it write independent checklists and briefings specific to each operation.

The crew were unaware of the risk they faced, but this accident still yielded one positive factor:

1. THIRD-PARTY INTERVENTION

Two forest rangers called emergency services and verified that the fire had gone out. They also attended to the injured passenger while they looked for more survivors. A short time later, emergency, firefighting and police personnel arrived on the scene.

EXT-Portugal/2011 Accident involving a Cessna FR-172-J aircraft, registration EC-CZG, in the vicinity of Almaraleja (Moura – Portugal) on 24 September 2011. Report approved on 25 September 2013.

The aircraft took off from the Badajoz Airport en route to the Faro Airport (Portugal) on a flight to observe and track imperial eagles. About eight minutes after takeoff, the pilot decided to land again after noticing the abnormal operation of the engine and a very low oil pressure reading. After being cleared to do so, the aircraft landed without incident and proceeded to parking.

Figure 11. EXT-PORTUGAL/2011 - Aircraft at the landing site

A little over an hour later, after doing all of the necessary checks and tests of the aircraft, the pilot took off once more to do the same flight. Forty minutes later, at an altitude of 12,000 ft, the pilot heard an unusual sound coming from the engine, which was losing power, so he decided to do an emergency landing. He reported his status to the Badajoz control tower, declared an emergency and selected a suitable location in which to make an off-field landing.

The aircraft was not damaged and all three occupants were uninjured and exited the aircraft under their own power. The pilot immediately reported the event and the condition of the occupants to the Badajoz Airport and to his own operations office. He also took photographs and gathered as much information about the flight as he could. CIAIAC's investigation did not result in any safety recommendations.

The positive factors that contributed to the successful outcome of this event were:

	1. THREAT IDENTIFICATION Forty minutes into the flight, at an altitude of 12,000 feet, the pilot heard an unusual noise coming from the engine.
	2. DECISION TO LAND AS PRECAUTION The pilot decided to land after noticing the incorrect operation of the engine and a loss of power.
	3. USE OF TRAINING INSTRUCTIONS He reported his situation to the Badajoz control tower and declared an emergency.
	4. DECISION TO LAND ON AN UNEXPECTED RUNWAY The pilot chose a suitable location in which to make an off-field landing.
	5. AIRMANSHIP AND FLIGHT SKILLS The pilot landed the aircraft without damaging it. The occupants were also unharmed.

A-009/2011 Accident involving an Ultramagicc T-180 balloon, registration EC-IQF, in Guadix (Granada) on 27 March 2011. Report approved on 28 November 2012.

After a balloon probe was released from the takeoff location, it was noted that the wind direction would take it in a direction that was difficult to access, so the pilot decided to delay the takeoff and do it from another location.

The balloon took off with six passengers and the pilot onboard from the town of Guadix (Granada), with a 6 km/h wind from the north. The pilot had used this takeoff location before

Half an hour into the flight, and in light of the rising wind speed, the pilot decided to land, but the presence of a high-voltage line below the balloon prevented him from doing so since the wind, which was from the west, was taking them in the direction of the power lines. The pilot decided to climb to try to change course, but the balloon went north. Upon descending, the wind on the ground again took the balloon toward the high-voltage lines, so he decided to land between two power lines located near a wind farm. Before descending the pilot gave the passengers a safety briefing.

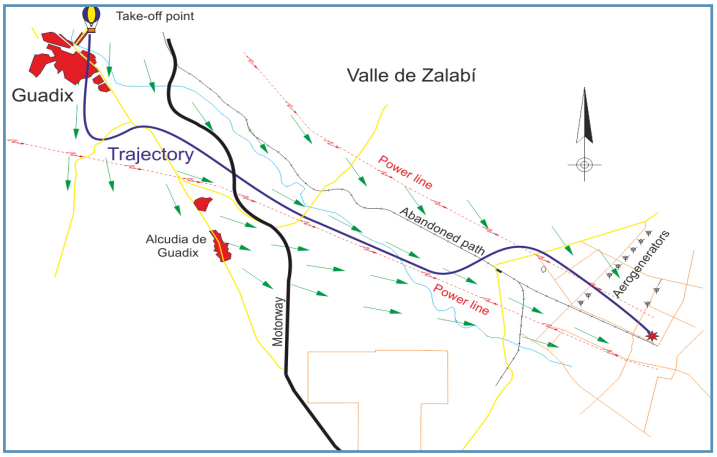

Figure 12. A-009/2011 - Diagram of the area

The landing was hard and the balloon was dragged along the ground for 170 m, which resulted in three passengers being thrown from the basket and receiving serious injuries. No safety recommendations were issued following the investigation.

This situation involved two separate sets of positive factors:

- Positive factors in the first situation

	1. PRE-FLIGHT PREPARATIONS AND PRECAUTIONS Before the flight, a balloon probe was released, which was blown into an area that was difficult to access.
	2. DECISION TO REJECT TAKEOFF The pilot delayed the takeoff and moved it to a different location.

- Positive factors in the second situation

	1. DECISION TO LAND AS PRECAUTION In light of the worsening wind situation, the pilot decided to land.
	2. AIRMANSHIP AND FLIGHT SKILLS By landing the balloon between two electrical lines, due to the limited space between them.
	3. USE OF TRAINING INSTRUCTIONS The pilot prepared the passengers for a windy landing by placing them strategically in the basket and giving them safety instructions.

IN-012/2011 Incident involving a PZL W-3AS helicopter, registration SP-SUH in Mijares (Ávila) on 11 April2011. Report approved on 28 November 2012.

The aircraft took off from the La Iglesuela aerodrome (Toledo) to go on a test flight after some maintenance work. During the course of the flight, the crewmembers heard a strange sound coming from the engines, while the cockpit filled with smoke.

The pilot made an emergency landing on a road, during which none of the crewmembers was injured. When they exited the helicopter, they saw smoke and fire issuing from the engine air intake system, which they proceeded to douse using the onboard fire extinguishers.

A subsequent inspection of the aircraft revealed that several components in the engine air intake cooling system were broken, causing them to be misaligned with their axis of rotation. The smoke and fire had been caused by friction inside the air conduits.

The investigation and testing concluded that the failure was caused by the faulty operation of the rear bearing on the engine fan rotor shaft. This had been due to the high grease injection pressure it had been subjected to during lubrication operations.

In light of the documentation examined during the investigation CIAIAC decided to accept the corrective measures proposed by the manufacturer of the aircraft, of the fan and by Poland's Civil Aviation Authority, as the state of manufacture and registration of the aircraft, and which were applicable to all PZL W-3AS aircraft.

The final technical report includes three recommendations (REC 97/12, 98/12 and 99/12), one for Poland's Civil Aviation Authority to have it ensure the implementation of the corrective actions proposed, and the others to the fan and aircraft manufacturers to have them carry out their proposed corrective actions.

The positive factors that managed to minimize the consequences of this incident were:

	1. DECISION TO LAND AS PRECAUTION The crew heard a noise coming from the engines and saw that the cockpit was filling up with smoke, so they decided to execute an emergency landing.
	2. DECISION TO LAND ON AN UNEXPECTED RUNWAY The crew landed on a road.
	3. AIRMANSHIP AND FLIGHT SKILLS The crew landed without further incident and without causing injuries to the occupants.
	4. USE OF TRAINING INSTRUCTIONS When they exited the helicopter, they saw smoke and fire issuing from the engine air intake system, which they proceeded to douse using the onboard fire extinguishers

IN-027/2011 Incident involving a Cessna 206 aircraft, registration G-CCRC, in the vicinity of the Santa Cilia de Jaca aerodrome (Huesca) on 23 July 2011. Report approved on 27 February 2014.

On 23 July 2011 at 13:05 LT, the pilot of a Cessna U-206 aircraft took off from the Santa Cilia de Jaca aerodrome on a parachuting flight. It was the aircraft's third such flight that day. The weather conditions were suited to the visual flight and for parachuting. There was a light wind form the west, and onboard the aircraft were five parachutists and the pilot.

When the pilot reduced the throttle to stop the climb, he smelled smoke, felt vibrations and the engine lost power.

The skydivers jumped from the airplane normally and landed in the designated location without problems. The pilot started to descend in order to land, keeping the same engine speed. Shortly before landing, the pilot opened the throttle but the engine did not respond, even though it was still running.

The terrain on the approach to runway 27 at the Santa Cilia de Jaca aerodrome descends sharply, and turbulence from the mountains usually affects the area before the threshold. Noticing that the wind had gained strength, the pilot opted to execute an emergency landing outside the aerodrome on a clearing parallel to and to the right of runway 27, this way assuring the landing. He reported his intentions via radio and informed aerodrome personnel of his status after landing.

CIAIAC's investigation concluded that the immediate cause of the incident was an engine failure, which was not detected earlier due to deficient maintenance (the airplane had a long history of engine problems). In the wake of this incident, three recommendations were issued (REC 09/14, REC 10/14 and REC 11/14), one to the French civil aviation authority to have it evaluate the actions of the aircraft's maintenance provider, another to the German authority to have it reevaluate the suitability of the airworthiness manager and a third to the operator to have it improve its ability to oversee the airworthiness of the aircraft it operates.

The positive factors that managed to minimize the consequences of this incident were:

	1. THREAT IDENTIFICATION When the pilot reduced the engine speed at the end of the climb, and while 3,300 m over the field, the pilot smelled smoke, felt vibrations and the engine lost power.
	2. DECISION TO LAND AS PRECAUTION Upon noticing the increased wind speed, the pilot opted to make an emergency landing outside the aerodrome.
	3. DECISION TO LAND ON AN UNEXPECTED RUNWAY The pilot chose a clearing that was parallel to and to the right of runway 27 to make the landing.
	4. USE OF TRAINING INSTRUCTIONS The pilot reported his intentions on the radio and after landing, notified aerodrome personnel of his situation.

A-029/2011 Accident involving a Bombardier Canadair CL-600-2B19 aircraft, registration EC-ITU, operated by Air Nostrum, at the barcelona airport on 30 July 2011. Report approved on 30 January 2013.

A CRJ-200 aircraft was on a scheduled commercial flight between the airports of Badajoz and Barcelona. The weather situation at the Barcelona airport was highly unstable, with rain and storms. The approach controller informed the crew that the storm was approaching the area of the runway 25R localizer, and offered them the option of making a visual approach, which the crew accepted and was cleared to execute.

During the approach they encountered a cloud layer, so the first officer, who was the pilot flying, climbed to maintain visibility, but he lost visual contact with the runway. By the time they regained visual contact, they were 775 ft above the theoretical glide slope. The captain decided to take the controls of the aircraft. He extended the spoilers and increased the descent rate. The EGPWS started issuing excessive descent rate warnings until they reached the radioaltitude level below which these warnings are disabled.

The aircraft made a hard landing, bounced and made contact again with the runway before decelerating normally and exiting the runway. The crew reported the hard landing to the airline.

The investigation resulted in three safety recommendations (REC 15/13 - REC 17/13), two of them issued to the airline, Air Nostrum, to have it revise its operational documentation and enhance its crew training, and a third to AESA to have it ensure that Spanish airlines comply with the requirements of Regulation EU 965/2012.

The positive factors that helped minimize the effects of this event were:

	1. ATC INTERVENTION / ASSISTANCE The approach controller informed the crew of the weather conditions on the approach.
	2. HARDWARE SAFETY NET The EGPWS started issuing high descent rate warnings until the aircraft reached the radioaltitude below which this warning is disabled by design.

Despite not helping to minimize the consequences of the accident, it should be noted that the crew immediately reported the hard landing to the company's maintenance department.

IN-033/2011 Incident involving an Airbus A320-214 aircraft, registration EC-LAJ, operated by Orbest, and a Boeing B737-800 aircraft, registration LN-RRH, operated by SAS, at the Palma de Mallorca airport on 17 September 2011. Report approved on 28 February 2013.

The A-320 aircraft was stopped at the holding point on taxiway H-2, waiting to be cleared to access runway 24R at the Palma de Mallorca airport and take off for Cork (Ireland). In the meantime, the B-737 aircraft was taxiing on taxiway North, parallel to runway 06L-24R, in the direction of taxiway H-1, to commence its flight to Stockholm. When the Boeing 737 crossed taxiway H-2, its left wingtip struck the rear of the Airbus A320.

Figure 13. IN-033/2011 - Close-up of the B-737 winglet lodged against the APU exhaust nozzle on the A-320

The crew of the Boeing felt the impact and immediately stopped the aircraft. They then called the control tower to report hitting the Airbus. The controller dispatched a marshaller to inspect the damage, who reported that there had been contact and that the left winglet on the B-737 was lodged in the APU exhaust nozzle of the A-320.

In an effort to separate the two aircraft, a tractor was used to push the B-737, after which both aircraft returned to the parking stand under their own power to evaluate the damage they had sustained.

The investigation noted that the incident was caused by the decision made by the crew of the Boeing to taxi to the H-1 holding point by passing behind the A-320, even though the clearance distance between them was below that specified in the operator's procedures.

Three recommendations were issued (REC 04/13 - REC 06/13) to the ICAO, AENA and the operator, SAS, to have them review the coding criteria for the purpose qualifier in NOTAMs.

The positive factors in this incident were:

	1. THREAT IDENTIFICATION The crew of the Boeing felt the impact.
	3. USE OF TRAINING INSTRUCTIONS The controller dispatched a marshaller to check the impact.
	2. USE OF TRAINING INSTRUCTIONS The crews called the control tower to confirm the impact. The controller sent a marshaller to check the situation.
	4. DECISION TO REJECT TAKEOFF Both aircraft returned under their own power to the parking stand to evaluate the damage they had sustained.

IN-035/2011 Incident involving a Cessna 172-H "Reims" aircraft, registration EC-CXP, in the vicinity of the Seville Airport on 27 September 2011. Report approved on 27 January 2014.

The aircraft took off at 16:39 on a local dual-control training flight departing from and landing at the Seville Airport (LEZL). Onboard were the instructor, a student and a third occupant.

Figure 14. IN-035/2011 - Aircraft at the landing site

According to the instructor's account, after taking off and while over point Sierra, at an altitude of about 1,000 ft, the engine started to misfire as its RPMs decreased. The instructor then decided to return to the airport, which he reported to ATC (LEZL TWR). When it became apparent that they would not reach the runway, the instructor decided to land nearby at the old San Pablo military base, southwest of the airport.

The occupants were not injured and the aircraft suffered no significant damage, except for that to the engine. When the engine was disassembled during the engine inspection conducted after the event, the number 2 cylinder rocker arm was found broken in two pieces, causing the engine to malfunction. The CIAIAC issued one recommendation (REC 06/14) to the type certificate holder for the engines to have it study this incident to determine the type of in-service failure.

The positive factors found in this incident were:

	1. THREAT IDENTIFICATION According to the instructor's account, after the aircraft took off and while at an altitude of about 1,000 ft, the engine started misfiring and losing power.
	2. DECISION TO RETURN TO DEPARTING POINT OR DIVERT The instructor then decided to return to the airport.
	3. USE OF TRAINING INSTRUCTIONS The crew contacted the tower to report their intention to return to the airport due to engine problems.
	4. DECISION TO LAND ON AN UNEXPECTED RUNWAY When it became apparent that they would not reach the runway, the instructor decided to land at the old San Pablo military base, which was near the airport.
	5. AIRMANSHIP OR FLIGHT SKILLS The pilot made an off-field landing that resulted in no damage or injuries.

A-037/2011 Accident involving two Bell 212 helicopters, registrations EC-GIC and CC-CIS, in Bienservida (Albacete) on 30 September 2011. Report approved on 26 June 2013.

After a fire was reported very close to the town of Bienservida (Albacete), three helicopters joined the firefighting efforts: EC-GXA (H01), EC-GIC (H02) and CC-CIS (H13). Each one was being flown by a single pilot.

The area chosen to take on water for the bambi buckets was a pond located 2 km NE of Bienservida. After fighting the fire for half an hour, H02 and H13 found themselves above the pond, where they collided with each other and fell into the pond. The pilot of H02 was able to exit the cockpit, aided by a local farmer, and by the crew from H01. The pilot of H02 survived, but the pilot of H13 was killed.

The investigation determined that one survival aspect for the pilot of H02 was the fact that his harness was completely fastened; however, the insufficient protection he was wearing meant that his burns were much more serious than they would have been had he been wearing not just the fire resistant flight suit, but fire resistant gloves and a regulation helmet. As for the pilot of H13, his shoulder harness was not secured; as a result, when the helicopter impacted the water, his body bent over forward violently. The ensuing blow made him lose consciousness. Furthermore, he was wearing street clothes and no helmet.

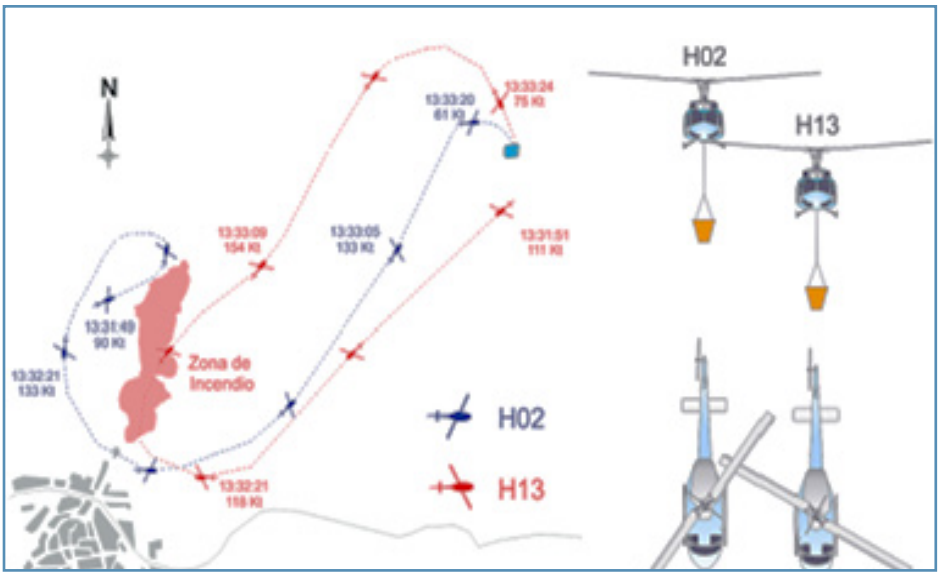

Figure 15. A-037/2011 - Flight paths before the impact and positions of aircraft just before the first blade impacted

Issued with the final report were nine safety recommendations (REC 31/13 to REC 39/13), of which five were for the operator, INAER Helicópteros, to have it modify its Operations

Manual and the training program for crews involved in firefighting operations. The other four were for the regional Ministry of Agriculture to have it improve its protocols for coordinating aerial resources and to ensure the operability of air and ground communications when fighting fires.

The positive factor that contributed to the survival of one of the pilots was:

1. PRE-FLIGHT PREPARATIONS AND PRECAUTIONS

One factor in the survival of the pilot of H02 was the fact that he was wearing a fire resistant flight suit and his harness was completely fastened.

IN-043/2011 Incident involving an Embraer 145 LU aircraft, registration LX-LGX, operated by Luxair on approach to the Madrid-Barajas Airport on 4 August 2011. Report approved on 23 January 2013.

The aircraft was on a flight from the international airport in Luxembourg to Madrid-Barajas.

The aircraft descended below the minimum altitudes specified in the standard arrival procedure, the radar vector guidance minimums as well the sector minimum. The crew continued to descend until they received two EGPWS warnings, at which time the crew disengaged the autopilot and started to climb. The aircraft's minimum altitude was 6,290 ft.

A few seconds later, the AIS sector controller instructed the crew to turn heading 260° for traffic separation and, after receiving no reply, to heading 270°. At that point the crew reported: "HEADING 270, WILL MAINTAIN SEVEN THOUSAND DUE TO MOUNTAINS, LGL3837". Eventually, the AIS sector instructed the crew to climb to 10,000 ft.

Figure 16. IN-043/2011 - Photograph of the aircraft

The final report contained three recommendations (REC 01/13, REC 02/13 and REC 03/13) for AENA involving the addition of faulty acknowledgments and the use of standard phraseology in the training programs for control personnel. It also recommended implementing the altitude alert function of the SACTA system and defining the tasks of planning controllers.

The positive factors that helped avoid a more serious incident were:

	1. HARDWARE SAFETY NET Two ground proximity warnings were issued by the EGPWS.
	2. AVOIDANCE MANEUVER The crew disengaged the autopilot and immediately started to climb.

IN-049/2011 Incident involving a Robin DR-300/180R aircraft, registration D-EGSK, at the Lillo aerodrome (Toledo) on 3 December 2011. Report approved on 24 October 2012.

Before starting with the task of towing gliders, the pilot prepared to make an initial check flight of the aircraft. Before this flight, the aircraft was refueled with 51 l so as to fill the main 110-l capacity tank. The reserve tank was left empty. The main tank and the fuel filter (gascolator) were then drained and the pre-flight inspection and checklists specified in the flight manual were completed. The pilot then taxied to runway 30 and took off.

When the aircraft was on its initial climb, some 100 ft above the ground, the engine stopped with no prior indication to warn the pilot of a malfunction of a loss of power. In light of the altitude, the pilot verified the position of the controls and the instruments and, noting nothing out of the ordinary, made an emergency landing some 300 m past the end of the runway on a crop field that was practically flat. The aircraft sustained significant damage but the occupants were not injured and were able to exit the aircraft under their own power.

Only two short-duration flights had been made since July 2011. The aircraft was kept in a hangar, where the weather conditions lead to high temperature differences between night and day. These circumstances indicate that before the aircraft was refueled, water had formed in the fuel tank as a result of condensation, and that when the tank, which was half full, was topped off, the water emulsed with the fuel. Then, when it was drained, the emulsion would have been sufficiently homogeneous to hide the presence of water. Then, while the aircraft was on the apron, the emulsion reversed with the water's presence in the fuel supply becoming evident during takeoff and causing the engine to stop. No safety recommendations were issued following the investigation.

The positive factors that contributed to the good outcome of the incident were:

	1. DECISION TO LAND AS PRECAUTION While on the initial climb, the engine stopped without warning and the pilot decided to land.
	2. DECISION TO LAND ON AN UNEXPECTED RUNWAY The crew immediately disengaged the autopilot, started to climb and landed on a field that was practically flat.

IN-050/2011 Incident involving two Boeing B757 aircraft, registrations OH-LBR (Finnair) and G-TCBA (Thomas Cook Airlines) in the Canaries TMA on 20 November 2011. Report approved on 24 October 2012.

The aircraft were flying standard arrival route ORTIS3G into Tenerife South/Reina Sofia, in radar and radio contact with the Canaries ACC. Aircraft FIN1601 was at flight level 390, just ahead of aircraft TCX13CS, which was at flight level 370.

After a relief at the Canaries ACC control position, TXC13CS requested to descend. At that moment the radar system experienced a fault, possibly due to a gambling error, and the label for TCX13CS disappeared from the screen and in its place appeared two labels for transponder code 3341, one at flight level 405 and another at flight level 370. The label for FIN1601 showed it flying at flight level 390.

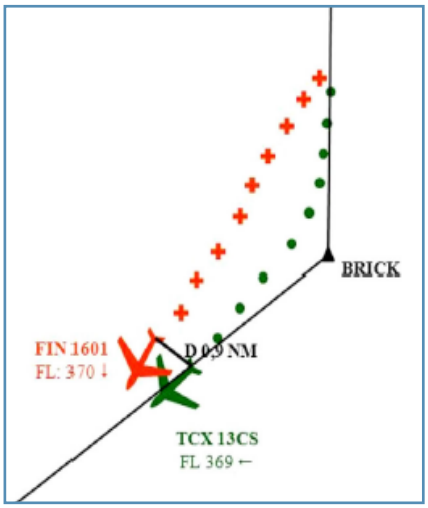

Figure 17. IN-050/2011 - Diagram of the approach

The controller cleared FIN1601 to descend to flight level 250, and one minute later he called TXC13CS to instruct a descent to flight level 390, to which the crew replied they were at flight level 370.

The controller then instructed TCX13CS to make a 30° turn to the right. Immediately afterward, FIN1601 reported they had received a climb resolution advisory on their TCAS system, and TCX13CS had received a descent resolution advisory.

FIN1601 probably continued with its descent, despite the instruction from the TCAS to climb. A few seconds later, TCX13CS received a TCAS resolution advisory in the opposite direction from before, instructing a climb. FIN1601 received a descend advisory, reversing the previous advisory to climb. Seconds later the TCAS informed both aircraft that the conflict had cleared. TCX13CS reported seconds later that they were clear of conflict after receiving its own TCAS advisory.

CIAIAC issued two safety recommendations (REC 100/12 and REC 101/12), one to AENA to have it ensure that its controllers are aware of potential faults in the SACTA system, and another to Finnair, the operator of FIN1601, whose crew did not react as instructed by the TCAS resolution advisory, to have it enhance its crew training on the procedures to follow in the event of a TCAS advisory.

The positive factors involved in resolving the conflict were:

	1. HARDWARE SAFETY NET Both aircraft received two TCAS warnings each during the incident.
	2. AVOIDANCE MANEUVER The crew of TCX13CS responded properly to the TCAS advisories.

IN-051/2011 Incident involving a Boeing B757-21B aircraft, registration G-LSAI operated by JET2, and an Airbus A321/B3, registration EC-JMR operated by Iberia, at the Tenerife South – Reina Sofía airport on 12 November 2011. Report approved on 28 February 2013.

The A321 aircraft had taken off from Paris-Charles de Gaulle and was making an ILS approach to runway 08 at the Tenerife South Airport. Approach control had cleared it to descend using the ILS procedure and transferred it to the tower frequency.

The B757-200 Aircraft, which was taking off from the Tenerife South airport, had been cleared to proceed to the runway 08 holding point when the control tower asked its crew if they were ready for immediate takeoff. The crew replied affirmatively and were cleared for immediate takeoff.

The A321 reported it was on short final, and the controller informed it that there was a taxiing aircraft. He then cleared it to land with the departing traffic in sight. Finally the Iberia A321 landed just as the Boeing aircraft became airborne. Both aircraft completed their respective maneuvers without further incident.

The investigation revealed that both crews were aware of the position of the other and were in constant visual contact during the landing/takeoff. It was also determined that the crew of the A321 considered the possibility of going around, but since weather conditions were good and the other aircraft was a long distance down the runway, they conducted a "decelerated approach" by reducing their landing speed.

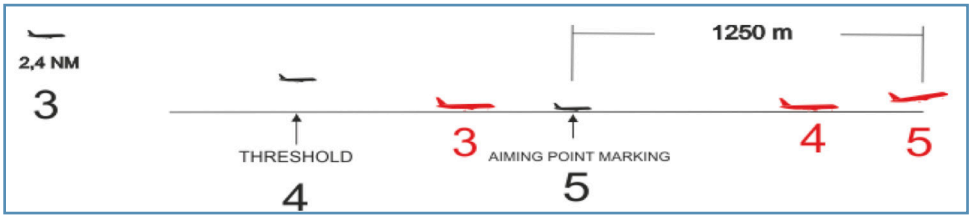

Figure 18. IN-051/2011 - Relative positions of the two aircraft

A safety recommendation (REC 07/13) was issued to AENA to have it modify and upgrade its tower controller training programs on aircraft separation.

The positive factors in this incident were:

	1.VISUAL DETECTION/ ANTICIPATION Both crews were aware of the other's position throughout the event.
	2. DECISION TO LAND AS PRECAUTION They considered the option of going around, but since weather conditions were good and the other aircraft was far down the runway when they were on short final, they continued the approach.
	3.AVOIDANCE MANEUVER The crew of the A321 lowered their landing speed.

IN-001/2012 Incident involving a Cirrus SR22 aircraft, registration N217ET and a Beechcraft 90 King Air aircraft, registration PH-KBB, 2 NM north of reporting point KANIG on 2 January 2012. Report approved on 28 November 2012.

Both aircraft were in radar and radio contact with the Barcelona ACC, and were on opposite and converging courses. ATC had cleared PH-KBB, which was inbound, to FL120 and N217ET, which was outbound, to FL110.

Both were going to fly through reporting point KANIG, separated vertically by 1000 ft; however, the approach took place at FL110 with a vertical separation of 200 ft and a horizontal separation of 0.2 NM. PH-KBB had descended from its cleared flight level and, according to its crew, they had been cleared to FL90. It is possible that the crew mistook another aircraft's clearance for its own.

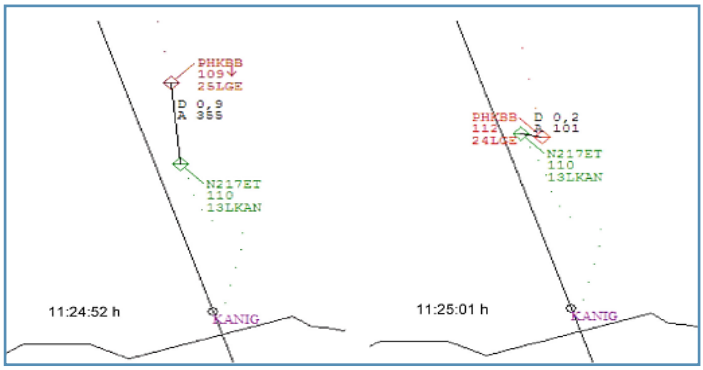

Figure 19. IN-001/2012 - Near miss between PH-KBB and N217ET

Both aircraft received traffic alerts (TA) but not resolution advisories (RA). The fast detection of the conflict by the ACC Barcelona controller and the reaction by the crew of PH-KBB to the controller's instruction to climb prevented a more serious conflict.

The investigation resulted in four recommendations (REC 84/12, REC 85/12, REC 102/12 and REC 103/12), two for AENA to have it consider implementing the STCA (Short-Term Conflict Alert) feature on the SACTA system at the Barcelona ACC, along with devices that detect the simultaneous use of ATC frequencies. Another recommendation was for DGAC to have it delete from national regulations the explicit reference to flight level for traffic on a potential collision course. The last recommendation was for the operator of PH-KBB to have its crews use proper phraseology and acknowledge ATC instructions.

The positive factors that helped limit the consequences of the incident were:

	1. HARDWARE SAFETY NET The TCAS systems on both aircraft issued two traffic alerts during the event.
	2. THREAT IDENTIFICATION The controller detected the conflict immediately.
	3. COMMUNICATIONS The controller instructed PH-KBB to climb.
	4. AVOIDANCE MANEUVER The crew of PH-KBB did not delay and carried out the instruction immediately.

EXT A-001/2012 Accident involving an MD-83 aircraft, registration EC-JJS, operated by Swiftair, at the Kandahar Airport (Afghanistan) on 24 January 2012. Report approved on 25 September 2013.

Swiftair was operating this scheduled passenger flight between the Dubai Airport (UAE) and the Kandahar Airport (Afghanistan) under an ACMI arrangement with South Africa's Gryphon Airlines.

During the approach to runway 05 at the Kandahar airport, with the first officer at the controls, the PAPI was out of service, meaning that on the final part of the approach they only had visual references with the runway and terrain. The crew were in visual contact with the runway 500 ft above minimums, and noticed that their position was a little right of the runway centerline, so the captain took over the controls to correct that deviation.

It was snowing but the visibility was not a limiting factor. The wind was practically head-on with no crosswind. During the flare, the crew felt a strong gust of wind from the right that pushed them to the left. The captain reacted by banking the airplane to the right, which caused the right wingtip to strike the ground before the wheels contacted the runway. The wingtip struck the ground some 20 meters before the threshold, destroying five threshold lights.

The captain considered it a hard landing, but it was the first officer who noticed the wingstrike. The control tower also noticed the wingstrike, ordering them to stop and dispatching the emergency services (firefighters). The crew stopped the engines and the firefighters verified there were no leaks or damage to the tires or brakes, after which the crew were allowed to restart the engines and proceed to parking. No occupants were hurt and the passengers were disembarked normally.

In the final report, the cause of the accident was determined to have been a failure to follow procedure by not going around when the approach clearly became unstabilized. The crew also made an RNAV (GPS) approach maneuver without permission (and without being trained to do so). This resulted in four safety recommendations (REC 50/13 - REC 53/13), two of them for the operator, Swiftair, to ensure that its crews do not perform unauthorized maneuvers and receive adequate training on procedural compliance, and two for AESA to ensure that Swiftair comply with the recommendations issued to it.

The positive factors found in this accident were:

	1. GOOD COCKPIT PRACTICES The captain took over the aircraft's controls in the final phase of the approach maneuver because he had more experience at the destinatioo airport than the first officer.
	3. USE OF TRAINING INSTRUCTIONS The controller told the crew that he was sending emergency units and ordered them to stop in the meantime.
	2. THREAT IDENTIFICATION The tower controller saw sparks coming off the airplane as it landed, and when it taxied in front of the tower, he saw the damage to the wingtip. The first officer also noticed the wingstrike.
	4. AERODROME INTERVENTION/ASSISTANCE The firefighters inspected the outside of the airplane to ensure that it had not lost any fluids or sustained damage to its wheels or brakes.

EXT IN-007/2012 Incident involving a Pilatus PC-6 B2-H4 Turbo Porter aircraft, registration EC-IBY, at the Évora – Alentejo aerodrome (Portugal) on 29 July 2012. Report approved on 12 November 2014.

The pilot was flying several skydiving flights. During the tenth rotation, the aircraft climbed to the parachuting altitude and the skydivers jumped out of the airplane.

When the pilot began the descent, he felt a hard impact in the tail area followed by a violent vibration of the control stick and instrument panel. The stick jammed in the pitch control direction and the pedals were stuck hard to the right. The pilot was wearing a parachute as part of his equipment.

The pilot reported the emergency to the airport's control tower and carefully evaluated the situation in order to take the proper steps, which enabled him to regain control of the airplane. He ended up deciding to try to land on the airport's runway after considering the option of jumping out of the airplane (which he considered to be the last alternative).

He reported his intentions to the control tower and requested help in checking the condition of the airplane's tail, though the control tower did not see anything unusual.

The first landing attempt was high and the pilot went around. He started a new final approach. After touching down, the airplane swerved violently to the left, exited the runway and traveled along the shoulder of the runway before coming to a stop. The pilot reported the airplane's condition to the tower and turned off the communications equipment and master switch.

The rudder had detached during the flight after the hinge bolt in the upper fitting became loose and fell off. After its investigation, CIAIAC issued three recommendations (REC 42/14 - REC 44/14), two to the Swiss civil aviation authority to have it review the Pilatus MOE, and another to the maintainer of the aircraft to have it review its MOE.

The determining positive factors in this incident were:

	1. PRE-FLIGHT PREPARATIONS AND PRECAUTIONS The pilot was wearing a parachute as part of his gear.
	2. THREAT IDENTIFICATION The pilot felt an impact and vibrations and the steering elements of the aircraft were jammed.
	3. USE OF TRAINING INSTRUCTIONS He followed the steps in the "identification, isolation and correction" procedure to troubleshoot the failure.
	4. AIRMANSHIP AND FLIGHT SKILLS The pilot managed to regain control of the airplane.
	5. DECISION TO RETURN TO DEPARTING POINT OR TO DIVERT The pilot decided to try landing on the airport runway.
	6. DECISION TO GO AROUND The pilot aborted the first landing attempt.

IN-007/2012 Incident involving a Brussels Airlines Airbus A319 aircraft, registration OO-SSR, and an Iberia Airbus A320-214 aircraft, registration EC-HAG, on approach to the Barcelona Airport on 8 February 2012. Report approved on 28 November 2012.

The aircraft, one inbound from Brussels (BEL3HH) and the other from Madrid (IBE0716), were on approach to runway 25R at the Barcelona-El Prat Airport.

Also approaching was another aircraft, a Boeing 777 (a heavy wake turbulence airplane), callsign DAL114 and operated by Delta Airlines. The Boeing 777 was first in the landing sequence, followed by IBE0716 and finally BEL3HH.

Once DAL114 and BEL3HH were established on final, the controller saw that the distance between them was 8 NM and that the second aircraft was flying 30 kt faster than the first. He then realized that there would not be enough room for IBE0716 to go in behind DAL114, as the required 5 NM separation could not be assured.

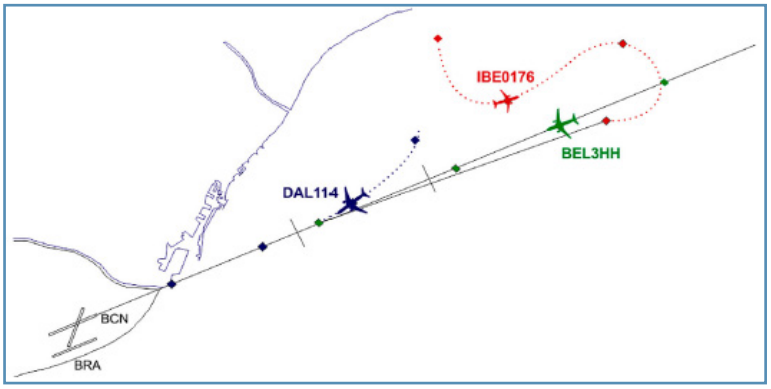

Figure 20. IN-007/2012 - Position of the three aircraft at the time of the TCAS warning

Because of this he changed the order, diverting IBE0716 to its left and placing it behind BEL3HH.

The TCAS RA was received while IBE0716 was making this turn. Both aircraft made the maneuver indicated by the TCAS and subsequently landed normally.

The investigation revealed that the controller's instruction had been incorrect and that he had not given traffic information to either aircraft. Moreover, the controller spoke in Spanish to the IBE flight and in English to the other two crews, meaning the latter were unaware of the instructions given to the IBE.

The final published report on the incident included two safety recommendations (REC 79/12 and REC 80/12) for AENA to have it enhance the Unit Training Plan for air traffic

controllers in terms of using standard phraseology in English and of vectoring, spacing and speed control techniques.

The positive factors that aided in resolving this conflict were:

	1. HARDWARE SAFETY NET The TCAS on IBE0716 and BEL3HH issued resolution advisories.
	2. AVOIDANCE MANEUVER Both aircraft carried out the maneuvers instructed by the resolution advisories.

IN-009/2012 Incident involving an Airbus A320-200 aircraft, registration EI-DEA operated by Aer Lingus, at the Barcelona-El Prat airport on 14 March 2012. Report approved on 29 April 2013.

Aircraft EI-DEA, inbound from the Cork airport (Ireland), had to circle over the Calella VOR while on approach to the Barcelona Airport, since the runway visual range (RVR) for runway 25R, approved for ILS Cat. II approaches, was 400 m, below the authorized minimums.

The crew requested a runway change to another with ILS Cat. III and with lower approved minimums that allowed landing, but ATC denied the request. After circling for half an hour without visibility conditions improving, the crew opted to divert to the Valencia airport to land. Once en route to Valencia, ATC notified them that the RVR on runway 25R had improved, and as a result the crew decided to return and attempt to land.

In light of the fuel remaining, if they missed the approach, they would have had to go to the Girona airport in order to be able to land with a fuel amount in excess of the minimum legal reserve fuel. Once on approach to runway 25R, the RVR again fell below minimums, so they aborted the landing and requested radar vectors to the Girona airport. ATC informed them they could go to Girona as there was no parking stand available on the apron, so the crew declared an urgency due to low fuel (PAN-PAN) and ATC cleared them to land on runway 25K (ILS Cat. III), which they did normally.

The investigation revealed that while the aircraft was circling, the approach controller repeatedly asked the control tower to change the runway configuration, but to no avail. It also revealed that after the aircraft declared an urgency condition, the tower proceeded to change the configuration, authorizing the landing on runway 25L. The report also detailed how the captain had anticipated adverse visibility conditions at the destination and ordered additional fuel to be loaded in excess of the minimum.

CIAIAC issued five recommendations with its report (REC 10/13 - REC 14/13) to Aena Navigation involving the operating procedures for reduced visibility, the communications procedures and enhanced controller training.

The positive factors in this incident were:

	1. PRE-FLIGHT PREPARATIONS AND PRECAUTIONS The captain decided to add extra fuel before the flight due to the fog that was forecast.
	2. DECISION TO GO AROUND During the final approach, the RVR again fell below that required and the crew interrupted the descent.
	3. USE OF TRAINING INSTRUCTIONS The crew declared an urgency due to insufficient fuel ("PAN PAN" call").
	4. ATC INTERVENTION/ASSISTANCE ATC changed the airport's runway configuration and cleared the aircraft to land on 25L, where the crew were able to land normally.

IN-011/2012 Incident involving two Boeing 737-8AS aircraft, registrations EI-EBA and EI-EVC, both operated by Ryanair, at the seville airport (LEZL) on 13 April 2012. Report approved on 29 April 2013.

Both aircraft were preparing to leave the parking stand to start their flights. Aircraft EI-EBA was departing for Gran Canaria and EI-EVC for Tenerife South. EI-EVC was parked at stand R11. It had finished boarding its passengers and its doors were still open. EI-EBA was cleared to taxi from stand R10, along the turning line with help from the apron coordinator on the ground, and proceed to the runway 27 threshold.

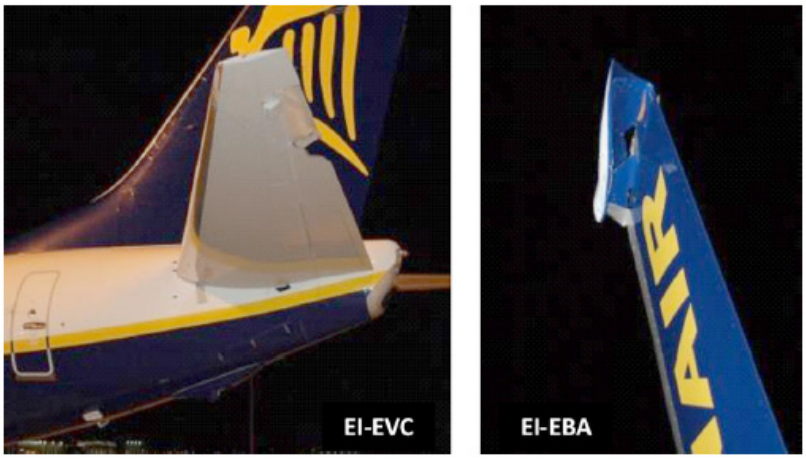

Figure 21. IN-011/2012 - Damage to the aircraft

As it turned, EI-EBA departed the turning line early and proceeded directly to the taxiway, but before it could reach it, its left winglet impacted the horizontal stabilizer and left elevator of EI-EVC. The resulting damage prevented both aircraft from continuing with their scheduled flights. There were no injuries and the aircraft were disembarked normally and transported to the airport terminal. No safety recommendations were issued.

The investigation concluded that the early deviation of EI-EBA from the turning line surprised the apron coordinator, who was unable, probably due to his inexperience, to make the correct signal to instruct the aircraft's captain to stop. This resulted in the aircraft not stopping until after the impact.

There was, however, one positive factor to note in this incident:

1. DECISION TO REJECT TAKEOFF
The crews decided not to continue with their scheduled flights and repair the aircraft.

IN-014/2012 Incident involving a Piper PA-28-161 "Warrior" aircraft, registration EC-IOT, operated by Flight Training Europe (FTE), at the Jerez airport (Cádiz) on 8 May 2012. Report approved on 28 February 2013.

A student was preparing to do a solo training flight. According to his statement, he started the aircraft after doing the fuel priming sequence three times without noting any anomalies, then he headed to an area of the apron to conduct the engine test. During said test the student closed down on the throttle to check the engine idle, in conformance with the "Check idle" item on the corresponding checklist. While he was doing this, the engine made a strong sound, it stopped and flames started to issue from the engine cover.

The student called the school's operations department and performed the checks in the associated engine fire checklist. In the meantime, flames started coming out of the engine cover. An instructor in another aircraft rushed over with an extinguisher he took from another aircraft parked in the vicinity. By the time he arrived, the student had exited the aircraft and the instructor discharged the extinguisher to put out the fire.

Figure 22. IN-014/2012 - View of the aircraft after it was taken to the hangar

Once the fire was out, the instructor entered the cockpit and secured the aircraft, placing the master switch in OFF. According to his statement, there was smoke inside and he decided to take the other extinguisher. On exiting the aircraft, the instructor gave the extinguisher to the maintenance mechanic who had just arrived, who discharged it on the reflashing fire. The student was not injured and the damage to the aircraft was confined to the engine and its cover.

The investigation revealed that adding the fuel priming sequence to the checklists originated in a school in Scotland, where the lists had been revised due to the cold temperatures there, which impeded a normal engine start-up if the the engine was not primed beforehand. These lists had not been adapted to the temperatures in Spain. The incident was deemed to have occurred due to excessive priming of the engine, which caused the excess fuel to contact a hot surface, flashing the fire. No safety recommendations were issued since the operator

revised the priming procedure in the expanded checklists to conform to the manufacturer's recommendations.

The positive factors that minimized the potential consequences of this incident were:

	1. LOGICAL PROBLEM SOLVING The student called the operations department as soon as he noticed the smoke.
	2. USE OF TRAINING INSTRUCTIONS The student carried out the engine fire procedure (except for one step).

A-017/2012 Accident involving a Menestrel-II aircraft, registration EC-YSF, at the "La Axarquía-Leoni Benabú" velodrome in Vélez (Málaga) on 25 May 2012. Report approved on 26 June 2013.

The amateur-built Menestrel II aircraft fell to the ground from an altitude of about 20 to 30 meters a few seconds after takeoff. According to the pilot's statement, at some point during the takeoff run, he "collapsed" and was rendered unconscious. At the start of the climb the aircraft had a high pitch angle, which remained practically constant until the aircraft rolled sharply to the left, which caused the aircraft to fall.

Figure 23. A-017/2012 - View of the accident aircraft

The aircraft crashed outside the aerodrome complex and was practically destroyed. Several eyewitnesses to the accident reported quickly to the scene to aid the pilot. They also notified emergency services.

The pilot was conscious and was asking for help. After being stabilized by medical personnel, he was removed from the wreckage by the firefighters who reported to the scene.

The CIAIAC's investigation concluded that the accident was likely caused by the loss of control of the aircraft during takeoff due to the pilot's possibly losing consciousness during the takeoff run. The pilot was seriously injured in the accident. No safety recommendation was issued.

A positive factor in the pilot's survival was:

1. THIRD-PARTY INTERVENTION
Several people who witnessed the accident notified emergency services. The firefighters removed the pilot from the aircraft wreckage after he had been stabilized by medical personnel. He was later transported to a hospital in Málaga.

A-019/2012 Accident involving an Air Tractor AT802A amphibious aircraft, registration EC-KRF, while fighting a fire near the Benagéber reservoir (Valencia) on 1 June 2012. Report approved on 24 July 2013.

The amphibious aircraft EC-KRF was based at the Castellón aerodrome, and had been mobilized to help fight a fire that had broken out in the province of Valencia. While taking on water for the second time from the Benageber reservoir, the aircraft capsized, remaining in an upside-down position. The pilot waited for the cockpit to flood and exited the aircraft under his own power. He was not injured, even though his life jacket inflated accidentally when the cord on the jacket got caught on something while he was still inside the aircraft. Once on the surface, he saw that the gear was down, which is what had caused the accident.

Figure 24. A-019/2012 - Condition of the aircraft after the accident

The investigation revealed that the landing gear had not been retracted after takeoff because the checklist had been interrupted and was not resumed. The situation was not detected and corrected during flight, and the "Gear Advisory" system was not connected due to the mistrust it causes among pilots either due to the frequency of the alarms or because it alarms too late.

Six safety recommendations were issued (REC 40/13 - REC 45/13). The first two were for the operator, Avialsa T-35, to have it create communications procedures for critical phases of flight, reinforce training and review the "Gear advisory" system calibration of the amphibious aircraft. Another was for the regional Valencian government and pertained to its coordination unit. One was for the manufacturer, Air Tractor, to improve the design so that the gear positions can be noticed by the pilot. And the last two were for the DGAC to have it carry out the regulatory changes needed in terms of improving the training of amphibious aircraft crews, and the requirement to use certified life jackets.

The following positive factor was found in this incident:

1. USE OF TRAINING INSTRUCTIONS

The pilot reacted properly, remaining calm while the cockpit flooded and then correctly carrying out all the steps needed to exit under his own power.

IN-021/2012 Incident involving an Air France Airbus A320 aircraft, registration F-GJVG, and a Ryanair Boeing B737-800 aircraft, registration EI-EBN, at the Barcelona-El Prat airport on 27 May 2012. Report approved on 26 June 2013.

Aircraft F-GJVG was taxiing on taxiway K toward runway 25L, as cleared by ATC. In the meantime, aircraft EI-EBN was making an ILS approach to runway 02, in radio contact with the Barcelona tower on the local frequency for runway 02. It was the last flight scheduled to land on this runway, since a configuration change was planned from nighttime preferred to daytime preferred.

F-GJVG was in radio contact with the Barcelona tower on the ground frequency and was cleared to proceed to the runway 25L holding point. Upon reaching the intersection of taxiway K and runway 02, the controller turned off the stop bar, since it was an temporary situation during the configuration change and he thought the runway was no longer in use. The aircraft continued taxiing, as its crew intended to cross runway 02. At that point EI-EBN was some 400 ft above the runway threshold.

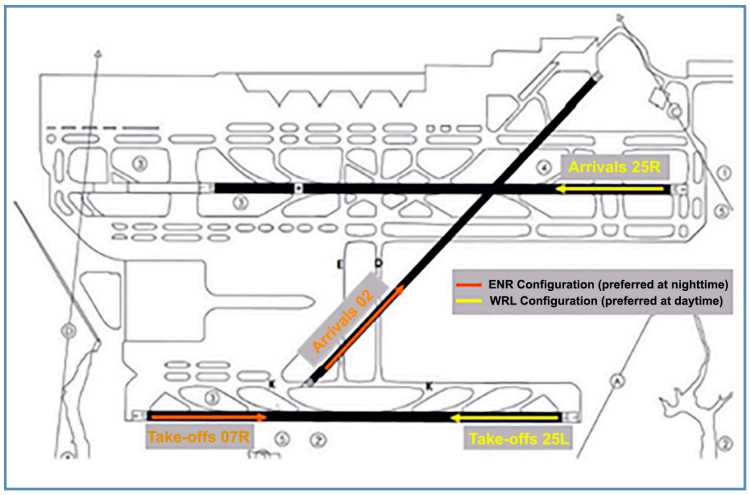

Figure 25. IN-021/2012 - ENR and WRL configurations at LEBL

When the controller noticed that the runway was occupied, he instructed EI-EBN to go around and alerted the ground controller, who instructed F-GJVG to stop. But when he saw it was already past the holding point on taxiway K7, he instructed it to continue taxiing, which it did, subsequently taking off from runway 25L. EI-EBN was cleared to make a new approach.

The investigation noted that the crew of F-GJVG were aware of the presence of EI-EBN, both because of the TCAS warning received and because they observed it directly, but they did not stop taxiing.

The incident was determined to have been caused by bad coordination between the controllers. Two recommendations were issued (REC 29/13 and REC 30/13) to AENA to have it revise its Training and Qualification Plan for the Barcelona tower in an effort to enhance the on-the-job training of controllers at every control position in the airport.

The positive factors that contributed to the favorable outcome of the incident were:

	1. THREAT IDENTIFICATION The local controller (LCL) noticed the imminent incursion and notified the ground controller.
	2. COMMUNICATIONS The local controller ordered the landing aircraft to go around.

A-023/2012 Accident involving a Sokol PZL Swidnik W-3A aircraft, registration EC-JUN, in Yátova (Valencia) on 2 July 2012. Report approved on 12 November 2014.

On Monday, 2 July 2012, a Sokol PZL Swidnik W-3A helicopter, registration EC-JUN, was involved in an accident as it was trying to land at the top of a hill so that the members of the Daroca (Zaragoza) fire brigade could place the bambi bucket in the working position.

The helicopter was taking part in fighting a fire in Cortes de Pallàs (Valencia). After reaching the area where the fire brigade was located, the helicopter circled over the planned landing zone several times at low altitude. Once established on the final segment of the landing approach, one of the two engines lost power and the crew made an emergency landing at the confluence of two rivers in a site called Callembaja, within the Yátova (Valencia) town limit, striking the terrain. Once on the ground, the crew disengaged the aircraft's systems to keep it from igniting.

The two crewmembers were seriously injured and the aircraft sustained significant damage.

The investigation determined that the cause of the accident was the improper response to an in-flight emergency caused by the loss of power to the number 1 engine following the fracture of the shaft leaving the turbine and entering the common gearbox and its subsequent impact with the ground. The final report included eight recommendations (REC 53/14 - REC 60/14). Five of them were issued to the operator, INAER, to have it consider in its Operations Manual operational aspects of flying under instruction, to have it specify the qualifications needed to be a supervising pilot and to have it provide MCC training to pilots involved in multi-crew operations. The other three were for AESA to have ensure that INAER's operations manuals contain the necessary information, that the crew receive training on procedural compliance, and that the necessary operational documentation be available onboard the aircraft.

The positive factors contained in this accident report were:

	1. THREAT IDENTIFICATION Once established on the final segment of the landing approach, the crew noticed that one of the engines lost power.
	2. DECISION TO LAND AS PRECAUTION The crew made an emergency landing.
	3. USE OF TRAINING INSTRUCTIONS The aircraft's systems were disconnected after impact.

A-024/2012 Accident involving an SMG-92 Turbo Finist aircraft, registration HA-NAH, operated by Swallow Aviation at the La Juliana (Seville) aerodrome on 1 July 2012. Report approved on 24 October 2012.

The aircraft was preparing to make its third flight of the day, a parachuting drop departing from the La Juliana aerodrome.

Figure 26. A-024/2012 - View of the aircraft

The takeoff run started at the runway 27 threshold. After reaching a speed that the pilot thought was the correct rotation speed, the pilot noticed that the aircraft was not lifting off the ground, so he decided to reject the takeoff. But while attempting to do so the aircraft exited the runway to the left, near the end of the runway, running into the perimeter fence.

Inside the aircraft were eight skydivers and two crew. There were no injuries and the aircraft was evacuated in an orderly fashion, with the pilot being the last one to exit after turning everything off.

The investigation revealed that the pilot may have forgotten to set the flaps to their takeoff position, meaning the aircraft's speed at the start of the rotation was less than required. This equated to doing a heavy takeoff on a short runway.

The positive factors in this case were:

	1. DECISION TO REJECT TAKEOFF Upon seeing the engine power was insufficient, the pilot aborted the takeoff by setting the thrust to reverse and applying the brakes.
	2. USE OF TRAINING INSTRUCTIONS The pilot evacuated the passengers and turned off all the systems before exiting the aircraft.

A-025/2012 Accident involving a Cessna 173-N aircraft, registration EC-HIK, operated by Aerotec, and a Miles Falcon Six M-3C aircraft, registration EC-ACB, operated by Fio, in the Cuatro Vientos aerodrome (Madrid) on 5 July 2012. Report approved on 26 June 2013.

While the Cessna 172N was stopped at the runway 28 holding point, doing an engine check before takeoff, the Miles Falcon Six, taxiing in from the military area, was crossing this same runway toward the holding point en route to the civil apron. The military aircraft, due to its very limited forward visibility, did not see the Cessna and impacted it first with its right wingtip, hitting the Cessna's right strut, and then with the propeller, striking the Cessna's elevator.

The Cessna reported the impact on the ground frequency. A marshaller was sent to check the damage. Neither aircraft's occupant was injured, though both aircraft sustained considerable damage.

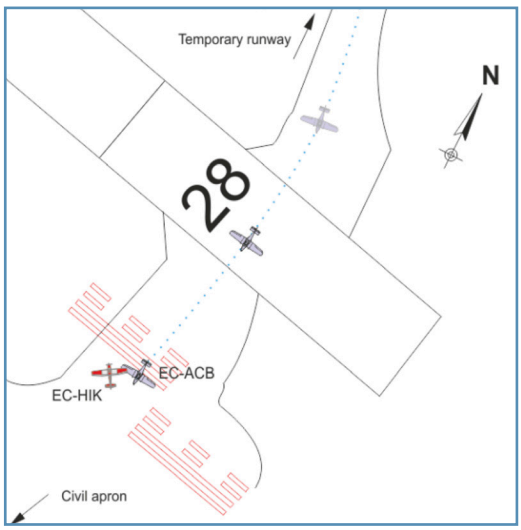

Figure 27. A-025/2012 - Diagram of the crash

The CIAIAC's investigation concluded that the factors that contributed to the accident sequence were: the reduced forward visibility typical of airplanes with a tailwheel configuration; the controller's failure to report the presence of an aircraft at the holding point and the wrong frequency selected by the pilot of the Falcon, which made it impossible to hear the controller's communications with the other aircraft and thus be aware of its presence. No safety recommendations were issued.

The positive factors in this case were:

	1. THREAT IDENTIFICATION Both pilots felt the impact and the Cessna pilot reported it to the tower controller.
	2. USE OF TRAINING INSTRUCTIONS The local controller dispatched a marshaller to check the damage and remove the aircraft from the runway.

A-026/2012 Accident involving an Ultramagic MK-10 Quad balloon, Registration EC-JKX, operated by Baló Tour S.L. in the town of Vic (Barcelona) on 1 July 2012. Report approved on 26 June 2013.

Before starting the flight, the pilot checked the weather information, held a briefing with the ten passengers, giving them safety instructions, and made all the necessary preparations. The balloon took off from a location used on other occasions by the pilot and the flight transpired normally for 40 minutes, until the wind conditions suddenly changed. At that point the pilot decided to land as quickly as possible. He gave a briefing to the passengers, giving them instructions for a hard landing with high winds and the passengers prepared for an emergency landing.

The balloon landed hard and was dragged along the ground for over 25 m before coming to a stop. Four passengers sustained injuries of varying severity, and the rest were uninjured. The balloon was not damaged, except for some slight abrasions.

Figure 28. A-026/2012 - Flightpath of the balloon

No safety recommendations were issued after the investigation into the accident.

The positive factors that minimized the consequences of this accident were:

	1. PRE-FLIGHT PREPARATIONS AND PRECAUTIONS The pilot checked the weather forecast and prepared correctly for the flight.
	2. DECISION TO LAND AS PRECAUTION The pilot decided to land when the wind conditions changed.
	3. USE OF TRAINING INSTRUCTIONS The pilot prepared the passengers for a windy landing by arranging them strategically in the basket and giving them safety instructions.

IN-028/2012 Incident involving a British Aerospace AVRO 146 Series RJ100 aircraft, registration SE-DST, while on approach to the Palma de Mallorca airport (spain) on 6 July 2012. Report approved on 27 November 2014.

On Friday, 6 July 2012, aircraft SE-DST, a British Aerospace 146, took off from the Malmoe/Sturup Airport (ESMS) in Sweden at 15:45 en route to Palma de Mallorca (LEPA) in Spain. Onboard were 101 passengers, 2 pilots and 3 flight attendants.

During the descent into the Palma de Mallorca Airport, the top display on the first officer's EFIS, the primary flight display (PFD), went blank. The first officer set the lower EFIS display, the navigation display (ND), into compact mode. Just then the first officer smelled something electrical burning. This was followed by the presence of smoke. They turned off the first officer's EFIS and donned their oxygen masks. They declared an emergency and were given landing priority. All activity on the runway parallel to the one on which the BAe was going to land was stopped. Over the course of the descent, the smoke cleared and the crew removed their masks. Neither the smoke nor the odor affected the passenger cabin.

The landing was uneventful and the flight crew, regarding the emergency as over, decided not to do an emergency evacuation and to continue taxiing to the parking stand, where the passengers disembarked normally. There were no injuries.

The CIAIAC declared the probable cause of this incident as the presence of water in the first officer's PFD unit resulting from an improperly positioned insulation panel, which caused water to condense and drip on the unit.

The positive factors involved in this incident were:

	1. THREAT IDENTIFICATION The copilot noticed that his PFD went blank, and when he put the ND in compact mode, he smelled smoke, which he later saw.
	2. USE OF TRAINING INSTRUCTIONS The crew disconnected the first officer's EFIS, donned their oxygen masks, focused on flying the airplane and declared an emergency, requesting priority.
	3. INAIR TRAFFIC INTREVENTION/ASSISTANCE ATC gave priority to the aircraft and stopped all activity on the runway parallel to the one on which the aircraft was going to land.

IN-031/2012 Incident involving a CESSNA 177RG aircraft, registration D-EEDM, at the Almería airport (Spain) on 11 August 2012. Report approved on 27 January 2014.

The aircraft, owned by the pilot flying, had gone on a local flight in Catania (Island of Sicily, Italy) lasting 15 minutes, after which the aircraft's four occupants left for Almería. They were scheduled to make a refueling stop at the airport in Cagliari (Island of Sardinia, Italy). After flying for four hours, the pilot decided to make another stop at the Murcia-San Javier Airport to take on more fuel. The stop was uneventful and the pilot was cleared to take off en route to Almeria.

After being cleared to land on runway 25 at the Almeria Airport, the pilot attempted to lower the landing gear, but he did not receive confirmation in the cockpit that the main gear was locked, so he decided to go around. The tower informed him that they could see the gear down, but they could not be sure it was locked. The pilot then decided to burn fuel and to lower and lock the gear using the emergency procedure. He did not receive the gear down and locked indication in the cockpit, so he decided to make an emergency landing.

When the aircraft touched down, the main gear legs (which were not locked) gave way when the weight of the aircraft was placed on them. The aircraft came to rest on the lower rear section of the fuselage and the nose gear, which was properly locked.

The investigation revealed that the incident occurred when the main gear actuator lug broke, which severed the mechanical continuity of the extension and retraction mechanism, rendering it inoperable as it was unable to transfer the motion of the hydraulic cylinder to the rest of the system. CIAIAC issued one safety recommendation (REC 07/14) to the civil aviation authority of the United States (FAA) to have it require the replacement of the lug by the one recommended in Cessna Service Letter SE79-37.

The positive factors in this incident were:

	1. THREAT IDENTIFICATION The pilot noticed that the green gear locked light had not turned on.
	2. DECISION TO GO AROUND The pilot went around since he could not be certain of the landing gear's condition.
	3. USE OF TRAINING INSTRUCTIONS The pilot decided to burn fuel and carry out the emergency procedure for manually lowering and locking the landing gear.

A-032/2012 Accident involving a Eurocopter AS-350-B3 helicopter, registration EC-KTU, while fighting a fire in the town of Guils de Cerdanya (Girona) on 11 August 2012. Report approved on 29 April2013.

The helicopter was taking part in firefighting efforts in a ravine in the southeast of the town of Guils de Cerdanya (Girona). It was equipped with a firefighting system consisting of a belly tank to transport water and a hose with a suction pump, which hung vertically from the tank to 3.5 m below the skids.

Figure 29. A-032/2012 - Helicopter and the Simplex 310 firefighting system

One hour and forty-eight minutes into the flight, while making pass number 23 of the second flight period, the operator heard a noise, fell a shudder and then the helicopter started shaking. The pilot was able to fly for about 30 seconds and make a powered landing in the vicinity.

Once on the ground, the crewmembers (the pilot and flight operator), who were uninjured, saw that the suction pump hose was lying on the engine's exhaust gas nozzle. The suction pump was broken and there was damage to the helicopter's fuselage and to the main rotor blades.

The investigation into the accident concluded that the helicopter's instability could have occurred when the suction pump from the firefighting system got momentarily entangled in some type of physical object.

The actions taken by the aircraft's operator, TAF Helicopters S.A., to reinforce the awareness and training of its crews in an effort to have them keep the suction pump far away from the ground while flying were considered sufficient to improve flight safety during operations involving the Simplex 310 firefighting system, and thus no safety recommendations were issued.

The positive factors that played a role in this accident were:

	1. THREAT IDENTIFICATION After feeling the vibrations, the flight operator checked all the flight instruments and the engine.
	2. AIRMANSHIP OR FLIGHT SKILLS The pilot controlled the aircraft and landed safely.

IN-033/2012 Incident involving a Boeing 757-21B, registration G-LSAH, 25NM NE of the Tenerife South Airport (Spain) on 7 August 2012 Report approved on 27 November 2014.

The Boeing 757-21B, registration G-LSAH, was preparing to fly from the Tenerife South Airport (TFS) to the Leeds Bradford Airport (LBA) in the United Kingdom. Before taking off, the crew contacted maintenance personnel when a problem was identified in the aft lavatories, where it was not possible to replace the water because the drain valve was hanging from the elastic sealant material in its housing in the service panel.

After removing the detached valve, the aircraft was returned to service, though the aft lavatories remained out of service. In this condition, the airplane departed Tenerife. During the climb phase, the crew received an EICAS "CABIN ALT" alert indicating a problem with the pressurization.

The crew performed the depressurization procedure and made an emergency descent to 10,000 ft, donning their oxygen masks while declaring an urgency. Since they were unable to control the cabin pressure manually, the oxygen masks were automatically released in the passenger cabin, though some did not do so correctly, forcing the flight attendants to address the situation by using the masks in the empty seats and relocating passengers to unoccupied seats.

The crew declared an emergency and after reaching a safe altitude, entered a circling pattern to burn fuel and reduce the airplane's weight to below the maximum authorized landing weight. They then landed at TFS without further incident.

The investigation concluded that the aircraft suffered an in-flight depressurization caused by air leaking through the area of the drain valve for the aft lavatory, which was in bad condition. The analysis and associated actions urgently taken by the operator to mitigate the deficiencies identified were deemed suitable, and as a result CIAIAC did not issue any safety recommendations.

The following positive factors were identified in this incident:

	1. HARDWARE SAFETY NET While climbing through approximately FL220-FL230, an EICAS CABIN ALT warning was received.
	2. THREAT IDENTIFICATION The crew noticed the EICAS warning, which indicated a problem with the pressurization.
	3. USE OF TRAINING INSTRUCTIONS The crew carried out the depressurization procedure and declared an urgency and then an emergency.
	4. LOGICAL PROBLEM SOLVING The flight attendants relocated passengers to unoccupied seats and used the masks from empty seats to ensure that every passenger had a mask.

IN-037/2012 Incident involving a Bombardier BD-710-1A2-20 aircraft, registration EC-JIL, and a Dassault Falcon 2000 aircraft, registration CS-DNP, on approach to runway 06 at the Ibiza Airport (Spain) on 21 September 2012. Report approved on 27 February 2014.

On 21 September 2012, a Bombardier BD-700 aircraft, registration EC-JIL, was on a flight from Nice to Ibiza. At the same time, a Dassault Falcon 2000, registration CS-DNP, was flying to Ibiza from Porto.

EC-JIL, which was in contact with Ibiza Approach (APP), was receiving vector guidance to intercept the runway 06 localizer. It was on course 240°, south of the localizer, and descending to FL 080. CS-DNP was on a southeasterly course direct to the TILNO IAF on the ILS approach to runway 06, instructed by TACC Levante.

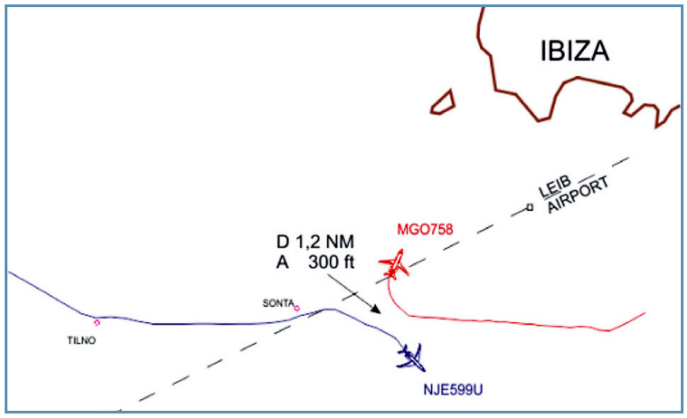

Figure 30. IN-027/2012 - Aircraft flightpaths

Later, when in contact with Ibiza APP, it was cleared to continue descending to FL 090. CS-DNP reached the TILNO IAF and after flying past it, turned left toward the localizer. Seconds later, CS-DNP requested to intercept the ILS glide slope for runway 06, and Ibiza APP instructed its crew to turn right to heading 160° and cross the localizer.

After several requests by the crew of CS-DNP to confirm the instruction to cross the localizer, Ibiza APP, after having twice instructed them to turn to course 160°, ended up instructing them to turn immediately to heading 180°. When CS-DNP started the turn, it was over the localizer on an opposite heading from EC-JIL, which had previously been cleared to turn right to heading 270°.

Both aircraft informed ATC that they had received a TCAS RA. They were able to complete their flights without further incident. Contributing to this event is the fact that the communications between Ibiza APP and EC-JIL were held in Spanish, while the rest were in English. The report included one recommendation (REC 08/14) to AESA to have it take

actions to minimize the problems detected when Spanish is used in situations involving crews with a different native language.

The positive factors that minimized the consequences of this incident were:

	1. HARDWARE SAFETY NET Both aircraft received a TCAS RA.
	2. AVOIDANCE MANEUVER Both aircraft followed the TCAS instructions.

IN-038/2012 Incident involving an Airbus 330-203 aircraft, registration EC-JQQ, and an Airbus 330-343 aircraft, registration EC-JHP, at the Madrid-Barajas Airport (Spain) on 6 October 2012. Report approved on 17 December 2014.

The Airbus A-330-203, registration EC-JQQ, operated by Air Europa and preparing to depart on a scheduled flight for Caracas, was being pushed back from the T3 parking stand on the south apron at the Madrid-Barajas airport.

The airport was in a south configuration and the Apron Control Service had relayed a conditional instruction that allowed the crew to push back and face north when it was clear of the other A-330 aircraft that would be passing behind it. A problem with the communications system prevented the captain from using the hotline to contact the flight coordinator, so visual signals were used to communicate. Upon seeing the Orbest aircraft, the apron assistant and the tractor operator stopped the pushback maneuver for the aircraft operated by Air Europa.

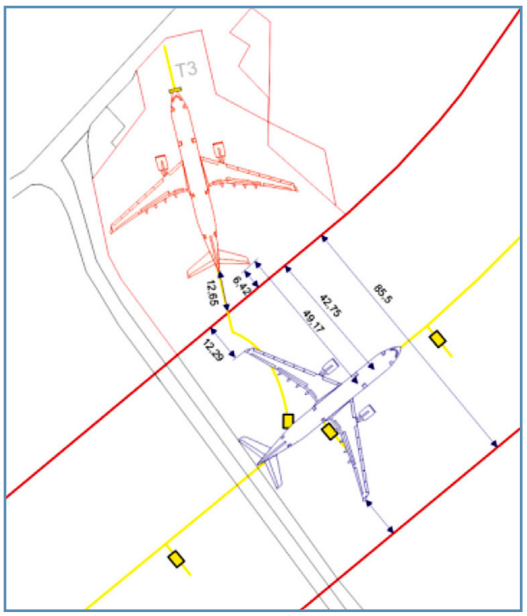

Figure 31. IN-038/2012 - Dimensions of taxiway I7 where it intersects parking stand T3

The taxiing aircraft, an Airbus A-330-343, registration EC-JHP, destination Cancun and operated by Orbest, continued to taxi on I-7 as instructed (this taxiway passes behind stands T1 to T8). While doing so, it struck the tailcone and right elevator of the Air Europa aircraft with its left winglet.

The crews of both aircraft felt the impact, and both aircraft sustained damage that grounded them until repairs could be made.

The report included five recommendations (REC 35/14, REC 49/14, REC 50/14, REC 51/14, REC 52/14), two of them for AENA to ensure that standard maneuvers and routes are used and to limit the use of conditional instructions, another for Air Europa to have it improve its communications practices, and another two for both Air Europa and Orbest, to have them establish a procedure for preserving flight recorders in their aircraft.

The positive factor found in this report was:

1. DECISION TO REJECT TAKEOFF
After assessing the damage, both aircraft were grounded until repairs could be made.

IN-040/2012 Incident involving a Cessna F152 aircraft, registration EC-DMC, and a Pilatus PC-12/47E aircraft, registration M-WINT, at the Sabadell Airport (Spain) on 11 October 2012. Report approved on 25 June 2014.

The Pilatus PC-12/47E aircraft, registration M-WINT, was on a private flight between the Denham airport in the United Kingdom and the Sabadell airport. At the same time, a CESSNA F152 aircraft, registration EC-DMC, was on a local dual-control training flight practicing takeoffs and landings, and joining the downwind leg of the traffic pattern for runway 31 for each sequence. That morning, the Sabadell control tower was going to evaluate a student controller from the Ferronats service provider.

Aircraft M-WINT had reached Terrasa and was holding over that point. The aircraft was cleared by the student controller in the tower to join the right downwind leg for the runway 31 traffic pattern. Meanwhile, aircraft EC-DMC was still performing the right circuit of runway 31. The student controller then cleared aircraft EC-DMC to execute a touch-and-go maneuver on runway 31. He later contacted the pilot of M-WINT, who informed him that he was turning onto final for runway 31, and so the student controller cleared him to continue the approach. But in fact, M-WINT was turning left and lining up with the wrong runway, RWY 13.

The instructor onboard EC-DMC clearly saw the two landing lights of an aircraft, and confirmed that it was an airplane heading toward them. He instructed the student pilot to gently turn left. The student controller, who was informed by his instructor (aiding in the evaluation) that M-WINT was heading for runway 13 instead of 31, ordered the aircraft to "break" right, but he did not include its callsign, meaning the instruction was given to another aircraft.

Finally, after the near miss, the student controller cleared M-WINT to land on runway 13, providing wind information. The final report included three recommendations (REC 32/14 - REC 34/14). Both AENA and Ferronats were recommended, when evaluating a candidate for an aerodrome visual control rating, that one member of the evaluation team monitor the radar display to look for potential conflicts. It was also recommended that Ferronats consider including in its refresher training programs aspects involving the use of standard phraseology.

The positive factors that aided in resolving the situation in this incident were:

	1.VISUAL DETECTION/ANTICIPATION The instructor onboard aircraft EC-DMC clearly saw the landing lights of the other aircraft, thus confirming that it was heading toward them.
	2.ASSISTANCE OF AN INSTRUCTOR/SUPERVISOR The instructor onboard aircraft EC-DMC instructed the student to make a gradual turn to the left.
	3.ASSISTANCE OF AN INSTRUCTOR/SUPERVISOR The ATC instructor told the student controller to instruct EC-DMC to make an evasive maneuver.

A-042/2012 Accident involving a Fairchild SA-226-TC aircraft, registration EC-JYC, operated by Zorex, at the San Javier aerodrome (Murcia) on 13 November 2012. Report approved on 25 September 2013.

The aircraft was preparing to take off en route to the Huesca airport. Onboard were the pilot and the first officer, who was the pilot flying. During the takeoff run from runway 05R, upon reaching a speed of 60 kt, the NWS (nosewheel steering) button was released (this is done at a speed when the aircraft can be steered aerodynamically using the rudder pedals), causing the aircraft to veer left. At that point the captain took control and stepped on the right pedal, but upon seeing they were departing the runway, he aborted the takeoff and actuated the reversers to brake harder. The aircraft departed the runway, coming to a stop near the intersection of the first access taxiway and the runway. The crew were not injured but the aircraft sustained significant damage.

The investigation was unable to determine the cause of the failure of the nosewheel steering system. It is thought that the wiring may not have been adequately protected beyond the insulation, and that if adverse humidity conditions were present, it could have short-circuited parts of the electrical system. The use of asymmetric reversers by the captain was crucial to preventing the airplane from veering excessively and limited the distance it traveled.

Figure 32. A-042/2012 - Tracks left by the landing gear

Two safety recommendations were issued (REC 46/13 and 47/13), the first for M7 Aerospace, the company that holds the type certificate for the aircraft, to have it issue the documentation needed to maintain the wiring of the electrical system for the NWS. The second was for the operator, Zorex, to require its crews to always report any abnormality they detect as quickly as possible, since they had noticed the imprecise operation of the NWS on previous flights and had not reported it.

The positive factors identified in this accident were:

	1. GOOD COCKPIT PRACTICES The captain quickly took control of the aircraft once it started to veer off the runway.
	2. DECISION TO REJECT TAKEOFF The pilot aborted the takeoff when he saw that he could not straighten out the nosewheel.
	3. AIRMANSHIP OR FLIGHT SKILLS The captain deployed the reversers asymmetrically, increasing the thrust on the right reverser to correct the aircraft's deviation to the left.

A-044/2012 Accident involving a Cessna 172M aircraft, registration EC-GUV, at the Casarrubios del Monte aerodrome (Toledo) on 26 December 2012. Report approved on 27 March 2014.

The Cessna 172M, registration EC-GUV, took off from runway 26 at the Casarrubios Aerodrome on a local flight with the pilot and two passengers onboard.

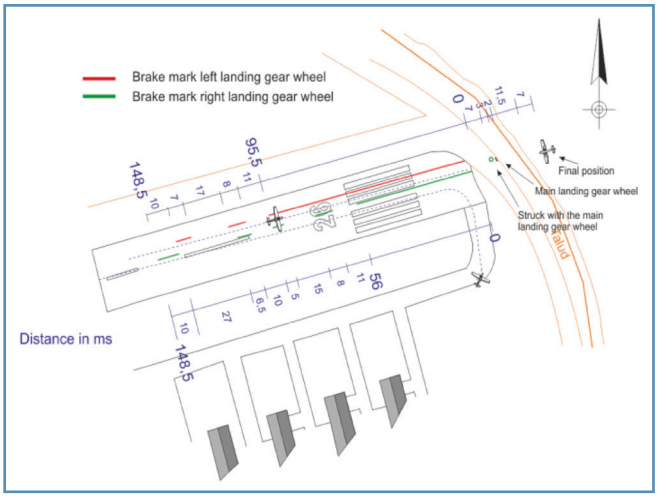

Figure 33. A-044/2012 - Skid marks left by the aircraft on the runway and location of the wreckage

After the initial climb and once established on the first downwind leg, the pilot felt the engine misfire, followed by a complete loss of engine power. He also saw smoke issuing from the engine. This caused the pilot to execute the engine failure procedure and make an emergency landing on runway 08.

The aircraft touched down on the runway some 150 m from the end of the paved area, bouncing several times. It was unable to stop within the confines of the runway and fell down an incline at the end of the runway, flipping over just before stopping.

All of the occupants exited the aircraft under their own power, one with serious injuries and the other with minor injuries. The aircraft sustained significant damage.

The reason for the emergency landing was the loss of power experienced by the aircraft. But the accident occurred because the aircraft could not be safely stopped within the limits of the runway while making an emergency landing.

CIAIAC issued three recommendations (REC 16/14, REC 17/14 and REC 18/14), one to the operator to have it revise the engine failure section of its Maneuvering Manual, another to the SINMA maintenance center to have it adapt its procedures to the specifications of the

aircraft maintenance manuals and to the materials referenced in them, and one to AESA to have it ensure that the SINMA procedures conform to the requirements of an EASA PART 145 maintenance center.

The investigation identified two positive factors:

	1. THREAT IDENTIFICATION The pilot felt the engine misfire before it stopped and saw smoke issue from the engine.
	2. USE OF TRAINING INSTRUCTIONS The pilot carried out the engine failure procedure.

IN-001/2013 Incident involving a Piper PA-34-220T aircraft, registration EC-IYV, operated by Flight Training Europe, at the Jerez Airport on 14 January 2013. Report approved on 30 May 2013.

During start-up for a flight to test the proficiency of a student pilot, the left engine had problems starting, which resulted in the battery discharging. The mechanics were asked for help, and eventually the engines were started with help from an external energy source. Before starting the flight, the aircraft successfully completed all the pre-flight checks and the engine and electrical system readings were normal.

While taxiing, it was noticed that while reducing the throttle, both the no. I VOR unit and the ADF readings were lost and that the communications display flashed, but when the throttle was increased, the systems recovered.

The pilots took off normally until they selected gear up, at which point all the displays turned off on all the navigation and communications equipment, and the engine readings fell to zero. This made them think they had a total electrical failure. They reduced the electrical load and were able to recover the instrument readings and the radio communications.

The contacted the aerodrome control tower to inform of their return, verified that the gear was still down and locked and landed with no further anomalies in the aircraft's electrical system.

The investigation and tests conducted revealed that the electrical fault had been due to excessive energy demand from the aircraft's systems. This caused a drop in voltage, which drained the power from the electromagnetic field in the alternators. The crew, which was well trained and experienced, properly identified the fault and solved it without problems, returning to the airfield and postponing their flight plan.

No safety recommendations were issued as a result of the investigation.

The positive factors in this event were:

	1. THREAT IDENTIFICATION The crew correctly identified the fault that was affecting the aircraft.
	2. USE OF TRAINING INSTRUCTIONS The crew correctly executed the procedure for a total electrical failure.
	3. DECISION TO RETURN TO DEPARTING POINT OR TO DIVERT The crew decided to return to the airport after the electrical failure.

A-003/2013 Accident involving a Piper PA-34-200T aircraft, registration EC-HUY, at the Casarrubios Aerodrome (Toledo) on 23 February 2013. Report approved on 17 November 2014.

On Saturday, 23 February 2013 at 15:45 local time, a Piper PA-34-200T aircraft, registration EC-HUY, took off from the Cuatro Vientos aerodrome (Madrid) on a local visual flight lasting one and a half hours. The crew consisted of an examiner and a pilot. The purpose of the flight was to recertify the pilot's multi-engine and instrument ratings.

After taking off, the aircraft left the aerodrome pattern via point W, shown on the visual chart for the Cuatro Vientos aerodrome, and proceeded to the Casarrubios aerodrome in Toledo.

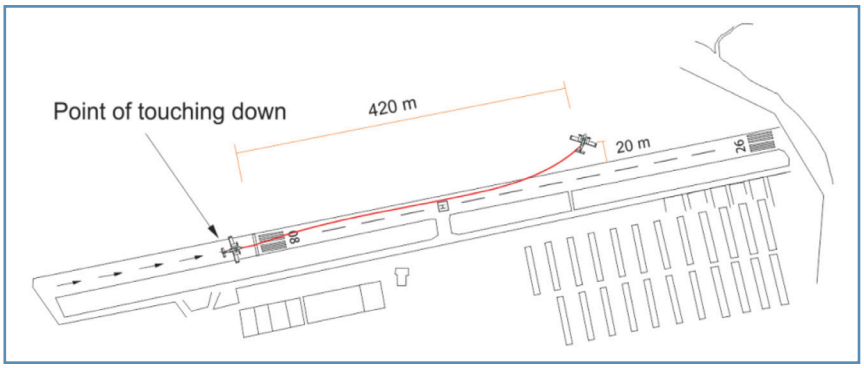

Figure 34. A-003/2013 - Trajectory of the landing run

Upon reaching the aerodrome, the crew entered the pattern for runway 26 to do some landings and takeoffs. After completing one of these maneuvers, the crew decided to land. They were aware of the presence of a crosswind, though they thought it was not strong enough to blow them off the runway. Even so, during the final leg, the pilot flying corrected for the wind by using the technique of lowering the wing on the side of the wind (known as slip).

The pilot's skill when landing led him to touch down slightly left of centerline, and the aircraft continued veering gradually to the left. Neither pilot was able to do anything to prevent this despite their inputs to the flight controls, engines and brakes.

Finally, after traveling some 450 m on the ground, the aircraft departed the runway via the left side toward the shoulder, where it stopped.

The crew were uninjured and able to exit the aircraft under their own power. The aircraft sustained a broken landing gear. Its left propeller impacted the ground and there was additional damage to the fuselage.

The positive factor that contributed to the favorable outcome of this incident was:

1. AIRMANSHIP OR FLIGHT SKILLS

During the final leg, the pilot flying corrected for the wind by using the technique of lowering the wind-side wing . The pilot's skill when landing resulted in his touching down slightly left of the runway centerline.

A-005/2013 Accident involving a Robinson R 44 II helicopter, registratioin EC-LIB, in Clariana de Cardener (Lleida) on 2 March 2013. Report approved on 30 May 2013.

The helicopter had taken off, with the pilot and two passengers onboard, from the Sabadell airport on a private flight to the town of Clariana de Cardener (Lleida). Upon starting the return flight, during the takeoff maneuver the helicopter lifted off slightly, moving both forward and to the side. This kicked up a cloud of dust, since they were in an unpaved area, which made the pilot lose his visual references and the control of the helicopter, which fell to the ground, impacting it with its left skid and turning over. The pilot leaned the mixture as soon as they went down, turned off the master switch, disconnected the battery and closed the fuel valve, as specified in the procedures.

All three occupants were unharmed and able to exit under their own power. The helicopter was heavily damaged.

Figure 35. A-005/2013 - The accident helicopter

The investigation concluded that the nose was perhaps pitched excessively down during takeoff and that the pilot was applying too much power. His use of the collective was also not too smooth in all likelihood. No safety recommendations were issued.

The following positive factor was identified in this accident:

1. USE OF TRAINING INSTRUCTIONS
Once the helicopter fell, the pilot acted in accordance with procedures and cut off all the components that could have ignited a fire and resulted in more serious consequences.

IN-009/2013 Incident involving a Boeing 737-800 aircraft, registration EI-DLE, at the Alicante Airport on 27 March 2013. Report approved on 28 May 2014.

During the take-off rotation from runway 28 at the Alicante airport, the tail section of the aircraft made contact with the runway. The captain and first officer noted that they had felt something strange and mentioned the possibility of having suffered a tailstrike, though they were unable to confirm at the time that it had in fact occurred.

During the initial climb after take-off, the purser called the captain to inform him that her colleagues in the rear of the aircraft had heard a strange noise at the end of the take-off run.

After speaking twice with the flight attendant (FA) and suspecting that the tail of the aircraft had indeed struck the asphalt, the captain decided to halt the climb at FL 220 and return to the departure airport. The crew informed ATC of its intentions and suggested that the runway be checked for any debris that may have been left by the airplane. After this message and before the runway could be checked, another aircraft was cleared to take off on the same runway, which it did so without any incident.

The airplane was cleared to commence its descent. While descending through 13,600 ft, the crew, after checking the QRH, depressurized the cabin to relieve the excess pressure from the point where the fuselage contacted the runway, which activated the cabin altitude alarm. The pilot and first officer donned their oxygen masks until they were at a safe altitude. The approach and landing were made without further incident.

A subsequent inspection revealed marks on the aft part of the fuselage that confirmed the contact with the runway, though the extent of the damage was limited enough that the airplane was dispatched without needing repair.

The positive factors that led to the successful resolution of this event were:

	1. THREAT IDENTIFICATION The captain and first officer stated that they had felt something unusual and they said that it could have been a tailstrike. The purser later informed them that her colleagues at the back of the airplane had heard a strange noise at the end of the takeoff run.
	2. DECISION TO RETURN TO DEPARTING POINT OR TO DIVERT After suspecting that the tail had in fact struck the asphalt, the captain decided to interrupt the climb and return to the airport of departure.
	3. USE OF TRAINING INSTRUCTIONS The crew reported their intentions to ATC and suggested checking the runway (though this was not done immediately).
	4. HARDWARE SAFETY NET At 13,600 ft the cabin depressurized. The cabin altitude alarm was activated and the pilot and first officer donned their oxygen masks until they reached a safe altitude.

A-016/2013 Accident involving an amateur-built Piper J-3 aircraft, registration EC-ZKS, in Torrox (Malaga) on 14 June 2013. Report approved on 25 September 2013.

The Piper J-3 aircraft took off from the La Azarquia-Leoni Benabu aerodrome normally en route to Motril to take part in the Motril (Granada) air show. A short time later, at an altitude of about 1000 ft, the pilot decided to check the aircraft's smoke system, so he turned the valve that activated it. Immediately afterwards, the aircraft's engine stopped.

Figure 36. A-016/2013 - Aerial view of the area where the aircraft landed

After attempting to start the engine without success, the pilot, seeing he was over the ocean at a low altitude, decided to make a forced landing as soon as possible. After assessing his options, he managed to make an emergency landing in a esplanade at the mouth of the Torrox River. The length of this area was limited, and the aircraft impacted a berm. Neither occupant was injured.

CIAIAC's investigation concluded that the engine stopped because the pilot inadvertently closed the fuel valve when he mistook it for the smoke valve. If the pilot had correctly carried out the engine failure procedure, he would probably have noticed that the fuel valve was closed, which would have enabled him to solve the problem.

No safety recommendations were issued.

The positive factors identified were:

	1. DECISION TO LAND AS PRECAUTION After attempting to start the engine without success, the pilot, seeing he was over the sea at a low altitude, decided to make a forced landing as quickly as possible.
	2. DECISION TO LAND ON AN UNEXPECTED RUNWAY The pilot decided to land at the mouth of the river after weighing his other options. Both the area chosen and the landing maneuver are deemed to have been correct.
	3. AIRMANSHIP OR FLIGHT SKILLS The pilot landed on a short field after clearing several obstacles.

A-018/2013 Accident involving an Agusta AW 119 MK II aircraft, registration EC-LFL, in the municipality of Quer (Guadalajara) on 6 July 2013. Report approved on 27 February 2014.

An AGUSTA AW 119 MK II helicopter, registration EC-LFL, was taking part in fighting a fire that had broken out in an unpopulated area located between the municipalities of Azuqueca de Henares, Quer and Alovera.

The helicopter was based in the city of Guadalajara and its mission was to transfer and support the fire crews and to drop water from a tank that was suspended from the helicopter.

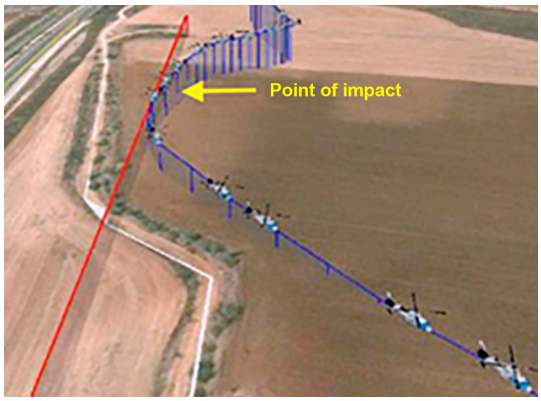

Figure 37. A-018/2013 - Final moments of the flightpath

The pilot was taking the water on from some lagoons located next to a treatment station located southeast of Azuqueca de Henares. He made the sixth drop while flying next to a high-voltage power line. After releasing the water, one of the main rotor blades struck one of the wires in the line, cutting it and seriously damaging the blade.

After the impact the pilot made a small turn to the left, controlling the yaw and landing 150 m further on. He was not injured and was able to exit the aircraft under his own power.

At the end of the investigation it was determined that the accident occurred because the pilot misjudged the distance. The pilot's description of how he handled the emergency indicates that he did in fact take the actions required when in cruise flight and the engine stops with a possible loss of blade material.

The positive factors that contributed to the favorable outcome of the incident were:

	1. THREAT IDENTIFICATION The pilot noticed that something was wrong, feeling a vibration consistent with an impact and the loss of material from a blade.
	2. USE OF TRAINING INSTRUCTIONS The pilot's description of how he handled the emergency indicates that he did in fact take the actions required when an emergency occurs in cruise flight.

A-024/2013 Accident involving an Airbus Helicopters AS-350-B3 aircraft, registration EC-KIE, in the municipality of la Puebla del Maestre (Badajoz) on 4 August 2013. Report approved on 12 November 2014.

An Airbus Helicopters AS-350-B3 aircraft, registration EC-KIE, was involved in efforts to fight a forest fire between the towns of Pallares and Llerena (Badajoz). When the pilot was informed that the fire was under control, he proceeded to stow the bambi bucket in its basket, took off and headed to the fire area to pick up the fire squad.

As he approached the fire area he received a call from the coordinator asking him to fly over a certain spot to see if the fire had reflashed. He proceeded to the specified area and saw that the fire had indeed reflashed. He reported this to the coordinator, who instructed him to drop water over the area.

He radioed the squad leader to inform him of his new orders and landed normally at a location agreed to with the squad. Three squad members proceeded to remove the bucket from the basket and laid it out in front of the helicopter. One remained next to the bucket to test the operation of the electrical opening system.

The helicopter started to bounce and the pilot decided to take off. The sharp movements gained in strength and the pilot lost control of the helicopter, which ended up turning over. He then shut off the fuel, stopped the engine and shut off the power.

The firefighters responded quickly and told him that smoke was coming out of the engine. He punched out one of the cockpit windows and gave them the extinguisher so they could discharge it on the turbine. Once the extinguisher was discharged, they opened the helicopter door and helped him exit.

Shortly afterwards they noticed that one of the firefighters had blood stains on his back that had been caused by lacerations. So they laid him face down and notified emergency services.

The pilot was not hurt and the firefighter who was underneath the helicopter was slightly injured. The investigation revealed that this accident was caused by a failure to follow the landing procedure, which contributed to destabilizing the helicopter while it was on the ground.

The positive factors identified in this accident were:

	1. USE OF TRAINING INSTRUCTIONS The pilot tried to control the aircraft but to no avail, as it ended up turned over on its right side. He then shut off the fuel and power and stopped the engine.
	2. LOGICAL PROBLEM SOLVING The firefighters responded quickly and told him that smoke was issuing from the engine. He punched out one of the cockpit windows and gave them an extinguisher so they could discharge it on the turbine.
	3. THIRD-PARTY INTERVENTION Shortly afterwards, when they were all out of the aircraft, they noticed that one of the firefighters had blood stains on his back that had been caused by lacerations. So they laid him face down and notified emergency serv.

IN-027/2013 Incident involving a Cessna 150-L aircraft, registration EC-KZP, on km 21 of Highway AP-1 (Burgos, Spain) on 21 August 2013. Report approved on 12 November 2014.

The Cessna 150-L aircraft, registration EC-KZP, took off from the Bilbao airport en route to Casarrubios del Monte. The aircraft had been fully refueled and the instructor had satisfactorily completed the pre-flight inspection and tests. The pilot flying was the student.

Approximately one hour into the flight they started having engine problems. The RPMs started to fall and recover uncontrollably, and the sound of the exhaust started to change. The instructor took control of the aircraft and checked the engine parameters, verifying that the readings were normal. He enriched the mixture and attempted different adjustments in an effort to stabilize the engine, but was unable to.

The engine did not stop at any point, but the aircraft continued to lose altitude, so they decided to divert to the Burgos airport, which they reported to the tower in Vitoria. Due to the loss of altitude, the instructor thought they would not make it to Burgos and decided to make an off-field landing. After doing so, the instructor tried to communicate with the Vitoria tower to report they were alright, but could not raise it on the radio.

He ended up telephoning the Bilbao Airport office (ARO) to report their location and condition, and to have the office inform the Vitoria tower. The Vitoria tower informed the Civil Guard, which reached the aircraft's location a few minutes later. The aircraft was not damaged and it was moved to the side of the road so as to interfere with the highway traffic as little as possible. The investigation concluded without being able to determine the cause of the loss of engine power.

The positive factors of note in this event were:

	1. THREAT IDENTIFICATION They had been flying for about one hour when the engine problems started.
	2. GOOD COCKPIT PRACTICES The instructor took control of the aircraft and checked the engine parameters to verify that the readings were normal.
	3. DECISION TO RETURN TO DEPARTING POINT OR TO DIVERT The engine did not stop at any point, but the aircraft continued to lose altitude at the rate of 400 fpm, so they decided to divert to the Burgos Airport and report this to the Vitoria tower.
	4. DECISION TO LAND ON AN UNEXPECTED RUNWAY The pilot did not find any clearings and thought their only choice was to land on the AP-1 highway. He picked a straight section with three lanes, without power lines and in the same direction of travel.
	5. LOGICAL PROBLEM SOLVING After landing, the instructor tried to communicate with the Vitoria tower to report they were alright, but could not raise it on the radio. He ended up telephoning the Bilbao Airport office (ARO) to report their location and condition, and to have the office inform the Vitoria tower.
	6. THIRD-PARTY INTERVENTION The Vitoria tower informed the Civil Guard, which reached the aircraft's location a few minutes later.

A-028/2013 Accident involving an ATR 72-202 aircraft, registration EC-GQF, 30 NM away from the Tenerife South Airport (Santa Cruz de Tenerife) on 4 August 2013. Report approved on 17 November 2014.

On Sunday, 4 August 2013, an ATR 72-202 aircraft, registration EC-GQF, operated by Naysa, suddenly fell at about 2000 ft/s while descending into the Tenerife South Airport. The aircraft was at an altitude of 8,100 ft, 30 NM away from the airport. A first officer in training was at the controls.

Following the sudden descent of the aircraft due to turbulence, the airplane's captain took the controls and disengaged the autopilot to avoid stressing the aircraft and to try to detect any anomalies.

One of the first officers went to check on the passengers and flight attendants. The two flight attendants, who were in the aisle at the time of the event, fell down and one was seriously injured.

The flight crew reported the turbulence to ATC at TFS, and requested landing priority and medical services. The airplane was able to land normally.

The investigation concluded that the accident occurred as the result of a sudden descent by the aircraft while crossing an area of clear-air turbulence that was impossible to detect.

The following positive factors are of note:

	1. GOOD COCKPIT PRACTICES The airplane's captain took the controls and disengaged the autopilot.
	2. USE OF TRAINING INSTRUCTIONS The flight crew reported the turbulence to ATC at TFS, and requested priority and medical services.

A-030/2013 Accident involving a Glaser Dirks DG-800B aircraft, registration D-KMLA, in Lles de Cerdanya (Lleida) on 13 September 2013. Report approved on 27 January 2014.

On Friday, 13 September 2013, a Glaser Dirks DG-800B, an unpowered glider with registration D-KLMA, took off from the La Cerdanya aerodrome, towed by another aircraft which released it in the vicinity of the municipality of Meranges (Girona) at an altitude of 2,100 m.

The pilot then caught several thermals and headed west, reaching the vicinity of the municipality of Lles de Cerdanya (Lleida), where he tried to find a new thermal in order to climb again. He headed for an area that he thought fulfilled the requirements, but when he reached it he realized that there was a strong downdraft.

The aircraft began to lose altitude quickly, and the pilot was forced to pitch down to maintain his speed. He quickly realized he did not have sufficient altitude to leave the valley he was in, which forced him to land in it.

Since he did not see any areas that were clear enough to land in, he opted to steer the glider toward an area with two trees. His intention was to pass between them such that the wings would impact the trees, thus helping to reduce his speed.

After hitting the trees, the aircraft fell to the ground, coming to a stop in an inverted position.

After the investigation it was determined that this accident was likely caused by the confluence of several circumstances: the aircraft's altitude was slightly lower than normal; an unexpected and strong downdraft and the geography of the valley where the aircraft was flying, which caused such a sudden loss of altitude that the pilot was unable to exit the valley.

The following positive factors contributed to the favorable outcome of the accident:

	1. ENVIRONMENT OBSERVATION The aircraft began to lose altitude quickly, and the pilot was forced to pitch down to maintain his speed. He quickly realized he did not have sufficient altitude to leave the valley he was in.
	2. USE OF TRAINING INSTRUCTIONS The pilot's reaction was correct in this situation: pitch down to regain speed, taking advantage of the glider's altitude and the downsloping terrain, while maneuvering to head to the main valley, the bottom of which is much lower, thus offering more room and altitude to continue the flight.
	3. DECISION TO LAND AS PRECAUTION The geography at the bottom of the valley did not favor completion of the maneuver started by the pilot. As a result, the pilot concluded that he had no chance to leave the valley and that he thus had to land.

A-031/2013 Accident involving an Ultramagic T210 N/S 210/35 aircraft, registration EC-JVU, in Segovia (city limits) on 14 September 2013. Report approved on 12 November 2014.

On Saturday, 14 September 2013, an ULTRAMAGIC T210 aerostatic balloon, registration EC-JVU, took off from a field in the vicinity of Segovia to go on a sightseeing flight over the city of Segovia.

After flying over the city center on an ESE heading, the wind practically stopped. The pilot tried to land, but he noticed there were high power lines in the area so he aborted the landing and climbed once more. When he descended again, the wind reversed, taking them back toward the city center. The pilot ruled out the option of flying over the city again since he thought they did not have enough fuel (about 20 kg of propane gas) and they were going too slowly.

So before entering the city, the pilot decided to land in an open field inside the fairgrounds. On the final descent he had to avoid a street lamp, which conditioned the descent maneuver, forcing him to descent rapidly to conform to the dimensions of the landing zone. This fast descent speed resulted in a hard landing that seriously injured one passenger (fracture of both ankles).

According to the statement of the pilot and the injured passenger, during the pre-flight briefing the occupants were told in plain language what position to assume during the landing.

The investigation concluded that the reason why this passenger was the only person to be injured is that she did not assume the position recommended for landing during the pilot's briefing, in Spanish, prior to the hard landing (the passenger did not understand Spanish). The balloon did not sustain any damage and the basket remained upright.

The positive factors that mitigated the possible effects of this accident were:

	1. DECISION TO LAND AS PRECAUTION The pilot decided to land when the wind conditions hampered the flight.
	2. USE OF TRAINING INSTRUCTIONS Before starting the flight, the pilot gave the passengers the information necessary in the event of an emergency landing. This could have avoided further injuries.
	3. DECISION TO LAND ON AN UNEXPECTED RUNWAY The pilot ruled out landing in a field near the city because the wind was taking them toward the city. He ruled out landing in another field because of power lines. He elected to land in a field before reaching an area with buildings.

IN-040/2013 Incident involving a Beechcraft 1900D aircraft, registration CS-TMU, and a Rockwell Commander aircraft, registration N111HY, at the Malaga Airport on 27 October 2013. Report approved on 12 November 2014.

On 27 October 2013 at 15:18 local time, a Beechcraft 1900D aircraft, callsign TAP1075, took off from runway 13 at the Malaga Airport (LEMG) en route to the Lisbon Airport (LPPT) under instrument rules (IFR). Onboard were a crew of two pilots and seventeen passengers.

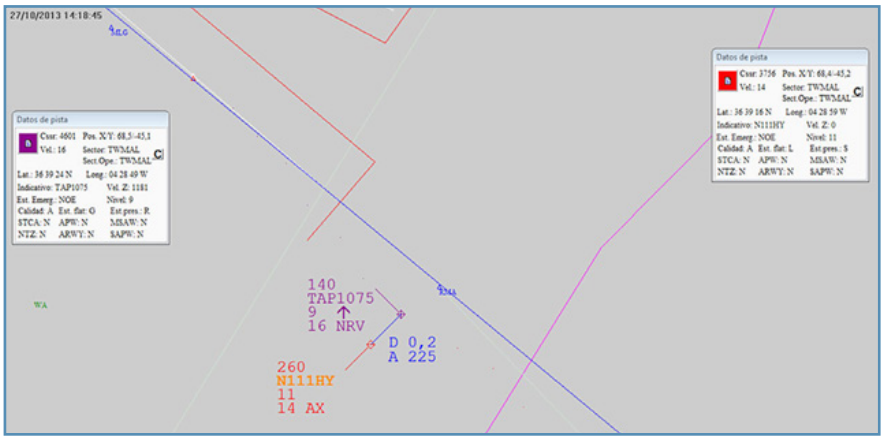

Figure 38. IN-040/2013 - Aircraft on the radar display at the instant of minimum separation

During the climb the crew informed ATC that they had received a traffic advisory when a Rockwell Commander, registration N111HY, which was on a private visual (VFR) flight along the coast, intercepted the extended centerline of runway 13 (QMS) and approached the Beechcraft.

ATC warned the private flight of its proximity to the other aircraft, after which it turned 180° to the left, the two aircraft being separated by 0.2 NM horizontally and by 225 ft vertically, with the Rockwell Commander above and to the left of the Beechcraft, which did not have to take any evasive actions and continued climbing normally.

The investigation conducted by CIAIAC concluded that the incident occurred because the controller did not instruct the pilot of the VFR flight not to cross the runway 13 extended centerline, and because the pilot did not request said clearance despite being required to do so because of his altitude.

The following positive factor is of note:

1. HARDWARE SAFETY NET

The crew of the Beechcraft 1900D received an advisory from the anti-collision system (TCAS) of a nearby traffic. They did not receive any other notifications, so they continued climbing on the standard departure route and did not have to make any evasive maneuvers.

A-002/2014 Accident involving an Ultramagic N-210 aircraft, registration EC-KVT, in Manresa (Barcelona) on 11 February 2014. Report approved on 29 October 2014.

The Ultramagic N-210 balloon, owned by Globus Grial S.L., took off on 11 February 2014 at 09:00 from the Pla de Bages aerodrome in Manresa (Barcelona) on a local sightseeing flight. Onboard were the pilot and nine passengers.

Figure 39. A-002/2014 - Map of the area

After flying for about one hour and while preparing to land south of the aerodrome, the balloon deviated from its flightpath due to an air current that forced the pilot to descend quickly in order to avoid some nearby power lines.

Before landing, the pilot gave the passengers safety instructions, as required by the company's Operations Manual. One of the passengers, however, suffered a fractured arm and had to be treated at a hospital afterwards. The aircraft was not damaged.

The figure shows the takeoff and landing sites, as well as the high-voltage line.

The investigation revealed that the likely cause of the accident was that the passenger's arm was resting on the basket when the basket contacted the ground at a speed that was higher than usual.

The positive factors in this case were:

	1. DECISION TO LAND AS PRECAUTION The pilot decided to descend quickly to avoid a nearby power line.
	2. USE OF TRAINING INSTRUCTIONS Before landing, the pilot gave the passengers safety instructions, as required by the company's Operations Manual.
	3. AIRMANSHIP OR FLIGHT SKILLS The balloon was dragged by an air current, and as a result the pilot decided to descend quickly in order to avoid a nearby power line.

IN-010/2014 Incident involving a Cessna 172-N aircraft, registration EC-HIK, in the Brunete airfield (Madrid) on 8 May 2014. Report approved on 17 November 2014.

On Thursday, 8 May 2014, a Cessna 172-N, registration EC-HIK, took off at 09:18 from the Cuatro Vientos aerodrome (Madrid) on a local training flight. Its callsign was AEP580, and onboard were two individuals, the instructor and the student pilot. The student was taking the airline transport pilot course (airplane) and was in the initial training phase with dual controls.

The purpose of the flight was do practice simulated engine failure maneuvers. After practicing for an hour and a half in various locations in the area, they decided to proceed to the Brunete airfield to practice one last scenario and return to Cuatro Vientos.

While on final approach to runway 17 with the engine at idle, the student, who was the pilot flying, thought they were too low to clear some wire they had to fly over, so he pulled back on the yoke. The aircraft lost altitude and the instructor tried to recover speed and altitude by advancing the throttle and leveling off the aircraft.

Despite the instructor's actions, the main gear struck the top of a berm located at the start of the terrain where the runway was located, destabilizing the aircraft and diverting it to the left, where it hit the airfield's perimeter fence and tore ten fence posts from the ground and the corresponding wire fence.

The aircraft stopped some 100 m past the impact point. The instructor secured the aircraft and both exited via the RH door. Neither one was injured.

CIAIAC concluded that the incident involving aircraft EC-HIK was likely caused when the aircraft stalled due to an input made to the flight controls to raise the aircraft's pitch angle without increasing the engine power while simulating an engine failure.

The following positive factor was identified:

1. GOOD COCKPIT PRACTICES
After the emergency, the instructor told the student to release the controls and increased power and leveled the airplane to gain altitude.

5. Classification / Lessons learned

In light of all the information presented in the previous section, a list of the positive factors identified in the reports on accidents and serious incidents published by CIAIAC in 2013 and 2014 has been created, with the positive factors being classified based on the party involved:

PARTY INVOLVED	POSITIVE FACTOR	REPORT
Pilot/Crew	 AVOIDANCE MANEUVER	IN-040/2010, IN-043/2011, IN-050/2011, IN-051/2011, IN-001/2012, IN-007/2012, IN-037/2012.
	 DECISION TO GO AROUND	IN-010/2010, IN-009/2012, IN-031/2012, EXT IN-007/2012
	 DECISION TO LAND AS PRECAUTION	A-035/2010, A-009/2011, IN-012/2011, IN-027/2011, IN-049/2011, IN-051/2011, A-023/2012, A-026/2012, A-016/2013, A-030/2013, A-031/2013, A-002/2014, EXT-Portugal/2011.
	 DECISION TO LAND ON AN UNEXPECTED RUNWAY	IN-012/2011, IN-049/2011, IN-027/2011, IN-035/2011, A-016/2013, IN-027/2013, A-031/2013, EXT-Portugal/2011.
	 DECISION TO REJECT TAKEOFF	A-009/2011, IN-033/2011, IN-011/2012, A-024/2012, IN-038/2012, A-042/2012.
	 DECISION TO RETURN TO DEPARTING POINT OR TO DIVERT	IN-027/2009, IN-019/2010, IN-035/2011, IN-001/2013, IN-009/2013, IN-027/2013, EXT IN-007/2012.
	 USE OF TRAINING INSTRUCTIONS / STANDARD OPERATING PROCEDURES	IN-027/2009, IN-010/2010, IN-019/2010, A-035/2010, A-008/2011, A-009/2011, IN-012/2011, IN-027/2011, IN-035/2011, IN-009/2012, IN-014/2012, A-019/2012, A-023/2012, A-024/2012, A-026/2012, IN-028/2012, IN-031/2012, IN-033/2012, A-044/2012, IN-001/2013, A-005/2013, IN-009/2013, A-018/2013, A-024/2013, A-028/2013, A-030/2013, A-031/2013, A-002/2014, EXT-Portugal/2011, EXT IN-007/2012.
	 VISUAL DETECTION / ANTICIPATION	IN-040/2010, IN-051/2011, IN-040/2012.
	 PRE-FLIGHT PREPARATIONS AND PRECAUTIONS	A-009/2011, A-037/2011, IN-009/2012, A-026/2012, EXT IN-007/2012.

PARTY INVOLVED	POSITIVE FACTOR	REPORT
Pilot/Crew	THREAT IDENTIFICATION	IN-027/2009, IN-019/2010, A-035/2010, A-008/2011, IN-027/2011, IN-033/2011, IN-035/2011, A-023/2012, A-025/2012, IN-028/2012, IN-031/2012, IN-033/2012, A-032/2012, A-044/2012, IN-001/2013, IN-009/2013, A-018/2013, IN-027/2013, EXT-Portugal/2011, EXT IN-007/2012.
	GOOD COCKPIT PRACTICES	IN-027/2011, A-042/2012, IN-027/2013, A-028/2013, IN-010/2014, EXT A-001/2012.
	AIRMANSHIP OR FLIGHT SKILLS	IN-027/2009, A-009/2011, IN-012/2011, IN-035/2011, A-032/2012, A-042/2012, A-003/2013, A-016/2013, A-002/2014, EXT-Portugal/2011, EXT IN-007/2012.
	LOGICAL PROBLEM SOLVING	IN-014/2012, IN-033/2012, A-024/2013, IN-027/2013.
	ENVIRONMENT OBSERVATION	A-030/2013.
	ASSISTANCE OF AN INSTRUCTOR OR SUPERVISOR	IN-040/2012.
Air traffic control services	AIR TRAFFIC CONTROL INTERVENTION / ASSISTANCE	IN-040/2010, A-029/2011, IN-009/2012, IN-028/2012.
	THREAT IDENTIFICATION	IN-040/2010, IN-001/2012, IN-021/2012, EXT A-001/2012.
	USE OF TRAINING INSTRUCTIONS / STANDARD OPERATING PROCEDURES	A-025/2012, IN-033/2011, EXT A-001/2012.
	ASSISTANCE OF AN INSTRUCTOR OR SUPERVISOR	IN-040/2012.
	COMMUNICATIONS	IN-001/2012, IN-021/2012.
Handling services	USE OF TRAINING INSTRUCTIONS / STANDARD OPERATING PROCEDURES	A-039/2010.
Airport services	AERODROME INTERVENTION / ASSISTANCE	IN-027/2009, IN-019/2010, EXT A-001/2012.

PARTY INVOLVED	POSITIVE FACTOR	REPORT
System onboard the aircraft or on the ground	HARDWARE SAFETY NET	IN-027/2009, IN-019/2010, IN-040/2010, A-029/2011, IN-043/2011, IN-050/2011, IN-001/2012, IN-007/2012, IN-033/2012, IN-037/2012, IN-009/2013, IN-040/2013.
Third parties	THIRD-PARTY INTERVENTION	A-017/2012, A-024/2013, IN-027/2013, EXT-Andorra/2011.

Table 1. Positive factors and related events

The lessons learned from these events are summarized below:

5.1. Avoidance maneuver

In the seven events studied, the crews avoided a conflict with other aircraft or with the ground.

On four occasions the crews followed the instructions on their TCAS, avoiding a dangerous reduction in their separation minimums, even when one of the crews involved did not follow the TCAS instructions.

On one occasion the crew reacted quickly to the warning issued by their EGPWS after going below the radar altitude minimums during an approach.

On two occasions the crews quickly obeyed ATC instructions and altered their flight parameters in reaction to the hazardous situations, either climbing faster or slowing down a descent in order to give the other aircraft time to execute a safe takeoff.

Therefore, in the event of a potential conflict with another aircraft (or the ground), the timely execution of an avoidance maneuver (whether dictated by ATC or an onboard system) will make it possible to continue safely with the operation while limiting the severity of the event to that of an incident.

5.2. Decision to go around

That positive factor is involved in four events in which going around was the right choice for various reasons, ranging from adverse weather conditions (variable intensity wind or visibility below minimums for an instrument operation) to waiting for these conditions to

improve or the failure of onboard systems (doubts about the locked status of the landing gear or malfunction of control surfaces) that require external verification or assistance before assessing whether or not a landing can be made in safe conditions on the second or subsequent landing attempt.

In these four events, the aircraft landed safely without significant personal injuries or material damage.

5.3. Decision to land as precaution

This positive factor represents the other side of deciding to go around, since the crew makes a decision to land ahead of schedule in order to avoid a worse outcome.

In this report we consider three aerostatic balloon flights and a glider flight in which suddenly changing wind conditions, including wind speeds that are either too high or too low, hamper normal flight and the pilot decides to land early after assessing the risks. Also included in this category is one pilot who decided to land early to avoid some power lines that could not be avoided in any other way. Anticipating a landing can prevent it from happening uncontrollably or with the possibility of impacting something. In some of these cases, the decision and anticipation did not prevent a hard landing, and there were injuries and structural damage in some cases, but no fatalities.

Another flight condition that is particularly suited to an early landing is an engine failure, or at least the loss of power. This condition was identified in six events, including one in which the pilot himself turned off his aircraft's only engine by mistake. Even in such an extreme circumstance involving human error or oversight, the decision to land as quickly as possible can save the life of the pilot and of any other occupants.

5.4. Decision to land on an unexpected runway

Whenever possible, once the decision is made to make an off-field landing (which will often follow the positive factor of deciding to land as a precaution), some time should be taken to prepare the landing since this could mean the difference between landing safely and having the aircraft flip, impact objects, fall down a slope and so on.

The cases considered here include six events caused by an engine malfunction in which the crew had enough time to weigh the pros and cons of different landing sites, and resulted in two landings on roads (including a toll highway), a military base, a flat crop field, a field parallel to the runway initially planned for the landing and a field at the mouth of a river.

Lastly, after a lack of wind left the pilot of an aerostatic balloon with no means to reach the desired location, he chose to land in a suburban fairground rather than go into the city proper. None of the above cases involved any fatalities and the material damage was scarce or moderate.

5.5. Decision to reject takeoff

When an aircraft is damaged prior to a flight, it will be necessary to inspect it and repair it if necessary before flying it, even if that means delaying or canceling the flight.

This lesson is exemplified in those events involving three pairs or aircraft in which some small but vital structural components (winglets, tail cones, stabilizers) were broken while taxiing or maneuvering to exit their parking stands. The crews and maintenance services took the proper action and rejected the takeoff until they were better able to determine the scope of the damage, regardless of how small it seemed.

Flight preparations should also be aborted if during the planning phase, the pilot anticipates adverse wind conditions. This is particularly relevant for balloon flights when the wind direction is entirely unsuited to the planned flight route.

Similarly, before the decision speed is reached during a takeoff run, if the pilot detects a loss of power or if the nosewheel gear is not controllable, the decision to reject the takeoff is appropriate.

In the cases considered there were no fatalities, only material damage of minor consequence.

5.6. Decision to return to departing point or to divert

This report details two problems involving the engine and one complete electrical failure that the crews decided to resolve by returning to the airport of departure before the situation turned into a real emergency. In one case with a loss of engine power and loss of altitude, the pilot decided to look for a suitable airport along the route, though the loss of altitude was so drastic that he was forced to make an off-field landing.

In another case, the crew received a gear not locked warning right after takeoff, which they resolved by immediately returning to the airport of origin. On two other occasions, a tailstrike and an abnormal vibration of the controls drove the crews to return instead of continuing with the flight.

When faced with unforeseen in-flight situations that are not easily corrected but that do not require an immediate emergency landing, the crews opted to return to the airport of departure or to divert to a closer airport in order to inspect and repair the problem on the ground.

5.7. Use of training instructions / standard operating procedures

In thirty of the events included in this report, the lesson learned is that when faced with an unusual situation, it is important to remain calm and apply established and learned procedures. If they are not, these procedures will not be as effective and can result in an undesired outcome or even complicate the situation further.

The situations that were positively evaluated in this study range from the correct application of the procedure by the pilot, allowing the recovery of the aircraft, to reporting an emergency to the airport to mobilize the necessary resources, to preparing the passengers for an emergency landing so as to avoid injuries, to powering down an aircraft after an emergency landing and avoid potential complications resulting from a fire.

Specifically, these situations were triggered by engine faults or malfunctions in ten of the cases, by changing weather conditions in three cases (all of them involving sightseeing balloon flights), by faults in some other airplane system in five cases, by a lack of fuel in two cases, by in-flight collisions in two cases, and in the rest by various situations such as depressurization, tailstrike and the loss of lift in gliders.

There are also cases that exemplify this lesson learned for controllers, such as when the controller sends marshallers to check the runway after two aircraft collide on the runway, or when they send firefighters after an aircraft is potentially damaged following a hard landing, and it is necessary to ensure that the aircraft is not leaking fluids on the runway and that the passengers can be disembarked safely.

As for handling personnel, there is one case in which, while passengers were preparing to board an airplane situated on the parking stand, another aircraft parked alongside it started its engines, the jet blast from which reached the area where the passengers were walking. The airport's handling personnel kept the passengers behind the jet blast barriers so they would not be affected by it.

5.8. Visual detection / anticipation

Beyond observing one's surroundings, visually detecting the movement of nearby aircraft raises flight safety by allowing crews to anticipate a conflict.

This lesson learned is exemplified in three events that describe how two aircraft conflict with each other within airport space. In one of them it is the controller who notices the situation and avoids it. In another it is the pilots themselves who detect the situation, and in the third it is a flight instructor who instructs his student pilot.

5.9. Pre-flight preparations and precautions

Pre-flight planning is one of the pillars of prevention since it provides a basis for a safe flight. This report details five cases that highlight this lesson.

Three of the cases underscore the importance of checking weather conditions before starting the flight. In two of these cases, the crews of aerostatic balloons were aware of the situation in the areas where they were going to fly, and in the third, the captain of the airplane decided to add extra fuel due to possible delays, since there was low visibility at the destination airport.

In two other situations the pilots had with them the proper equipment for the planned operation, thus reducing their likelihood of being injured in the event of an accident.

5.10. Threat identification

This lesson learned is very important since not every flight situation resulting in damage or injury has an alarm associated with it, and even if they did, not every aircraft has all of these systems. Furthermore, a proper interpretation is essential to apply the suitable procedure that will allow resolving the conflict.

This report includes twenty events in which the crew were able to detect and correctly interpret a malfunction or an alert in the aircraft.

Specifically, in 13 cases the crews were able to correctly identify the signs of a malfunction. Seven of these involved engine system faults associated with a loss of power, the presence of smoke, vibrations, misfiring and so on.

In four cases the crews correctly interpreted alarms for landing gear not locked, pressurization failures and fires.

In the three remaining cases an impact with the ground was detected.

Similarly, quickly detecting a fault, a threat or an unauthorized traffic in the airspace, whether visually or on radar, will allow a controller to resolve the situation in a timely manner.

Examples of this are found in two events in which the controller was able to detect crossing aircraft and alerted the aircraft involved. In a third case, the tower controller realized that a runway was occupied and instructed the approaching aircraft to go around. Another case involved an airplane that was buffeted by strong winds during an approach, causing its wingtip to strike the runway. The controller saw the wingstrike and dispatched emergency services to assist the airplane.

5.11. Good cockpit practices

Having a command hierarchy in the cockpit, where every member of the crew knows their place, is essential. Specifically, it is important to be able to delegate and manage the workload for the first officer to recognize problems during the flight and in those cases where the first officer is the pilot flying, to turn the controls over to the captain whenever the situation calls for the captain's more extensive experience.

Therefore, in emergency or unusual situations, crews must keep these factors in mind and apply them to avoid conflicts in the cockpit that worsen a situation or impede its resolution.

These good practices are also applicable to instructors and student pilots during training flights.

This report contains five examples of this lesson. In three of them, the captain took control of the aircraft due to his or her greater experience flying aircraft or handling the situation at hand, and in the other two cases, it was the instructor who took over the flying duties in order to regain control of the aircraft.

5.12. Airmanship or flight skills

If a pilot ever encounters an unforeseen obstacle or is faced with an aircraft that is difficult to control, proper training and good knowledge and control of the aircraft will allow the pilot to avoid a conflict and safely resolve the situation.

Some of the examples contained in this report in which airmanship or flight skills were key to the successful outcome of an operation involved situations in which the presence of a crosswind or high wind speeds diverted the aircraft from its flight path, in which some kind of impact with the aircraft during flight led to a loss of control, or in which unforeseen situations arose while engaged in firefighting duties that required the pilot's skills to resolve.

5.13. Logical problem solving

When an aviation professional has no clear instruction on how to proceed when faced with a complication or problem, it has been shown that taking action based on reasoning, experience and knowledge can be of great help in minimizing the consequences of the situation.

Some events that serve to showcase this lesson learned include that of a student pilot who was doing an engine test when the engine started making loud noises before stopping and giving off smoke. The student called the academy's operations department.

Another case took place during the climb phase when an alert was received indicative of a pressurization problem in the aircraft. The crew carried out the depressurization procedure and made an emergency landing, but the oxygen masks did not drop over every passenger seat, so the flight attendants relocated the passengers to unoccupied seats where the mask was working properly.

Also, during firefighting operations, the pilot of a helicopter lost control of his aircraft, which ended up turning over. After this, the firefighters told him that there was smoke pouring from the engine, so the pilot punched out the window and gave them an extinguisher so they could discharge on the engine.

Lastly, when a pilot encountered engine problems while flying from Bilbao to Casarrubios del Monte, he decided to divert to an alternate airport (Vitoria), the control tower of which he tried to contact by radio. When he did not receive a response, he called them on the phone.

5.14. Environment observation

In VFR situations in particular, being aware of one's surroundings can help the pilot to discover and resolve navigation errors as well as to identify risks and obstacles on the ground.

The crew can use this information to better evaluate their situation should any kind of setback arise.

An example of this is provided by the case of a glider that entered a part of the valley where, due to atmospheric conditions, it quickly started to lose altitude. This forced the pilot to pitch down to maintain speed. Thanks to the pilot's awareness of the environment, he realized he was not high enough to make it out of the valley. When he was unable to find a large enough clearing on which to land, he steered the glider toward an area with trees so that when he passed between them, they would reduce the glider's speed.

5.15. Assistance from an instructor or supervisor

Instructors or supervisors are responsible for properly training student pilots or controllers and for the safety of the operation. That is why they have to be mindful of the actions performed by the student, of the setting and of the actions of other aircraft that share the same airspace. They must be ready for any eventuality and guide the student to ensure the successful outcome of the operation.

One such example considered in this report involved two crossing aircraft, in which the instructor told the student controller to instruct one of the conflicting aircraft to carry out an avoidance maneuver. In another case, an instructor warned his student pilot of the presence of an aircraft flying toward them, instructing him to make a slow turn to the left to avoid the conflict.

5.16. ATC intervention / assistance

Air traffic controllers play a crucial role in preventing aviation accidents or serious incidents, notifying crews of the presence of other aircraft or of changing weather conditions. When necessary, they can even reroute air traffic to increase safety. This is evidenced by cases in which they worked to ensure the successful outcome of the operation despite the presence of another aircraft or of adverse weather conditions. This positive factor is also relevant in cases where the runway configuration is changed or when activity on a runway had to be stopped.

5.17. Communications

Radio communications allow hazards that endanger flight safety to be handled and solved, thus avoiding greater problems.

These communications, which usually take place between ATC and crews, often make all the difference between a serious incident and an accident, which is why proper communications are so important.

This report describes two events that exemplify the value of fast communications between ATC and crews. In one, the controller prevented a reduction in the flight separation minimums between two aircraft. In the other, the controller corrected a previous erroneous instruction (after an aircraft occupied a runway while another aircraft was preparing to land) by instructing the landing aircraft to go around.

5.18. Aerodrome intervention / assistance

The readiness and efficiency of firefighting and emergency personnel is essential, since on many occasions they are the first to arrive at the scene whenever an event occurs within the airport boundaries. They can minimize the consequences of an accident or serious incident and can prevent any knock-on effects.

This report contains examples of this, such as a landing with the nose gear retracted, an engine fire and a hard landing, all of which required the presence of emergency services (firefighters) to ensure that the aircraft were able to reach the parking apron and the passengers disembarked safely.

5.19. Hardware safety net

So far, the positive actions listed have all been triggered by human action; however, onboard systems and safety nets deployed on the ground alert and assist the human element to make decisions when faced with potentially dangerous situations.

One such onboard system is TCAS, which in six cases in this report alerted crews (on either one or both of the aircraft involved) about the dangerous situation resulting from the excessive proximity between the aircraft. Another such system, in this case used to warn of the proximity of the ground, is EGPWS, which in two cases described in this report warned the crews of this condition so they could take appropriate action.

Also worth noting is the assistance provided by cockpit alerts, such as gear not locked or fire warnings, which probably appear before the crew can, through their own devices, become fully aware of these conditions.

All of these cases, except for one (excessive descent rate that led to a hard landing), were classified as incidents with no major consequences.

5.20. Third-party intervention

When an event occurs beyond airport boundaries, it is the eyewitnesses who are the first on the scene to help. This assistance is extremely important since otherwise emergency services would not be notified in time.

There are four examples in this report of eyewitnesses helping pilots avoid even worse consequences. The assistance provided by these people included reporting the event to emergency services so that the injured could be treated as quickly as possible.

In one case, a control tower informed the Civil Guard of where an off-field landing may have taken place, in case the pilot was unable to report his position. The Civil Guard's help was essential to moving the aircraft off the highway.

6. Conclusions

After analyzing the 75 technical reports published by CIAIAC in 2013 and 2014, only 18 failed to reveal any positive factors. This is mainly because they involved fatal accidents in which the aircraft were destroyed. There were positive factors, however, in two accidents with fatalities.

This report highlights the ability of the parties involved to end a chain of unforeseen circumstances that if not stopped, could have given rise to a more severe event or one with greater consequences.

This report also shows that the investigations conducted by CIAIAC not only determine the causes of accidents or serious incidents, they also reveal the positive actions that were carried out and that managed to offset some of the consequences of the event. The positive actions contained in this report were taken directly from the published files; in other words, the information was already present in those reports (no new positive factors are identified that were not already noted by the investigators in charge). The added value of this new look at those reports is to classify and group the positive actions, arranging them based on the party involved, and providing the lessons learned from the events. A Positive Taxonomy offers a useful tool for promoting a culture of safety through positive actions and outcomes, and setting aside the image of failure and mistakes.

This CIAIAC document has opted for a positive attitude based on presenting practical cases, and shows that we can learn from both the unexpected and from the good decisions and successes that resolved those cases. The lessons drawn seek to promote good habits and highlight those behaviors that can put an end to these mishaps.

The analysis of the reports published in 2013-2014 identified a total of 20 different positive lessons that are sufficiently sound that they can be included in future reports, since most, except for environment observation, were present as a positive factor in more than one event, as shown in Figure 40.

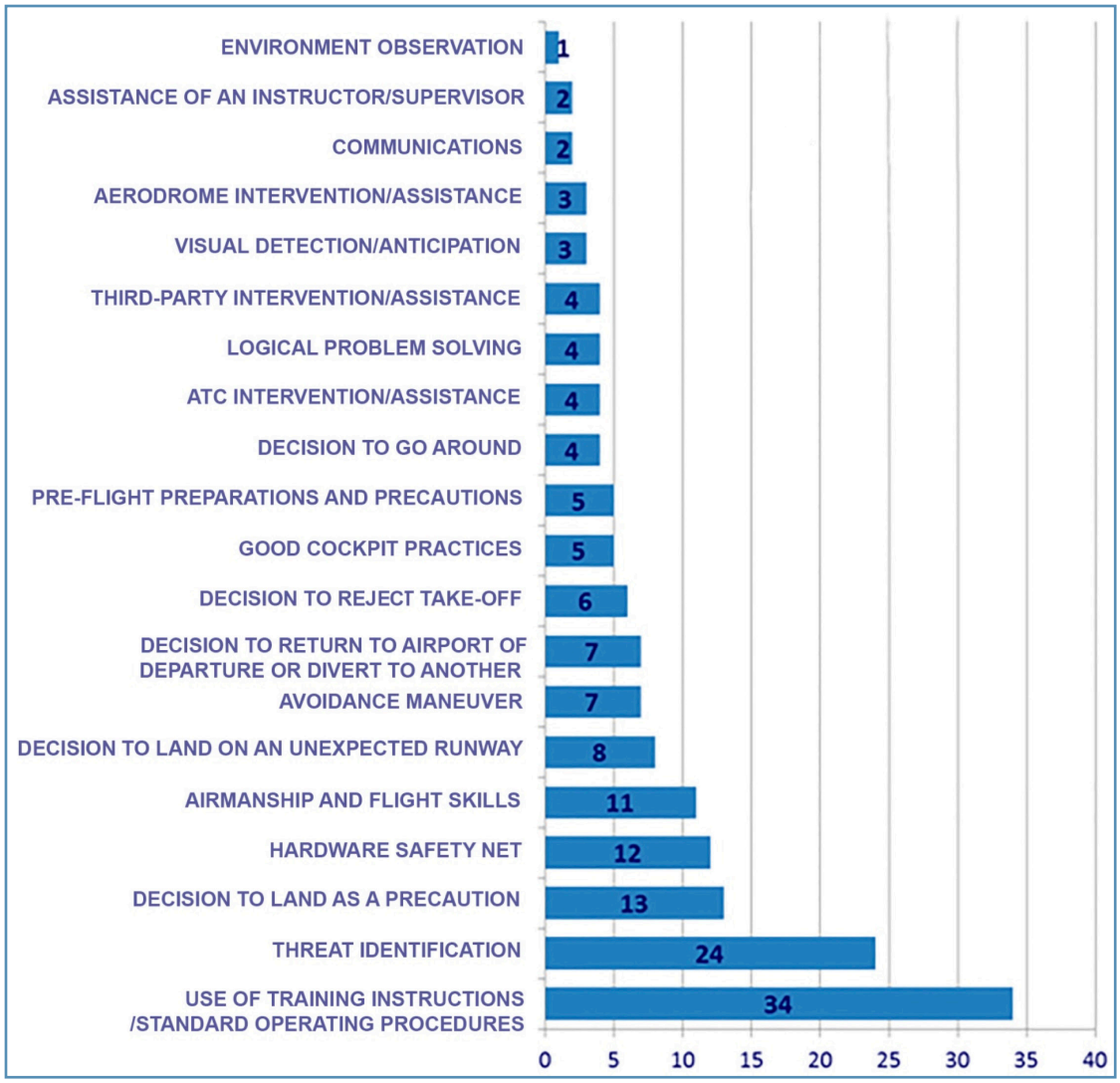

Figure 40. Number of times each positive factor helped mitigate the severity of an event

We must keep in mind, however, that in civil aviation there are three types of operations: commercial aviation, general aviation and aerial work. Each of these has its own characteristics, and as such it is to be expected that certain positive factors will occur more frequently in one type or the other.

Of the 57 reports where positive factors were found, 23 involve commercial air transport events, 19 involve general aviation and 15 aerial work. Figure 41 shows the frequency of each factor for each type of operation:

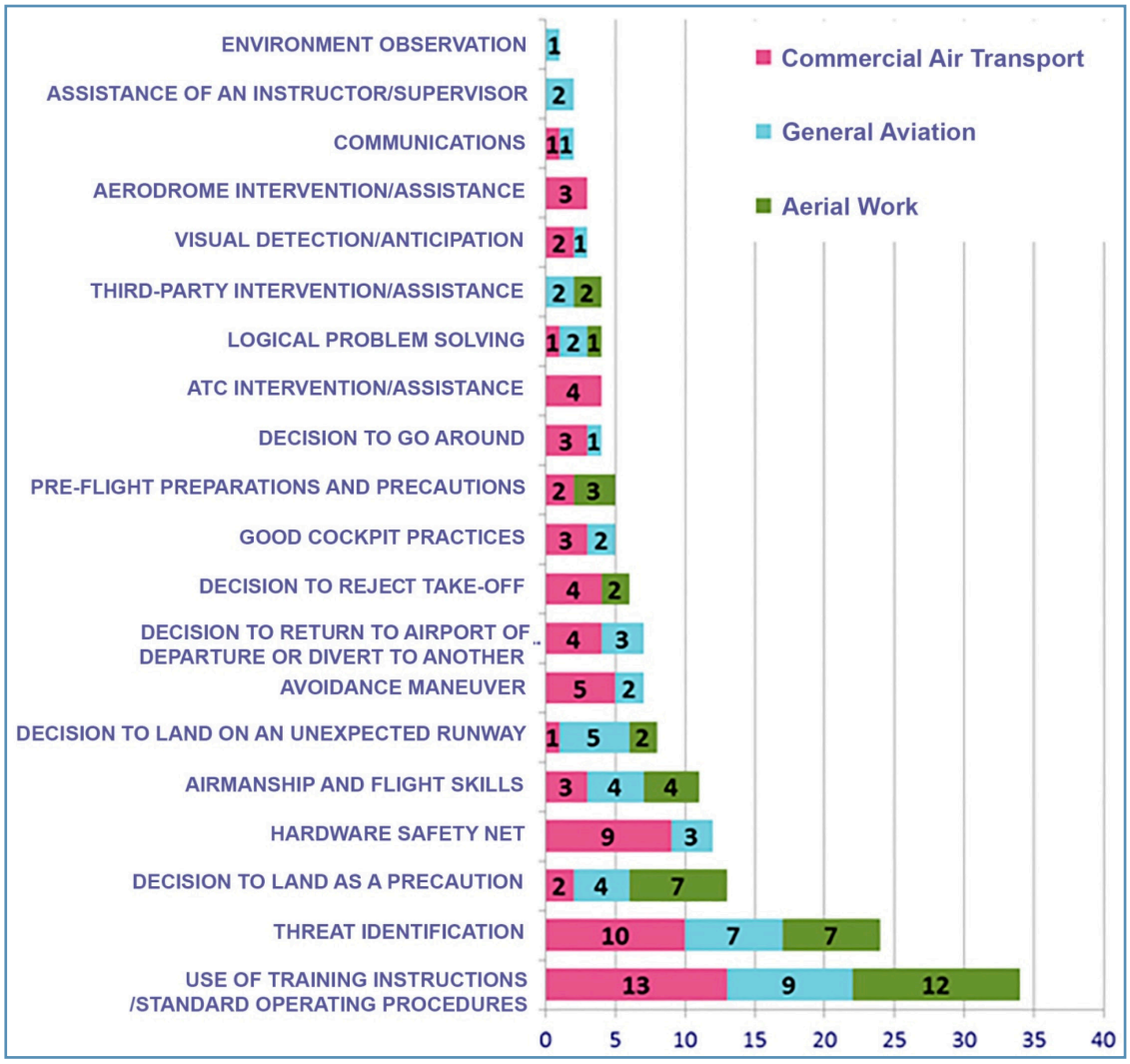

Figure 41. Positive factors classified by type of flight operation

An analysis of each operation type separately shows that:

- Approximately 50% of the reports pertaining to commercial air transport involved the positive factors "Use of training instructions" and "Threat identification".
- For general aviation, around 50% of the reports contain the same factors, "Use of training instructions" and "Threat identification".
- For aerial work, the key positive factors were Use of training instructions", "Threat identification" and "Decision to land as precaution".

Note that not all of the factors affect each operation type equally. It seems unlikely that some positive factors will appear in certain operations.

Therefore, to make it easier to interpret the above figure, Figures 42, 43 and 44 show each of these flight operations, the positive factors present in each and the frequency of their occurrence.

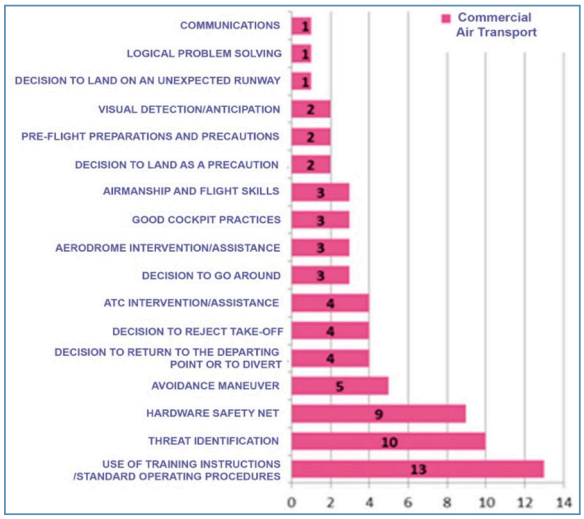

Figure 42. Positive factors associated with commercial air transport

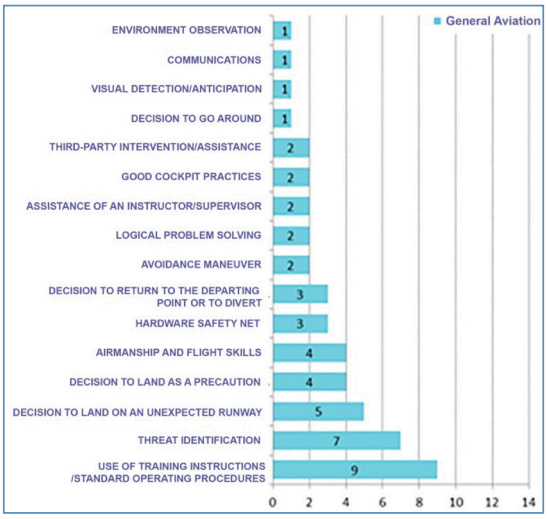

Figure 43. Positive factors associated with general aviation

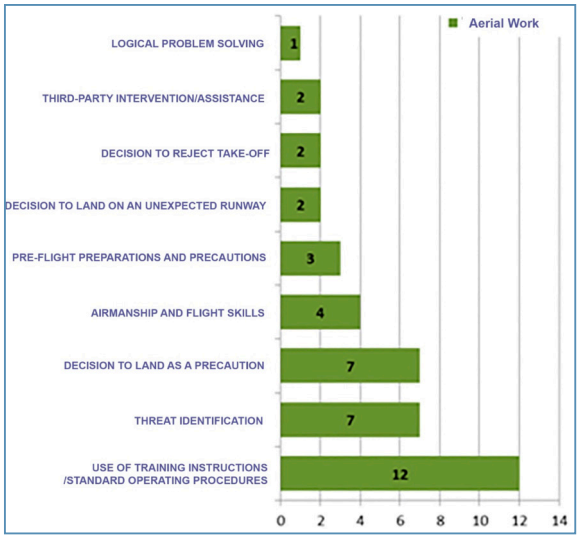

Figure 44. Positive factors associated with aerial work

To summarize, the table below shows which positive factors were involved in each operation type.

FACTOR	Commercial air transport	General aviation	Aerial work
USE OF TRAINING INSTRUCTIONS/ SOPs	✓	✓	✓
THREAT IDENTIFICATION	✓	✓	✓
COMMUNICATIONS	✓	✓	—
HARDWARE SAFETY NET	✓	✓	✓
DECISION TO LAND AS PRECAUTION	✓	✓	✓
DECISION TO LAND ON AN UNEXPECTED RUNWAY	✓	✓	✓
DECISION TO RETURN TO DEPARTING POINT OR TO DIVERT	✓	✓	—
ATC INTERVENTION / ASSISTANCE	✓	—	—
AERODROME INTERVENTION / ASSISTANCE	✓	—	—
AIRMANSHIP OR FLIGHT SKILLS	✓	✓	✓
AVOIDANCE MANEUVER	✓	✓	—
DECISION TO GO AROUND	✓	✓	—
DECISION TO REJECT TAKEOFF	✓	—	✓
PRE-FLIGHT PREPARATIONS AND PRECAUTIONS	✓	—	✓
GOOD COCKPIT PRACTICES	✓	✓	—
VISUAL DETECTION / ANTICIPATION	✓	✓	—
LOGICAL PROBLEM SOLVING	✓	✓	✓
ENVIRONMENT OBSERVATION	—	✓	—
ASSISTANCE OF AN INSTRUCTOR / SUPERVISOR	—	✓	—
THIRD-PARTY INTERVENTION	—	✓	✓

Table 2. Factors involved by type of flight

We can see from Table 2 that the following positive factors did not appear in the reports involving commercial air transport:

- Assistance of an instructor/supervisor
- Third-party intervention
- Environment observation

The factors below were not identified in reports involving general aviation:

- Decision to reject takeoff
- Pre-flight preparations and precautions
- ATC intervention/assistance
- Aerodrome intervention/assistance

Finally, the factors below were not identified in the events involving aerial work:

- ATC intervention/assistance
- Aerodrome intervention/assistance
- Decision to return to departing point or to divert
- Decision to go around
- Good cockpit practices
- Environment observation
- Visual detection/anticipation
- Communications
- Avoidance maneuver
- Assistance of an instructor/supervisor

In this regard, it may be noted that the factor "ATC Intervention/Assistance" does not appear in aerial work operations, as these operations do not usually take place in controlled airspace. Similarly, it is unlikely for the "Assistance of an instructor/supervisor" factor to appear in commercial air transport, since it would only be relevant if there were a trainee in the control tower.

There are, however, other factors that do not appear in all operation types but whose lessons could be extrapolated to them so as to improve their safety. Such is the case of "Environment observation" for aerial work or "Pre-flight preparations and precautions" for general aviation.

In conclusion, we hope that this and subsequent studies enhance the value of each of these positive factors in order to both increase the safety culture and reduce the number of civil aviation accidents.

Annex A

Use Manual

AVOIDANCE MANEUVER

Decision to carry out an avoidance maneuver on the ground or in flight after detecting another aircraft visually or on ACAS. For example, this category includes the decision to exit the taxiway to avoid another aircraft.

How it is used in this report:

- Fast decisions made by the crew to alter some flight parameter to avoid colliding with the ground, another aircraft or any object.
- Compliance with instructions received from ATC or TCAS to avoid conflicts with other aircraft.

DECISION TO GO AROUND

The pilot/controller decides to go around and land safely.

How it is used in this report:

- Regardless of the reason, the crew does not think that the landing characteristics are sufficient to ensure a safe landing and they decide to abort the operation.

DECISION TO LAND AS PRECAUTION

This factor includes decisions to land beyond the limits of the aerodrome as a precaution, with or without an emergency condition. An example would be interrupting a flight due to adverse environmental conditions.

How it is used in this report:

- Decision to make a controlled landing as a preventive measure in response to a fault in or abnormal operation of the aircraft.
- Decision to land as the best response to an external hazard, such as an unforeseen obstacle or changing weather conditions

DECISION TO LAND ON AN UNEXPECTED RUNWAY

This factor includes decisions to land on unexpected runways, such as a secondary runway, a grass runway or some other surface within the limits of the aerodrome.

How it is used in this report:

- Once the pilot decided that the safest option is to to land, he/she studies the various options available and selects the terrain best suited for the landing.

Cross references to/from other positive factors:

- The decision to land on an unexpected runway is preceded by the decision to land as a precaution or to return to the departure point or divert.

DECISION TO REJECT TAKEOFF

This factor includes decisions to reject a takeoff either before or after starting the takeoff run. It also applies to flights that are canceled, postponed or delayed for safety reasons.

How it is used in this report:

- Decision to reject the takeoff during the takeoff run due to a fault or malfunction in some aircraft system or component.
- Weather conditions.
- Decision to reject the takeoff due to material damage to the aircraft before or after the start of the takeoff run.

DECISION TO RETURN TO DEPARTING POINT OR TO DIVERT

This factor includes the decision to interrupt the planned flight (often during the initial climb) and return to the departure airport or divert to an alternate.

How it is used in this report:

- Independently of the operation type, decision to return to the aerodrome or to divert to an alternative due to a failure, damage or malfunction of the aircraft.
- In the case of commercial aviation, the decision to land as an emergency measure must take place at an aerodrome. As a result, this factor includes the decision to interrupt the flight due to a malfunction, failure or damage in the aircraft and to return to the departure aerodrome or go to an alternate.
- When it is impossible to land safely at the planned aerodrome, the decision is made to divert to another.

AERODROME INTERVENTION / ASSISTANCE

Application of the aerodrome's emergency plan. Information provided by the aerodrome's Rescue and Firefighting Service to the crew by radio, verbally or using visual signals to help the aircraft's occupants during an emergency on the ground.

How it is used in this report:

- Assistance from firefighters or any other airport emergency personnel to ensure the safety of anyone inside the aircraft or otherwise involved in the flight.
- Does not include services sent by the local controller, such as dispatching a marshaller after two aircraft impact each other on the apron.

ATC INTERVENTION / ASSISTANCE

Information from an ATS station (tower, AFIS, etc.) received via radio that increases the level of safety for the rest of the flight.

How it is used in this report:

- Intervention by ATC to rearrange traffic and increase flight safety when required by an emergency.
- Change in airport configuration to facilitate aircraft landings and informing the crews of the new conditions.
- Broadcasting messages on weather changes that can affect operations.
- Communications with aircraft under its control about the presence of unauthorized aircraft or other hazards.

ASSISTANCE OF AN INSTRUCTOR OR SUPERVISOR

The instructor or supervisor intervenes to give key information to the trainee. This may take place using radio communications when the individuals are not physically in the same place.

How it is used in this report:

- Instructions or guidance that the instructor gives to the student pilot or controller to solve a real or potential conflict and that allows the flight to continue safely.

PASSENGER INTERVENTION / ASSISTANCE

A person onboard who is not part of the crew spontaneously helps the pilot with an action or decision so that the flight can continue safely.

How it is used in this report:

- Instruction that a passenger gives to the pilot to help resolve a real or potential conflict and that allows the flight to continue safely.

THIRD-PARTY INTERVENTION / ASSISTANCE

A person outside the aircraft spontaneously helps the pilot with an action or decision so that the flight can continue safely.

How it is used in this report:

- Instruction that a person outside the aircraft gives to the pilot to help resolve a real or potential conflict and that allows the flight to continue safely

HARDWARE SAFETY NET

The activation of a notification system onboard the aircraft or on the ground alerts the flight crew or ATC personnel of a possible safety violation (e.g. TAWS or ACAS warnings in aircraft or MSAW warning for ATC).

How it is used in this report:

- Correct operation of alerts in the aircraft's warning systems or in ATC systems.
- Correct operation of the TCAS.

ACCURATE USAGE OF DOCUMENTATION

Reading, and especially interpreting the documents (such as maps or charts) helps the pilots improve their situational awareness.

How it is used in this report:

- Use in flight of documentation related to the operation and available at that moment in the aircraft.

COMMUNICATIONS

Radio messages are transmitted, with or without standard phraseology, that help break a chain of events that would probably have led to an accident.

How it is used in this report:

- Radio transmission of instructions that allow resolving a real or potential conflict.
- Transmission of messages from a crew to ATC to report a potential conflict inside the airspace.

DESIGN REQUIREMENTS

Design requirements such that the relevant part of the aviation system (aerodrome, aircraft, ATC, ground equipment, etc.) is able to work as planned, thus preventing a worse outcome.

How it is used in this report:

- Correct operation of some aviation system thanks to which the consequences of an event are lessened.

ENGINE FAILURE ANTICIPATION

The pilot takes actions to land safely in the event of an engine failure, especially during takeoff. By extension, this factor is used to include the risk of an in-flight engine failure (e.g. uncertified aircraft) or an approach with engine problems.

How it is used in this report:

- Landing safely after an engine failure without incident and without injuries.

ENVIRONMENT OBSERVATION

Observing and interpreting the surroundings (such as marks on the ground) helps operators on the front line to improve their situational awareness.

How it is used in this report:

- Analysis of the surroundings that help operators on the front line to orient themselves and make the best decision to resolve the conflict.

LOGICAL PROBLEM SOLVING

Applying empirical reasoning that is not necessarily based on an aviation context or on specific instructions. An example of this atypical thinking would be calling on the previous frequency to deal with a radiocommunications problem

How it is used in this report:

- Actions that are not part of the standard operating procedures or that are not included in training but that offer a plausible and valuable solution to mitigate the effects of the event.

USE OF TRAINING INSTRUCTIONS / STANDARD OPERATING PROCEDURES

In unusual conditions, the operator on the front line acts automatically and follows the standard operating procedures learned during initial or refresher training.

How it is used in this report:

- In unusual situations or in tense and/or stressful moments, the operator on the front line effectively uses the procedures learned in training.
- Operators on the front line may refer to crews, controllers, ground personnel, handling personnel, etc.

VISUAL DETECTION / ANTICIPATION

Scanning the environment helps the pilot avoid another aircraft, an obstacle, elevated terrain, clouds, etc.

How it is used in this report:

- Visual contact with the conflicting object during flight operations.

PRE-FLIGHT PREPARATIONS AND PRECAUTIONS

Includes checking the flight plan, weather, equipment for the planned operation, etc.

How it is used in this report:

- Checking weather conditions, using the right protection equipment for the operation, checking the aircraft and any other pre-flight action that helps verify the safety of the flight.

THREAT IDENTIFICATION

Awareness by the crew or the controller of the threats that could affect flight safety.

How it is used in this report:

- Correct interpretation of alerting systems.
- Detection of unusual performance in the aircraft or one of its systems.
- Detection of a system failing to confirm an action taken.
- Detection of an impact or strike.
- Visual detection of smoke or fire.
- Detection of an unauthorized runway or airspace incursion.

GOOD COCKPIT PRACTICES

Includes those factors that demonstrate coordination within the cockpit.

How it is used in this report:

- The person with more operating experience takes the controls even if he/she was not the pilot flying initially.

AIRMANSHIP AND FLIGHT SKILLS

Good pilot practices while flying the aircraft in non-standard situations that leads to a safe landing.

How it is used in this report:

- Landings on unexpected runways, such as small fields.
- Landings where great precision and airmanship are exhibited.
- Actions taken that aid in controlling the aircraft.
- Emergency landings with no material damage or injuries.

THIRD-PARTY INTERVENTION

Person inside or outside the aircraft who witnesses the event or is aware of it, and whose intervention is important to the survival of the crew. This intervention must never jeopardize the physical integrity of the person doing it.

How it is used in this report:

- Action carried out by someone who witnesses or is aware of the event and that voluntarily and spontaneously helps the crew to survive by notifying rescue and emergency services and/or by securing the aircraft to avoid more serious consequences.

Annex B

List of events

EVENTS	IN-027/2009	IN-010/2010	IN-019/2010	A-035/2010	A-039/2010	IN-040/2010	A-008/2011	EXT-ANDORRA/2011	EXT-PORTUGAL/2011	A-009/2011	IN-012/2011	IN-027/2011	A-029/2011	IN-033/2011	IN-035/2011	A-037/2011	IN-043/2011	IN-049/2011	IN-050/2011	IN-051/2011	IN-001/2012
USE OF TRAINING INSTRUCTIONS/ SOPs	X	X	X	X	X		X		X	X	X	X		X	X						
THREAT IDENTIFICATION	X		X	X		X	X		X			X		X	X						X
COMMUNICATIONS																					X
HARDWARE SAFETY NET	X		X			X							X				X		X		X
DECISION TO LAND AS PRECAUTION				X					X	X	X	X						X		X	
DECISION TO LAND ON AN UNEXPECTED RUNWAY									X		X	X			X			X			
DECISION TO RETURN TO DEPARTING POINT OR TO DIVERT	X		X												X						
ATC INTERVENTION / ASSISTANCE						X							X								
AERODROME INTERVENTION / ASSISTANCE	X		X																		
AIRMANSHIP OR FLIGHT SKILLS	X								X	X	X				X						
AVOIDANCE MANEUVER						X											X		X	X	X
DECISION TO GO AROUND		X																			
DECISION TO REJECT TAKEOFF										X				X							
PRE-FLIGHT PREPARATIONS AND PRECAUTIONS										X						X					
GOOD COCKPIT PRACTICES																					
VISUAL DETECTION / ANTICIPATION						X														X	
LOGICAL PROBLEM SOLVING																					
ENVIRONMENT OBSERVATION																					
ASSISTANCE OF AN INSTRUCTOR / SUPERVISOR																					
THIRD-PARTY INTERVENTION								X													

EVENTS	EXT A-001/2012	EXT IN-007/2012	IN-007/2012	IN-009/2012	IN-011/2012	IN-014/2012	A-017/2012	A-019/2012	IN-021/2012	A-023/2012	A-024/2012	A-025/2012	A-026/2012	IN-028/2012	IN-031/2012	A-032/2012	IN-033/2012	IN-037/2012	IN-038/2012	IN-040/2012
USE OF TRAINING INSTRUCTIONS/ SOPs	X	X		X		X		X		X	X	X	X	X	X		X			
THREAT IDENTIFICATION	X	X							X	X		X		X	X	X	X			
COMMUNICATIONS									X											
HARDWARE SAFETY NET			X														X	X		
DECISION TO LAND AS PRECAUTION										X			X							
DECISION TO LAND ON AN UNEXPECTED RUNWAY																				
DECISION TO RETURN TO DEPARTING POINT OR TO DIVERT		X																		
ATC INTERVENTION / ASSISTANCE				X										X						
AERODROME INTERVENTION / ASSISTANCE	X																			
AIRMANSHIP OR FLIGHT SKILLS		X														X				
AVOIDANCE MANEUVER			X															X		
DECISION TO GO AROUND		X		X											X					
DECISION TO REJECT TAKEOFF					X						X								X	
PRE-FLIGHT PREPARATIONS AND PRECAUTIONS		X		X									X							
GOOD COCKPIT PRACTICES	X																			
VISUAL DETECTION / ANTICIPATION																				X
LOGICAL PROBLEM SOLVING						X											X			
ENVIRONMENT OBSERVATION																				
ASSISTANCE OF AN INSTRUCTOR / SUPERVISOR																				X
THIRD-PARTY INTERVENTION							X													

EVENTS	A-042/2012	A-044/2012	IN-001/2013	A-003/2013	A-005/2013	IN-009/2013	A-016/2013	A-018/2013	A-024/2013	IN-027/2013	A-028/2013	A-030/2013	A-031/2013	IN-040/2013	A-002/2014	IN-010/2014
USE OF TRAINING INSTRUCTIONS/ SOPs		X	X		X	X		X	X		X	X	X		X	
THREAT IDENTIFICATION		X	X			X		X		X						
COMMUNICATIONS																
HARDWARE SAFETY NET						X								X		
DECISION TO LAND AS PRECAUTION							X					X	X		X	
DECISION TO LAND ON AN UNEXPECTED RUNWAY							X			X			X			
DECISION TO RETURN TO DEPARTING POINT OR TO DIVERT			X			X				X						
ATC INTERVENTION / ASSISTANCE																
AERODROME INTERVENTION / ASSISTANCE																
AIRMANSHIP OR FLIGHT SKILLS	X			X			X								X	
AVOIDANCE MANEUVER																
DECISION TO GO AROUND																
DECISION TO REJECT TAKEOFF	X															
PRE-FLIGHT PREPARATIONS AND PRECAUTIONS																
GOOD COCKPIT PRACTICES	X									X	X					X
VISUAL DETECTION / ANTICIPATION																
LOGICAL PROBLEM SOLVING									X	X						
ENVIRONMENT OBSERVATION												X				
ASSISTANCE OF AN INSTRUCTOR / SUPERVISOR																
THIRD-PARTY INTERVENTION									X	X						

Annex C

Definitions and abbreviations

DEFINITIONS

Below is a list and description of the terms used in this report. Included in parentheses with each definition is the regulatory source from which it was taken.

Accident

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

- a person is fatally or seriously injured as a result of: being in the aircraft, or direct contact with any part of the aircraft, including parts which have become detached from the aircraft, or direct exposure to jet blast, 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
- 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 the engine, its cowlings or accessories; or for damage limited to propellers, wing tips, antennas, tires, brakes, fairings, small dents or puncture holes in the aircraft skin; or
- the aircraft is missing or is completely inaccessible. (ICAO Annex 13, 10th Edition)

Aircraft

Any machine that can derive support in the atmosphere from the reactions of the air other than the reactions of the air against the earth's surface. (ICAO Annex 13, 10th Edition)

Causes

Actions, omissions, events, conditions, or a combination thereof, which led to the accident or incident; the identification of causes does not imply the assignment of fault or the determination of administrative, civil or criminal liability. [Regulation (EU) 996-2010]

Incident

Any occurrence associated with the use of an aircraft that is not an accident and that affects or could affect the safety of operations. (RD 398/1998)

Serious incident	Any incident involving circumstances indicating that there was a high probability of an accident. (RD 398/1998)
Investigation	Any activities undertaken for the purpose of preventing accidents and incidents. These activities include gathering and analyzing information, drafting conclusions, determining causes and, when applicable, issuing safety recommendations. (RD 398/1998)
Serious injury	An injury that is sustained by a person in an accident and which requires hospitalization for more than 48 hours, commencing within seven days from the date the injury was received, or which results in: a bone fracture (except for simple fractures of fingers, toes or nose); or lacerations that cause severe hemorrhaging or nerve, muscle or tendon damage; or injury to any internal organ; or second or third degree burns affecting more than 5% of the body surface; or verified exposure to infectious substances or harmful radiation. (RD 398/1998)
Fatal injury	Any injury sustained by a person in an accident and which results in his or her death within 30 days of the date of the accident. (RD 398/1998)
Operator	Any natural or legal person, operating or proposing to operate one or more aircraft. [Regulation (EU) 996-2010]
Event	In this document, term used to refer to an Accident or Serious Incident.
Safety recommendation	A proposal from the State's accident investigation authority, based on information derived from said safety investigation, made with the intention of preventing accidents and incidents. (RD 398/1998)

ABBREVIATIONS

A	Accident
ACAS	Airborne Collision Avoidance System
ACC	Air Control Centre
ACMI	Aircraft, Crew, Maintenance & Insurance
ADF	Automatic Direction Finder
AENA	Aeropuertos Españoles y Navegación Aérea
AESA	Spain's National Aviation Safety Agency
AFIS	Aerodrome Flight Information Service
AIS	Aeronautical Information Service
APP	Approach
APU	Auxiliary Power Unit
ARO	Airport Reporting Office
ATC	Air Traffic Control
ATIS	Automatic Terminal Information Service
ATS	Air Traffic Service
CAST	Commercial Aviation Safety Team
CIAIAC	Spain's Civil Aviation Accident and Incident Investigation Commission
CICTT	CAST/ICAO Common Taxonomy Team
DGAC	Dirección General de Aviación Civil (Spain's Civil Aviation Authority)
EASA	European Aviation Safety Agency
EFIS	Electric Flight Information System
EGPWS	Enhanced Ground Proximity Warning System

EICAS	Engine Indication and Crew Alerting System
ESE	East SouthEast
ESMS	Malmö/Sturup airport ICAO code (Sweden)
EU	European Union
FA	Flight attendant
FAA	Federal Aviation Administration (USA)
FL	Flight Level
Fpm	Feet per minute
Ft	Feet
Ft/s	Feet per second
GPS	Global Positioning System
GPWS	Ground Proximity Warning System
ICAO	International Civil Aviation Organization
IFR	Instrumental Flight Rules
ILS	Instrument Landing System
IN	Incident
Kg	Kilograms
Kt	Knots
km	Kilometers
l	Liters
LCL	Local controller
LAB	Leeds Bradford airport IATA code (United Kingdom)
LEMG	Málaga airport ICAO code (Spain)

LEPA	Palma de Mallorca airport ICAO code (Spain)
LEZL	Seville airport ICAO code (Spain)
LPPT	Lisboa airport ICAO code (Portugal)
LT	Local Time
m	Meters
MAYDAY	Emergency call
MCC	Multi-Crew Cooperation
MOE	Maintenance Organization Exposition
MSAW	Minimum Safe Altitude Warning
No.	Number
ND	Navigation Display
NE	Northeast
NM	Nautical Miles
NOTAM	Notice to Airmen
NWS	Nose Wheel Steering
PAN-PAN	Urgency call
PAPI	Precision Approach Path Indicator
PFD	Primary Flight Display
QMS	Quality Management System
QRH	Quick Reference Handbook
RA	Resolution Advisory
RD	Royal Decree
REC	Safety recommendation

RH	Right Hand
RNAV	Area Navigation
Rpm	Revolutions per minute
RVR	Runway Visual Range
RWY	Runway
SAS	Scandinavian Airlines
SACTA	Automated Air Traffic Control System
SOP's	Standard Operating Procedures
STCA	Short Term Conflict Alert
TA	Traffic Alert
TACC	Terminal Area Control Center
TAWS	Terrain Awareness and Warning System
TCAS	Traffic Alert and Collision Avoidance System
TFS	Tenerife South airport IATA code (Spain)
TMA	Terminal Control Area
TWR	Tower
UAE	United Arab Emirates
UTC	Universal Time Coordinated
VFR	Visual Flight Rules
VOR	Very High Frequency Omnidirectional Range
W	West

Annex D

List of figures

Figure 1. Reports published in 2013-2014 that identified positive factors 9
Figure 2. Positive factors classified by the type of flight operation 10
Figure 3. Diagram of the positive taxonomy employed in this report. 12
Figure 4. IN 027/2009 - Airplane landing 17
Figure 5. IN-010/2010 - Ryanair B737. 19
Figure 6. A-035/2010 - Aircraft at the crash site. 23
Figure 7. A-039/2010 - Aircraft's position and jet blast area. 25
Figure 8. IN-040/2010 - Flightpaths of EC-FAN (red) and EC-HDK (green) 27
Figure 9. A-008/2011 - Accident helicopter 29
Figure 10. EXT-ANDORRA/2011 - Helicopter 31
Figure 11. EXT-PORTUGAL/2011 - Aircraft at the landing site 33
Figure 12. A-009/2011 - Diagram of the area. 35
Figure 13. IN-033/2011 - Close-up of the B-737 winglet lodged against the APU exhaust nozzle on the A-320. 42
Figure 14. IN-035/2011 - Aircraft at the landing site. 44
Figure 15. A-037/2011 - Flight paths before the impact and positions of aircraft just before the first blade impacted 46
Figure 16. IN-043/2011 - Photograph of the aircraft 48
Figure 17. IN-050/2011 - Diagram of the approach 51
Figure 18. IN-051/2011 - Relative positions of the two aircraft. 53
Figure 19. IN-001/2012 - Near miss between PH-KBB and N217ET. 55
Figure 20. IN-007/2012 - Position of the three aircraft at the time of the TCAS warning 61
Figure 21. IN-011/2012 - Damage to the aircraft 65
Figure 22. IN-014/2012 - View of the aircraft after it was taken to the hangar. 66
Figure 23. A-017/2012 - View of the accident aircraft. 68
Figure 24. A-019/2012 - Condition of the aircraft after the accident 69
Figure 25. IN-021/2012 - ENR and WRL configurations at LEBL. 71
Figure 26. A-024/2012 - View of the aircraft 74
Figure 27. A-025/2012 - Diagram of the crash. 75
Figure 28. A-026/2012 - Flightpath of the balloon 77
Figure 29. A-032/2012 - Helicopter and the Simplex 310 firefighting system 81
Figure 30. IN-027/2012 - Aircraft flightpaths. 85
Figure 31. IN-038/2012 - Dimensions of taxiway I7 where it intersects parking stand T3.. 87
Figure 32. A-042/2012 - Tracks left by the landing gear 91
Figure 33. A-044/2012 - Skid marks left by the aircraft on the runway and location of the wreckage. 93
Figure 34. A-003/2013 - Trajectory of the landing run. 96
Figure 35. A-005/2013 - The accident helicopter 98
Figure 36. A-016/2013 - Aerial view of the area where the aircraft landed 101
Figure 37. A-018/2013 - Final moments of the flightpath 103

Figure 38. IN-040/2013 - Aircraft on the radar display at the instant of minimum separation. 113
Figure 39. A-002/2014 - Map of the area 115
Figure 40. Number of times each positive factor helped mitigate the severity of an event 131
Figure 41. Positive factors classified by type of flight operation 132
Figure 42. Positive factors associated with commercial air transport. 133
Figure 43. Positive factors associated with general aviation. 133
Figure 44. Positive factors associated with aerial work 133

Annex E

List of tables

Table 1. Positive factors and related events 118
Table 2. Factors involved by type of flight. 134

For any consultation regarding the contents of this publication please address to:

COMISIÓN DE INVESTIGACIÓN DE ACCIDENTES E INCIDENTES DE AVIACIÓN CIVIL

Tel. : +34 91 597 89 63

Fax: +34 91 463 55 35

E-mail: ciaiac@fomento. es

C/ Fruela, 6 - 28011 Madrid (España)