Report on the Design and Analysis of a Runway Excursions Database

A Research Project Conducted for the Flight Safety Foundation

by

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EXECUTIVE SUMMARY

At the request of the Flight Safety Foundation, a database was constructed to document world-wide runway excursion accidents occurring between January 1995 and March 2008. Two purposes were envisioned for the database: The first was to provide a comprehensive tool by which researchers can identify runway excursion accidents and extract those that may be useful to a particular research interest. The second was to provide a schema of contributing factors that describe runway excursions in order to follow trends and identify common causes.

The database was designed to provide a framework for tracking runway excursions and the factors that may predispose them. It is anticipated that the database will be periodically updated so that it remains a useful research tool and so that trends in runway excursion accidents can be continually monitored. This report describes the structure and scope of the runway excursions database, and it provides descriptive statistics that characterize the accidents that occurred over the subject time period.

Relevant accidents were identified using the Ascend's World Aircraft Accident Summary (WAAS). Once identified, a search was conducted for original accident reports or other informational sources that could provide additional detail on causes and circumstances. These documents were used to code reports for database entry. Runway excursions during takeoff were studied and codified separately from those that occurred during landing. Some database fields are common to both types of events, while others are unique to each type. Over the study time period, there were 113 accidents identified as takeoff excursions and 435 as landing excursions. Only accidents involving fixed-wing aircraft weighing 12,500 pounds or more were considered. Events involving military aircraft or those resulting from acts of sabotage or violence were excluded.

Takeoff runway excursions were predisposed by a number of factors. Rejecting takeoffs after V_1 was reached was the most often cited factor. Some of these resulted from pilots' perceptions that their aircraft may have suffered a catastrophic failure that would not allow safe flight. The inability to rotate was also a circumstance that led to aborts above V_1. Misloading of aircraft, takeoff performance calculation errors, or flight control anomalies could foster this condition, leading to a predictable and inevitable overrun.

The second most commonly cited factor in takeoff excursions was loss of directional control. A variety of mechanical anomalies combined with contaminated runways and crosswinds underlay these events. The typical result was a runway veer off, and in some cases the departure from the runway happened so quickly that there was no time to initiate an abort. In all, approximately 30 percent of runway excursions involved a significant mechanical issue that either initiated the accident sequence or exacerbated it.

Runway excursions during landing resulted from a wide variety of environmental factors, flight crew errors, and mechanical issues. Landing long and/or fast in the wake of an unstabilized approach was a common scenario. Accident flight crews did not conduct go-arounds when their approaches became unstabilized and in many cases, it appeared that flight crews were fixated on landing even in the face of numerous flight path deviations, improper airspeeds, and GPWS warnings. Any one of these factors alone would normally warrant a go-around, however, flight crews often appeared unwilling to even consider aborting their approach. Regardless of the cause, failing to conduct a go-around was the most often cited factor in landing excursions, and this was closely followed by landing long.

Mechanical problems were also a common cause or contributor to landing excursions. In some instances, the mechanical issue was created by flight crew errors—usually hard landings that caused landing gear to fail. In other accidents, however, the mechanical problems were unpredictable. For

instance, spontaneous collapse of the landing gear was a relatively frequent occurrence, and asymmetric forces on the aircraft due to thrust reverse or braking problems were at the root of many landing veer offs.

There were several environmental factors that were common to the majority of landing excursions. Crosswind and tailwind conditions were frequent, and a large number of landing excursions occurred with tailwinds that exceeded 10 knots. Wet or otherwise contaminated runways were also a persistent underlying thread to these accidents.

Overall, this study of runway excursion accidents suggest that there is a need for greatly improved education regarding runway excursion risk factors. The consequences of these accidents ranged from minor to fatal. Though only a few involved a large number of fatalities, the frequency of these accidents is high and this magnifies the total number of fatalities beyond those of more catastrophic but less frequent types of airplane crashes. The data indicates that changes to flight crew procedures, company policies, and regulations have the potential to greatly reduce the risk of runway excursion accidents.

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INTRODUCTION

At the request of the Flight Safety Foundation (FSF), Safety Management Specialties has compiled a database of worldwide runway excursion accidents from 1995 through March 2008. This effort was designed to support FSF's Runway Safety Initiative, of which runway excursions are a key focus, and to provide a usable data tool for documenting and analyzing runway excursion accidents into the future.

The immediate goals for this project included designing the database, identifying the runway excursion events that will populate it, coding those events for entry into the database, and providing a summary of the data for insight into the causes, consequences, and preventives associated with runway excursions. This report documents the findings of this last goal.

DEFINITIONS

A runway excursion mishap is characterized by an aircraft departing the usable surface of a runway during takeoff or landing. An excursion can occur either by overrunning the end of the runway, or by veering off the side. A runway excursion during takeoff assumes that the aircraft started its takeoff roll on the runway surface, and later departed that surface, with its wheels still on the ground. Runway excursions during landing are generally predicated on an aircraft having initially touched down on the runway surface, followed by a departure from that surface with its wheels still on the ground. Events where aircraft depart the runway while airborne are not considered runway excursions.

That an aircraft happens to depart the runway in a given event, may be merely a chance occurrence. There are many takeoff and landing accidents that share a variety of similar causes, circumstances, and consequences, but in some the aircraft happened to remain on the runway, if only by the slimmest of margins. Despite these similarities, only accidents where the aircraft departed the runway are considered in this research effort.

DATABASE DESIGN

The runway excursions database is designed to capture pertinent information about runway excursion accidents, including their contributing circumstances, their causes, and to some extent, their consequences. It is intended as a recordkeeping tool used to track runway excursions into the future. The database structure allows for basic categorizations of accident causes, and will enable researchers to search for and retrieve subsets of accidents based on descriptive information and underlying factors. The design is not intended to define or limit the various ways in which runway excursion accidents can be categorized, but rather to provide an information resource from which future research can be initiated.

DATABASE SCOPE

To be included in the database, a runway excursion event must meet several criteria. Candidate events were first identified from the World Aircraft Accident Summary (WAAS), a database of worldwide aviation mishaps that is administered by the Ascend Division of Airclaims on behalf of the UK CAA. WAAS tracks aviation accidents and it includes a brief description of the mishap circumstances compiled from available information sources. The following criteria were used to qualify a runway excursion event for inclusion in the database:

- Events dates 1995 through March 2008
- Airplanes only
- Civilian operators only (no military)
- Maximum takeoff weight 12,500 lbs. or greater
- Normal mishap circumstances (i.e., not resulting from intentional acts of violence or sabotage)
- Classification as an accident, not an incident

The last item in this list presents subjective challenges to determining whether a given event is included. In the United States, the determination that an aviation mishap constitutes an accident and whether it is investigated as such, falls under the purview of the National Transportation Safety Board (NTSB). The NTSB considers a mishap to be an accident if it involves at least substantial damage to an aircraft and/or serious or fatal injuries. A *fatal injury* is one where death ensues within 30 days of the event. *Serious injuries* are those that require a hospital stay in excess of 48 hours or those that meet specific injury criteria.[1]

Substantial damage means damage or failure which adversely affects the structural strength, performance, or flight characteristics of the aircraft, and which would normally require major repair or replacement of the affected component. However, the NTSB exempts some types of damage from this criterion. These include damage limited to a single engine; bent fairings or cowlings, dented skin, small puncture holes in the skin or fabric; damage to propeller blades resulting from ground contact; and damage to landing gear, wheels, tires, flaps, engine accessories, brakes, or wingtips.[1]

These are the general criteria that were used to assess a candidate event for inclusion in the runway excursion database. However, these criteria are not universally recognized, and there is no specific categorization of accidents versus incidents in the WAAS. The FSF now considers accidents to fall within two distinct categories: *Major damage accidents* are mishaps where the aircraft is destroyed (total loss), or where the damage is in excess of one-half the value of the aircraft were it *new* at the time of the accident. A mishap is also considered a major damage accident if it involves two or more fatalities, or the combination of one fatality and substantial damage to the aircraft. The lesser category of accidents are *substantial damage accidents.* These involve at least substantial damage to an aircraft or serious injuries (including up to one fatality).

For purposes of this research effort, mishaps were considered accidents and included in the database if they met the criteria used by NTSB, and this is generally consistent with the FSF categorizations. However, event descriptions in the WAAS are often not detailed enough to make a clear distinction between accidents versus incidents. So, absent a definitive labeling of a mishap as an incident by an investigating agency, researchers made a subjective determination with a strong tendency toward inclusion in the database versus exclusion. Events were deemed as incidents only when the loss percentage identified in the WAAS was less than ten percent of an aircraft's insurance value, and the description of that damage was clearly limited to the NTSB exemptions listed above.

DATABASE STRUCTURE

The runway excursions database is comprised of two independent parts, a module for takeoff excursions and a module for landing excursions. Each module has fields that are common to both, which des-

[1] See United States Code of Federal Regulations 49 CFR 830.

cribe basic data on each accident such as location, time, type of aircraft, etc. Each database module also includes fields that describe circumstances and behaviors that are relevant to all accidents. However, the database designs start to diverge when documenting factors that are unique to takeoffs versus landings.

In general, the database modules are constructed to record basic descriptors for each accident such as date, time, location, aircraft type and registration, and environmental conditions. Beyond these, data fields are designed to capture the causal factors, circumstantial factors, and consequences that are unique to each excursion category. Appendix 1 describes the fields and field values for the takeoff excursions module and similarly, Appendix 2 describes the structure for the landing excursions module.

CODING PROCESS

After candidate runway excursion events were identified using the WAAS, efforts were made to locate the best information source(s) for each accident. Ideally, this would be a formal report on an accident investigation conducted by an agency of the country in which the accident occurred. Often, however, such formal reports were not available because it is usually only high profile accidents that warrant detailed investigations. In the United States, for example, the NTSB investigates all aircraft accidents and publishes a factual summary and a delineation of causes. However, only accidents deemed major investigations have a complete published report associated with them, which includes a detailed technical analysis of the accident and its causation, along with conclusions and safety recommendations. An accident is classified as a major investigation if it meets certain criteria, but to some extent the determination is discretionary.

In other countries, the conduct and the level of investigation afforded any accident are largely discretionary. There may be different levels of investigation, or no investigation at all. In Canada, for example, the Transportation Safety Board (TSB) investigates accidents almost entirely at its discretion, though a database of very basic information is kept on each accident.[2] To a greater or lesser degree, the same is true in other western countries.

When a sanctioned accident investigation report or summary was found, it was used as the sole source of information for coding in the runway excursions database. When such information was not available, secondary information sources were used. These sources use information from a variety of official and/or unofficial sources. Secondary information sources include the ICAO ADREP, the FSF Aviation Safety Network, and the narrative description included in the WAAS. These resources will have a summary description of an accident that may be very terse to somewhat detailed. Often, however, the information sources used to create these summaries are not documented. Each record in the runway excursions database documents the data sources that were used in the coding process.

The database also includes a narrative synopsis of each runway excursion accident. This description may derive from any one or any combination of data sources. It is included in the database for reference only so that users can have a digestible description of each accident. However, these synopses are often incomplete, and do not necessarily contain all the information used for coding the field values.

DATA QUALITY

Users of the runway excursions database should understand that it is designed to serve two purposes, and that those can foster inherent contradictions. On the one hand, the database serves as a repos-

[2] CADORS – Canadian Aviation Daily Occurrence Reporting System

itory of retrievable information. This goal fosters a tendency for accident factors to be coded liberally so that researchers will retrieve all records relevant to their interest, even though they may have to cull out false positives. This approach is typically preferred in scientific research so that each researcher determines the relevance of a given accident to his/her research purpose. On the other hand, the database is also designed to provide basic statistical tracking of runway excursions and their underlying factors. Coding accidents for this purpose requires a uniform and consistent methodology, and as such, is potentially controversial.

Analysis of each accident was conducted by a principal investigator with extensive experience as a pilot and safety research scientist. A randomly selected ten percent of the coded accidents were independently analyzed by a second investigator with similar credentials. Verification of a ten percent random sample occurred at two junctures: First, with respect to whether an event qualified for inclusion in the database, and secondly, when the qualified accident records were coded.

There were virtually no instances of substantial differences between coders. When inconsistencies were discovered within the sample, they were usually minor omissions of factors and not significant differences in interpretation. When discovered, differences identified in the ten percent sample were resolved by consensus. Because these occurred so infrequently, it was concluded that the coding process has been substantially consistent. Assurance that data records added in the future will remain consistent will be largely enhanced by a detailed data dictionary and specific coding instructions that will accompany the database.

Though the quality and accuracy of each database record within the runway excursions database is largely consistent, to some extent the coding of accident factors is subjective. Future database users may take issue with some of the coded values for any given accident. Generally, accident factors were recorded if they were cited in the accident description, even if their validity was arguable. In some instances, however, factors were inferred by the principal investigator by interpreting events through a lens of subject matter expertise. This occurred most often when the available information on an accident did not include a determination of causes or contributing factors.

Finally, factors coded in the database were chosen in consideration of the causes and circumstances behind the runway excursion, i.e., their relevance to the fact that the aircraft actually departed the runway. However, the chain of events comprising a runway excursion begins before an aircraft actually leaves the runway, and the mere fact that the aircraft departed the runway may be weakly connected to those precipitating events. As such, some factors were cited only because they resulted in an excursion, and not because they were strongly relevant to more salient aspects of an accident. For example, in landing accidents, a frequent theme was the unexpected collapse of a main wheel resulting in a runway veer off. In these events, gear collapse was coded as a factor, but asymmetric deceleration of the wheels was also coded because that deceleration resulted in the aircraft leaving the runway. Asymmetric deceleration in this circumstance logically may be regarded as a link in a chain of *consequences*, and not necessarily a link in the chain of *causes*. However, for database coding purposes, it is regarded as a cause since it led to the aircraft leaving the runway surface.

TAKEOFF EXCURSIONS—DATA DISTRIBUTIONS

The takeoff excursions database module contains 113 accidents (see Appendix 3). Because this number is small, there are inherent limitations to drawing conclusions from the data. As the data set is categorically parsed by field values at various levels of aggregation, the subsets result in even smaller numbers and the significance of differences between these is greatly reduced and usually unknown. Dealing with small numbers greatly diminishes the ability to make quantitative comparisons, but the data can still indicate which factors may be important contributors to runway excursion accidents. Breakdowns of the takeoff excursion data follow, and should be regarded with those caveats in mind.

Geographic Distributions. With the notable exception of Australasian countries, runway excursions during takeoff occur in all parts of the world and involve operators from all regions. Figure 1 shows the distribution by geographic region of takeoff excursion occurrences and the distribution of involved operators, based on their country of origin. North America shows the greatest fraction of takeoff excursion events, as well as operators, but this may be because air traffic volume in that region is greater than in others. Drawing accurate conclusions when comparing takeoff excursions in any of the regions is difficult without a capability for calculating rates. Rate calculations require additional information on traffic activity that is not readily available.

It is interesting, however, to observe that the contribution of events and operators in Africa is second only to North America, with approximately two-thirds as many events. On the premise that flight activity in Africa is far less than in North America, one can speculate that the rate of takeoff excursions in Africa is far greater than in North America and perhaps other regions, as well.

Figure 1

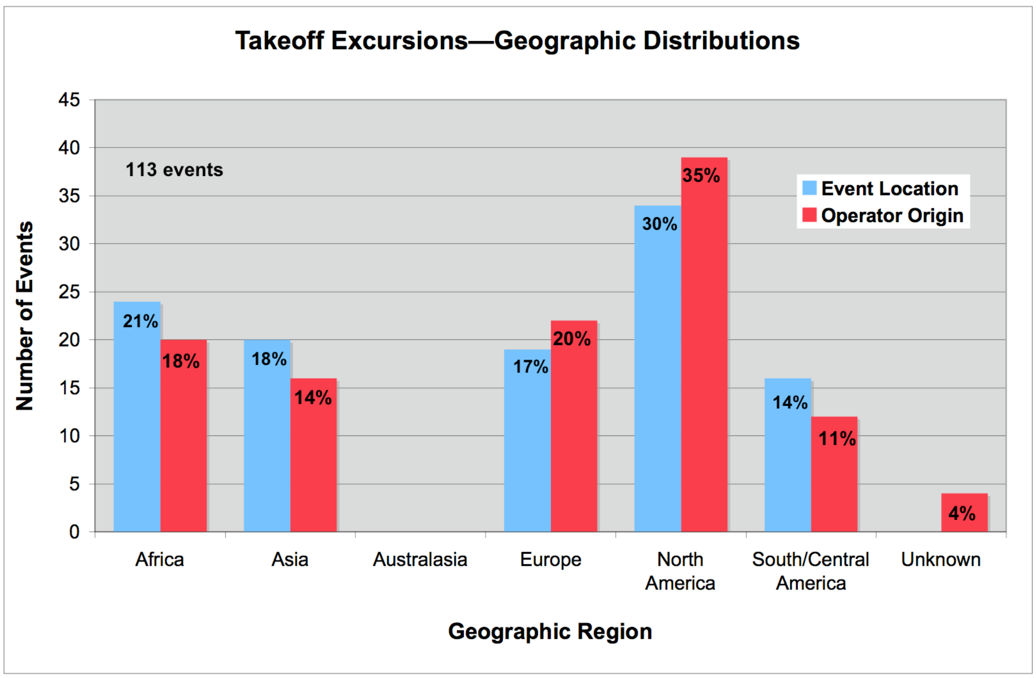
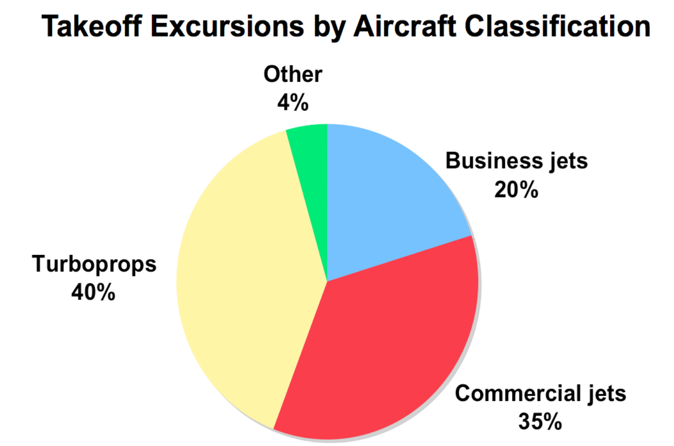


Figure 1 shows that operators' locations generally follow the distribution of takeoff excursion events. Again, this may be explained by recognizing that operators' locations generally correspond to the regions they fly to, and/or by the likelihood that the number of operators in a region has a correspondence with flight activity.

That there were no takeoff excursions in the Australasia region may be significant, but cannot be determined from these data. Making a conclusive determination would again require a comparison of accidents rates.

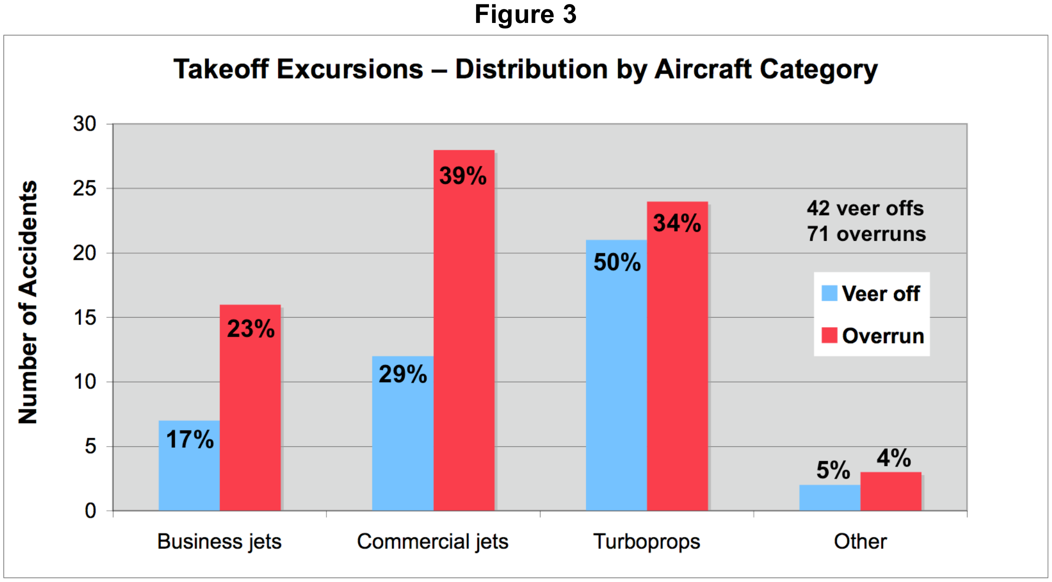
Aircraft Involvement. Of the 113 takeoff excursion events in the database, 37 percent are veer offs, and 63 percent are overruns. Takeoff excursions, especially runway overruns are often associated with rejected takeoffs, and the coded accidents reinforce this. Veer offs during takeoff occurred for a wider variety reasons involving a loss of directional control. Occasionally, however, pilots would purposely steer the aircraft off the side of the runway to avoid an overrun, especially when there were obstacles at the end of the runway. The distribution of aircraft categories involved in takeoff excursions is depicted in Figure 2, below.

Figure 2



Since the underlying mechanisms behind runway overruns are generally different than those behind runway veer offs, it is also interesting to observe the aircraft categories within these two sets. Figure 3 shows that, within the dataset, jet aircraft are more often involved in overruns versus veer offs, while the opposite is true of turboprops. The significance of this difference is unknown because of small number limitations and the absence of a valid denominator such as activity measures or fleet size. If the differences are real, however, it may be due to the generally higher takeoff speeds of jet aircraft.

Figure 3



Operator Characteristics. The database records information about the nature of the aircraft's operation at the time of the accident. Figures 4 and 5 depict these distributions, but no firm conclusions about the propensity for a takeoff excursion can be drawn. Doing so would require additional information on the fleet size or the traffic activity within each category. Qualitatively, however, it is interesting that takeoff excursions by non-scheduled operators exceed those of major carriers when it is likely that major carrier operations are far more numerous.

Figure 4

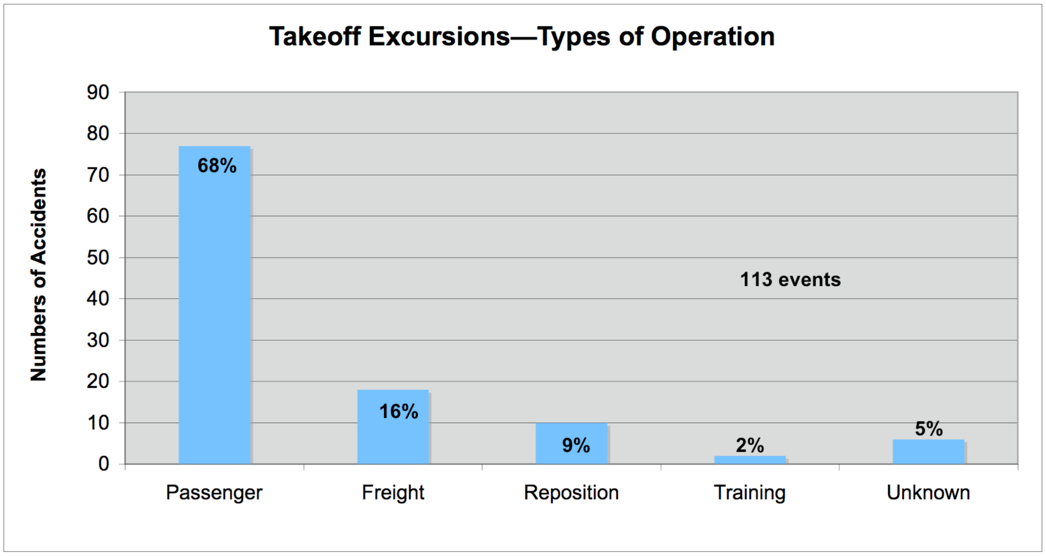
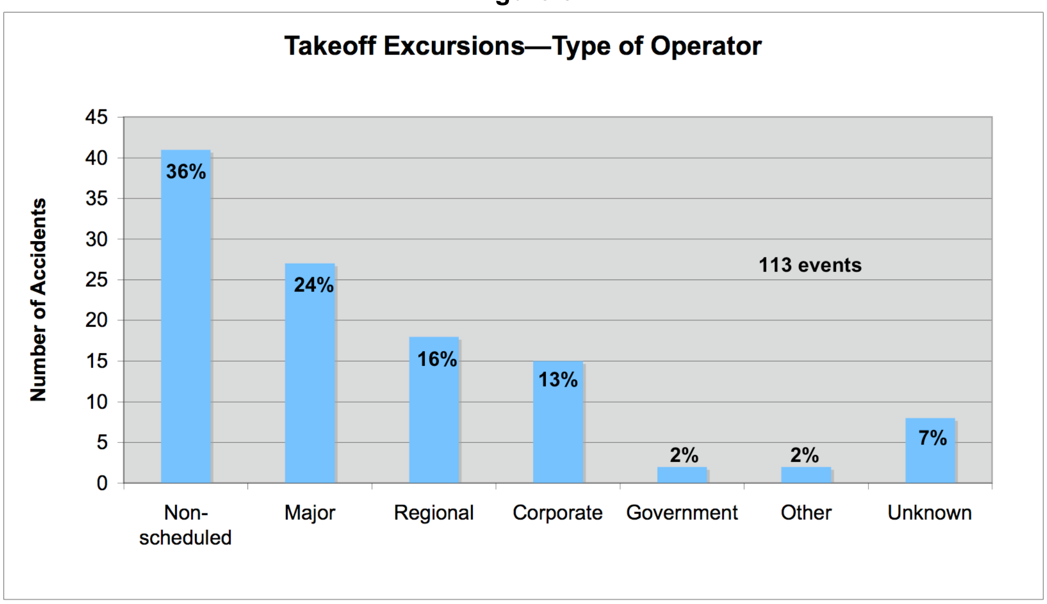


Figure 5



Flight Crew Composition. Without the benefit of a detailed accident report, it is difficult to get information on which pilot was flying the aircraft or the crew members' experience levels. Figure 6 shows that the pilot flying could not be determined for a majority of the landing excursion accidents. For those accidents where that information was available, the captain was the flying pilot 54 percent of the time and the first officer (FO) was the flying pilot 37 percent of the time. Approximately 9 percent of the takeoff excursion accidents with information about the flying pilot involved a single person flight crew. Crewmember experience levels for takeoff excursion accidents are summarized in the Table 1.

Figure 6

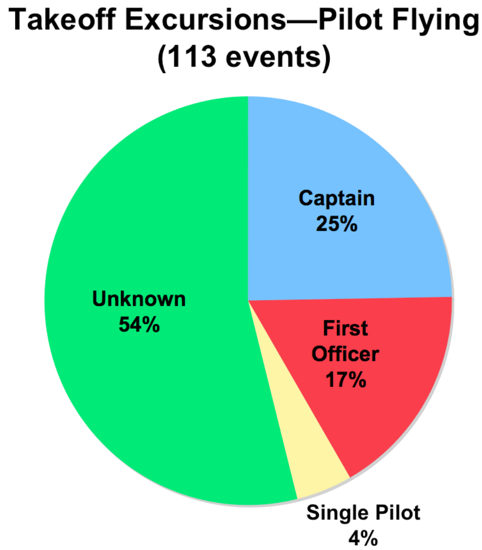


Table 1: Flight Crew Experience

	Min	Max	Mean	Std Dev
Capt/Single Pilot Total Hours	2504	27,000	10,420	6913
FO Total Hours	736	15,000	4694	4440
Capt/Single Pilot Hours in Type	35	16,000	2025	2907
FO Hours in Type	10	2500	682	849

Environmental Factors. Figure 7 shows that approximately two-thirds of takeoff excursions occur in daylight. However, this is probably consistent with the normal fraction of daylight flights. Of more interest are weather-related factors. Figure 8 shows that 11 percent of the takeoff excursion events occurred when precipitation was present, and this would likely be connected with runway contamination as well.

Figure 7

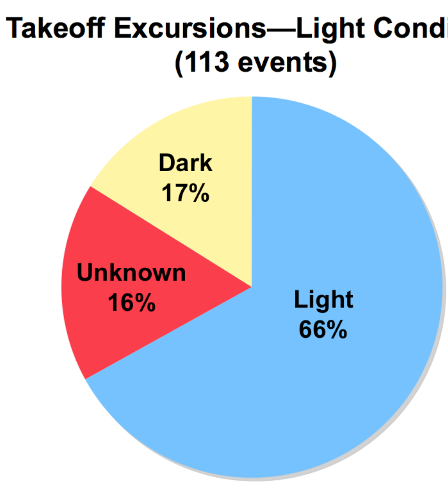


Figure 8

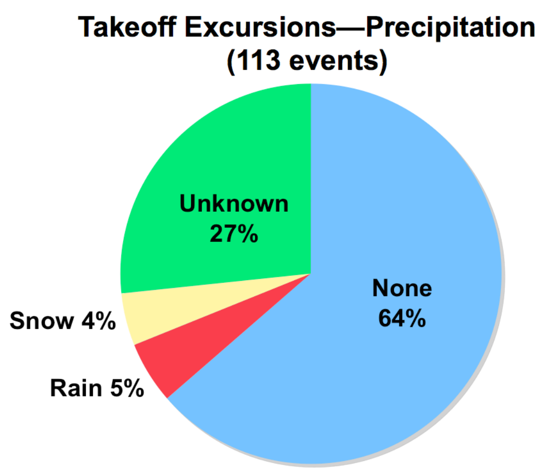
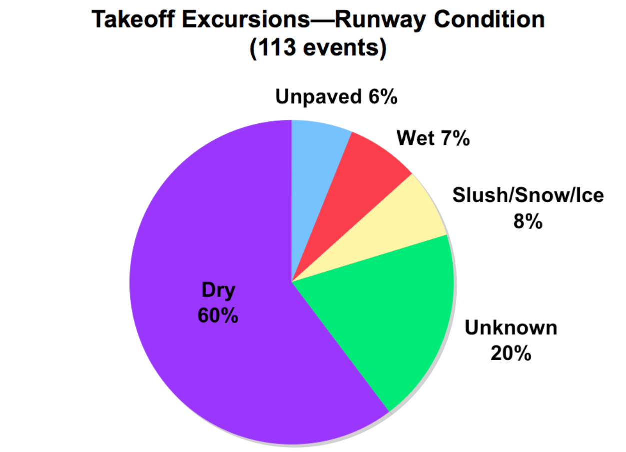


Table 2 shows that wind was a factor in some events. Eight percent of the takeoff excursions cited crosswind as a significant factor in the accident. Note, however, that there are no citations involving tailwinds, which one might logically expect to see in the case of some overruns.

Table 2: Runway Wind Factors

	Citations	Percent of Events
Crosswind	9	8.0
Gusts	4	3.5
Turbulence	1	0.9
None	103	91.2
Total	113	

Figure 9



Runway Condition and Contamination. When known, the condition of the takeoff runway was recorded, regardless of whether it was deemed as a causal factor in the accident. Approximately 15 percent of the takeoff excursions occurred when the runway was wet or had an accumulation of frozen precipitation. Another six percent of the mishaps, however, occurred on unpaved runways found in desolate locales such as Alaska or Africa (Figure 9).

TAKEOFF EXCURSIONS—CONTRIBUTING FACTORS

The takeoff excursions database is designed to capture contributing and causal factors in several categories. These are each represented by a data field and a restricted set of field values. The factors described by each field value derived from those that are commonly understood to contribute to takeoff excursions, and by the accident data itself.

Mechanical Origins. The data analysis uncovered a variety of mechanical issues that contribute to takeoff excursions. These appear in the database in various fields, and generally fall into two categories: mechanical failures that initiated the accident chain and surprised the flight crew, and those involving equipment that was known to be inoperative and yet still contributed to the excursion. Figure 10 shows that mechanical issues played a role in over one-quarter of the takeoff excursion accidents, and Figure 11 illustrates that, compared to all takeoff excursions, mechanical cause factors played a somewhat greater role in overruns than in veer offs.

Figure 10

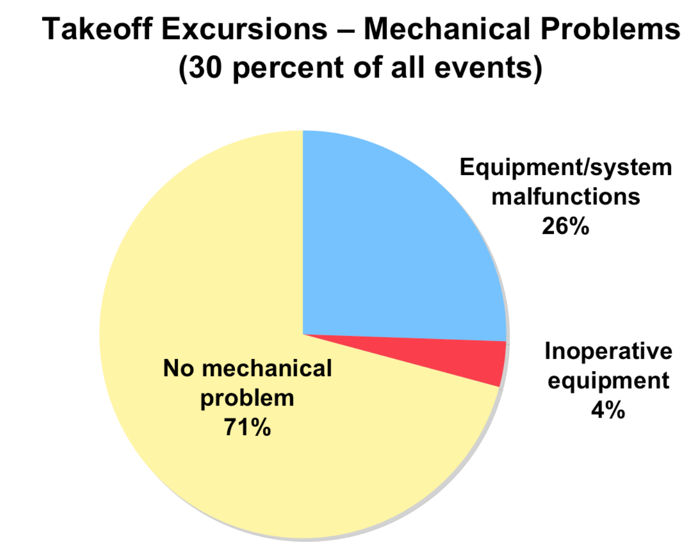
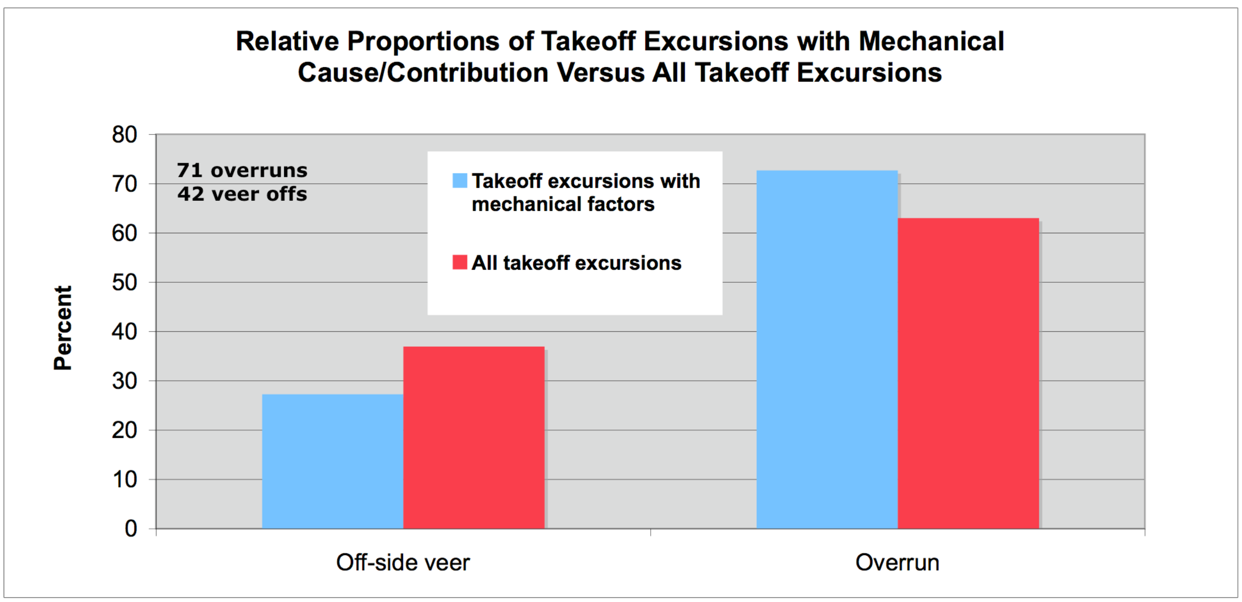


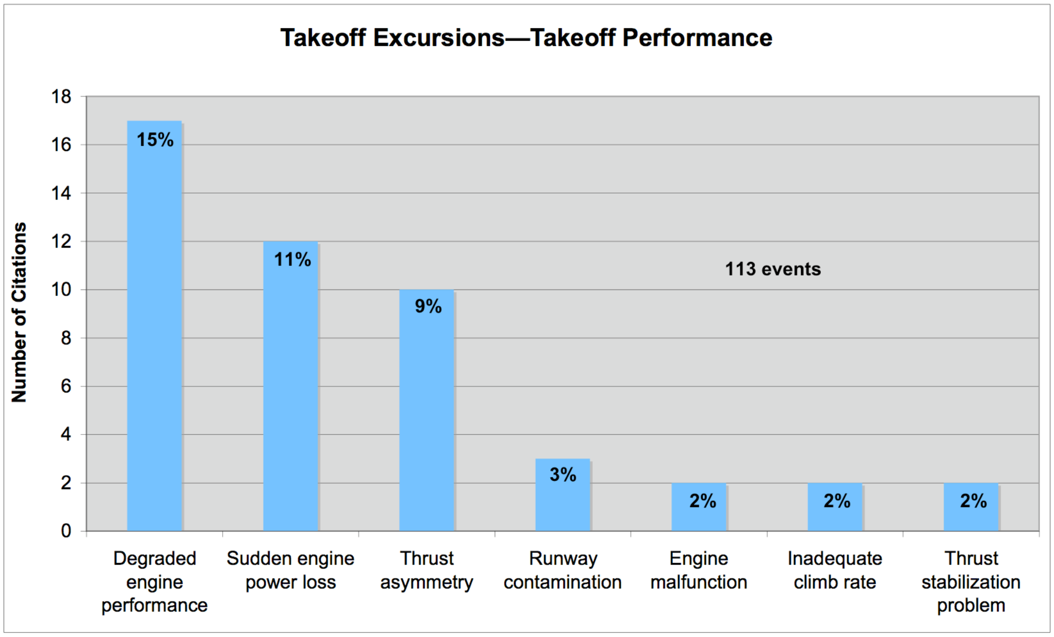
Figure 11



Takeoff Performance. Takeoff performance factors were characterized in two ways: by events or circumstances that degraded expected performance, and by errors or oversights in performance calculations. Figure 12 charts the number of citations describing performance degradation.[3]

[3] Note: In this chart and all those describing other accident factors, the values shown on the vertical axis are numbers of citations—not numbers of accidents. A given accident can have more than one cited value in any given field.

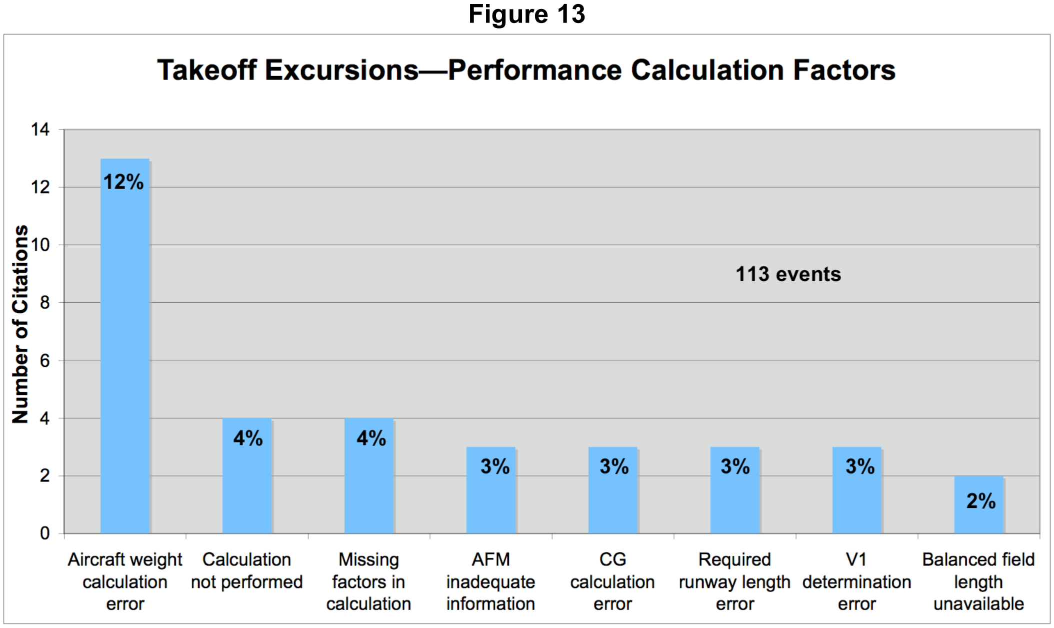
Figure 12



The two most predominant factors, "Sudden engine power loss" and "Degraded engine performance" were mutually exclusive of each other, whereas the other depicted factors are not. Power loss during takeoff roll is a classic precursor to rejected takeoffs and the standard scenario for determining balanced field length and V_1. Note that, collectively, one-fourth of the takeoff excursion accidents involved either sudden power loss or degraded engine performance.

Figure 13 shows deficiencies or errors in the calculation of takeoff performance. Such calculations may involve determining the runway length required, or alternately the field limit weight of the aircraft. Weight calculation errors refer not only to field limit weight, but also to the accurate weight determination of the loaded aircraft.

Figure 13

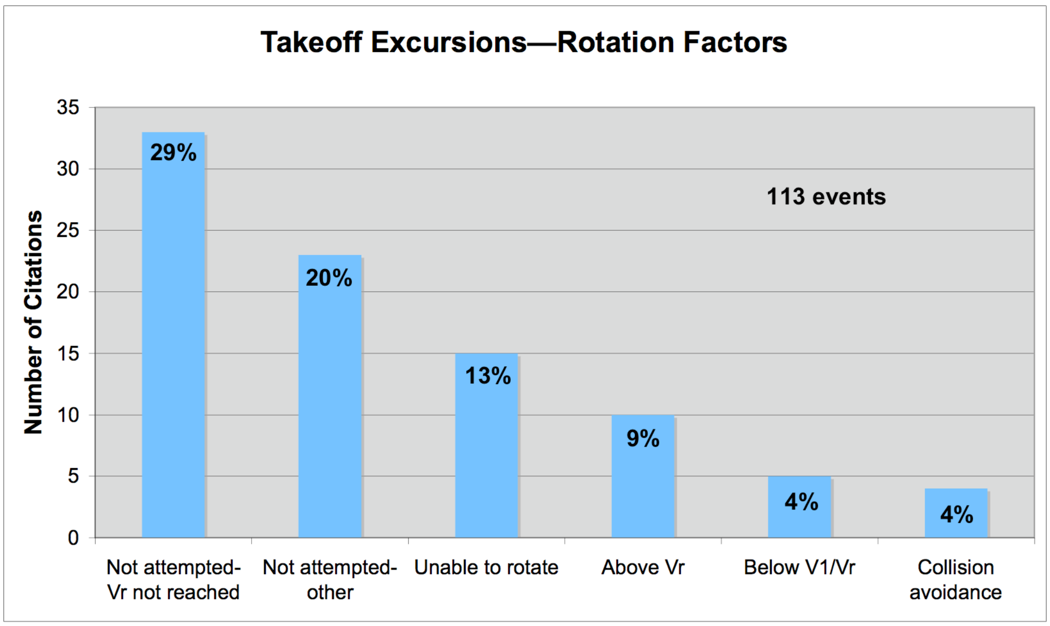


Rotation Factors. This field captured descriptors relevant to the airplane's ability to rotate and the flight crew's initiation of rotation. Figure 14 summarizes the distribution of these factors.

Events labeled by "Unable to rotate" usually refer to situations where aircraft was incorrectly loaded and the elevator was ineffective at the expected rotation speed. They may also involve a flight control problem. "Not attempted–Vr not reached" usually applies to veer off excursions where the aircraft departed the runway before attaining rotation speed. When "Collision avoidance" is cited, it implies that the decision to rotate was either early or late in response to a perceived collision hazard.

References to rotation speed "Above Vr" and "Below V1/Vr" may refer to delayed and unsuccessful attempts to rotate, or to instances where the aircraft becomes momentarily airborne and then settles back to the runway.

Figure 14



Flap/Slat Configuration. There have been some infamous accidents caused by errors in the setting of takeoff flaps. Northwest Airlines flight 255 departing Detroit in 1987 is perhaps the most well known (though technically does not qualify as a runway excursion), and more recently, the 2008 Spannair crash in Madrid is suspected to have similar underpinnings. Table 3, however, shows that flap configuration problems are not frequent contributors to takeoff excursions.

Table 3: Flap/Slat Configuration Factors

Total Events = 113	Accidents	Percent
Flaps/slats malfunction	2	1.8
Flaps/slats misset	4	3.5
None	107	92.9

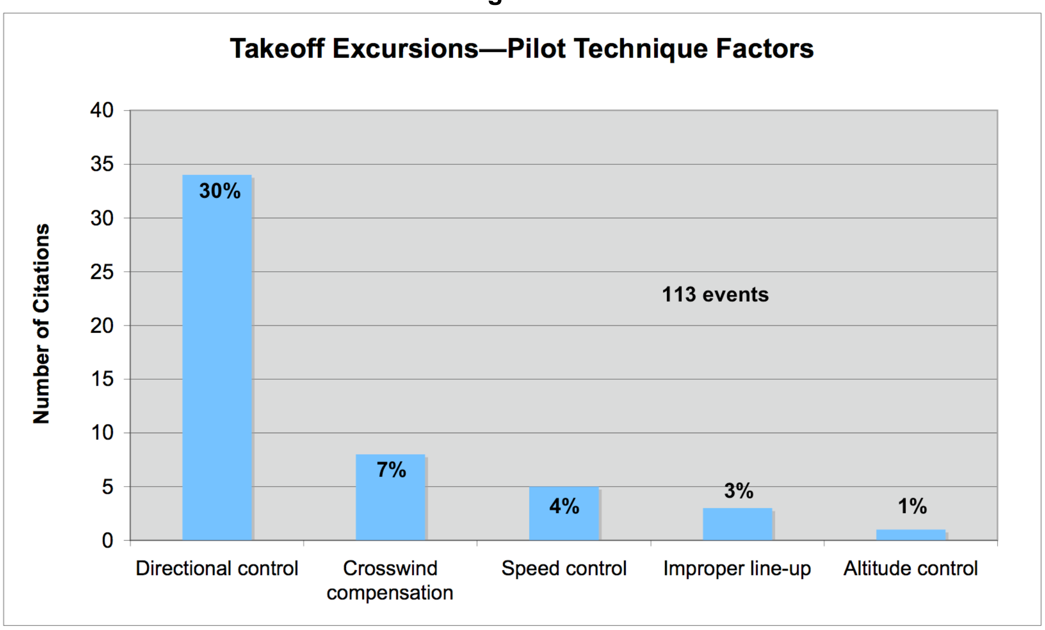
Wheel Factors. This field generally captures problems with or affecting landing gear and tires and their effect on aircraft directional control. Table 4 shows that tire failure is a predominant factor in this regard. Tire failures are often a consequence of rejected takeoffs, but 13 of the 16 "tire failure" citations in this field occurred during the takeoff roll and motivated the takeoff abort. The other three occurred during the abort process and contributed to the aircraft departing the runways.

Table 4: Wheel Factors

Total Events = 113	Citations	Percent of Events
Asymmetric deceleration–main gear problem	1	0.9
Asymmetric deceleration–runway contaminant	1	0.9
Asymmetrical deceleration	1	0.9
Landing gear malfunction–other	1	0.9
Tire failure	16	14.2
None	95	84.1

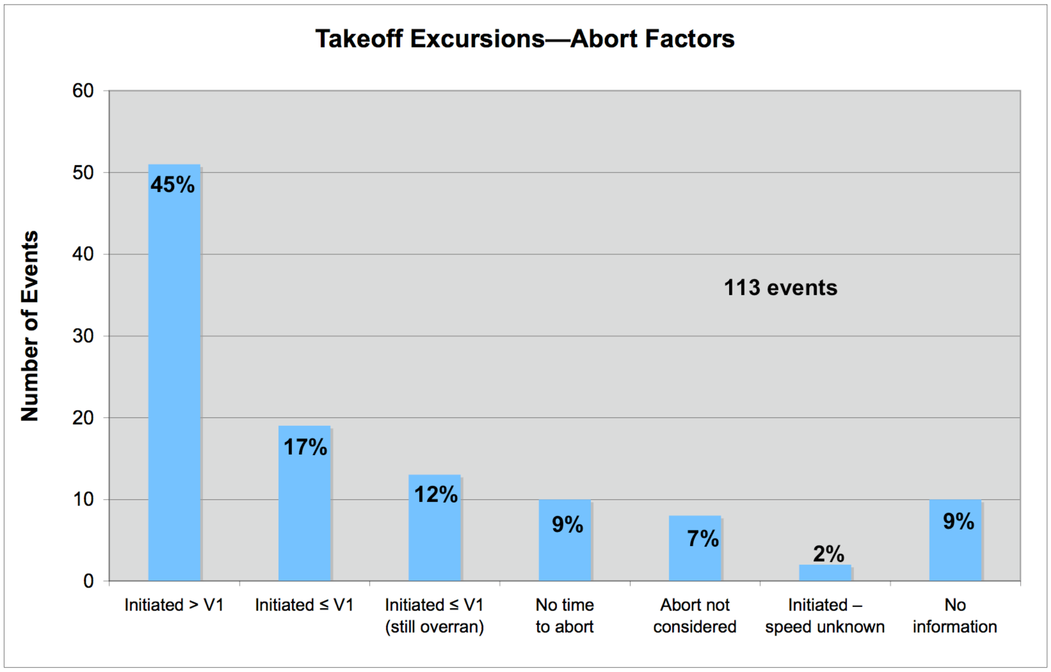
Pilot Technique. Factors in this field refer to alleged or implied deficiencies in piloting skills or judgments regarding control of the aircraft. Citations in this field are illustrated in the Figure 15, below. References to "Directional control" arise from sometimes-nebulous assertions within accident reports that a pilot was unable to maintain directional control, implying that such was possible. "Crosswind compensation" was also an occasional theme in some veer off excursions.

Figure 15



Takeoff Abort Factors. The decision to reject a takeoff is guided by pilots' understanding of the aircraft's performance given the takeoff conditions, and by the regulations that guide the certification and flight-testing of aircraft. Aircraft certification standards require that manufacturers provide flight crews with the ability to determine V_1, the abort initiation speed. This speed is a function of both the accelerate-stop and the accelerate-go capabilities of the aircraft, and there are many elements of the aircraft, its operating environment, and the runway that can affect the accurate calculation of V_1. In theory, an aircraft should be able to stop on the remaining runway if a takeoff abort is initiated at or before V_1. However, aircraft manufacturers do not provide performance data for all possible takeoff situations.

Figure 16



Also, pilots do not always assess takeoff factors properly when determining V_1. Finally, calculating V_1 is predicated on certain assumptions regarding pilot behavior during the takeoff abort process, and the take-off excursion data clearly indicates that pilots do not always act in accordance with these assumptions.[4]

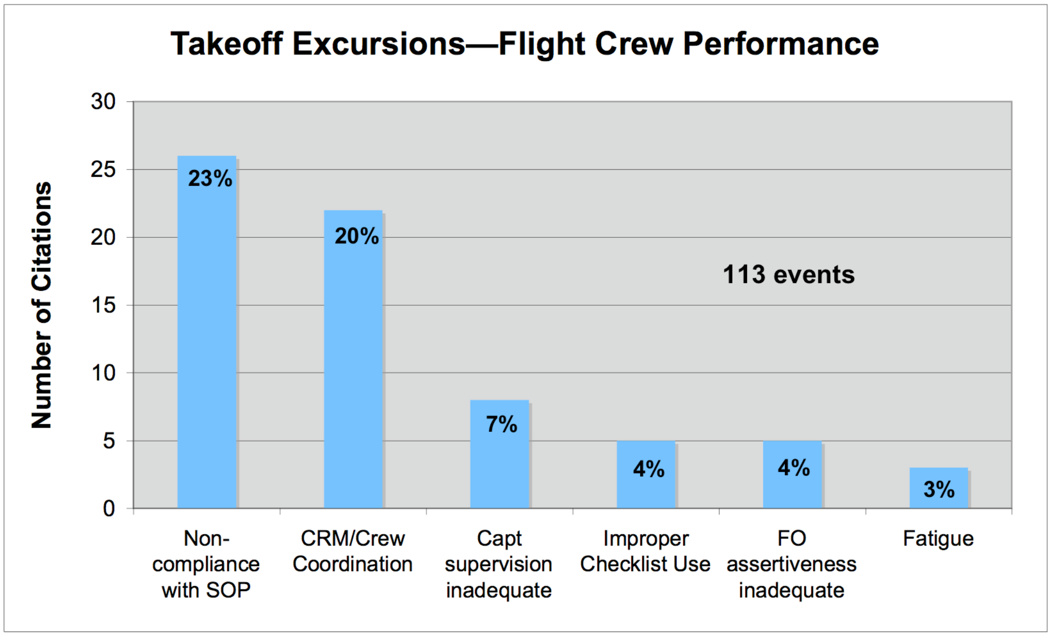
The takeoff abort factors address two questions: First, was a rejected takeoff initiated? Second, what speed did the initiation occur (above or below V_1)? Figure 16 shows frequencies of abort factors within the takeoff excursion dataset. Obviously, rejecting a takeoff after V_1 is highly associated with takeoff excursions. It should not be assumed, however, that failures to abort prior to V_1, result from poor pilot judgments. A large fraction of takeoff excursion overruns were in response to problems that occurred after V_1, where pilots were fearful that the airplane would not safely fly. Though accident descriptions indicate that this perception is often erroneous, many pilots may be predisposed to respond by stopping rather than by going, and this suggests that such behavior is worthy of further study.

The data also indicate that takeoff excursions occur even when an abort is initiated below V_1. Though some of these are veer offs, others are overruns, indicating a potential (but often unidentifiable) error in determining an accurate V_1. The field value, "No time to abort," generally references aircraft that veer off the runway before the pilot can respond. The factor "Not considered" was coded when there was no indication that the pilot thought of aborting prior to the excursion, such as when they were focused on continuing the takeoff.

[4] The Takeoff Safety Training Aid, published by the United States Federal Aviation Administration, provides a thorough treatment of these principles in chapter 2.

Flight Crew Performance Factors. This field records factors associated with flight crew interactions and behaviors, as depicted in Figure 17. References to crew resource management (CRM) and standard operating procedures (SOPs) dominate the values in this field. Takeoff excursion accident reports

Figure 17



commonly cite CRM failures and other crew coordination breakdowns. Non-compliance with SOPs were usually interpretations made during the coding process, whenever there were recognizable instances of crew members failing to follow required procedures. Examples would include the absence of required callouts, not using checklists, and foregoing performance calculations.

"Capt supervision inadequate" refers to a Captain's failure to adequately monitor a copilot flying the aircraft, such that the Captain can assume control if necessary. "FO assertiveness inadequate" describes a first officer who is unable or unwilling to reject or override the Captain's authority in the face of an impending hazard.

Overall Summary of Contributing Factors. Figure 18 shows the overall frequencies of cited factors in the takeoff excursions database. Generally, it indicates that factors associated with piloting technique, performance deficiencies, flight crew interactions, and rotation are each present in more than one-third of the coded events.

Figures 19 through 21 show takeoff excursion factors in more detail. Figure 19 shows that, among environmental factors, crosswinds and runway contaminants are the key elements associated with takeoff excursions. Figures 20 and 21 summarize the top 20 factors for all takeoff excursion accidents. The factors cited most frequently are takeoff aborts initiated above V_1, and general difficulties with directional control. Takeoff aborts initiated below V_1 are also frequent, indicating that some takeoff scenarios are independent of that parameter, or that there are other overriding factors at work.

Figure 18

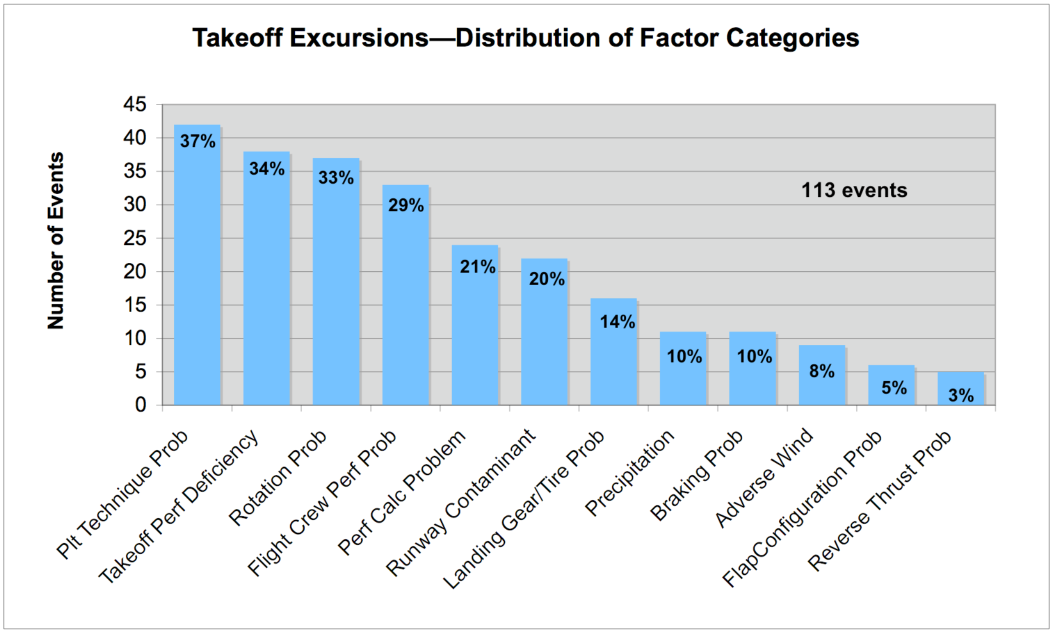


Figure 19

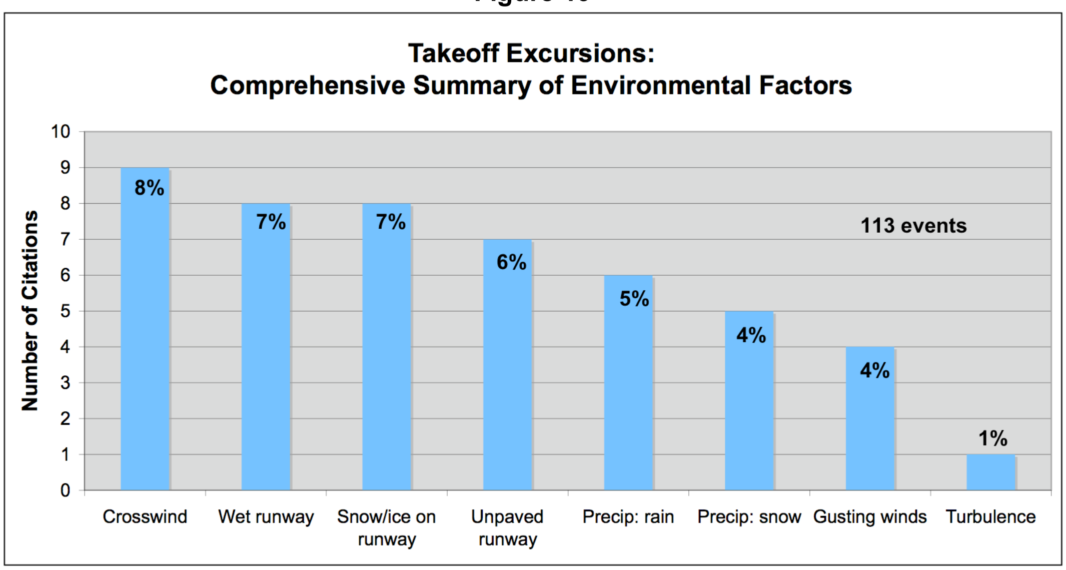


Figure 20

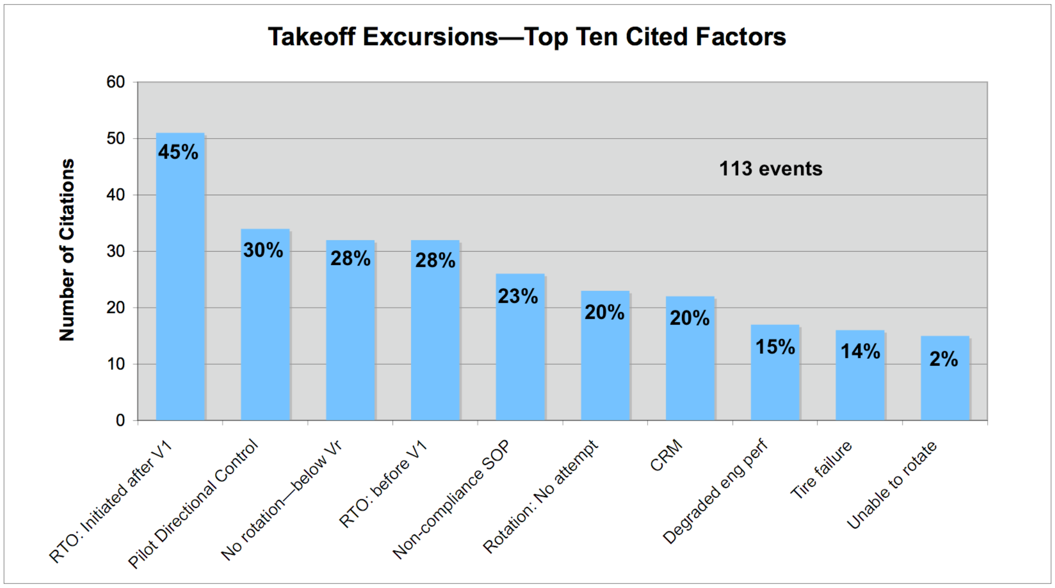
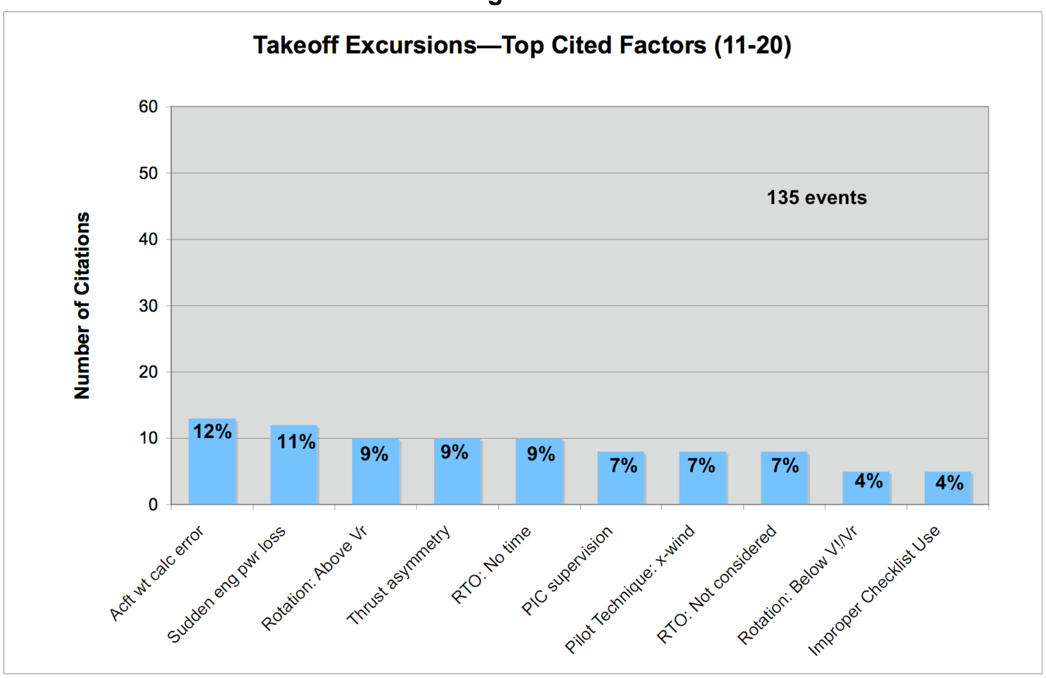


Figure 21



Takeoff Excursion Risk Factor Interactions. Data breakdowns for takeoff excursions clearly show that some factors are more frequently present than others. The next logical question is whether there are *combinations* of factors that are more significant than others. Also of interest is whether certain factors are more or less salient to veer offs than to overruns. Table 5 shows various risk factor combinations in veer off accidents that occur during takeoff. The cells highlighted in yellow indicate where the factor in each row has a 20 percent or greater overlap with the factor shown in each column (minimum value greater than or equal to 2).

The small number of events comprising the takeoff excursions data set—made even smaller when considering only veer offs—limits our ability to know whether differences in the tabulated values are significant. However, it is interesting to note where there are associations of factors that may warrant further, more detailed study. For instance, aborts at or below V_1 often still resulted in a veer off when there was an engine power loss, a runway contaminant, or a crosswind. There is also some indication that the negative effects of crosswinds and tailwinds are magnified when gusts, turbulence, or windshear are present.

Table 6 shows a similar risk factor combinations for takeoff overruns. Though the number of overruns during takeoff is considerably larger than the number of veer offs, it is still a relatively small value, which makes comparisons difficult when further subdivided. The numbers in these data suggest that there might be some interesting associations between engine power loss and aborts initiated above V_1, as well as an association between these high speed aborts and the presence of runway contaminants.

Table 5: Takeoff Excursion Veer Offs—Risk Factor Interactions

*Number of Events with the Cited Pairs of Factors**	Abort ≤ V_1 (18 events)	Abort > V_1 (5 events)	Engine Power Loss (12 events)	Runway Contamination (8 events)	Perf Calc: Wt/CG (2 events)	Perf Calc: V1/Rwy Length (1 event)	Crosswind (8 events)	Tailwind (0 events)	Gusts/Turb/ Windshear (5 events)
Abort ≤ V1			8	5	1	0	3	0	2
Abort > V1			2	1	1	0	2	0	0
Engine Power Loss	8	2		2	0	0	0	0	1
Runway Contamination	5	1	2		0	0	3	0	1
Perf Calc: Wt/CG	1	1	0	0		1	0	0	0
Perf Calc: V1/Rwy Length	0	0	0	0	1		0	0	0
Crosswind	3	2	0	3	0	0		0	4
Tailwind	0	0	0	0	0	0	0		0
Gusts/Turb/ Windshear	2	0	1	1	0	0	4	0	

Table 6: Takeoff Excursion Overruns—Risk Factor Interactions

*Number of Events with the Cited Pairs of Factors**	Abort ≤ V_1 (14 events)	Abort > V_1 (46 events)	Engine Power Loss (17 events)	Runway Contamination (8 events)	Perf Calc: Wt/CG (11 events)	Perf Calc: V1/Rwy Length (7 events)	Crosswind (1 event)	Tailwind (0 events)	Gusts/Turb/ Windshear (0 events)
Abort ≤ V1			3	2	2	2	0	0	0
Abort > V1			9	5	7	3	1	0	0
Engine Power Loss	3	9		3	1	2	0	0	0
Runway Contamination	2	5	3		2	2	0	0	0
Perf Calc: Wt/CG	2	7	1	2		1	0	0	0
Perf Calc: V1/Rwy Length	2	3	2	2	1		0	0	0
Crosswind	0	1	0	0	0	0		0	0
Tailwind	0	0	0	0	0	0	0		0
Gusts/Turb/ Windshear	0	0	0	0	0	0	0	0	

** – Cells highlighted in yellow are those where the co-existence of two factors is greater than or equal to 20 percent.*

Consequences of Takeoff Excursion Accidents. The design of the takeoff excursions database is primarily centered on documenting causal and circumstantial factors. However, two data fields were included to provide information on the accident consequences. First, each accident is labeled by the most serious injury it entailed, and second, by whether a post crash fire occurred. Figure 22 shows a breakdown of accidents by injury severity. Of particular note is the category "Unknown—but not fatal." Some accident information sources, in particular the FSF Aviation Safety Network, cited numbers of fatalities and overall numbers of injuries, but did not delineate non-fatal injuries. When this was the only information available, and no fatality occurred, the accident was coded with this value. Were further detail on injuries available, the majority of these events would likely fall in the "minor" or "none" category.

Figure 22

Takeoff Excursions – Most Severe Injury (113 events)

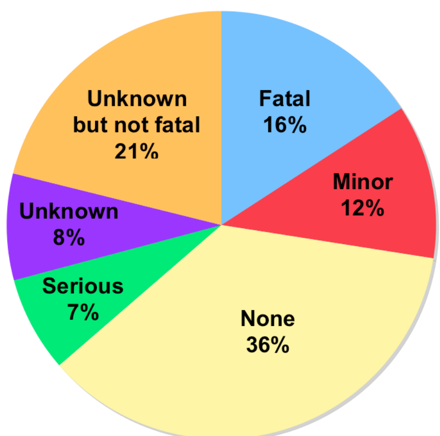
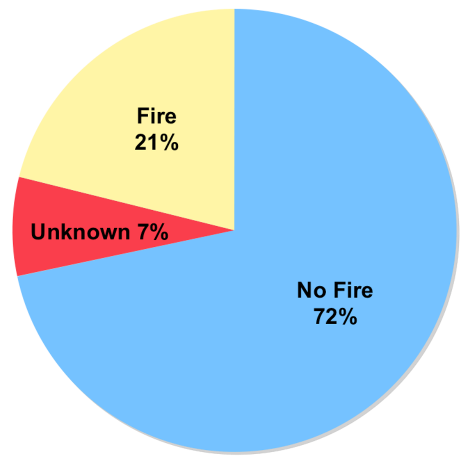


Figure 23

Takeoff Excursions—Post Crash Fire (113 events)



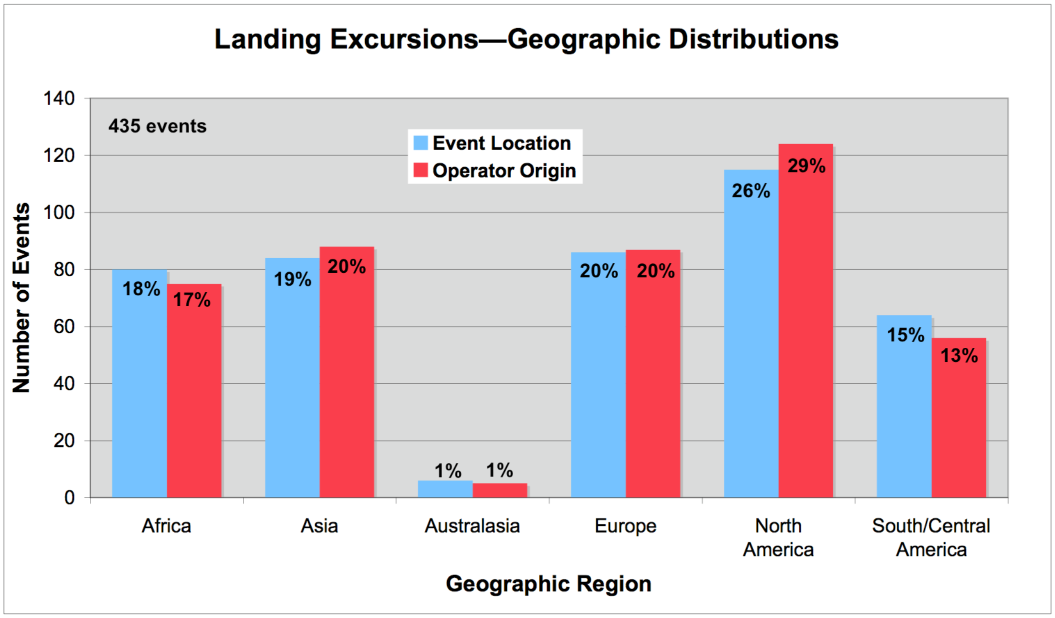
Post crash fires frequently contribute to injuries and fatalities in the wake of runway excursions. Takeoff excursions resulting in fire are especially problematic because of the large volume of fuel on board aircraft at the start of a flight. Figure 23 shows that fires occurred in approximately one-fifth of the takeoff excursions. This is a noticeably higher fraction than those that occur after landing excursions (see Figure 55). Half of the takeoff excursions resulting in fires incurred fatalities.

LANDING EXCURSIONS—DATA DISTRIBUTIONS

The landing excursions database module is comprised of 435 accidents (see Appendix 4). Of these, 230 are veer offs and 205 are overruns. Unlike the database of takeoff accidents, the landing excursion dataset does not suffer nearly as much for small number limitations, thus it is more likely that statistically significant differences can be identified in data analysis.

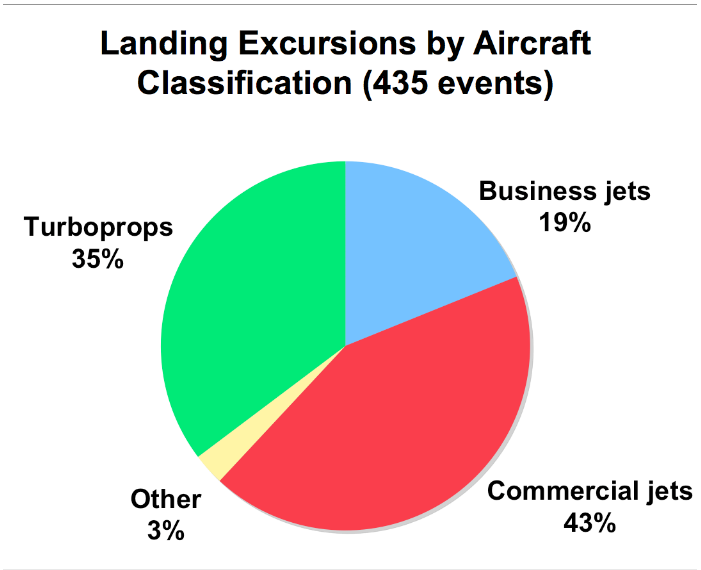
Geographic Distributions. Figure 24 shows the distribution of event locations and operator origins for runway excursions during landing. This figure shows strong parallels with its counterpart for takeoff excursions (see page 5). Operators' locations closely follow the distribution of accident locations. Australasian operators and accidents are virtually absent, and events in Africa may be disproportionate to other regions.

Figure 24



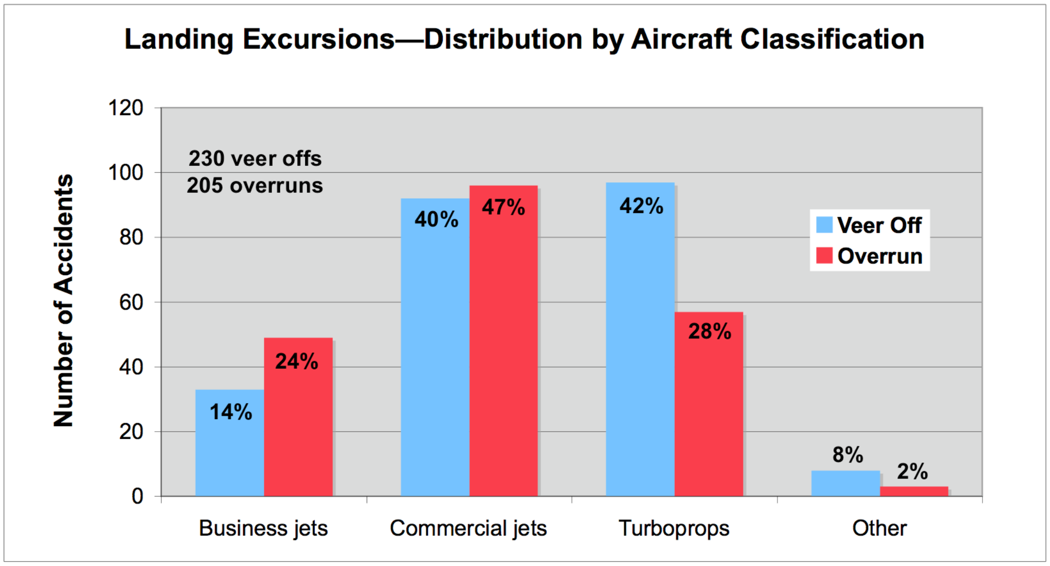
Aircraft Involvement. Figure 25 illustrates the involvement of various classes of aircraft experiencing landing excursions. Percentage-wise the breakdown is very similar to that found in takeoff excursions, which suggests that the distribution is more a function of activity within each aircraft class rather than a greater or lesser propensity for experiencing a landing excursion event.

Figure 25



When looking separately at landing veer offs versus landing overruns (Figure 26), it appears that turboprop aircraft have a smaller likelihood of experiencing an overrun than a veer off. Logically, this may be attributable to lower landing speeds.

Figure 26



Operator Characteristics. The distributions depicted in Figures 27 and 28 are virtually identical to those in the takeoff excursion dataset, and thus, are probably a function of the worldwide fleet makeup. Without additional information on fleet sizes or flight activity, one cannot discern whether a particular operating category is over- or under-represented.

Figure 27

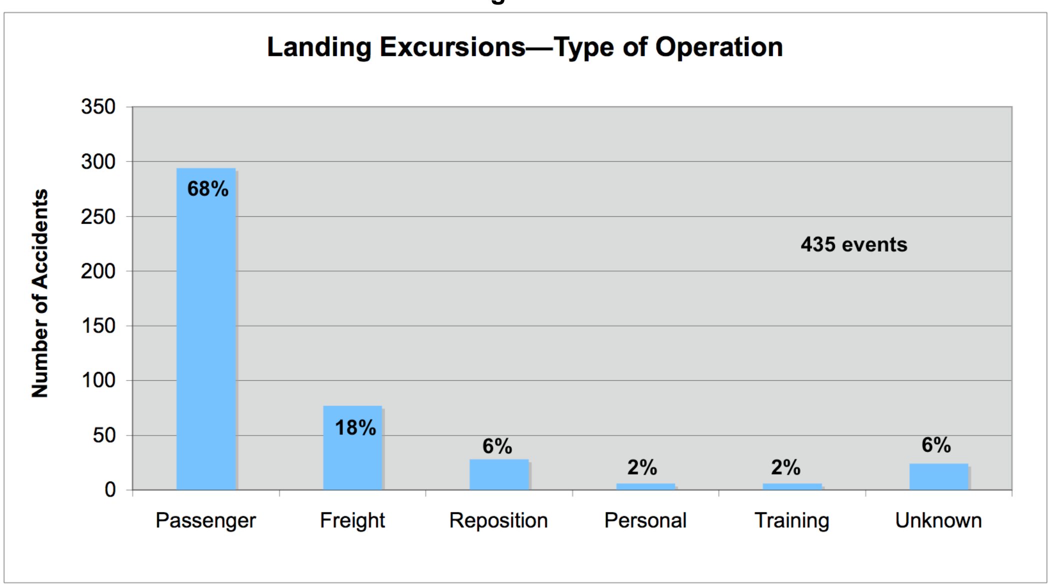
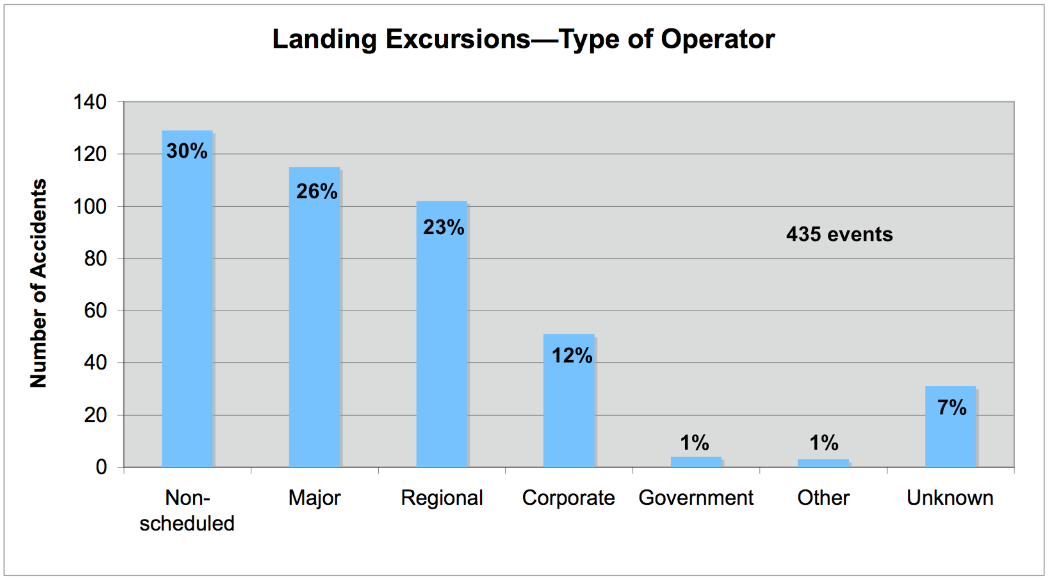
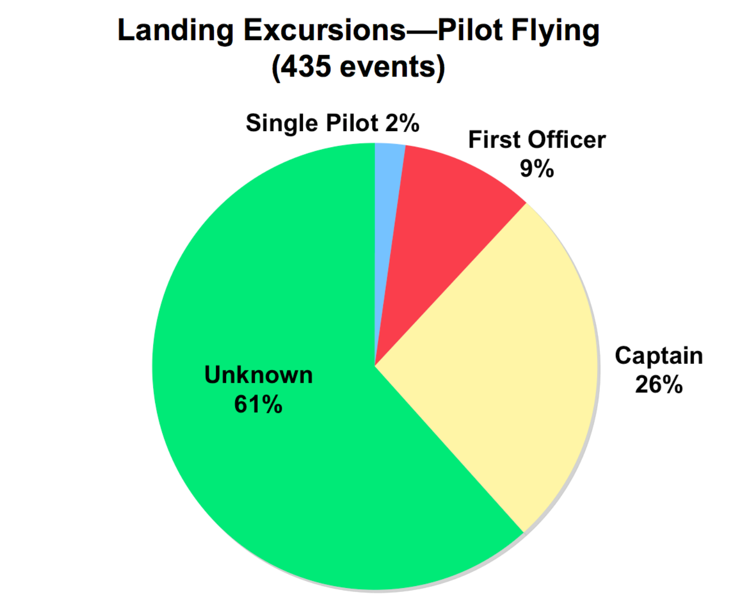


Figure 28



Flight Crew Composition. Without a detailed accident report, it rarely possible to know which pilot in a 2-person flight crew was manipulating the controls at the time of the accident. As such, whether the captain or FO is the pilot flying is unknown in approximately sixty percent of the landing excursion events, as shown in Figure 29. For those accidents where it is known, the captain was the flying pilot in three out of four cases. This is a much higher fraction than would be expected when flight crews alternate flying legs, as is traditionally done in commercial operations. It may indicate that, in marginal weather or abnormal circumstances (such as with inoperative equipment), the captain was more likely to assume control of the aircraft for landing.

Figure 29



When available, pilot flight hours were captured during the database coding process. Total flight time and time in type was recorded, as was recent experience in type. This information is usually available only if a detailed accident report exists, and often only for the captain. Table 7 summarizes the statistical data for flight time, when available, for both captains and FOs.

Table 7: Flight Crew Experience

	Min	Max	Mean	Std Dev
Capt/Single Pilot Total Hours	1045	29,612	10,028	6257
FO Total Hours	412	21,000	5079	4236
Capt/Single Pilot Hours in Type	107	14,000	2447	2809
FO Hours in Type	10	9767	1033	1535

Environmental Factors. Landing excursions often involve adverse weather conditions, which generally appear to increase the probability of an accident. Figures 30 shows lighting conditions. Without traffic activity information, these data are unremarkable. Figures 31 and 32 give breakdowns of airport weather conditions and the presence of precipitation. Unfortunately, the high fraction of unknowns in each group hinders any useful comparisons. Unknowns arise mainly because a large fraction of the runway excursion accidents do not have detailed environmental descriptions, especially when they occurred in less developed countries.

Figure 30

Landing Excursions—Lighting Condition (435 events)

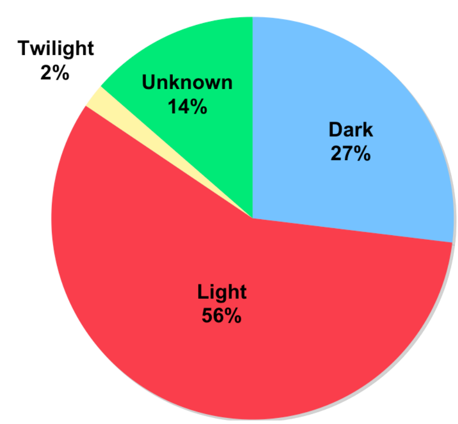


Figure 31

Landing Excursions—Airport Weather Condition (435 events)

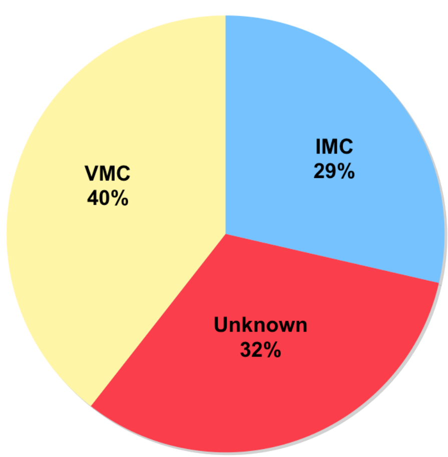


Figure 32

Landing Excursions—Precipitation (435 events)

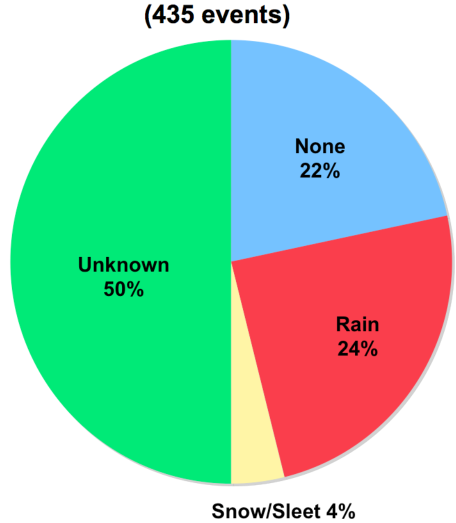
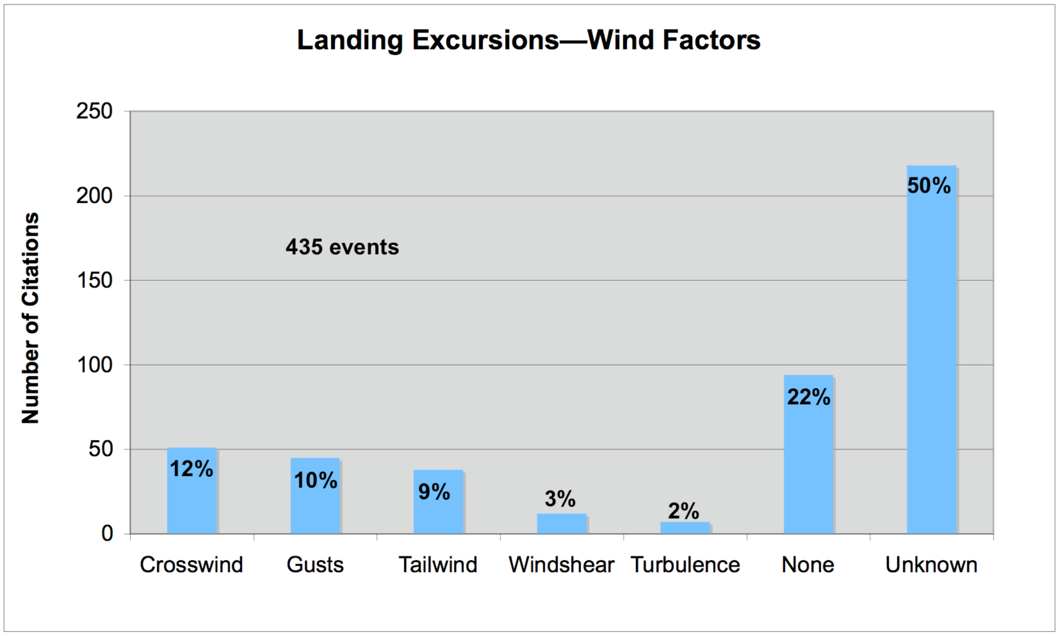


Figure 33 shows runway wind factors. Although there is also a large segment of unknowns in this distribution, these factors are often cited explicitly in accident narratives. Predictably, crosswinds, tailwinds, and wind gusts play a role in many landing excursions.

Figure 33



Because wind is often considered to be a contributing factor in runway excursions, the database calculates crosswind and headwind/tailwind components when runway direction and wind information are known. Table 8 describes these data using basic statistics. Longitudinal winds ranged from 20-knot tailwinds to 32-knot headwinds. The standard deviation of these values is nearly 8 knots, which suggests that roughly one-third of landing excursions involve steady tailwinds of up to 6 knots, and another one-sixth had steady tailwinds between 6 and 20 knots. In practical terms, these data indicate that landing with a tailwind of any magnitude is a significant risk factor in landing excursions. The data also imply that some accidents were exacerbated by tailwind gusts of up to 10 knots.

The data set can be similarly characterized in terms of crosswinds. Crosswind component values ranged from zero to 45 knots. Thus, in two-thirds of the landing excursions, there were steady crosswind components of up to 13 knots. Crosswind gust factors ran as high as 20 knots. The large fraction of landing excursions occurring with significant crosswinds suggests that they may be a significant risk factor.

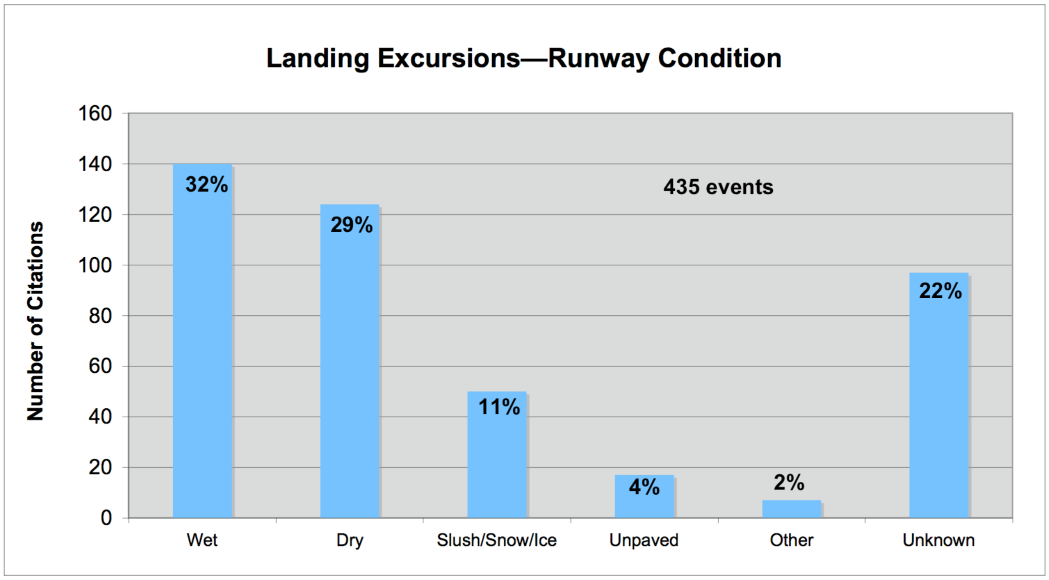
Table 8: Wind Data

Wind values given in knots. Negative numbers imply tailwind.

	Min	Max	Mean	Std Dev
Steady Headwind	-20	32	1.4	7.8
Headwind Gust Factor	-10	16	0.4	3.0
Steady Crosswind	0	45	6.4	7.2
Crosswind Gust Factor	0	20	1.7	3.6

Runway Condition and Contamination. As shown in Figure 34, wet and otherwise contaminated runways are present in the majority of accidents where runway condition was known. The mere fact that a runway was wet was not often cited as a significant factor in accident reports, however many runway excursion accidents also contain references to standing water and heavy rain. These conditions were clearly linked to a greater probability of hydroplaning, which resulted in both overruns and veer offs because of ineffective braking and steering.

Figure 34



LANDING EXCURSIONS—CONTRIBUTING FACTORS

As with the takeoff data, the landing excursions database module is designed to record circumstantial and causal factors that are relevant to the genesis of landing excursion accidents. The fields and field values in the database have evolved through a combination of commonly expected factors and from factors seen repeatedly in the landing excursions data set. Factors were coded when they were cited in accident reports, or when they were deemed relevant to initiation of the accident chain or to the mechanisms that led to the aircraft departing the runway.

Mechanical Origins. Figure 35 shows that thirty-eight percent of all landing excursion accidents had some form of mechanical failure or malfunction. Mechanical factors can be initiators in the accident chain ("equipment/system malfunctions"), circumstantial contributors ("inoperative equipment"), or failures that occur within the accident chain ("landing gear damaged on touchdown") that ultimately cause the runway excursion. Figure 36 illustrates that landing excursions involving mechanical issues are more likely to result in veer off events than overruns, and this is probably due to the large influence of spontaneous landing gear collapses or collapses caused by impacting the runway.

Figure 35

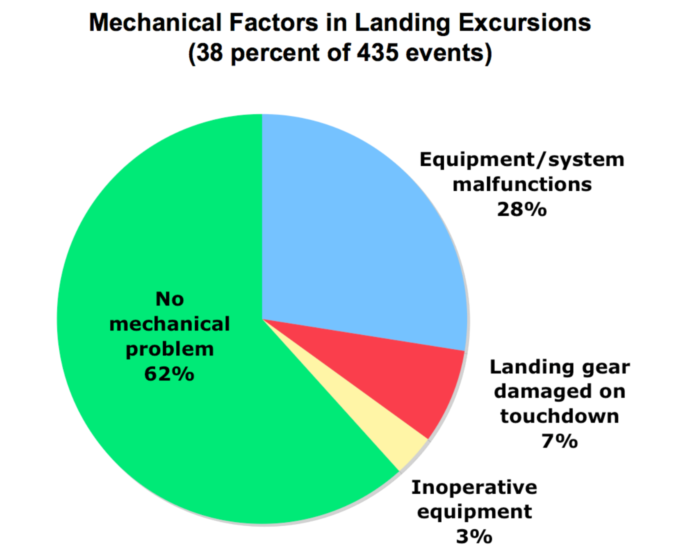
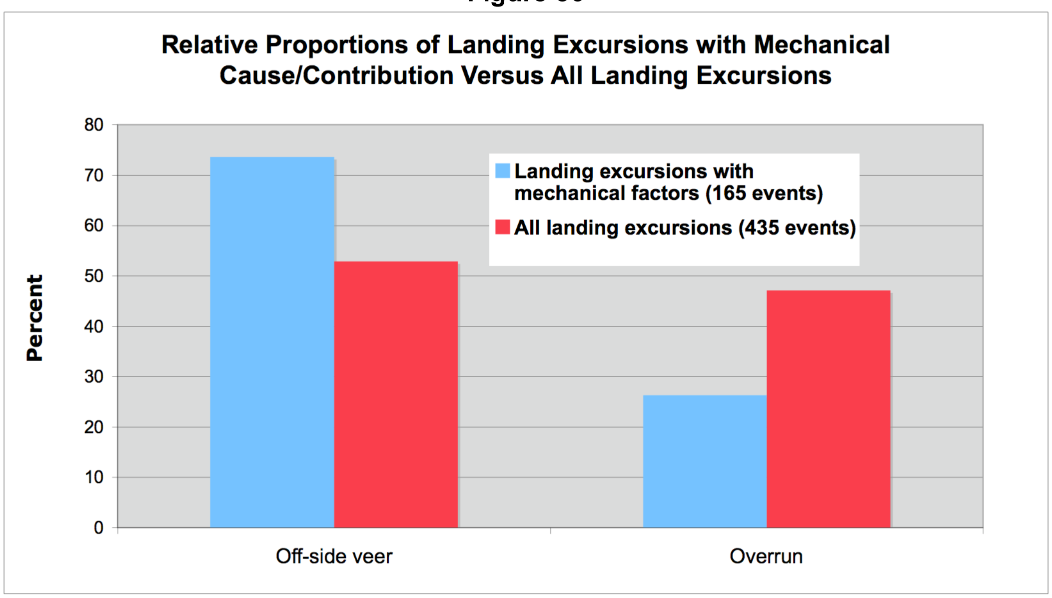


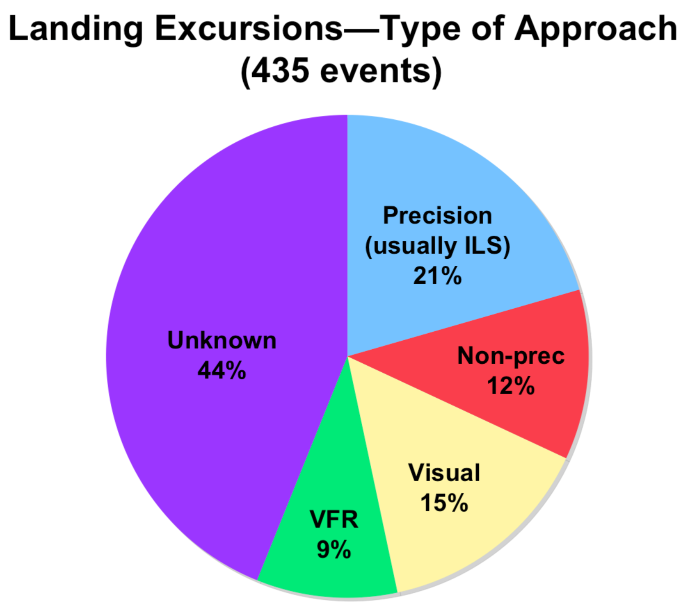
Figure 36



Approach and Touchdown Factors. A runway excursion during landing can be parsed into a chain of three segments: approach, touchdown and initial roll, and final rollout. Each segment *can* (but does not always) set the stage for the next. The final rollout is usually where the aircraft ends up either on or off the runway. Often, however, the nature of the touchdown and initial roll will determine that outcome. Similarly, the events and circumstances during approach segment will set the stage for touchdown.

Approach Types. The aircraft documented in the runway excursions database are generally high performance large (greater than 12,500 lb. MOTW) airplanes. They are usually operated on IFR flight plans and will generally fly some type of instrument approach to their destinations. Figure 37 shows that, for events where the approach type is known, 83 percent are instrument approaches (precision, non-precision, or visual) and 17 percent are VFR approaches. If visual approaches are paired with VFR approaches, then 57 percent of the approaches are flown by reference to instruments and 43 percent are flown visually.

Figure 37



Approach Quality. Airmen are routinely taught that good landings result from good approaches, and the stabilized approach concept arises from this adage. Past investigations have found that unstabilized approaches are a significant precursor to approach and landing accidents. The stabilized approach concept has become a mantra for airline training, so the importance of understanding its role in landing excursions cannot be overstated.

A rigorous definition of the stabilized approach was developed during the FSF's original work on Approach and Landing Accident Reduction (ALAR).[5] This definition states that an approach is stabilized when *all* of the following conditions are met:

1. The aircraft is on the correct flight path;
2. Only small changes in heading/pitch are required to maintain the correct flight path;
3. The aircraft speed is not more than V_{REF} + 20 knots indicated airspeed and not less than V_{REF};
4. The aircraft is in the correct landing configuration;
5. Sink rate is no greater than 1,000 feet per minute; if an approach requires a sink rate greater than 1,000 feet per minute, a special briefing should be conducted;
6. Power setting is appropriate for the aircraft configuration and is not below the minimum power for approach as defined by the aircraft operating manual;
7. All briefings and checklists have been conducted;

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5 "FSF ALAR Briefing Notes," *Flight Safety Digest,* Flight Safety Foundation, vol. 19, no. 8-11, Aug-Nov 2000, pp. 133-138.

8. Specific types of approaches are stabilized if they also fulfill the following: instrument landing system (ILS) approaches must be flown within one dot of the glideslope and localizer; a Category II or Category III ILS approach must be flown within the expanded localizer band; during a circling approach, wings should be level on final when the aircraft reaches 300 feet above airport elevation; and
9. Unique approach procedures or abnormal conditions requiring a deviation from the above elements of a stabilized approach require a special briefing.

In ideal conditions, an aircraft on a stabilized approach would fly itself to the runway touchdown zone with no control inputs from the pilot. Inherent to this concept is the directive that a go-around *will* be commenced if the approach is not stabilized by the *approach gate* (1000 HAT in IMC or 500 HAT in VMC) or does not remain stabilized inside the approach gate.

Approach quality (stabilized or unstabilized) is documented in the landing excursions database, and the coding of this factor depends on whether accident reports or other information sources make explicit reference to a stabilized or unstabilized approach. Lacking such a statement, approach quality may also be inferred from other available information.

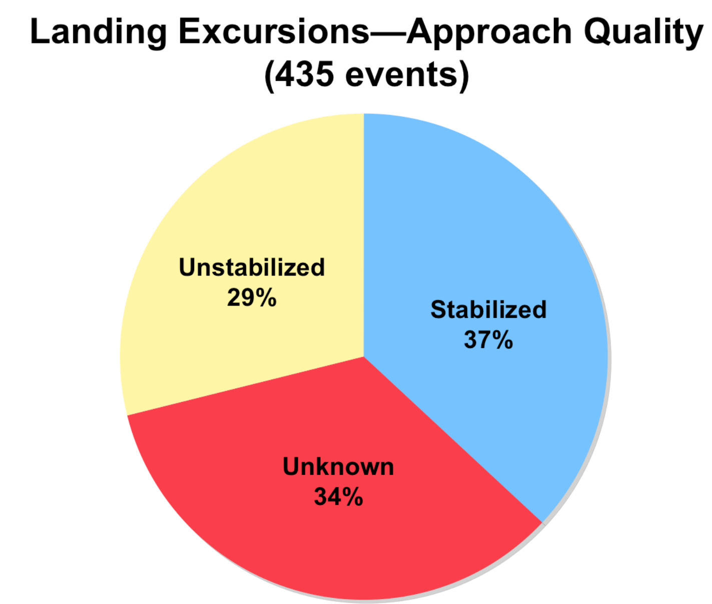
Difficulties arise, however. The circumstances, chain of events, and other described details cast each accident in its own shade of gray. Some analysts argue that stabilized approaches are not always feasible in some common types of aviation operations. For instance, the landing excursions data contains many mishaps associated with non-precision approaches. Non-precision approaches routinely require descent rates greater than 1000 feet per minute,[6] and can also incorporate step-down descents that are inherently inconsistent with trimming the aircraft for minimal control input.

Another problem involves deciding when the approach phase ends and the touchdown phase begins. Analyzing landing excursions for database entry revealed many situations where everything was stable until the aircraft began the its roundout (landing flare). Should a disturbance at this time negate an otherwise stable approach? Given such vague circumstances, and to provide consistency in database coding, an approach was considered stable if it remained so up until the roundout. This seems consistent with the ALAR definition because the roundout normally requires substantial control input and significant changes to descent rate, both of which put the aircraft in a transient state. It is also consistent with delineating the end of the approach segment and the beginning of the touchdown segment, as previously discussed.

As illustrated in Figure 38, landing excursion accidents can occur in the wake of both stabilized and unstabilized approaches. There are also a large number of unknowns because in many cases, adequate information about the quality of the approach was missing from accident reports. That stabilized and unstabilized approaches can both result in a landing excursion suggests that at least two different types of scenarios may predispose these accidents: one that arises from pilots' failures to fly stabilized approaches (and subsequent failure to go around), and another that is independent of approach quality.

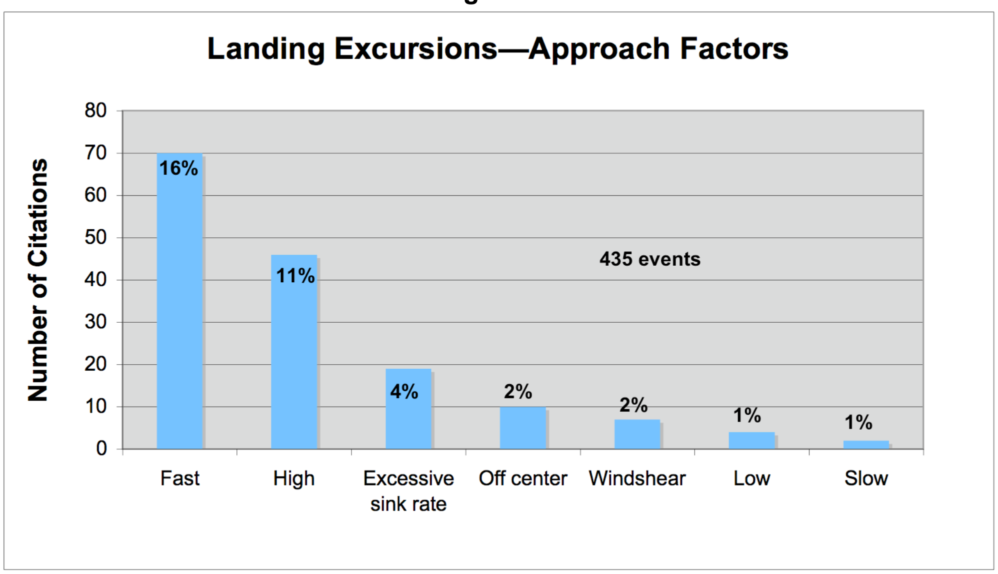
[6] The FSF ALAR definition of a stabilized approach requires descent rates not greater than 1000 feet per minute.

Figure 38



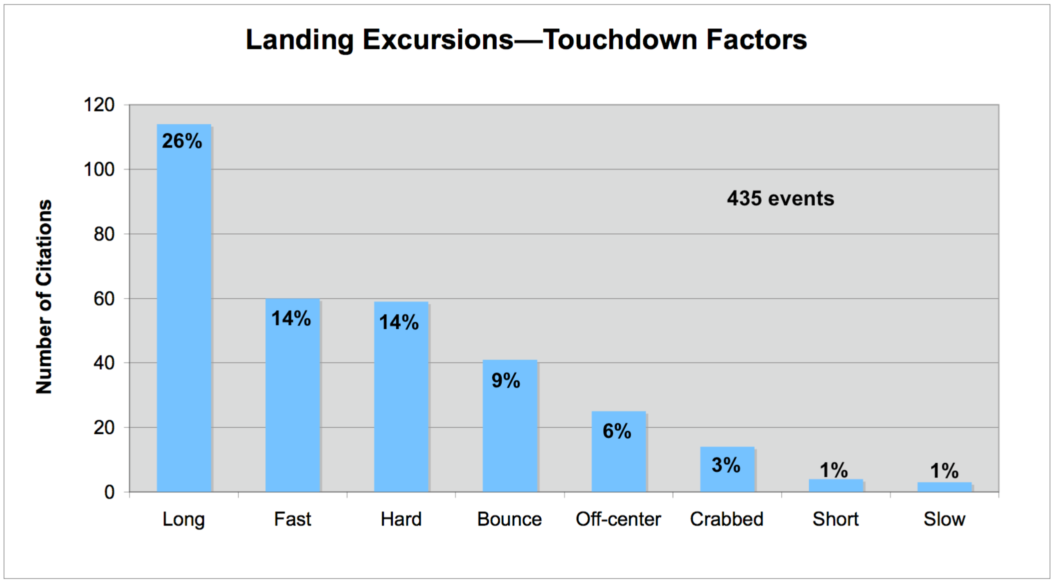
Approach Factors. Other approach descriptors are also included in the database, and their frequencies are shown in Figure 39. Aircraft involved in landing excursions (usually overruns) were often described as being high and/or fast on approach. These descriptors are commonly associated with the touchdown factor, "long," which dominates the distribution depicted in Figure 40.

Figure 39



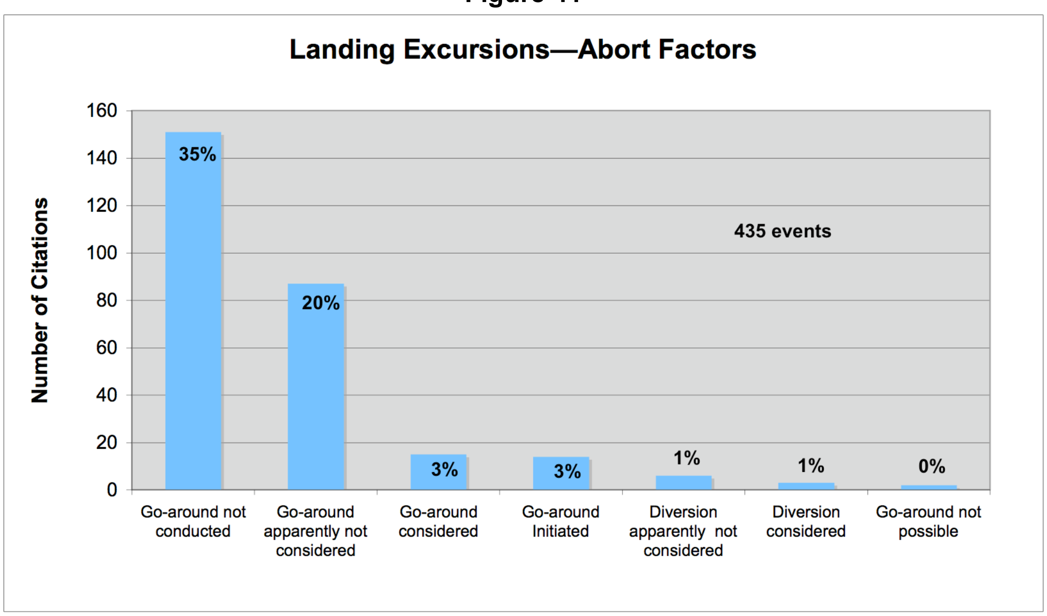
Touchdown Factors. This distribution (Figure 40) is highly affected by two related initiators of landing excursion accidents: fast landings or long landings. Pilots who do not manage energy properly on approach will arrive at the threshold with excess energy in the form of speed or height. This will likely be followed by a long landing, either from excessive float, or by crossing the threshold too high. Some pilots who find themselves high and/or fast will opt to get on the ground quickly. They will push the nose over or greatly reduce power in order to plant the wheels, believing that they can slow the aircraft with wheel brakes, speed brakes, and reverse thrust. The excessive sink rates created in these circumstances can result in hard and bounced landings, leading to landing gear damage and then loss of directional control.

Figure 40



Landing Abort Factors. The conservative cure for any type of unstabilized approach is to initiate a go-around. Many landing excursion accidents, however, illustrate that pilots frequently fail to even consider going around (Figure 41). In some cases, this failure is explicitly referenced by flight crew statements or the characterizations of the accident investigators. In others, failing to consider a go-around was evident during the database coding process, because the accident descriptions strongly suggested it. For instance, there were numerous examples of accidents where the flying pilot (most often the captain) had multiple cues that strongly suggested aborting the approach. These included verbal suggestions by a FO, one or more GPWS warnings, and obvious deviations from the flight path.

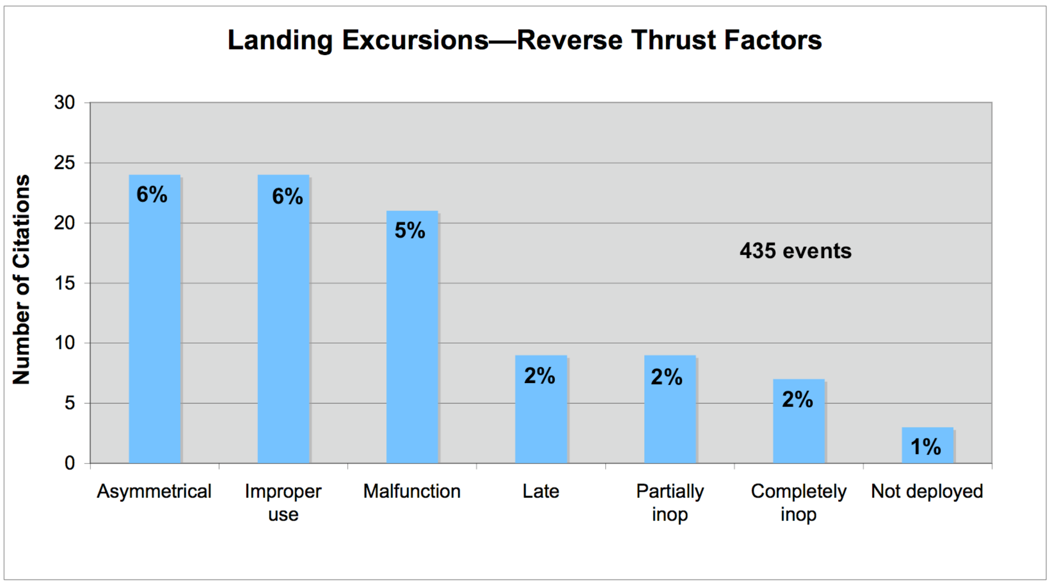
Figure 41



Reverse Thrust Factors. Figure 42 shows the frequency of citations involving reverse thrust problems. “Reverse thrust” refers to thrust reversers on turbojet/turbofan engines as well as thrust reverse mechanisms on turboprop aircraft. Problems with thrust reverse include both mechanical anomalies and misuse. Reverse thrust problems almost never affect all engines equally, and this causes asymmetrical deceleration. When this occurs, it can lead to a veer off, especially on contaminated runways.

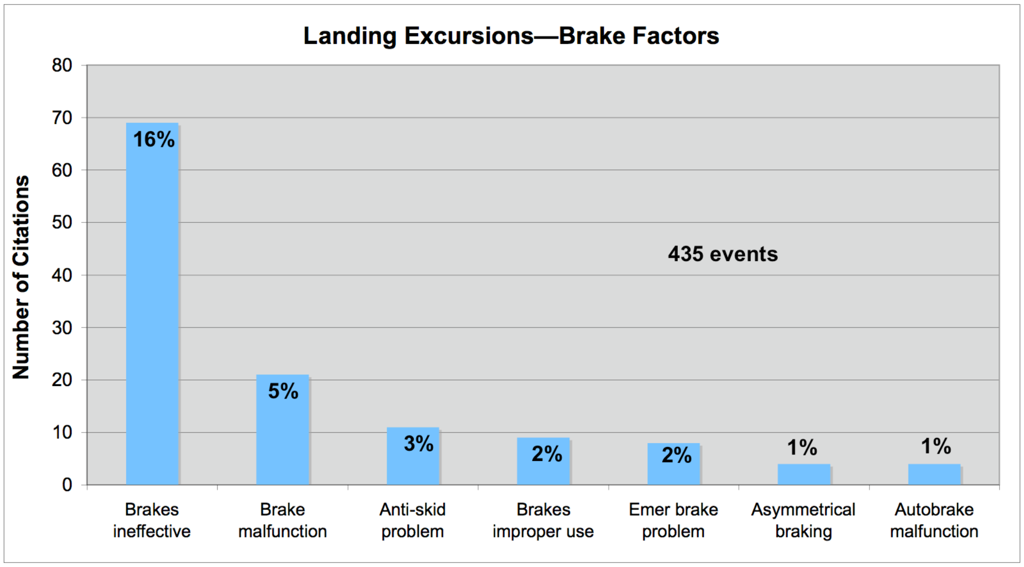
In some cases, reverse thrust problems were initiated by a mechanical failure such as one thrust reverser not deploying. Just as often, however, a thrust reverser that fails to deploy or a prop that doesn’t go completely into reverse arises from improper procedures by the pilot. Other examples of improper use include pilots cycling the reverse thrust on and off, initiating it late in the landing roll where it is much less effective, or failing to properly reverse on all engines at the same time.

Figure 42



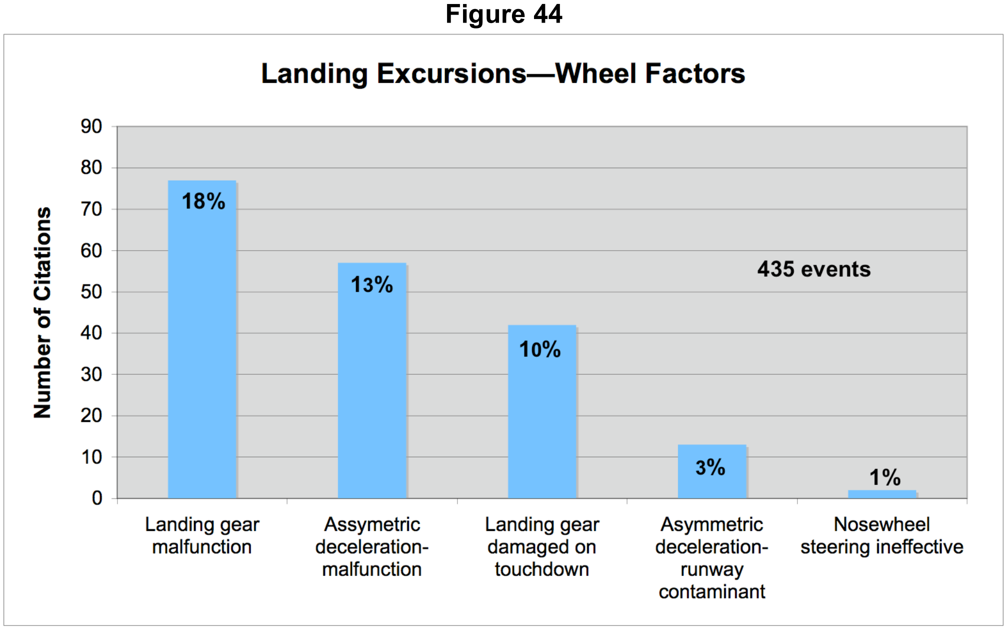
Brake Factors. The brake factors field documents problems with normal and emergency braking systems (Figure 43). The primary reference to braking issues in landing excursions was ineffective braking, due either to hydroplaning on wet runways or to other contamination conditions. Brake system malfunctions were relatively rare. A notable but small group of accidents, however, involved braking problems related to flight crews’ misunderstanding of the braking system. Most modern aircraft use logic circuits to control autobrakes, and certain events must occur before the autobrakes will activate, even when armed. When pilots inadvertently did not perform required actions, such as bringing both power levers all the way back, braking systems did not engage as expected.

Figure 43



Wheel Factors. Landing gear issues were a significant factor in landing excursions—especially during veer offs. The most common events were the spontaneous collapse of a landing gear strut, leading to asymmetric deceleration, and structural damage to the landing gear resulting from hard touchdowns. The wheel factors field also captures instances of asymmetric deceleration due to runway contaminants such as snow or slush (Figure 44).

Figure 44



Aircraft Configuration. Operational problems with flaps and speed brakes are infrequent in the landing excursions data set, but can clearly have deleterious effects when problems occur. Figure 45 shows the frequency of cited factors associated with speed brakes and Figure 46 aggregates these into basic categories. The most common error in configuring aircraft is the flight crew's failure to arm the speed brakes. This not only affects touchdown, but as previously mentioned, can affect autobrake system function as well. Figure 47 shows that problems with flaps and slats were also few in number, and primarily involved missetting.

Figure 45

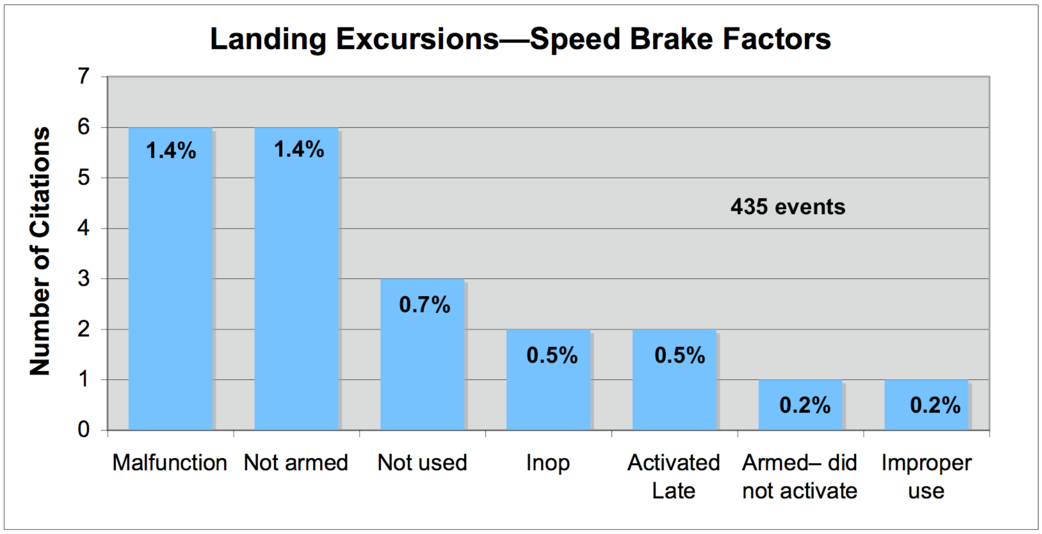


Figure 46

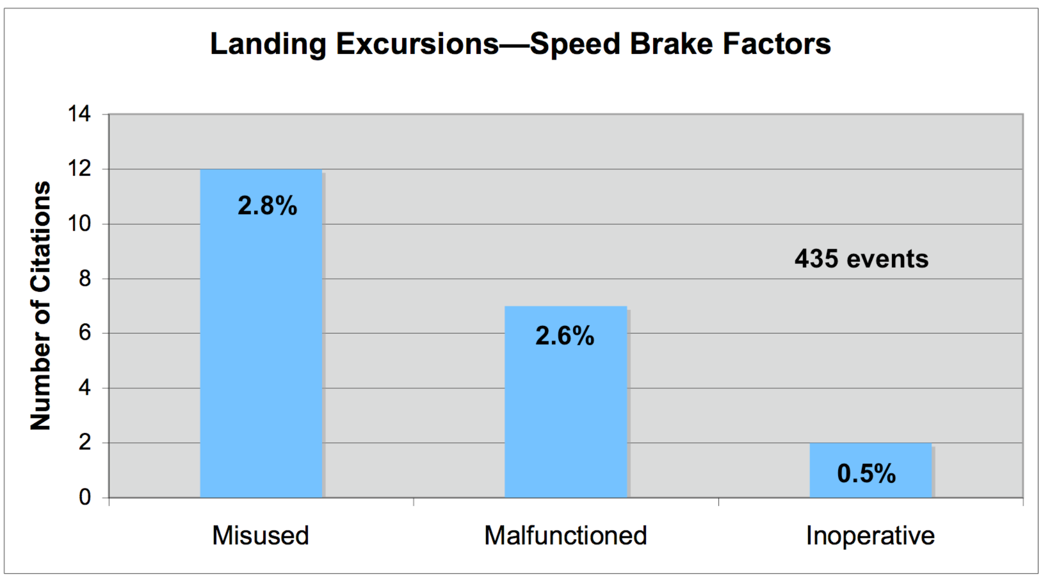
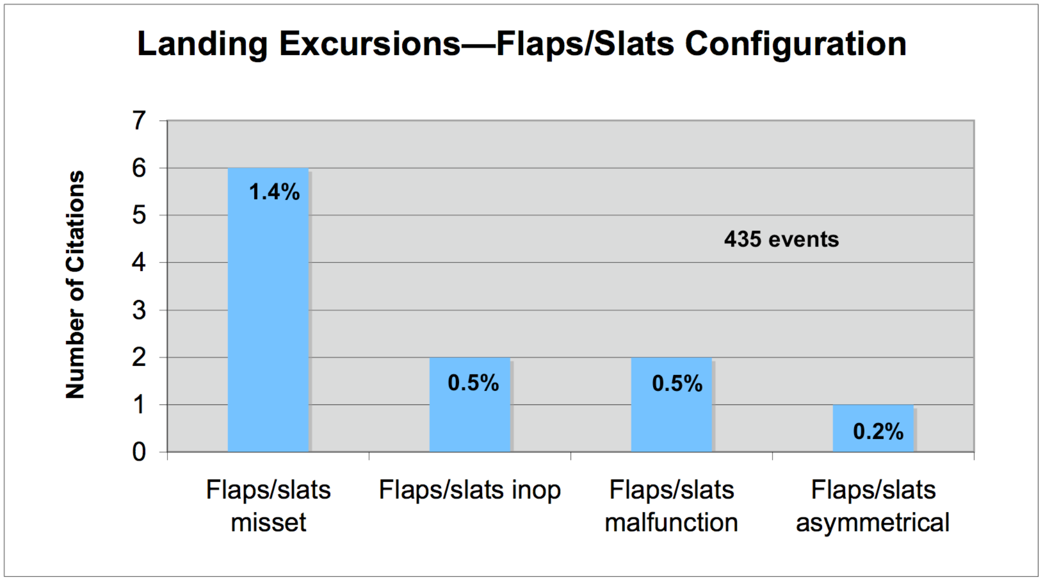
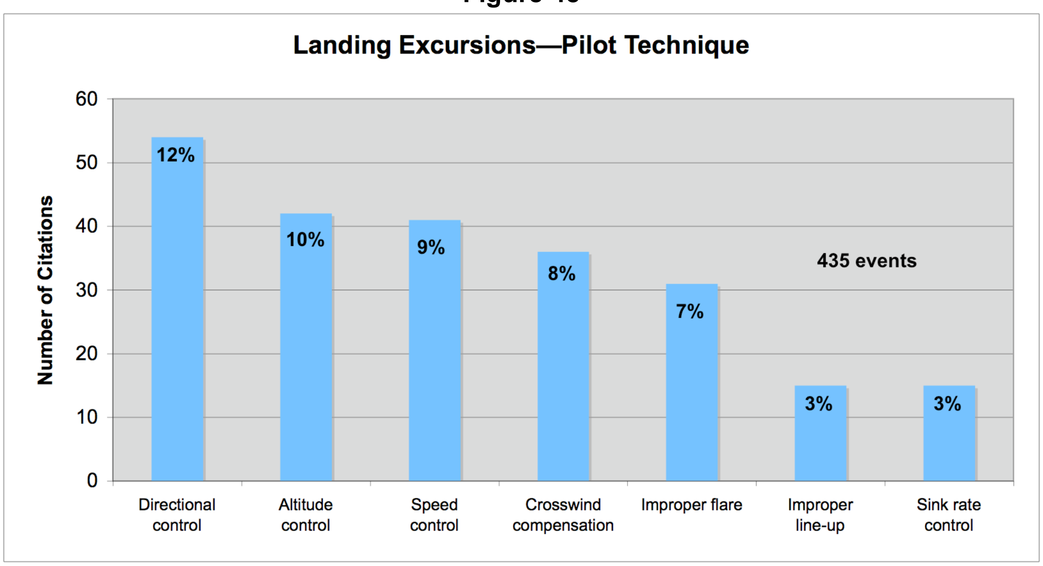


Figure 47



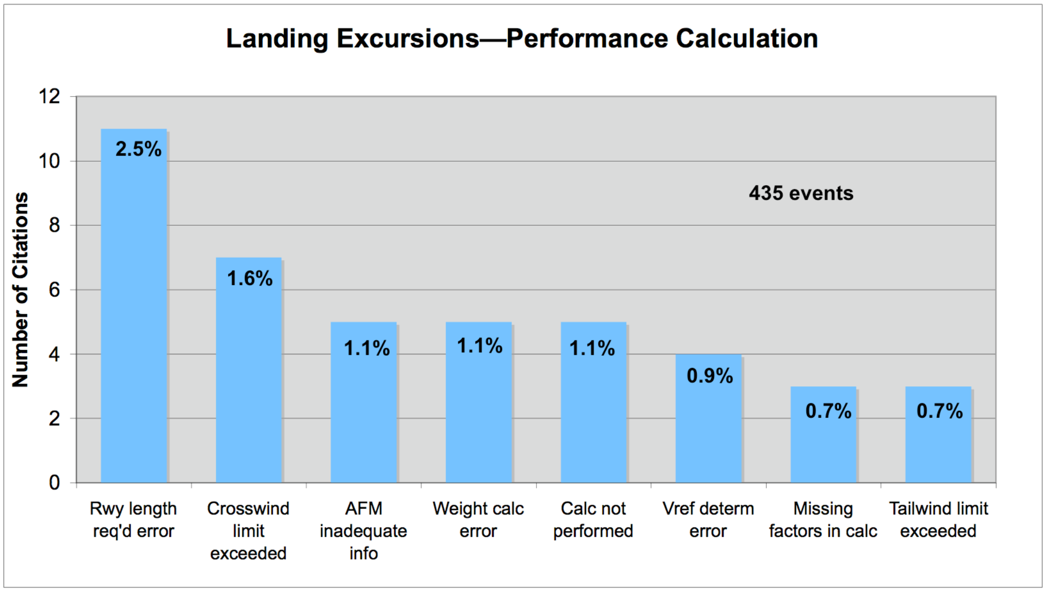
Pilot Technique. Piloting skills are often found to be a factor in landing excursions (Figure 48). Many of the factors coded in this field are derived by inference, and most refer to pilots' difficulties with flying stabilized approaches in terms of speed and altitude control. Accident reports also make frequent reference to problems maintaining directional control, but the underlying reasons are not usually evident, implying a deficiency in piloting technique. Citations under pilot technique are often associated with other factors in the database. For instance, crosswind compensation is coded whenever there are descriptions of sideways drift or crab during crosswind conditions, and improper flare is an implied problem in some hard landing events, as is sink rate control.

Figure 48



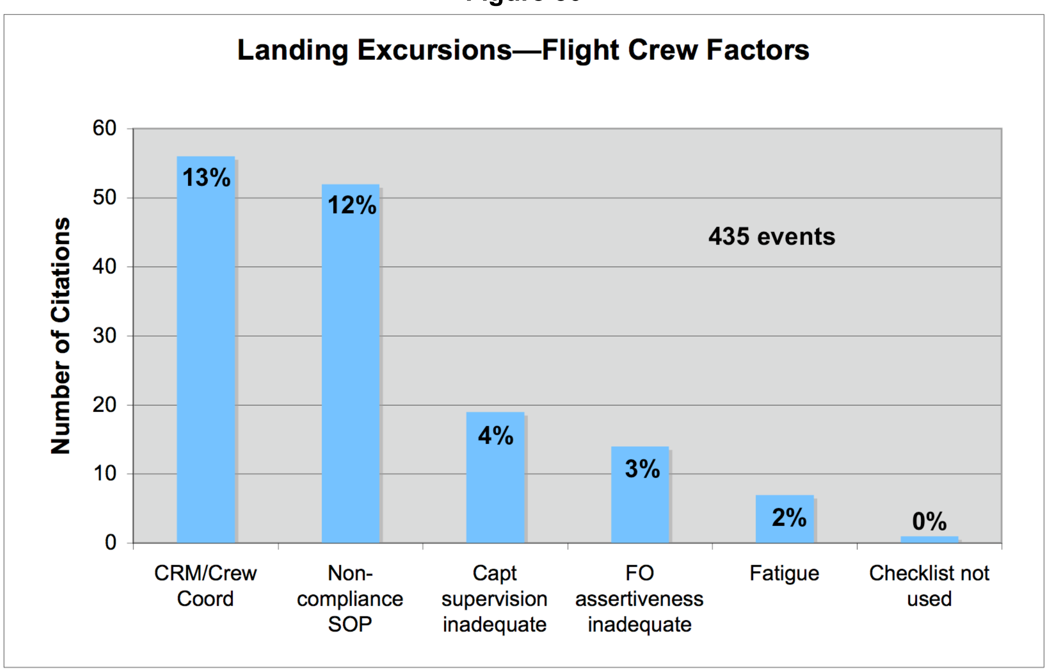
Performance Calculation. As with takeoff excursions, flight crews that fail to properly or consistently calculate aircraft performance requirements can increase their likelihood of a landing excursion. This is also true for pilots who fail to account for crosswind or tailwind limits. Figure 49 shows that the most frequent problem is miscalculation of landing length requirements in the given conditions. In some cases, aircraft flight manuals (AFMs) did not provide enough information about abnormal conditions such as contaminated runways. In others, pilots failed to take into account factors that degrade landing performance. For larger aircraft, mistakes in calculating required runway needs are connected with weight calculation errors. Inaccurate information on aircraft landing weight compromises the proper determination of flap settings and approach speeds (Vref).

Figure 49



Flight Crew Performance Factors. Flight deck human factors issues in landing excursion accidents mirror those seen in takeoff excursions (Figure 50). Breakdowns in crew coordination and other CRM deficiencies are relatively common. Captains who fail to adequately monitor their FO when the FO

Figure 50



is pilot flying are not ready to forestall problems that might then cascade toward an accident. Alternately, FOs are sometimes reluctant to intrude on the captain's authority when the captain's performance or judgments go beyond the boundaries of normal operating procedures. This factor, "FO assertiveness inadequate" is probably underreported in accident records as there are many events where approaches were clearly unstable or where a go-around was clearly called for, and the FO took no apparent steps to motivate their captain toward corrective action.

The factor "Non-compliance SOP" also refers to a variety of errors that were consistent among some landing excursions. Failing to perform required callouts, not executing checklists, not initiating a go-around or missed approach when losing sight of the runway, and not arming spoilers are recurring examples of these.

Overall Summary of Landing Excursion Factors. The landing excursion data suggests that failing to initiate a go-around or otherwise failing to fly the aircraft in a manner that promotes a proper touchdown on the runway (i.e., in the touchdown zone, at or near V_{ref}, and with a reasonable sink rate) are the deficiencies that most often leads to landing excursions. To avoid such accidents, pilots need to repeatedly evaluate the quality of their approach and probability of a good landing throughout the approach phase. If their approach becomes unstabilized or the likelihood of an acceptable touchdown is decreasing as the aircraft nears the runway, prudence and SOPs would dictate initiating a go-around. Landing excursion accident reports, however, illustrate that pilots sometimes do not recognize the progression of hazardous conditions; believing instead that they can recover, or being so focused on landing that nothing will deter them from continuing toward that goal.

Figures 51 summarizes the ten most frequent environmental conditions in landing excursions. Not surprisingly, wet runways and rain are the largest contributors. Figures 52 and 53 are comprehensive depictions of the most often cited factors in the landing excursions database.

Figure 51

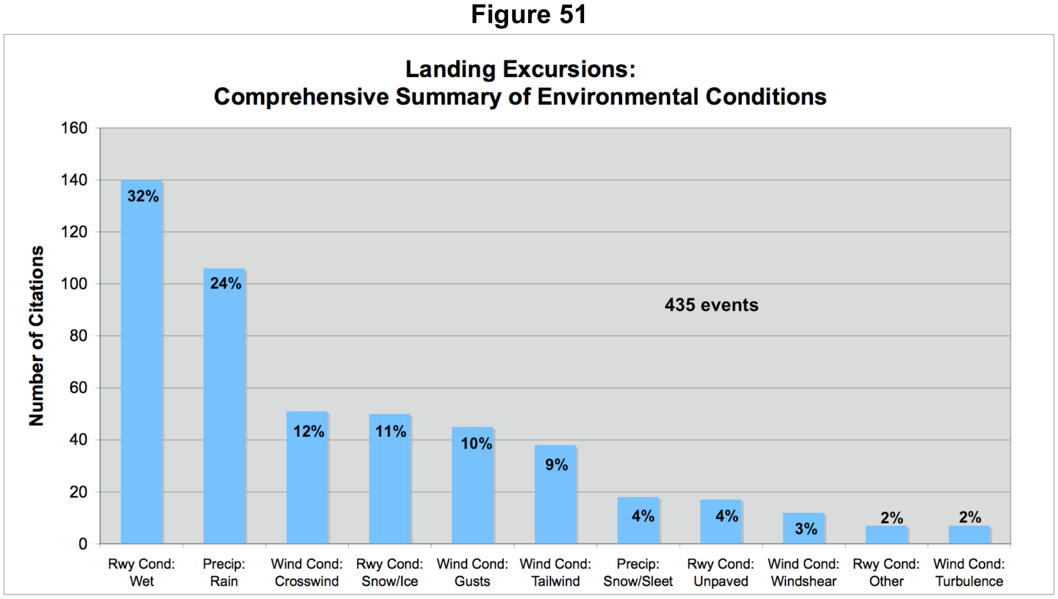


Figure 52

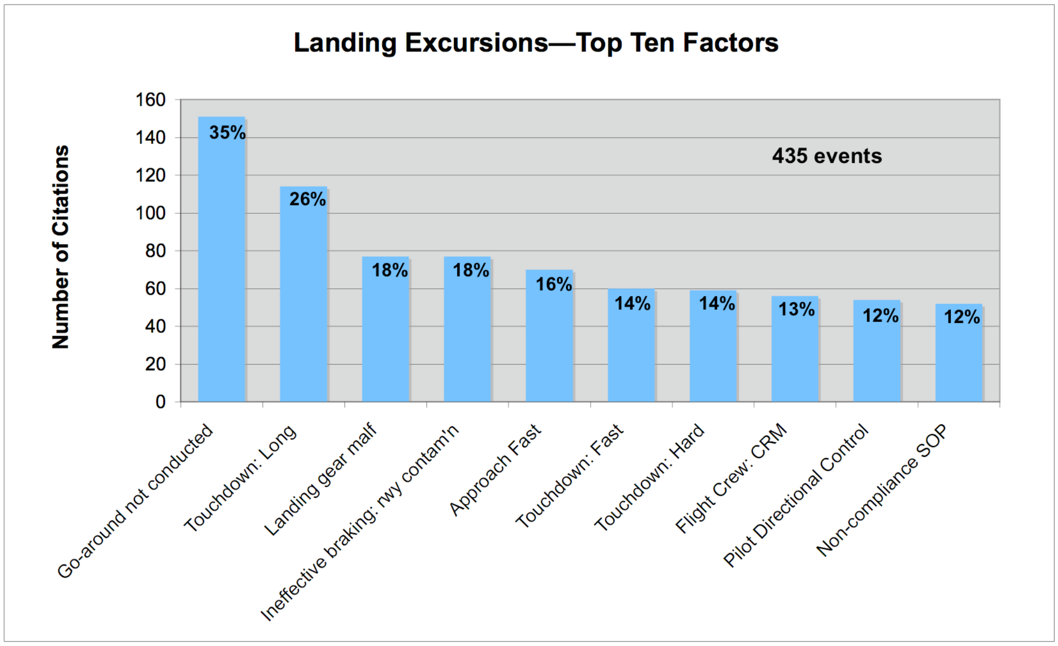
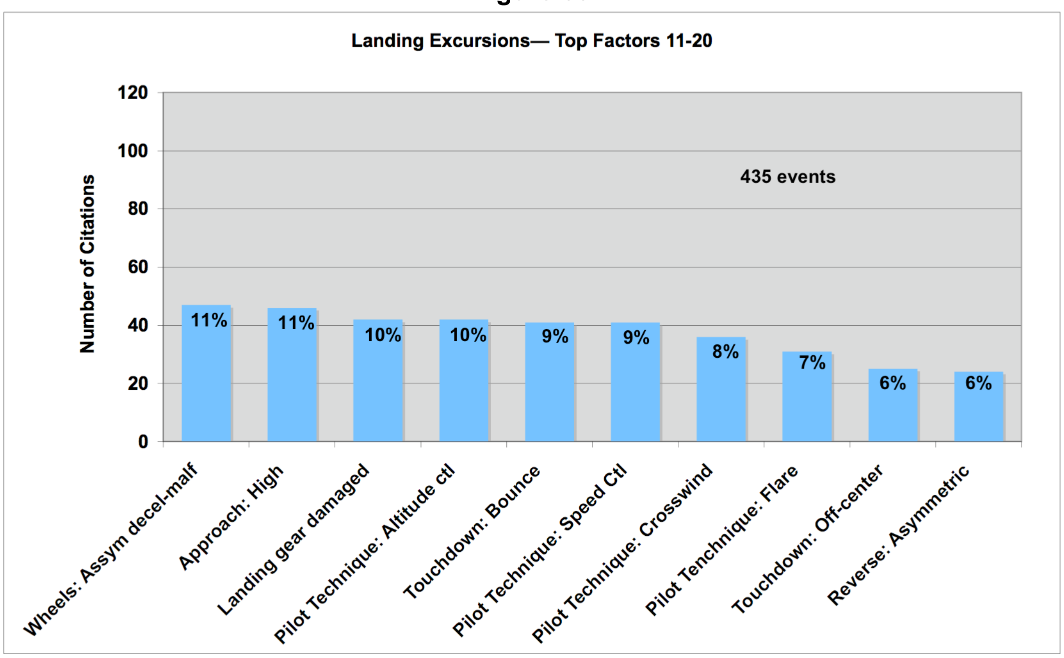


Figure 53



Landing Excursion Risk Factor Interactions. Tables 8 and 9 show interactions between selected risk factors for landing excursion veer offs and overruns, respectively. In contrast to the takeoff excursion data, the landing event data is not nearly as affected by the inaccuracies inherent to small numbers. In each table, yellow highlighted cells are those with values greater than or equal to 20 percent of the column total.

The number of highlighted cells for both veer offs and overruns shows that the landing excursion data has some strong associations between pairs of factors. For instance, Table 9 shows that, for veer offs, the factor(s) "touchdown long/fast" have little association with the other listed factors. However, the next column, "touchdown hard/bounce" shows strong associations with many of the other factors.

Conversely, Table 10 shows that "touchdown long/fast" is much more strongly associated with factors inherent in overruns, whereas "touchdown hard/bounce" has relatively weak associations. In veer offs, "touchdown hard/bounce" is somewhat associated with both stabilized and unstabilized approaches to a very similar degree. This implies that other factors in landing veer off accidents may be of equal or greater importance than a stabilized approach. Looking at overruns, however, the factor, "touchdown long/fast" has a very strong correlation with unstabilized approaches, and a much weaker correlation to stabilized approaches. Similar observations can be made with respect to various wind factors and runway contamination. For example, tailwinds are clearly a frequent contributor to overruns while crosswinds have a stronger presence with veer offs.

The risk factor interaction tables present the possibility of many associations between various contributing factors, but determining whether any pair of associated factors has a causal connection would require deeper study and analysis. The strong associations displayed in the tables serve to suggest areas where more detailed investigation may be fruitful. For instance, the "Go-around not conducted" columns exemplify strong associations with other factors such as unstabilized approaches, long/fast landings, runway contamination, and hard/bounced landings. Logically, these factors may have causal connection to each other that significantly increases the probability of a runway excursion accident. However, a final determination requires explicit study of events where these factors were present.

Table 9: Landing Excursion Veer Offs— Risk Factor Interactions

*Number of Events with the Cited Pairs of Factors**	Stabilized Approach (114 events)	Unstabilized Approach (39 events)	Go-around Not Conducted (44 events)	Touchdown long/fast (54 events)	Touchdown hard/bounce (50 events)	Runway Contamination (90 events)	Crosswind (47 events)	Tailwind (8 events)	Gusts/Turb/ Windshear (32 events)
Stabilized Approach			5	4	17	39	24	5	14
Unstabilized Approach			36	7	20	20	8	1	11
Go-around Not Conducted	5	36		9	24	25	10	1	10
Touchdown long/fast	4	7	9		5	4	2	1	9
Touchdown hard/bounce	17	20	24	5		21	17	2	12
Runway Contam	39	20	25	4	21		24	5	21
Crosswind	24	8	10	2	17	24		3	22
Tailwind	5	1	1	1	2	5	3		1
Gusts/Turb/ Windshear	14	11	10	9	12	21	22	1	

Table 10: Landing Excursion Overruns— Risk Factor Interactions

*Number of Events with the Cited Pairs of Factors**	Stabilized Approach (47 events)	Unstabilized Approach (87 events)	Go-around Not Conducted (107 events)	Touchdown long/fast (118 events)	Touchdown hard/bounce (17 events)	Runway Contamination (101 events)	Crosswind (18 events)	Tailwind (30 events)	Gusts/Turb/ Windshear (22 events)
Stabilized Approach			13	13	3	25	3	8	6
Unstabilized Approach			84	77	8	43	7	14	13
Go-around Not Conducted	13	84		91	14	53	10	19	18
Touchdown long/fast	13	77	91		15	53	9	20	14
Touchdown hard/bounce	3	8	14	15		5	2	7	5
Runway Contam	25	43	53	53	5		10	15	16
Crosswind	3	7	10	9	2	10		7	16
Tailwind	8	14	19	20	7	15	7		8
Gusts/Turb/ Windshear	6	13	18	14	5	16	16	8	

** – Cells highlighted in yellow are those where the co-existence of two factors is greater than or equal to 20 percent*

Consequences of Landing Excursions. In contrast with takeoff excursions, landing events have a greater likelihood of producing no injuries, as illustrated by nearly half the landing excursion accidents (Figure 54). The proportion of fatal injuries was also less in these events. This may be due to the underlying physics of each type of event: In takeoff accidents, kinetic energy is increasing as the aircraft proceeds down the runway, while in landing accidents, energy is constantly decreasing. Fuel loads during landing are less as well, lessening the probability and severity of a post-crash fire (Figure 55).

Figure 54

Landing Excursions—Most Severe Injury (435 events)

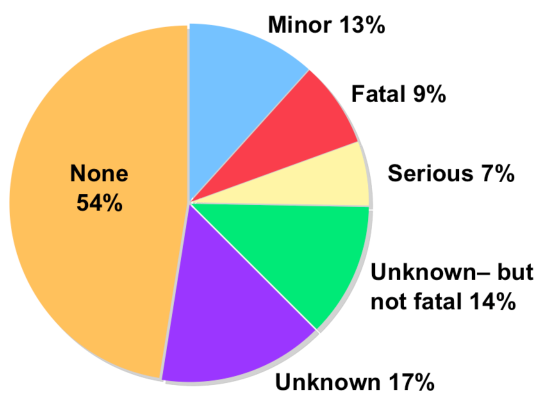
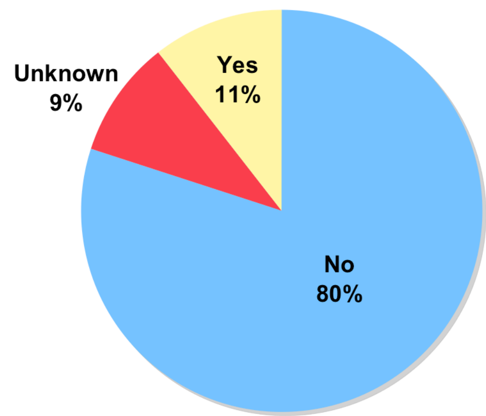


Figure 55

Landing Excursions—Post Crash Fire (435 events)



CONCLUSIONS

The development of a runway excursions database and this initial look at the various parameters identified in these accidents has had some predictable and some surprising results. That takeoff runway excursions are often associated with rejecting takeoffs after V_1 simply validates the meaning of V_1 and its importance. That pilots will often initiate aborts after V_1, however, suggests that their psychology when operating in the real world may be different than in training. The repeated fear that the airplane might not safety fly, given some disconcerting event occurring at or after V_1, indicates a possible deficit in pilots' understanding of airplane performance and their appreciation for the low probability of circumstances that would truly prevent safe flight.

It is also interesting that a large number of takeoff excursions occur even when the aircraft has not reached V_1. Many of these are veer offs, where events transpire so quickly that the aircraft leaves the runway before an abort can be initiated. As mentioned previously, however, some pilots will make prolonged attempts to regain control before initiating their abort—a tendency which can be futile, or which guarantees an overrun that could have been avoided.

The landing excursion accident analysis depicts a wide variety of scenarios that can lead to departing the runway. The data validates the commonly held belief that unstabilized approaches are a frequent precursor of excursions. Unstabilized approaches can result in long and fast landings where aircraft have no chance to stop on the remaining runway. They can also lead to pilots' prolonged attempts at recovery that, when unsuccessful, result in hard contact and significant aircraft damage leading to a veer off.

A large number of landing excursions involved the flight crew's apparent failure to even consider going around. This may result from training deficiencies or stresses that make pilots reluctant to go around. Accident narratives frequently describe circumstances where the flying pilot (most often the captain) appears to be hyper-focused on continuing an approach that is clearly too fast and/or too high. This scenario was characteristic of so many landing excursions, that it strongly suggests the need for cockpit procedures that inherently compel the crew to iteratively evaluate approach parameters throughout the final approach segment and force the initiation of a go-around when any parameter or combination thereof exceeds tolerance.

The frequent presence of runway contaminants in runway excursions strongly implies that they, too, are a significant risk factor, along with weather conditions such as rain, crosswinds, gusting winds, and low visibility.

An unexpected finding in this analysis is the relatively frequent occurrence of mechanical failures that either initiate an accident sequence or that grow out of the accident sequence and lead to the excursion. For example, in landing excursions, there were numerous cases of gear collapse, brake failure, and thrust reverser malfunctions that could not have been predicted by the flight crew until they occurred, at which point a runway excursion may have been inevitable.

APPENDIX 1

Listing of Data Fields and Field Values

Takeoff Excursions Database

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TAKEOFF EXCURSIONS DATABASE

Data Fields and Field Values

Field Name	Authorized Values	Definition/Description
Data Source	Names of agencies or data sources used to acquire information on the accident codified in the data record	Textual description of information sources used to construct database record
Aircraft Type and Series	Textual description of aircraft type, preferably utilizing accepted type/series designators	Description of aircraft make, model, and series
Basic Aircraft Type	Textual description of aircraft type not including series (e.g., "B747" includes all B747 dash models	Description of aircraft make and model
Flight Data Recorder		Presence and operational status of a flight data recorder, if known
	Installed/Operational	Aircraft was equipped with a working FDR at the time of the accident
	Installed/Operating Anomaly	Aircraft was equipped with a partially working FDR at the time of the accident
	Installed/Not Operational	Aircraft was equipped with an FDR, but it did not function at the time of the accident
	Not Installed	Aircraft was not equipped with an FDR
	Unknown	Presence of FDR at the time of the accident is unknown
Cockpit Voice Recorder		Presence and operational status of a cockpit voice recorder, if known
	Installed/Operational	Aircraft was equipped with a working CVR at the time of the accident
	Installed/Operating Anomaly	Aircraft was equipped with a partially working CVR at the time of the accident
	Installed/Not Operational	Aircraft was equipped with an CVR, but it did not function at the time of the accident
	Not Installed	Aircraft was not equipped with an CVR
	Unknown	Presence of CVR at the time of the accident is unknown
Local Date	YYYY/MM/DD	Date of the accident in the time zone in which it occurred.
Local Time	HHMM (24-hour clock)	Time of the accident in the time zone in which it occurred.
Arpt ICAO ID	XXXX	4-letter ICAO location identifier for the airport at which the accident occurred, or free text location description
Operator Name	Name of entity operating the accident aircraft	Person or organization responsible for conduct of the flight
Country of Origin	2-letter ICAO country code	ICAO country code for the operator's home base
Type of Operation		Primary purpose of operator's flights
	Passenger	Primary flight purpose is to carry passengers
	Freight	Primary flight purpose is to carry cargo
	Reposition	Moving the aircraft with no passengers aboard, only the required flight crew, to a new staging area

Field Name	Authorized Values	Definition/Description
	Personal	A flight conducted for personal, non-commercial and non-corporate purposes
	Training	A flight, the primary purpose of which is flight training.
	Other	A flight conducted for a purpose not otherwise described in the authorized list.
	Unknown	The type of operation is unknown
Operating Domain		The geographical area of the operator's flights
	International	Operator's flights typically originate and end in various countries
	Domestic	Operator's flights typically originate and end in one country
	Unknown	Operating domain unknown
Type of Operator		Characterization of the operator's business purpose
	Corporate	Private operation in support of a business, operated under less restrictive flight rules than airlines
	Government	Operations in support of a government purpose, but not military
	Major	Scheduled passenger operations using large jet transports
	Non-scheduled	Charter services for either passengers or freight
	Regional	Small scheduled airlines using small turbojet or turboprop aircraft and operating within a limited geographical domain
	Other	Other operator type not encompassed by existing field values
	Unknown	Type of operator unknown
Pilot Flying		Person operator the flight controls at the time of the accident
	Captain	Captain in a 2-pilot flight crew
	First officer	First officer in a 2-pilot flight crew
	Single pilot	Lone pilot in a single pilot operation
	Control transfer prior to landing	Transfer of flight controls occurred during the events comprising the accident
	Unknown	It is unknown which crew member was flying the airplane
Capt/SP Total Hours	Any non-negative integer	Captain's or single pilot's total flight experience in hours flown
FO Total Hours	Any non-negative integer	First officer’s total flight experience in hours flown
Capt/SP Hours in Type	Any non-negative integer	Captain's or single pilot's total flight experience in the accident aircraft type
FO Hours in Type	Any non-negative integer	First officer’s total flight experience in the accident aircraft type
Capt/SP Hours in Type Prev Month	Any non-negative integer	Approximate number of hours flown by the captain or single pilot in the accident aircraft type within the past month
FO Hours in Type Prev Month	Any non-negative integer	Approximate number of hours flown by the first officer in the accident aircraft type within the past month
Capt/SP Flights in Airfield Prev Month	Any non-negative integer	Number of operations flown by the captain or single pilot into the accident airport within the past month

Field Name	Authorized Values	Definition/Description
FO Flights into Airfield Prev Month	Any non-negative integer	Number of operations flown by the first officer into the accident airport within the past month
Lighting Conditions		Light condition at the time of the accident
	Light	Daylight
	Dark	Night
	Twilight	Dusk/dawn; Sunrise/sunset
	Unknown	Lighting condition not described in accident report and not able to be inferred by time of day
Airport Wx Conditions		Description of the weather conditions at or in the vicinity of the accident airport as they pertain to weather flight was being conducted under visual or instrument flight rules
	VMC	Visual meteorological conditions: ceiling ≥ 1000 feet and visibility ≥ 3 statute miles
	IMC	Instrument meteorological conditions: ceiling < 1000 feet or visibility < 3 statute miles
	Unknown	Airport meteorological condition unknown at the time of the accident
Runway Direction	Positive integer > 0 and ≤ 360	Compass direction, in degrees magnetic, of the runway involved in the accident, usually given in the nearest 10-degree increment
Surface Wind Direction	Positive integer > 0 and ≤ 360 and the number 999	Compass direction, in degrees magnetic, of the airport surface wind at the time of the accident; 999 signifies wind reported as calm
Surface Wind Velocity	Integer ≥ 0	Surface wind velocity in knots at the time of the accident
Surface Wind Gust Factor	Integer ≥ 0	Surface wind gust magnitude in knots over and above the steady wind component
Steady Headwind	Calculated value rounded to the nearest integer	Surface wind steady headwind component in knots. Negative values imply a tailwind
Headwind Gust Factor	Calculated value rounded to the nearest integer	Headwind component of the gust factor given in the field "Surface Wind Gust Factor." Negative values imply a tailwind gust factor
Steady Crosswind	Calculated value rounded to the nearest integer	Surface wind steady crosswind component in knots.
Crosswind Gust Factor	Calculated value rounded to the nearest integer	Crosswind component of the gust factor given in the field "Surface Wind Gust Factor."
Precipitation		Type of precipitation present at the time of the accident
	Rain	Rain with water temperature above freezing
	Sleet	Rain/snow combination with water temperature at freezing
	Snow	Snow with water temperature below freezing
	Hail	Ice pellets associated with thunderstorms
	Unknown	Presence of precipitation at the time of the accident is not known
	None	No precipitation occurring at the time of the accident
Prevailing Visibility	Positive decimal number	Reported prevailing airport visibility at the time of the accident, in statute miles

Field Name	Authorized Values	Definition/Description
Runway Condition		Description of runway contamination or surface condition as it would affect stopping capability or usability of the runway
	Dry	Dry pavement
	Wet	Wet pavement
	Standing water	Presence of pooled water
	Slush	Combination of snow and water at temperatures near freezing
	Snow	Snow with temperature below freezing
	Ice	Frozen water
	Rubber	Rubber deposits from tires
	Grass	Runway with grass surface
	Dirt	Unpaved runway
	Gravel	Gravel covered runway
	FOD	Objects or debris on runway that could potentially damage an aircraft
	Obstruction	Obstruction on runway presenting a potential collision hazard for aircraft
	Other	Runway contaminant not otherwise listed
	Unknown	Status of runway surface not known
Braking Action Gnd Vehicle		Description of braking action report at the time of the accident as provided by a ground vehicle operator or as measured by a runway friction device
	Good	Traditional description
	Fair	Traditional description
	Poor	Traditional description
	Nil	Traditional description
	None/Unknown	Braking action report unavailable or braking action information unknown
Braking Action Acft		Description of braking action report at the time of the accident as provided by the flight crew of another aircraft
	Good	Traditional description
	Fair	Traditional description
	Poor	Traditional description
	Nil	Traditional description
	None/Unknown	Braking action report unavailable or braking action information unknown
Runway Lights		Presence and operational status of edge lights on the accident runway
	Yes-on	Runway lights present and operating
	Yes-off	Runway lights present but not operating
	Yes-state unknown	Runway lights present but operational state unknown
	No	Runway lights non-existent
	Unknown	Information on runway lights not available

Field Name	Authorized Values	Definition/Description
	Not applicable	Presence and operational status of runway lights is not relevant, sometimes because of the existence of daylight conditions at the time of accident
Event Type		Type of runway excursion
	Overrun	Departing the end of the runway while on the ground
	Off-side veer	Departing the side of the runway while on the ground*
	Unknown	Unable to discriminate how aircraft left the runway
		**Some off-side veers are intentional on the part of the flight crew in their efforts to avoid overrunning the end of the runway, usually because they fear colliding with objects off the end such as approach lights, ILS antennas, etc. When offside veers occurred near the end of the runway for these reasons, they are coded as overruns.*
Most serious injury		Degree of the most serious injury incurred as a result of the accident or it's aftermath, either by an aircraft occupant or a person on the ground.
	Fatal	Death ensued as a result of accident-related injuries
	Serious	Injury that required a hospital stay of at least 48 hours
	Minor	Degree of injury less than serious
	None	No injuries
	Unknown/no fatals	Nature of injuries unknown. They may include serious or minor injuries, but no fatalities.
	Unknown	No injury information available
Runway Wind Factors		Characterization of runway wind conditions as causal or contributing factors to an accident.
	Crosswind	Component of wind blowing across the runway
	Tailwind	Component of wind from behind the aircraft increasing its groundspeed
	Gusts	Wind with rapidly changing velocities or directions
	Turbulence	Wind causing disruptive forces on the aircraft in 3-dimensions
	Windshear	Adjacent layers of wind with substantially different velocity and/or direction
	None	Wind was not a significant factor in the accident
	Unknown	Wind condition was not described or wind effect on the accident circumstances is not known.
Reverse Thrust Factors		Accident factors associated with the use of reverse thrust mechanisms in both turbojet and turboprop aircraft.
	Completely inop	Reverse thrust installed but inoperative on all engines with flight crew aware of inoperative condition.
	Asymmetrical	Reverse thrust created asymmetrical forces on the aircraft
	Late	Reverse thrust activated after an inappropriate delay
	Improper use	Reverse thrust used or controlled in some inappropriate way

Field Name	Authorized Values	Definition/Description
	Partially inop	Reverse thrust installed but inoperative on some, but not all, engines, with flight crew aware of inoperative condition
	Malfunction	Reverse thrust fails to function as expected by the flight crew
	Not deployed	Reverse thrust available but not used
	Unknown	Effect of reverse thrust on accident circumstances not known
	Not applicable	Reverse thrust issues do not apply to this accident, perhaps because reverse thrust mechanism is not installed on the accident aircraft.
Brake Factors		Accident factors associated with the use of wheel brakes, associated systems, emergency brakes, or other stopping mechanisms such as drag chutes. Does not include reverse thrust factors.
	Asymmetrical	Brakes produced asymmetrical stopping forces on the aircraft.
	Improper use	Inappropriate use of primary wheel brakes
	Malfunction	Primary wheel brakes did not function as the flight crew expected
	Ineffective-runway friction	Wheel braking substantially degraded by slippery runway conditions other than hydroplaning
	Ineffective-hydroplaning	Wheel braking substantially degraded by hydroplaning of the aircraft tires
	Not used	Primary wheel brakes intentionally not activated by the flight crew
	Anti-skid inop	Anti-skid wheel brake system installed but known to be inoperative
	Anti-skid malfunction	Anti-skid wheel brake system installed but did not function as expected
	Emer brake malfunction	Emergency braking system installed, but did not function as expected
	Emer brake asymmetrical	Emergency braking system created asymmetrical forces on the aircraft
	Emer brake improper use	Emergency braking system used inappropriately
	Emer brake not used	Emergency braking system installed, operational, but not activated
	Parking brake engaged	Parking brake was not disengaged by the flight crew
	Unknown	Accident factors associated with brakes are not known, but may be relevant
	Not applicable	Brake factors are not relevant to the accident
Wheel Factors		Factors involving aircraft landing gear and its components that contributed to the circumstances of the accident.
	Main gear collapse on touchdown–not locked	Collapse of main landing gear on touchdown
	Nosewheel steering malfunction	Failure of the nosewheel steering system to function as expected
	Nosewheel steering ineffective-hydroplaning	Nosewheel steering substantially degraded because the nose tire was hydroplaning

Field Name	Authorized Values	Definition/Description
	Wheel(s) would not deploy	One or more landing gear struts would not deploy
	Landing gear damaged on touchdown	Damage to any landing gear strut as a result of excessive forces incurred during the landing
	Landing gear malfunction–other	Failure of the landing gear to function as expected when such failure is not covered by another value in this field
	Tire failure	Tire failure as a cause or contributor to the accident—not as a consequence of the runway excursion
	Unknown	Contribution of wheel factors to the accident are not known but may be relevant to cause of the accident
	Not applicable	Wheel factors are not relevant to this accident
Pilot Technique		Factors that address possible deficiencies in piloting skills
	Crosswind compensation	Pilot's inability to adequately correct for sideways drift and/or to maintain alignment with the runway
	Speed control	Pilot inability to keep airspeed at the desired or prudent value
	Sink rate control	Pilot's inability to keep descent rate at the desired or prudent value
	Altitude control	Pilot's inability to manage altitude such that the aircraft maintains the glide slope and/or passes the runway threshold at a reasonable height.
	Directional control	Pilots' inability to maintain directional control when it was reasonably possible to do so
	Improper flare	Error in the process of transitioning the aircraft from final approach to touchdown over the runway
	Improper line-up	Pilot's inability to accurately align the aircraft with the runway centerline on approach and/or through the takeoff or landing ground roll
	Unknown	Pilot technique factors are not known but may be relevant to the accident circumstances
	Not applicable	Pilot technique factors are not relevant to this accident
Takeoff Abort Factors		Factors that characterize the potential decision to reject a takeoff and the speed at which the abort process was initiated
	Considered	Aborting the takeoff was considered but rejected by the flight crew
	Not considered	Aborting the takeoff was not considered and not executed
	Initiated ≤ V1	Takeoff rejected beginning at a speed at or below V1
	Initiated ≤ V1-insuff rwy remaining	Takeoff rejected beginning at a speed at or below V1 (as understood by the flight crew) but adequate stopping distance on the runway was not available.
	Initiated > V1	Takeoff rejected beginning at a speed greater than V1
	Initiated-speed unknown	Takeoff rejected beginning at an unknown speed
	No time to abort	Unable to abort takeoff before aircraft departed the runway surface
	Unknown	Takeoff abort factors may be relevant but are not known

Field Name	Authorized Values	Definition/Description
	Not applicable	Takeoff abort factors are not applicable to this accident
Rotation Factors		Factors describing if and when the accident aircraft rotated to become airborne
	Below V1/Vr	Aircraft rotated early, prior to reaching V1 or Vr
	Below V1/Vr insufficient runway remaining	Aircraft rotated early, prior to reaching V1 or Vr with insufficient runway remaining to stop
	Above Vr	Aircraft was rotated late, at a speed in excess of Vr
	Above Vr insufficient runway remaining	Aircraft was rotated late, at a speed in excess of Vr, and with insufficient runway remaining to stop
	Unable to rotate	Aircraft would not become airborne when rotation initiated by the pilot
	Not attempted-Vr not reached	Rotation speed not reached and the flight crew did not attempt to get the aircraft off the ground
	Not attempted-other	Flight purposely did not rotate the aircraft
	Collision avoidance	Rotation was affected by (early or late) by the need to avoid a collision with something on or near the runway
	Balanced field length unavailable	The runway length was not sufficient to accelerate to rotation speed, decide to abort, initiate the abort, and come to a stop without overunning
	Unknown	Rotation factors may have contributed to the accident but the factors are not known
	Not applicable	Rotation factors were not pertinent to the accident
Takeoff Performance Factors		Factors that may have contributed to a decision to abort the takeoff, or may have increased the distance needed to become airborne
	Degraded engine performance	One or more engines did not perform as expected
	Sudden engine power loss	Large and sudden change in an engine's power or thrust production—the classic engine failure on takeoff
	Engine malfunction	Non-specific operating anomaly with an engine
	Thrust stabilization problem	Delay in achieving the commanded engine power setting on takeoff
	Thrust asymmetry	Significant difference in engine power/thrust between engine(s) on each side of the aircraft
	Runway contamination	Substances on the runway that may impede acceleration on takeoff
	Wing contamination	Ice or snow adhering to the aircraft with the potential to degrade lift and/or increase drag
	Inadequate climb rate	Failure to achieve the expected initial climb rate after rotation
	Unknown	Takeoff performance factors may be relevant to the accident but are not known
	Not applicable	Engine performance factors are not applicable to the accident
Spoiler/Air Brake Factors		Accident factors associated with aircraft spoilers, air brakes, or the like
	Not used	Spoilers/air brakes available but not used by the flight crew

Field Name	Authorized Values	Definition/Description
	Not armed	Flight crew unintentionally failed to arm the spoilers/air brakes
	Improper use	Spoilers/airbrakes used in a manner inconsistent with their design, purpose, and/or standard operating procedure
	Inop	Spoilers/air brakes were known by the flight crew to be non-operational
	Malfunction	Spoilers/air brakes did not operate as designed or as expected
	Late	Spoilers/air brakes were deployed later than intended or than was prudent
	Unknown	Spoiler/air brake factors may be relevant to the accident but are not known
	Not applicable	Spoiler/air brake factors are not applicable to the accident
Flap/Slat Configuration Factors		Accident factors referencing flap/slat settings
	Flaps/slats inop	Flaps were known be inoperative prior to flight
	Flaps/slats malfunction	Flaps did not function as designed or as expected
	Flaps/slats misset	Flaps were incorrectly set
	Flaps/slats asymmetrical	Flaps position was inconsistent between the two sides of the aircraft
	Unknown	Flap/slat factors may have been relevant to the accident but were not known
	Not applicable	Flap/slat factors are not applicable to the accident
Performance Calculation Factors		Factors affecting the ability or the accuracy of aircraft performance calculations with respect to takeoff, landing, and runway requirements
	Required runway length error	Error in accurately calculating or otherwise determining the adequate runway length for takeoff or landing
	Balanced field length unavailable	The runway length was not sufficient to accelerate to rotation speed, decide to abort, initiate the abort, and come to a stop without overunning
	Vref determination error	Error in accurately calculating Vref prior to landing. Vref being the minimum target airspeed during landing approach with the aircraft in landing configuration
	V1 determination error	Error in accurately calculating V1, the highest speed at which a decision to abort a takeoff can be prudently made with remaining runway sufficient for stopping
	Crosswind limit exceeded	Flight crew attempted to land or takeoff with a crosswind component in excess of that recommended or allowed
	Tailwind limit exceeded	Flight crew attempted to land or takeoff with a tailwind component in excess of that recommended or allowed

Field Name	Authorized Values	Definition/Description
	Aircraft weight calculation error	Error in determining the actual aircraft weight when calculating takeoff or landing performance. Also, errors in calculating aircraft performance requirements resulting from using an inaccurate aircraft weight value
	CG calculation error	Error in determining the aircraft center of gravity
	MEL error	Errors involving misinterpretation of the aircraft's minimum equipment list
	Missing factors in calculation	Performance calculation errors due to a lack or information or failure to utilize necessary information
	AFM inadequate information	Inability to accurately calculate aircraft performance due to a lack of information provided by the aircraft manufacturer
	Calculation not performed	Flight crew did not attempt to calculate performance values
	Unknown	Aircraft performance calculations my be pertinent to the accident, but are not known
	Not applicable	Aircraft performance calculation was not pertinent to the accident
Flight Crew Factors		Factors involving flight crew performance, human factors considerations, and adherence to policies and procedures
	CRM	Problem with the application of crew resource management principles
	Crew coordination breakdown	Improper or ineffective teamwork involving multi-person flight crews
	Capt supervision inadequate	Captain did not adequately monitor the first officer's performance, especially when the first officer was the flying pilot
	FO assertiveness inadequate	First officer did not adequately assert him/herself when observing inappropriate or incorrect actions by the Captain
	Non-compliance with SOP	Non-adherence to accepted, standard, or required policies and/or procedures regarding aircraft operation
	Checklist not used	A checklist should have been, but was not used or executed
	Checklist not completed	A checklist was initiated but not finished
	Fatigue	References to flight crew fatigue as a factor in pilots' performance
	Unknown	Flight crew factors may be relevant to the accident, but are not known
	Not applicable	Flight crew factors are not pertinent to the accident
Mechanical Anomaly	Any text	Description of aircraft mechanical issues that may have contributed to the accident and are not referenced in other fields
Other Factors	Any text	Description of pertinent accident factors not referenced in other fields
Narrative	Any text	A representative narrative or description of the accident circumstances obtained from one or more information sources or summarized from those sources. This narrative does not necessarily contain all the information used to code the accident factors or to fill in other information in the database record

APPENDIX 2

Listing of Data Fields and Field Values

Landing Excursions Database

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LANDING EXCURSIONS DATABASE

Data Fields and Field Values

Field Name	Authorized Values	Definition/Description
Data Source	Names of agencies or data sources used to acquire information on the accident codified in the data record	Textual description of information sources used to construct database record
Aircraft Type and Series	Textual description of aircraft type, preferably utilizing accepted type/series designators	Description of aircraft make, model, and series
Basic Aircraft Type	Textual description of aircraft type not including series (e.g., "B747" includes all B747 dash models	Description of aircraft make and model
Flight Data Recorder		Presence and operational status of a flight data recorder, if known
	Installed/Operational	Aircraft was equipped with a working FDR at the time of the accident
	Installed/Operating Anomaly	Aircraft was equipped with a partially working FDR at the time of the accident
	Installed/Not Operational	Aircraft was equipped with an FDR, but it did not function at the time of the accident
	Not Installed	Aircraft was not equipped with an FDR
	Unknown	Presence of FDR at the time of the accident is unknown
Cockpit Voice Recorder		Presence and operational status of a cockpit voice recorder, if known
	Installed/Operational	Aircraft was equipped with a working CVR at the time of the accident
	Installed/Operating Anomaly	Aircraft was equipped with a partially working CVR at the time of the accident
	Installed/Not Operational	Aircraft was equipped with an CVR, but it did not function at the time of the accident
	Not Installed	Aircraft was not equipped with an CVR
	Unknown	Presence of CVR at the time of the accident is unknown
Local Date	YYYY/MM/DD	Date of the accident in the time zone in which it occurred.
Local Time	HHMM (24-hour clock)	Time of the accident in the time zone in which it occurred.
Arpt ICAO ID	XXXX	4-letter ICAO location identifier for the airport at which the accident occurred, or free text location description
Operator Name	Name of entity operating the accident aircraft	Person or organization responsible for conduct of the flight
Country of Origin	2-letter ICAO country code	ICAO country code for the operator's home base
Type of Operation		Primary purpose of operator's flights
	Passenger	Primary flight purpose is to carry passengers
	Freight	Primary flight purpose is to carry cargo
	Reposition	Moving the aircraft with no passengers aboard, only the required flight crew, to a new staging area

Field Name	Authorized Values	Definition/Description
	Personal	A flight conducted for personal, non-commercial and non-corporate purposes
	Training	A flight, the primary purpose of which is flight training.
	Other	A flight conducted for a purpose not otherwise described in the authorized list.
	Unknown	The type of operation is unknown
Operating Domain		The geographical area of the operator's flights
	International	Operator's flights typically originate and end in various countries
	Domestic	Operator's flights typically originate and end in one country
	Unknown	Operating domain unknown
Type of Operator		Characterization of the operator's business purpose
	Corporate	Private operation in support of a business, operated under less restrictive flight rules than airlines
	Government	Operations in support of a government purpose, but not military
	Major	Scheduled passenger operations using large jet transports
	Non-scheduled	Charter services for either passengers or freight
	Regional	Small scheduled airlines using small turbojet or turboprop aircraft and operating within a limited geographical domain
	Other	Other operator type not encompassed by existing field values
	Unknown	Type of operator unknown
Pilot Flying		Person operator the flight controls at the time of the accident
	Captain	Captain in a 2-pilot flight crew
	First officer	First officer in a 2-pilot flight crew
	Single pilot	Lone pilot in a single pilot operation
	Control transfer prior to landing	Transfer of flight controls occurred during the events comprising the accident
	Unknown	
Capt/SP Total Hours	Any non-negative integer	Captain's or single pilot's total flight experience in hours flown
FO Total Hours	Any non-negative integer	First officer’s total flight experience in hours flown
Capt/SP Hours in Type	Any non-negative integer	Captain's or single pilot's total flight experience in the accident aircraft type
FO Hours in Type	Any non-negative integer	First officer’s total flight experience in the accident aircraft type
Capt/SP Hours in Type Prev Month	Any non-negative integer	Approximate number of hours flown by the captain or single pilot in the accident aircraft type within the past month
FO Hours in Type Prev Month	Any non-negative integer	Approximate number of hours flown by the first officer in the accident aircraft type within the past month
Capt/SP Flights in Airfield Prev Month	Any non-negative integer	Number of operations flown by the captain or single pilot into the accident airport within the past month

Field Name	Authorized Values	Definition/Description
FO Flights into Airfield Prev Month	Any non-negative integer	Number of operations flown by the first officer into the accident airport within the past month
Lighting Conditions		Light condition at the time of the accident
	Light	Daylight
	Dark	Night
	Twilight	Dusk/dawn; Sunrise/sunset
	Unknown	Lighting condition not described in accident report and not able to be inferred by time of day
Airport Wx Conditions		Description of the weather conditions at or in the vicinity of the accident airport as they pertain to weather flight was being conducted under visual or instrument flight rules
	VMC	Visual meteorological conditions: ceiling ≥ 1000 feet and visibility ≥ 3 statute miles
	IMC	Instrument meteorological conditions: ceiling < 1000 feet or visibility < 3 statute miles
	Unknown	Airport meteorological condition unknown at the time of the accident
Runway Direction	Positive integer > 0 and ≤ 360	Compass direction, in degrees magnetic, of the runway involved in the accident, usually given in the nearest 10-degree increment
Surface Wind Direction	Positive integer > 0 and ≤ 360 and the number 999	Compass direction, in degrees magnetic, of the airport surface wind at the time of the accident; 999 signifies wind reported as calm
Surface Wind Velocity	Integer ≥ 0	Surface wind velocity in knots at the time of the accident
Surface Wind Gust Factor	Integer ≥ 0	Surface wind gust magnitude in knots over and above the steady wind component
Steady Headwind	Calculated value rounded to the nearest integer	Surface wind steady headwind component in knots. Negative values imply a tailwind
Headwind Gust Factor	Calculated value rounded to the nearest integer	Headwind component of the gust factor given in the field "Surface Wind Gust Factor." Negative values imply a tailwind gust factor
Steady Crosswind	Calculated value rounded to the nearest integer	Surface wind steady crosswind component in knots.
Crosswind Gust Factor	Calculated value rounded to the nearest integer	Crosswind component of the gust factor given in the field "Surface Wind Gust Factor."
Precipitation		Type of precipitation present at the time of the accident
	Rain	Rain with water temperature above freezing
	Sleet	Rain/snow combination with water temperature at freezing
	Snow	Snow with water temperature below freezing
	Hail	Ice pellets associated with thunderstorms
	Unknown	Presence of precipitation at the time of the accident is not known
	None	No precipitation occurring at the time of the accident
Prevailing Visibility	Positive decimal number	Reported prevailing airport visibility at the time of the accident, in statute miles

Field Name	Authorized Values	Definition/Description
Runway Condition		Description of runway contamination or surface condition as it would affect stopping capability or usability of the runway
	Dry	Dry pavement
	Wet	Wet pavement
	Standing water	Presence of pooled water
	Slush	Combination of snow and water at temperatures near freezing
	Snow	Snow with temperature below freezing
	Ice	Frozen water
	Rubber	Rubber deposits from tires
	Grass	Runway with grass surface
	Dirt	Unpaved runway
	Gravel	Gravel covered runway
	FOD	Objects or debris on runway that could potentially damage an aircraft
	Obstruction	Obstruction on runway presenting a potential collision hazard for aircraft
	Other	Runway contaminant not otherwise listed
	Unknown	Status of runway surface not known
Braking Action Gnd Vehicle		Description of braking action report at the time of the accident as provided by a ground vehicle operator or as measured by a runway friction device
	Good	Traditional description
	Fair	Traditional description
	Poor	Traditional description
	Nil	Traditional description
	None/Unknown	Braking action report unavailable or braking action information unknown
Braking Action Acft		Description of braking action report at the time of the accident as provided by the flight crew of another aircraft
	Good	Traditional description
	Fair	Traditional description
	Poor	Traditional description
	Nil	Traditional description
	None/Unknown	Braking action report unavailable or braking action information unknown
Runway Lights		Presence and operational status of edge lights on the accident runway
	Yes-on	Runway lights present and operating
	Yes-off	Runway lights present but not operating
	Yes-state unknown	Runway lights present but operational state unknown
	No	Runway lights non-existent
	Unknown	Information on runway lights not available

Field Name	Authorized Values	Definition/Description
	Not applicable	Presence and operational status of runway lights is not relevant, sometimes because of the existence of daylight conditions at the time of accident
Approach Lights		Presence and operational status of an approach lighting system on the accident runway
	Yes-on	Approach lights present and operating
	Yes-off	Approach lights present but not operating
	Yes-state unknown	Approach lights present but operational state unknown
	No	Approach lights non-existent
	Unknown	Information on approach lights not available
	Not applicable	Presence and operational status of approach lights is not relevant
Glidepath Lights		Presence and operational status of glidepath lights (e.g., VASI or PAPI) on the accident runway
	Yes-on	Glidepath lights present and operating
	Yes-off	Glidepath lights present but not operating
	Yes-state unknown	Glidepath lights present but operational state unknown
	No	Glidepath lights non-existent
	Unknown	Information on glidepath lights not available
	Not applicable	Presence and operational status of glidepath lights is not relevant
Type of Approach		Categorization of instrument approach procedure or that the approach was a VFR approach
	VFR	Aircraft approach (and landing) was made under visual flight rules
	Precision	An instrument approach with highly sensitive vertical and horizontal guidance such as an ILS, PAR, or LPV approach
	Non-precision	An instrument approach without vertical guidance
	Visual	An instrument approach conducted in VMC using by visually acquiring the runway and without the use of navigation aids
	Contact	An instrument approach conducted by flying a path to the runway using visual landmarks
	Unknown	Type of approach used during the accident is unknown
	Not applicable	Type of approach is not applicable to the accident
Approach Quality		Characterization of the approach stability
	Stabilized	Aircraft was flown within reasonable parameters of airspeed, descent rate, and flight path toward the aim point on approach to the runway such that minimal control inputs or changes are needed to maintain the desired flight path
	Unstabilized	An approach lacking one or more characteristics of a stabilized approach
	Unknown	Nature of the approach is unknown
	Not applicable	Approach quality is not relevant to the accident

Field Name	Authorized Values	Definition/Description
Event Type		Type of runway excursion
	Overrun	Departing the end of the runway while on the ground
	Off-side veer	Departing the side of the runway while on the ground*
	Unknown	Unable to discriminate how aircraft left the runway
		**Some off-side veers are intentional on the part of the flight crew in their efforts to avoid overrunning the end of the runway, usually because they fear colliding with objects off the end such as approach lights, ILS antennas, etc. When offside veers occurred near the end of the runway for these reasons, they are coded as overruns.*
Most serious injury		Degree of the most serious injury incurred as a result of the accident or it's aftermath, either by an aircraft occupant or a person on the ground.
	Fatal	Death ensued as a result of accident-related injuries
	Serious	Injury that required a hospital stay of at least 48 hours
	Minor	Degree of injury less than serious
	None	No injuries
	Unknown/no fatals	Nature of injuries unknown. They may include serious or minor injuries, but no fatalities.
	Unknown	No injury information available
Approach Factors		Factors relevant to the accident that characterize problems with the approach to the runway
	Fast	Aircraft was flown at an unreasonably high airspeed on approach
	Slow	Aircraft was flown at an unreasonably low airspeed on approach
	High	Aircraft was flown high relative to a reasonable flight path or descent angle
	Low	Aircraft was flown low relative to a reasonable flight path or descent angle
	Excessive sink rate	Aircraft was flown at an excessive rate of descent during some part of the final approach
	Windshear	Windshear affected the pilot's ability to fly the aircraft near the desired approach path
	Off center	Aircraft was not laterally aligned with the desired approach path or runway centerline
	Not applicable	Approach factors were not relevant to the accident
Touchdown Factors		Factors relevant to the accident the describe problems with the manner in which the aircraft contacted the runway surface
	Hard	Aircraft contacted the runway with unreasonably excessive force
	Fast	Aircraft contacted the runway at an unreasonably high groundspeed
	Slow	Aircraft contacted the runway at an unreasonably low groundspeed

Field Name	Authorized Values	Definition/Description
	Long	Aircraft contacted the runway at an unreasonably long distance from the runway threshold given accepted practices and mandated tolerances
	Short	Aircraft initially touched down short of the runway threshold
	Off center	Aircraft touched down with significant lateral displacement from the runway center
	Crabbed (misaligned)	Aircraft touched down with a heading substantially different from the runway heading
	Sideways drift	Aircraft touched down with a significant lateral component of velocity
	Bounce	Aircraft made several touchdowns over the course of the landing
	Tailstrike	Aircraft touched down with a deck angle that caused the tail to strike the runway surface
	Not applicable	Touchdown factors were not relevant to the accident
Landing Abort Factors		Factors relevant to the accident that describe whether an approach or landing abort was considered or initiated
	Go-around not conducted	A go-around or missed approach was not conducted or initiated when such was appropriate
	Go-around considered	Rejected landing considered by the flight crew, but not initiated
	Go-around apparently not considered	Possibility of rejecting the landing was not considered by the flight crew
	Go-around initiated	Rejected landing was initiated
	Go-around not possible	Rejecting the landing was not possible, usually because of insufficient runway remaining or the inability safely climb over obstacles
	Diversion considered	Option of diverting to another airport was considered by the flight crew, but not initiated
	Diversion apparently not considered	Option of diverting to another airport was not considered by the flight crew
	Unknown	Landing abort factors may be relevant to the accident but are not known
	Not applicable	Landing abort factors are not relevant to the accident
Runway Wind Factors		Characterization of runway wind conditions as causal or contributing factors to an accident.
	Crosswind	Component of wind blowing across the runway
	Tailwind	Component of wind from behind the aircraft increasing its groundspeed
	Gusts	Wind with rapidly changing velocities or directions
	Turbulence	Wind causing disruptive forces on the aircraft in 3-dimensions
	Windshear	Adjacent layers of wind with substantially different velocity and/or direction
	None	Wind was not a significant factor in the accident

Field Name	Authorized Values	Definition/Description
	Unknown	Wind condition was not described or wind effect on the accident circumstances is not known.
Reverse Thrust Factors		Accident factors associated with the use of reverse thrust mechanisms in both turbojet and turboprop aircraft.
	Completely inop	Reverse thrust installed but inoperative on all engines with flight crew aware of inoperative condition.
	Asymmetrical	Reverse thrust created asymmetrical forces on the aircraft
	Late	Reverse thrust activated after an inappropriate delay
	Improper use	Reverse thrust used or controlled in some inappropriate way
	Partially inop	Reverse thrust installed but inoperative on some, but not all, engines, with flight crew aware of inoperative condition
	Malfunction	Reverse thrust fails to function as expected by the flight crew
	Not deployed	Reverse thrust available but not used
	Unknown	Effect of reverse thrust on accident circumstances not known
	Not applicable	Reverse thrust issues do not apply to this accident, perhaps because reverse thrust mechanism is not installed on the accident aircraft.
Brake Factors		Accident factors associated with the use of wheel brakes, associated systems, emergency brakes, or other stopping mechanisms such as drag chutes. Does not include reverse thrust factors.
	Asymmetrical	Brakes produced asymmetrical stopping forces on the aircraft.
	Improper use	Inappropriate use of primary wheel brakes
	Malfunction	Primary wheel brakes did not function as the flight crew expected
	Ineffective-runway friction	Wheel braking substantially degraded by slippery runway conditions other than hydroplaning
	Ineffective-hydroplaning	Wheel braking substantially degraded by hydroplaning of the aircraft tires
	Not used	Primary wheel brakes intentionally not activated by the flight crew
	Anti-skid inop	Anti-skid wheel brake system installed but known to be inoperative
	Anti-skid malfunction	Anti-skid wheel brake system installed but did not function as expected
	Emer brake malfunction	Emergency braking system installed, but did not function as expected
	Emer brake asymmetrical	Emergency braking system created asymmetrical forces on the aircraft
	Emer brake improper use	Emergency braking system used inappropriately
	Emer brake not used	Emergency braking system installed, operational, but not activated
	Parking brake engaged	Parking brake was not disengaged by the flight crew

Field Name	Authorized Values	Definition/Description
	Unknown	Accident factors associated with brakes are not known, but may be relevant
	Not applicable	Brake factors are not relevant to the accident
Wheel Factors		Factors involving aircraft landing gear and its components that contributed to the circumstances of the accident.
	Main gear collapse on touchdown–not locked	Collapse of main landing gear on touchdown
	Nosewheel steering malfunction	Failure of the nosewheel steering system to function as expected
	Nosewheel steering ineffective-hydroplaning	Nosewheel steering substantially degraded because the nose tire was hydroplaning
	Wheel(s) would not deploy	One or more landing gear struts would not deploy
	Landing gear damaged on touchdown	Damage to any landing gear strut as a result of excessive forces incurred during the landing
	Landing gear malfunction–other	Failure of the landing gear to function as expected when such failure is not covered by another value in this field
	Tire failure	Tire failure as a cause or contributor to the accident—not as a consequence of the runway excursion
	Unknown	Contribution of wheel factors to the accident are not known but may be relevant to cause of the accident
	Not applicable	Wheel factors are not relevant to this accident
Pilot Technique		Factors that address possible deficiencies in piloting skills
	Crosswind compensation	Pilot's inability to adequately correct for sideways drift and/or to maintain alignment with the runway
	Speed control	Pilot inability to keep airspeed at the desired or prudent value
	Sink rate control	Pilot's inability to keep descent rate at the desired or prudent value
	Altitude control	Pilot's inability to manage altitude such that the aircraft maintains the glide slope and/or passes the runway threshold at a reasonable height.
	Directional control	Pilots' inability to maintain directional control when it was reasonably possible to do so
	Improper flare	Error in the process of transitioning the aircraft from final approach to touchdown over the runway
	Improper line-up	Pilot's inability to accurately align the aircraft with the runway centerline on approach and/or through the takeoff or landing ground roll
	Unknown	Pilot technique factors are not known but may be relevant to the accident circumstances
	Not applicable	Pilot technique factors are not relevant to this accident
Spoiler/Air Brake Factors		Accident factors associated with aircraft spoilers, air brakes, or the like
	Not used	Spoilers/air brakes available but not used by the flight crew

Field Name	Authorized Values	Definition/Description
	Not armed	Flight crew unintentionally failed to arm the spoilers/air brakes
	Improper use	Spoilers/airbrakes used in a manner inconsistent with their design, purpose, and/or standard operating procedure
	Inop	Spoilers/air brakes were known by the flight crew to be non-operational
	Malfunction	Spoilers/air brakes did not operate as designed or as expected
	Late	Spoilers/air brakes were deployed later than intended or than was prudent
	Unknown	Spoiler/air brake factors may be relevant to the accident but are not known
	Not applicable	Spoiler/air brake factors are not applicable to the accident
Flap/Slat Configuration Factors		Accident factors referencing flap/slat settings
	Flaps/slats inop	Flaps were known be inoperative prior to flight
	Flaps/slats malfunction	Flaps did not function as designed or as expected
	Flaps/slats misset	Flaps were incorrectly set
	Flaps/slats asymmetrical	Flaps position was inconsistent between the two sides of the aircraft
	Unknown	Flap/slat factors may have been relevant to the accident but were not known
	Not applicable	Flap/slat factors are not applicable to the accident
Performance Calculation Factors		Factors affecting the ability or the accuracy of aircraft performance calculations with respect to takeoff, landing, and runway requirements
	Required runway length error	Error in accurately calculating or otherwise determining the adequate runway length for takeoff or landing
	Balanced field length unavailable	The runway length was not sufficient to accelerate to rotation speed, decide to abort, initiate the abort, and come to a stop without overunning
	Vref determination error	Error in accurately calculating Vref prior to landing. Vref being the minimum target airspeed during landing approach with the aircraft in landing configuration
	V1 determination error	Error in accurately calculating V1, the highest speed at which a decision to abort a takeoff can be prudently made with remaining runway sufficient for stopping
	Crosswind limit exceeded	Flight crew attempted to land or takeoff with a crosswind component in excess of that recommended or allowed
	Tailwind limit exceeded	Flight crew attempted to land or takeoff with a tailwind component in excess of that recommended or allowed

Field Name	Authorized Values	Definition/Description
	Aircraft weight calculation error	Error in determining the actual aircraft weight when calculating takeoff or landing performance. Also, errors in calculating aircraft performance requirements resulting from using an inaccurate aircraft weight value
	CG calculation error	Error in determining the aircraft center of gravity
	MEL error	Errors involving misinterpretation of the aircraft's minimum equipment list
	Missing factors in calculation	Performance calculation errors due to a lack or information or failure to utilize necessary information
	AFM inadequate information	Inability to accurately calculate aircraft performance due to a lack of information provided by the aircraft manufacturer
	Calculation not performed	Flight crew did not attempt to calculate performance values
	Unknown	Aircraft performance calculations my be pertinent to the accident, but are not known
	Not applicable	Aircraft performance calculation was not pertinent to the accident
Flight Crew Factors		Factors involving flight crew performance, human factors considerations, and adherence to policies and procedures
	CRM	Problem with the application of crew resource management principles
	Crew coordination breakdown	Improper or ineffective teamwork involving multi-person flight crews
	Capt supervision inadequate	Captain did not adequately monitor the first officer's performance, especially when the first officer was the flying pilot
	FO assertiveness inadequate	First officer did not adequately assert him/herself when observing inappropriate or incorrect actions by the Captain
	Non-compliance with SOP	Non-adherence to accepted, standard, or required policies and/or procedures regarding aircraft operation
	Checklist not used	A checklist should have been, but was not used or executed
	Checklist not completed	A checklist was initiated but not finished
	Fatigue	References to flight crew fatigue as a factor in pilots' performance
	Unknown	Flight crew factors may be relevant to the accident, but are not known
	Not applicable	Flight crew factors are not pertinent to the accident
Mechanical Anomaly	Any text	Description of aircraft mechanical issues that may have contributed to the accident and are not referenced in other fields
Other Factors	Any text	Description of pertinent accident factors not referenced in other fields
Narrative	Any text	A representative narrative or description of the accident circumstances obtained from one or more information sources or summarized from those sources. This narrative does not necessarily contain all the information used to code the accident factors or to fill in other information in the database record

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APPENDIX 3

List of Takeoff Excursion Accidents Used in this Study

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Num	Date	Aircraft	Excursion Type	Operator	Location
1	01/21/95	Tupolev Tu-154B	Overrun	Kazakhstan Airlines	Quaid-i-Azam Intl. Ap., Karachi, PK
2	01/26/95	Antonov An-26	Overrun	Guinee Air Services	Sambailo Ap., Sambailo, GN
3	04/04/95	Antonov An-26	Overrun	Ukraine Flight State Academy	Palana Ap., Palana, Kamchatka, RU
4	05/23/95	Learjet 35A	Overrun	Walmart Stores Inc	Rogers Municipal Ap., Rogers, Arkansas, US
5	10/12/95	ATR-72-210	Off-side veer	Iran Asseman Airlines	Shiraz Ap., Shiraz, IR
6	10/19/95	Douglas DC-10-30	Overrun	Canadian Airlines International	Vancouver Intl. Ap., Vancouver, British Columbia, CA
7	12/12/95	Boeing 747-200B	Off-side veer	China Airlines	Ninoy Aquino Intl. Ap., Manila, PH
8	12/20/95	Boeing 747-100	Off-side veer	Tower Air	JFK Intl. Ap., New York, New York, US
9	01/03/96	Learjet 35A	Off-side veer	National Jets	Oro-Barrie-Orillia Regional Ap., Barrie, Ontario, CA
10	01/08/96	Antonov An-32B	Overrun	Scibe Airlift	Simba Zikidi Market, Kinshasa, ZR
11	02/02/96	Antonov An-32	Off-side veer	Ukraine Air Alliance	Luremo Ap., Luremo, AO
12	03/26/96	Tupolev Tu-154M	Off-side veer	Iran Air Tours	not reported, IR
13	04/24/96	Dassault Falcon 20	Overrun	Philippine Central Bank	Mati Ap., Davao, PH
14	05/01/96	Rockwell Sabreliner 75A	Overrun	USDA Forest Service Aviation	Albuquerque Intl Ap., Albuquerque, New Mexico, US
15	05/01/96	Boeing 727-200 Adv.	Overrun	Fly Lineas Aereas	Mariscal Sucre Ap., Quito, EC
16	06/06/96	B.Ae. Jetstream 32	Off-side veer	JSX Capital Corp.	San Luis Obispo County Ap., San Luis Obispo, California, US
17	06/13/96	Douglas DC-10-30	Overrun	Garuda Indonesia	Fukuoka Ap., Fukuoka, JP
18	07/11/96	Hawker-Siddeley 748 Srs.2B	Overrun	Bouraq Indonesia	Pattimura Ap., Ambon, ID
19	07/18/96	Bristol 170 Freighter Mk.31M	Overrun	MRS 4000 Investment Ltd.	Enstone Ap., nr. Chipping Norton, Oxfordshire, GB
20	08/02/96	Boeing 737-200C Adv.	Overrun	Air Algerie	Zenata Ap., Tlemcen, DZ
21	08/16/96	Hawker-Siddeley 748 Srs.2A	Overrun	Emerald Airways	Liverpool Intl. Ap., Liverpool, GB
22	09/18/96	Fairchild C-123K Provider	Overrun	Krissalan de Aviacion	Bahia de Tortugas, MX
23	10/30/96	GA Gulfstream IV	Off-side veer	Alberto Culver Co.	Palwaukee Municipal Ap., Chicago, Illinois, US
24	01/10/97	Beech Commuter 1900D	Off-side veer	FloridaGulf Airlines	Bangor Intl. Ap., Bangor, Maine, US
25	03/03/97	Let 410UVP Turbolet	Off-side veer	Islena Airlines	La Ceiba Intl. Ap., La Ceiba, HN
26	03/10/97	Airbus A320-210	Overrun	Gulf Air	Abu Dhabi Intl. Ap., Abu Dhabi, AE
27	04/01/97	Convair 580	Overrun	Compagnie Africaine d'Aviation	Tshikapa Ap., Tshikapa, ZR
28	04/04/97	ATL-98 Carvair	Overrun	Custom Air Service Inc.	Griffin-Spalding County Ap., Griffin, Georgia, US
29	04/11/97	Boeing 737-200 Adv.	Off-side veer	Sempati Air	Sjamsudin Noor Ap., Banjarmasin, Kalimantan, ID
30	04/14/97	Fokker F.27-600	Overrun	TAAG - Angola Airlines	Maya Maya Ap., Brazzaville, CG
31	07/20/97	Douglas MD-82	Overrun	China Northern Airlines	Dalian Ap., Dalian, CN
32	08/03/97	Boeing 737-200C	Overrun	Air Afrique	Douala Ap., Douala, CM
33	09/06/97	Boeing 737-200 Adv.	Off-side veer	Saudi Arabian Airlines	Nejran Ap., Nejran, SA
34	11/29/97	Beech Commuter 1900D	Overrun	Ministic Air	Island Lake/Garden Hill Ap., Island Lake, Manitoba, CA
35	12/17/97	Ilyushin Il-18DF	Overrun	Ramaer	Jan Smuts Intl. Ap., Johannesburg, ZA
36	12/31/97	Fairchild SA-227AC Metro III	Off-side veer	AeroSur	Trinidad Ap., Trinidad, BO
37	01/02/98	Douglas DC-6B	Off-side veer	Woods Air Service Inc.	Nixon Fork Mine Airstrip, 50km N of McGrath, Alaska, US
38	01/27/98	Fokker F.27-600	Off-side veer	Myanma Airways	Thandwe Ap., Thandwe, MM
39	02/01/98	Learjet 36A	Off-side veer	Medical Jets International Inc	Muharraq Intl. Ap., Al Manamah, BH
40	05/12/98	Dassault Falcon 20	Overrun	Grand Aire Express	Custer Ap., Monroe, Michigan, US
41	05/15/98	Fokker F.28-4000	Overrun	Merpati Nusantara Airlines	Wolter Monginsidi Ap., Kendari, Sulawesi, ID

Num	Date	Aircraft	Excursion Type	Operator	Location
42	05/29/98	Boeing 737-500	Off-side veer	Jet Airways (India)	Santa Cruz Ap., Mumbai, IN
43	08/28/98	Dassault Falcon 200	Overrun	Reliant Airlines	El Paso Intl. Ap., El Paso, Texas, US
44	08/29/98	Tupolev Tu-154M	Overrun	Cubana	Mariscal Sucre Ap., Quito, EC
45	09/12/98	Boeing 767-300ER	Off-side veer	Vietnam Airlines	Tan Son Nhat Ap., Ho Chi Minh City, VN
46	12/03/98	Hawker-Siddeley 748 Srs.2A	Overrun	First Air	Iqaluit Ap., Iqaluit, Northwest Territories, CA
47	12/18/98	CASA 212-200	Off-side veer	FS Air Service	Nixon Fork Mine Airstrip, nr. McGrath, Alaska, US
48	02/07/99	Boeing 707-320F	Overrun	Clipper International	Ivanka Ap., Bratislava, SK
49	03/20/99	Yakovlev Yak-40	Overrun	Guinee Ecuatorial Airlines	Bata Ap., Bata, GQ
50	08/31/99	Boeing 737-200C	Overrun	LAPA	Aeroparque Jorge Newbery, Buenos Aires, AR
51	11/19/99	Boeing 737-300	Off-side veer	Air France	Charles de Gaulle Ap., Paris, FR
52	03/25/00	Antonov An-32	Overrun	Uralex	Huambo Ap., Huambo, AO
53	07/19/00	Grumman 159 Gulfstream I	Off-side veer	Procuraduria General de la Republica Nacional	Gen Juan N Alvarez Intl. Ap., Acapulco, MX
54	09/19/00	Antonov (WSK-PZL Mielec) An-28	Off-side veer	Koryak Air Enterprise	Tigil Ap., Tigil, RU
55	10/19/00	Beech 300 King Air	Overrun	Aerosmith Aviation Inc	Buchanan Field, Concord, California, US
56	11/05/00	Antonov An-24RV	Overrun	Cheboksary Air Enterprise	Cheboksary Ap., Cheboksary, RU
57	11/07/00	Antonov An-32B	Overrun	Renan	Lubao Ap., Lubao, ZR
58	01/04/01	Learjet 35	Overrun	Air Response North Inc.	Schenectady County Ap., Schenectady, New York, US
59	03/17/01	Airbus A320-210	Overrun	Northwest Airlines	Metropolitan Ap., Detroit, Michigan, US
60	04/18/01	Ilyushin Il-76M	Overrun	Yuzhnoe	Ostend Ap., Ostend, BE
61	07/24/01	Vickers 800 Viscount	Off-side veer	Transtel	N'Djamena Ap., N'Djamena, TD
62	10/08/01	Douglas MD-87	Off-side veer	SAS	Linate Ap., Milan, IT
63	10/21/01	Yakovlev Yak-40	Overrun	Kyrghyzstan Airlines	Osh Ap., Osh, KG
64	11/26/01	Cessna 550 Citation II	Overrun	Procuraduria General de la Republica Nacional	Benito Juarez Intl. Ap., Mexico City, MX
65	11/28/01	ATR-42-500	Off-side veer	Aeronaves TSM	Ponciano Arriaga Intl. Ap., San Luis Potosi, MX
66	01/14/02	Boeing 737-200	Overrun	Lion Airlines	Sultan Syarif Kasim II Ap., Pekanbaru, ID
67	04/13/02	A.S.T.A. (GAF) Nomad N24A	Off-side veer	Speen Ulrich	RAF Weston-on-the-Green, Bicester, Oxfordshire, GB
68	04/19/02	Antonov An-32B	Overrun	SELVA Colombia	Guillermo Leon Valencia Ap., Popayan, CO
69	05/20/02	Cessna 550 Citation II	Overrun	Avalon Correctional Services	Wiley Post Ap., Bethany, Oklahoma, US
70	06/11/02	Fokker F.27-600	Overrun	Sudan Airways	Khartoum Ap., Khartoum, SD
71	09/29/02	Fairchild SA-227AC Metro III	Off-side veer	Skylink Charter	Hawthorne Municipal Ap., Hawthorne, California, US
72	12/03/02	Learjet 36A	Overrun	Phoenix Air Group Inc	Astoria Regional Ap., Astoria, Oregon, US
73	01/17/03	Fokker F.28-4000	Overrun	TAME Ecuador	Mariscal Sucre Ap., Quito, EC
74	01/24/03	Grumman 159 Gulfstream I	Off-side veer	African Commuter Services	Busia Airstrip, Busia, KE
75	03/19/03	Beech Commuter 1900D	Overrun	Ashanti Aviation	Obuasi Ap., Obuasi, GH
76	04/09/03	Yakovlev Yak-40	Overrun	Uzbekistan Airways	Urgench Ap., Urgench, UZ
77	04/15/03	Vickers 800 Viscount	Overrun	Trans Int Air	Not Reported, ZR
78	06/17/03	Douglas MD-88	Overrun	Onur Air	Eelde Ap., Groningen, NL
79	06/24/03	Tupolev Tu-134A	Overrun	Voronezhavia	Nyagan Ap., Nyagan, , RU
80	07/11/03	Boeing 707-320C	Overrun	Air Memphis	Zia Intl. Ap., Dhaka, BD
81	09/14/03	Let 410UVP Turbolet	Overrun	ACS Ltd	Langkien Ap., Langkien, SD
82	11/11/03	Cessna 560 Citation Excel	Overrun	West Coast Charters LLC	Palwaukee Municipal Ap., Wheeling, Illinois, US

Num	Date	Aircraft	Excursion Type	Operator	Location
83	04/02/04	Boeing 707-320C	Off-side veer	Air Memphis	Cairo Intl. Ap., Cairo, EG
84	04/09/04	Airbus A340-310	Overrun	Emirates Airlines	Jan Smuts Intl. Ap., Johannesburg, ZA
85	04/27/04	Boeing 737-500	Off-side veer	Aerosvit Airlines	Sheremetyevo Ap., Moscow, RU
86	06/26/04	Antonov An-12	Off-side veer	Sarit Airlines	Wau Ap., Wau, SD
87	07/21/04	Fairchild SA-226T Merlin IIIB	Off-side veer	REG Management Co LLC	Rifle/Garfield County Regional Ap, Rifle, Colorado, US
88	08/11/04	Boeing 737-200 Adv.	Overrun	Air Guinee Express	Lungi Intl. Ap., Freetown, SL
89	09/25/04	Bushmaster 2000 (Ford Tri-Motor)	Off-side veer	Staggerwing Productions (R.R. Fuchs dba)	Fullerton Municipal Ap, Fullerton, California, US
90	10/14/04	Boeing 747-200F	Overrun	MK Airlines	Halifax Intl. Ap., Halifax, Nova Scotia, CA
91	11/07/04	Boeing 747-200F	Overrun	Lufthansa Cargo Airlines	Sharjah Intl. Ap., Sharjah, AE
92	02/02/05	Canadair Challenger 600	Overrun	448 Alliance LLC	Teterboro Ap., Teterboro, New Jersey, US
93	03/04/05	Antonov An-24B	Overrun	Trans Air Congo	Impfondo Ap., Impfondo, CG
94	03/09/05	Canadair Challenger 600	Overrun	Romeo Mike Aviation Inc	Lemons Municipal Ap., Tupelo, Mississippi, US
95	03/28/05	Ilyushin Il-18	Overrun	Aerocaribbean	Simon Bolivar Intl. Ap., Caracas, VE
96	03/31/05	Antonov An-12	Overrun	IRBIS	Riyan Ap., Mukalla, YE
97	05/09/05	Rockwell Sabreliner 75A	Overrun	Compass Acquisitions & Development Inc	Brownwood Regional Ap., Brownwood, Texas, US
98	09/19/05	Fairchild SA-227AC Metro III	Off-side veer	Dynamic Air	Rotterdam Ap., Rotterdam, NL
99	12/10/05	Cessna CJ3	Off-side veer	Aerocharter L U Bettermann	Leipzig-Halle Ap., Leipzig, DE
100	12/24/05	Antonov (WSK-PZL Mielec) An-28	Off-side veer	African Union	Zalingei Ap., Zalingei, SD
101	03/22/06	Learjet 35	Off-side veer	Bankair	Philadelphia Intl. Ap., Philadelphia, Pennsylvania, US
102	06/03/06	Fairchild/Dornier 328Jet	Overrun	East Coast Flight Services Inc	Manassas Regional Ap., Manassas, Virginia, US
103	06/07/06	Boeing 747-200F	Overrun	TradeWinds Airlines	Rio Negro Ap., Medellin, CO
104	08/27/06	Canadair RJ 100	Overrun	Comair	Blue Grass Ap., Lexington, Kentucky, US
105	12/15/06	Fairchild SA-227AC Metro III	Off-side veer	Baires Fly	Ezeiza Intl. Ap., Buenos Aires, AR
106	03/26/07	Learjet 36A	Off-side veer	Phoenix Air	Newport News/Williamsburg Ap., Hampton, Virginia, US
107	04/11/07	Fairchild SA-226T Merlin III	Off-side veer	Gamble Aviation LLC	Palwaukee Ap, Wheeling, Illinois, US
108	04/30/07	Boeing 737-500	Overrun	Royal Air Maroc	Senou Intl. Ap., Bamako, ML
109	06/10/07	Dassault Falcon 900	Overrun	Trishan Air Inc	Santa Barbara Municipal Ap., Santa Barbara, California, US
110	07/05/07	Rockwell Sabreliner CT-39A	Overrun	Jett Paqueteria SAdeCV	Culiacan Intl. Ap., Culiacan, MX
111	09/03/07	Rockwell Sabreliner 75	Off-side veer	Jet Lease Corp	Juan Santamaria Intl. Ap., San Jose, CR
112	12/30/07	Boeing 737-300	Off-side veer	TAROM	Otopeni Intl. Ap., Bucharest, RO
113	02/19/08	ATR-72-210	Overrun	Air Bagan	Putao Ap., Putao, MM

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APPENDIX 4

List of Landing Excursion Accidents Used in this Study

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Num	Date	Aircraft	Excur Type	Operator	Location
1	01/02/95	Boeing 737-200C Adv.	Off-side veer	Air Zaire	N'Djili Ap., Kinshasa, ZR
2	01/05/95	Fokker 50	Off-side veer	Norwegian Air Shuttle	Vigra Ap., Vigra, NO
3	01/14/95	Yakovlev Yak-40	Off-side veer	Chelal-Chelyabinsk Airline	Tobolsk Ap., Tobolsk, RU
4	01/16/95	Boeing 737-200 Adv.	Overrun	Sempati Air	Adisutjipto Ap., Yogyakarta, Jawa, ID
5	01/20/95	Boeing 727-100	Off-side veer	TAESA	Capitan Carlos Perez Ap., Villahermosa, Tabasco, MX
6	01/25/95	Yakovlev Yak-40	Overrun	Volga Airlines	Rostov Ap., Rostov, RU
7	01/26/95	Dassault Falcon 10	Off-side veer	Aerocharter	Zhulyany Ap., Kiev, UA
8	01/31/95	Boeing 727-100F	Overrun	Angola Air Charter	Huambo Ap., Huambo, AO
9	02/06/95	Antonov An-24B	Off-side veer	Arkhangelsk Airlines	Arkhangelsk Ap., Arkhangelsk, RU
10	02/10/95	Boeing 737-200 Adv.	Overrun	TAAG - Angola Airlines	Dundo Ap., Dundo, AO
11	03/01/95	Mitsubishi Mu-300 Diamond 1A	Overrun	Lignum Ltd	Jasper-Hinton Ap., Hinton, Alberta, CA
12	03/27/95	Antonov An-12	Overrun	Amuraviatrans	Bunia Ap., Bunia, ZR
13	04/13/95	Yakovlev Yak-40K	Off-side veer	Kazakhstan Airlines	Dzhambul Ap., Dzhambul, KZ
14	04/17/95	Douglas C-54G (DC-4)	Off-side veer	Brooks Air Fuels (Roger W. Brooks)	Kivalina, Alaska, US
15	04/28/95	Douglas DC-8-54AF	Overrun	Millon Air	La Aurora Ap., Guatemala City, GT
16	05/07/95	Fokker F.27-600	Off-side veer	Trigana Air Service PT	Sentani Ap., Jayapura, Irian Jaya, ID
17	05/09/95	Antonov An-12	Overrun	St Petersburg Aviation Detachment	Lukapa Ap., Lukapa, AO
18	05/11/95	Lockheed 100-30 Hercules	Off-side veer	Pelita Air Service	Sentani Ap., Jayapura, Irian Jaya, ID
19	05/31/95	Fokker F.28-1000	Overrun	Air Niugini	Madang Ap., Madang, PG
20	06/12/95	Learjet 35	Overrun	Servicios Turisticos SA de CV	Magdalena de Kino Ap., Magdalena de Kino, Sonora, MX
21	06/24/95	Tupolev Tu-134A	Overrun	Harka Air	Murtala Muhammed Ap., Lagos, NG
22	07/01/95	Fokker F.27-500	Off-side veer	East West Airlines	Baroda Ap., Baroda, IN
23	08/04/95	Fokker F.28-4000	Off-side veer	Merpati Nusantara Airlines	Hasanudin Intl. Ap., Ujung Pandang, Sulawesi, ID
24	08/17/95	Boeing 707-320C	Overrun	Air Afrique	N'Djamena Ap., N'Djamena, TD
25	08/23/95	Douglas MD-82	Off-side veer	Korean Air	Kimpo Intl. Ap., Seoul, KR
26	09/15/95	Fokker 50	Overrun	Malaysia Airlines	Tawau Ap., Tawau, Sabah, MY
27	10/18/95	Dornier 228-200	Off-side veer	Air Maldives	Male Intl. Ap., Male, MV
28	10/24/95	ATR-42-300	Off-side veer	Eagle Aviation	Wilson Ap., Nairobi, KE
29	11/13/95	Boeing 737-200 Adv.	Overrun	Nigeria Airways	Kaduna Ap., Kaduna, NG
30	11/15/95	Lockheed 1329 JetStar 731	Overrun	TAESA	Miguel Hidalgo Ap., Guadalajara, MX
31	11/22/95	Antonov An-12	Overrun	KIT Space & Transport Air (KOSMOS)	Huambo Ap., Huambo, AO
32	12/02/95	Boeing 737-200 Adv.	Overrun	Indian Airlines	Indira Gandhi Intl. Ap., Delhi, IN
33	12/30/95	BAC One-Eleven 500	Off-side veer	TAROM	Ataturk Ap., Istanbul, TR
34	01/24/96	Dassault Falcon 10	Off-side veer	Masco Corp	Detroit Metropolitan Ap., Detroit, Michigan, US
35	01/28/96	Douglas DC-8-55CF	Overrun	Affretair	Harare Intl. Ap., Harare, ZW
36	03/10/96	CASA 212-200	Overrun	Merpati Nusantara Airlines	Soroako Ap., Soroako, ID
37	04/04/96	Fairchild SA-226T Merlin III	Off-side veer	Alas del Sur	Ushuaia, AR
38	04/16/96	Fokker F.27-500	Off-side veer	Merpati Nusantara Airlines	Eltari Ap., Kupang, Timor, ID
39	04/25/96	Hawker-Siddeley 748 Srs.2A	Overrun	Royal Nepal Airlines	Meghauli Ap., Meghauli, NP
40	05/18/96	Let 410UVP Turbolet	Overrun	Archana Airways	Kanpur Ap., Kanpur, IN
41	05/30/96	Learjet 24D	Off-side veer	Conasupo	Toluca Ap., Toluca, MX

Num	Date	Aircraft	Excur Type	Operator	Location
42	06/05/96	Fairchild SA-26AT Merlin IIB	Off-side veer	FS Air Service	Illinois Creek Airstrip, 130km SW of Galena, Alaska, US
43	06/20/96	Fairchild SA-26T Merlin IIA	Off-side veer	Keewatin Air Ltd.	Whale Cove Airstrip, Whale Cove, N.W.T., CA
44	06/30/96	Boeing 707-320C	Off-side veer	DAS Air	Senou Ap., Bamako, ML
45	07/03/96	Aerospatiale Corvette 601	Off-side veer	Casa Air Service	Blagnac Ap., Toulouse, FR
46	07/23/96	IAI 1124 Westwind	Overrun	Arkia	Rosh Pina Ap., Rosh Pina, IL
47	07/25/96	Dassault Falcon 20	Off-side veer	Air Service SA	Aeroparque Jorge Newbery Ap., Buenos Aires, AR
48	08/13/96	Learjet 25B	Overrun	MAC Aviation SA	Northolt Ap., London, GB
49	08/21/96	Boeing 707-320C	Overrun	Egyptair	Ataturk Ap., Istanbul, TR
50	08/29/96	Cessna 550 Citation II	Overrun	Then Air KG	Coburg Ap., Coburg, DE
51	09/30/96	IAI 1125 Astra SP	Off-side veer	K&M Flight Corp.	Pitkin County Ap., Aspen, Colorado, US
52	10/06/96	Antonov An-12	Overrun	GOSNiiGA	Lukapa Ap., Lukapa, AO
53	10/11/96	Fairchild SA-226TC Metro II	Overrun	Servicios y Transportes Aereos Petroleros SA	M. Rondon Ap., Cuiaba, BR
54	10/23/96	Fairchild SA-226TC Metro II	Off-side veer	Propair	Puvirnituq Ap., Puvirnituq, Quebec, CA
55	10/26/96	Learjet 35A	Overrun	Lider Taxi Aereo	Congonhas Ap., Sao Paulo, BR
56	11/06/96	Douglas MD-11	Overrun	Malaysia Airlines	Ezeiza Intl. Ap., Buenos Aires, AR
57	11/16/96	Tupolev Tu-134	Off-side veer	Vietnam Airlines	Da Nang Ap., Da Nang, VN
58	12/02/96	Let 410UVP Turbolet	Off-side veer	Kostroma Air Enterprise	Nyagan Ap., Nyagan, RU
59	12/03/96	Boeing 737-300	Off-side veer	Polynesian Airlines	Faleolo Intl. Ap., Apia, WS
60	12/08/96	Fokker 50	Off-side veer	KLM cityhopper	Heathrow Ap., London, GB
61	12/19/96	Airbus A320-230	Off-side veer	Mexicana	Capitan Carlos Perez Ap., Villahermosa, MX
62	12/24/96	Embraer EMB-120 Brasilia	Off-side veer	Nordeste Linhas Aereas Regionais	Vitoria da Conquista Ap., Vitoria da Conquista, BR
63	12/28/96	Boeing 737-200F Adv.	Off-side veer	Blue Dart Express	Hindustan Ap., Bangalore, IN
64	01/01/97	Learjet 35	Overrun	AirNet Systems Inc	Downtown Ap., Kansas City, Missouri, US
65	01/03/97	Shorts 330-200	Off-side veer	Titan Airways	Liverpool Intl. Ap., Liverpool, GB
66	01/16/97	Learjet 24	Off-side veer	Air Cargo Express Airlines	Muscatine Municipal Ap., Muscatine, Iowa, US
67	01/16/97	Boeing 707-320F	Off-side veer	First International Airlines	Kananga Ap., Kananga, ZR
68	01/21/97	Beech 300 King Air	Overrun	E. W. Marine	Monroe County Ap., Bloomington, Indiana, US
69	02/04/97	Fairchild SA-226TC Metro II	Off-side veer	Aerolineas Cuahonte	La Zaro Cardenas Ap., Uruapan, MX
70	02/14/97	Boeing 737-200 Adv.	Off-side veer	VARIG	Carajas Ap., Carajas, BR
71	02/19/97	Yakovlev Yak-40	Overrun	Semeiavia	Semipalatinsk Ap., Semipalatinsk, KZ
72	02/27/97	Learjet 35A	Overrun	Colvin Air Charter	Downtown Ap., Greenville, South Carolina, US
73	03/05/97	Douglas MD-82	Off-side veer	American Airlines	Cleveland Hopkins Intl. Ap., Cleveland, Ohio, US
74	03/14/97	Boeing 727-200F	Off-side veer	Kelowna Flightcraft	Hamilton Ap., Hamilton, Ontario, CA
75	03/20/97	Boeing 747-200B	Overrun	Garuda Indonesia	Chiang Kai Shek Intl Ap., Taipei, TW
76	04/12/97	Douglas DC-9-51	Off-side veer	Ghana Airways	Felix Houphouet Boigny Ap., Abidjan, CI
77	04/13/97	Antonov An-12	Overrun	Avia	Verkhneviluisk Ap., Verkhneviluisk, RU
78	04/24/97	Bristol 170 Freighter Mk.31M	Off-side veer	Hawkair Aviation Services	Bronson Creek Ap., Bronson Creek, British Columbia, CA
79	05/06/97	Fokker F.27-500	Off-side veer	Channel Express	States Ap., St. Helier, Jersey, GB
80	06/07/97	BAC One-Eleven 500	Off-side veer	TAROM	Arlanda Ap., Stockholm, SE
81	07/02/97	British Aerospace ATP	Off-side veer	Biman Bangladesh Airlines	Patenga Ap., Chittagong, BD
82	07/11/97	Airbus A340-310	Off-side veer	TAP - Air Portugal	N'Djili Ap., Kinshasa, ZR

Num	Date	Aircraft	Excur Type	Operator	Location
83	07/17/97	Boeing 737-300	Overrun	VARIG	Santos Dumont Ap., Rio de Janeiro, BR
84	07/29/97	BAC One-Eleven 200	Off-side veer	ADC Airlines	Calabar Ap., Calabar, NG
85	07/30/97	ATR-42-500	Overrun	Air Littoral	Peretola Ap., Florence, IT
86	08/12/97	Boeing 727-200 Adv.	Overrun	Olympic Airways	Makedonia Ap., Thessaloniki, GR
87	10/09/97	Cessna 660 Citation VI	Off-side veer	Airborne Remote Sensing Centre	Harbin Ap., Harbin, CN
88	10/20/97	Antonov An-24RV	Overrun	Mongolian Airlines	Ulaangom Ap., Ulaangom, MN
89	10/21/97	Boeing 737-300	Overrun	Pakistan International Airlines	Quaid-E-Azam Intl. Ap., Karachi, PK
90	10/28/97	Fairchild FH-227D	Overrun	Aerogal	Chachoan Ap., Ambato, EC
91	11/02/97	Fairchild SA-226TC Metro II	Off-side veer	Perimeter Airlines	Island Lake/Garden Hill Ap., Island Lake, Manitoba, CA
92	11/08/97	Antonov An-12	Off-side veer	Aviaobshchemash	Bryansk Ap., Bryansk, RU
93	11/16/97	Fokker F.28-1000	Off-side veer	Air Niugini	Nadzab Ap., Nadzab, PG
94	11/18/97	Douglas DC-8-54AF	Off-side veer	Cougar Air	Mwanza Ap., Mwanza, TZ
95	11/25/97	Shorts 360	Off-side veer	Corporate Air	Logan Intl. Ap., Billings, Montana, US
96	12/07/97	Fokker F.27-500	Overrun	KLM uk	La Villiaze Ap., St. Peter Port, Guernsey, Channel Islands, GB
97	12/24/97	Boeing 757-200	Off-side veer	Transavia Airlines	Schiphol Ap., Amsterdam, NL
98	01/11/98	Avro RJ100	Overrun	THY - Turkish Airlines	Samsun Ap., Samsun, TR
99	01/20/98	ATR-42-300	Off-side veer	Italair	Fertilia Ap., Alghero, Sardinia, IT
100	02/13/98	Junkers Ju-52-3M	Off-side veer	Ju-Air	Samedan Ap., Samedan, CH
101	02/19/98	Grumman 159 Gulfstream IC	Off-side veer	Skyways Kenya	North Airstrip, Mogadishu, SO
102	02/26/98	Fokker 100	Off-side veer	US Airways	Municipal Ap., Birmingham, Alabama, US
103	03/03/98	Fokker 100	Off-side veer	Mexicana	Benito Juarez Intl. Ap., Mexico City, MX
104	03/04/98	Cessna 650 Citation VII	Overrun	Tenneco Management Co	Manistee County/Blacker Ap., Manistee, Michigan, US
105	03/22/98	Airbus A320-210	Overrun	Philippine Airlines	Bacolod Ap., Bacolod, PH
106	04/12/98	Boeing 737-200 Adv.	Off-side veer	Orient Eagle Airways	Almaty Intl. Ap., Almaty, KZ
107	04/23/98	Shorts 330-200	Overrun	SAFT Gabon	La Lope Ap., La Lope, GA
108	05/16/98	Fokker F.28-4000	Overrun	Manunggal Air	Seletar Ap., Singapore, SG
109	05/21/98	Airbus A320-210	Overrun	Leisure International Airways	Ibiza Ap., Ibiza, ES
110	05/21/98	Boeing 737-400	Overrun	Istanbul Airlines	Ataturk Ap., Istanbul, TR
111	05/23/98	Learjet 24B	Overrun	Panther Aviation	Executive Ap., Orlando, Florida, US
112	06/03/98	Lockheed C-130H Hercules	Off-side veer	TransAfrik	Mongu Ap., Mongu, ZM
113	06/25/98	B.Ae. Jetstream 32	Off-side veer	LAER - Lineas Aereas Entre Rios	Aeroparque Jorge Newbery, Buenos Aires, AR
114	07/19/98	Boeing 737-200C Adv.	Off-side veer	Sudan Airways	Khartoum Ap., Khartoum, SD
115	07/26/98	Fairchild FH-227	Off-side veer	Legion Express	Keflavik Intl. Ap., Reykjavik, IS
116	08/05/98	Boeing 747-400	Off-side veer	Korean Air	Kimpo Intl. Ap., Seoul, KR
117	08/06/98	Hawker-Siddeley 748 Srs.2A	Overrun	Wasaya Airways	Kasabonika Ap., Kasabonika, Ontario, CA
118	08/09/98	Dornier 228-200	Off-side veer	UNI Air	Peikan Ap., Matsu, TW
119	08/11/98	Antonov An-12	Overrun	ALADA	Saurimo Ap., Saurimo, AO
120	08/14/98	Yakovlev Yak-40	Overrun	Kyrghyzstan Airlines	Dzhala-Abad Ap., Dzhala-Abad, KG
121	08/27/98	Airbus A340-200	Off-side veer	SABENA	Brussels National Ap., Brussels, BE
122	09/05/98	Yakovlev Yak-40K	Overrun	GESA-GEA	Malabo Ap., Malabo, GQ
123	09/11/98	Boeing 767-300ERF	Off-side veer	United Parcel Service	Ellington Field, Houston, Texas, US

Num	Date	Aircraft	Excur Type	Operator	Location
124	09/16/98	Boeing 737-500	Off-side veer	Continental Airlines	Miguel Hidalgo Ap., Guadalajara, MX
125	09/22/98	Fokker F.28-3000C	Off-side veer	SATENA	La Vanguardia Ap., Villavicencio, CO
126	09/26/98	Grumman HU-16E Albatross	Off-side veer	Urbano M. Dasilva	Sedona Ap., Sedona, Arizona, US
127	09/26/98	Cessna 560 Citation Ultra	Overrun	Gamston Aviation	Fairoaks Ap., Chobham, GB
128	09/28/98	Cessna 550 Citation II	Off-side veer	Ram Air Sales & Leasing LLC	Memorial Ap., Pueblo, Colorado, US
129	09/30/98	Douglas MD-82	Overrun	Korean Air	Ulsan Ap., Ulsan, KR
130	11/01/98	Boeing 737-200 Adv.	Off-side veer	AirTran Airways	Hartsfield Intl. Ap., Atlanta, Georgia, US
131	11/26/98	Dassault Falcon 900	Off-side veer	Government of Gabon	Le Bourget Ap., Paris, FR
132	11/26/98	ATR-42-500	Overrun	AD	Morelia Ap., Morelia, MX
133	12/17/98	Antonov An-124	Overrun	Heavylift Volga-Dnepr	Gander Ap., Gander, Newfoundland, CA
134	01/07/99	Douglas DC-3A	Off-side veer	Servivensa	Regional Ap., Canaima, VE
135	01/20/99	Antonov An-12	Off-side veer	Unidentified Operator	Lukapa Ap., Lukapa, AO
136	01/22/99	Beech Commuter 1900D	Off-side veer	Colgan Air	Barnstable Municipal Ap., Hyannis, Massachusetts, US
137	01/22/99	Cessna 650 Citation VII	Off-side veer	Executive Jet Aviation	Port Columbus Intl. Ap., Columbus, Ohio, US
138	01/31/99	Boeing 727-200 Adv.	Off-side veer	Air Algerie	Ain el Bey Ap., Constantine, DZ
139	02/04/99	Antonov An-26	Overrun	Air Angol	Luzamba Ap., Luzamba, AO
140	02/10/99	Boeing 737-200 Adv.	Off-side veer	Bouraq Indonesia	Hasanudin Ap., Ujung Pandang, Sulawesi, ID
141	02/12/99	DHC Dash 8-100	Off-side veer	Wideroe's Flyveselskap	Hammerfest Ap., Hammerfest, NO
142	02/14/99	Hawker-Siddeley 748 Srs.2	Off-side veer	748 Air Services	Foxtrot Airstrip, SD
143	02/16/99	GA 1159 Gulfstream II	Overrun	Trans Exec Air Service Inc	Van Nuys Ap., Los Angeles, California, US
144	02/25/99	Dornier 328-100	Overrun	Minerva Italy	Cristoforo Colombo Ap., Genoa, IT
145	03/04/99	Boeing 737-200 Adv.	Off-side veer	Air France	Parme Ap., Biarritz, FR
146	03/15/99	Douglas MD-83	Overrun	Korean Air	Pohang Ap., Pohang, KR
147	03/24/99	Airbus A300-620C	Overrun	Amiri Flight	Diagoras Ap., Rhodes, GR
148	03/30/99	Fokker F.28-4000	Off-side veer	Air Niugini	Goroka Ap., Goroka, PG
149	04/13/99	Lockheed 1329 JetStar 8	Off-side veer	Servicios Aereos del Centro	Merida Intl. Ap., Merida, MX
150	04/17/99	Beechjet 400	Overrun	Vecellio & Grogan Inc	Raleigh County Memorial Ap., Beckley, West Virginia, US
151	05/19/99	Yakovlev Yak-40	Overrun	Centrafrican Airlines	Berberati Ap., Berberati, CF
152	06/01/99	Douglas MD-82	Overrun	American Airlines	National Ap. (Adams Field), Little Rock, Arkansas, US
153	06/09/99	Boeing 737-300	Off-side veer	Shantou Airlines	Guangdong Ap., Zhanjiang, CN
154	06/28/99	Airbus A310-220F	Overrun	FedEx	Ninoy Aquino Intl. Ap., Manila, PH
155	07/04/99	Douglas DC-6	Overrun	LAN - Lineas Aereas Nacionales	Vanguardia Ap., Villavicencio, CO
156	08/01/99	Fokker F.28-1000	Overrun	Canadian Regional Airlines	St John's Intl. Ap., St John's, Newfoundland, CA
157	08/13/99	Fokker F.28-1000	Overrun	Myanma Airways	Mingaladon Ap., Yangon, MM
158	08/14/99	Boeing 707-320C	Overrun	Trans Arabian Air Transport	Juba Ap., Juba, SD
159	08/16/99	Canadair Challenger 600	Off-side veer	Hop A Jet Inc	Executive Ap., Fort Lauderdale, Florida, US
160	08/22/99	Douglas MD-11	Off-side veer	China Airlines	Chep Lap Kok Intl. Ap., Hong Kong, HK
161	09/02/99	Boeing 747SP	Off-side veer	China Airlines	Chiang Kai Shek Intl. Ap., Taipei, TW
162	09/13/99	Airbus A320-210	Off-side veer	Iberia	Sondica Ap., Bilbao, ES
163	09/14/99	Boeing 757-200	Off-side veer	Britannia Airways	Costa Brava Ap., Gerona, ES
164	09/22/99	Boeing 747-400	Overrun	Qantas	Bangkok Intl. Ap., Bangkok, TH

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165	09/25/99	Learjet 36A	Overrun	Air Med Luftfahrzeugbereithaltung GmbH	Langenlebarn AFB, Tulln, AT
166	09/26/99	Learjet 24	Overrun	Dolphin Aviation Inc	Lee Gilmer Memorial Ap., Gainesville, Georgia, US
167	10/16/99	Douglas DC-8-62CF	Off-side veer	Continental Cargo Airlines	N'Djili Ap., Kinshasa, ZR
168	10/17/99	Douglas MD-11F	Overrun	FedEx	Subic Bay Intl. Ap., Olongapo, PH
169	10/26/99	Airbus A320-230	Off-side veer	Indian Airlines	Mingaladon Ap., Yangon, MM
170	11/18/99	Fokker 100	Off-side veer	TAM - Transportes AÈreos Regionais SA	Santos Dumont Ap., Rio de Janeiro, BR
171	11/22/99	Fairchild SA-227AC Metro III	Overrun	Bearskin Airlines	Dryden Regional Ap., Dryden, Ontario, CA
172	11/27/99	Dassault Falcon 200	Off-side veer	Smithair	Boise Air Terminal, Boise, Idaho, US
173	12/21/99	Douglas DC-10-30	Overrun	Cubana	La Aurora Ap., Guatemala City, GT
174	12/28/99	Lockheed 100-30 Hercules	Overrun	TransAfrik	Luzamba Ap., Luzamba, AO
175	01/27/00	Mitsubishi Mu-300 Diamond 1A	Off-side veer	Matrix Aviation Corp	Love Field, Dallas, Texas, US
176	02/16/00	NAMC YS-11A	Overrun	Air Nippon	Okadama Ap., Sapporo, JP
177	02/22/00	Boeing 767-300ER	Off-side veer	Egyptair	Harare Intl. Ap., Harare, ZW
178	02/27/00	Boeing 737-400	Overrun	Transbrasil	Salgado Filho Ap., Port Alegre, BR
179	03/01/00	Airbus A320-230	Off-side veer	South African Airways	Lusaka Ap., Lusaka, ZM
180	03/05/00	Boeing 737-300	Overrun	Southwest Airlines	Burbank Intl. Ap., Burbank, California, US
181	03/12/00	Learjet 60	Overrun	Bombardier Business Jet Solutions (Flexjets)	Jackson Hole Ap., Jackson, Wyoming, US
182	03/17/00	Dassault Falcon 900	Overrun	BP Amoco Corp	Barnstable Municipal Ap., Hyannis, Massachusetts, US
183	03/21/00	Saab 340B	Overrun	American Eagle Airlines	Killeen Municipal Ap., Killeen, Texas, US
184	04/22/00	Avro RJ70	Overrun	THY - Turkish Airlines	Siirt Ap., Siirt, TR
185	04/30/00	Douglas DC-10-30F	Overrun	DAS Air	Entebbe Intl. Ap., Entebbe, UG
186	06/07/00	Antonov An-32	Off-side veer	Aviatrans K	Lima 25 Airstrip, Kardafan, SD
187	06/26/00	Boeing 737-200C Adv.	Off-side veer	Yemenia	Khartoum Ap., Khartoum, SD
188	07/01/00	Fokker F.27-500	Overrun	Channel Express	Baginton Ap., Coventry, GB
189	07/18/00	Fokker F.28-4000	Off-side veer	Iran Asseman Airlines	Ahwaz Ap., Ahwaz, IR
190	07/23/00	Antonov (WSK-PZL Mielec) An-28	Off-side veer	Riga Aeroclub	Ostre Aera Ap., Hedmark, NO
191	07/28/00	Grumman 159 Gulfstream IF	Off-side veer	Airwave Transport	Dorval Intl. Ap., Montreal, Quebec, CA
192	08/15/00	Antonov An-12	Overrun	Inter Trans Air	Kisangani Ap., Kisangani, ZR
193	09/21/00	Boeing 707-320B	Off-side veer	Government of Togo	Diori Hamani Intl. Ap., Niamey, NE
194	09/27/00	Convair 580	Off-side veer	Air Inuit/Hydro-Quebec	LG4 Airstrip, Quebec, CA
195	10/06/00	Douglas DC-9-31	Overrun	Aeromexico	General Lucio Blanco Ap., Reynosa, MX
196	11/05/00	Boeing 747-200BM	Off-side veer	Cameroon Airlines	Charles de Gaulle Ap., Paris, FR
197	11/21/00	Aerospatiale Corvette 601	Overrun	CALIF SNIAS/Eurocopter	Le Bourget Ap., Paris, FR
198	12/23/00	Douglas DC-10-10	Overrun	Hawaiian Air	Faaa Ap., Papeete, Tahiti, PF
199	12/29/00	B.Ae. Jetstream 41	Overrun	Atlantic Coast Airlines	Charlottesville-Albemarle Ap., Charlottesville, Virginia, US
200	01/14/01	Learjet 60	Off-side veer	Ark-Air Flight Inc	Troy Municipal Ap., Troy, Alabama, US
201	01/31/01	Douglas DC-6B	Off-side veer	Everts Air Fuel Inc.	Donlin Creek Airstrip, 20km N of Crooked Creek, Alaska, US
202	02/04/01	Shorts 360-300	Off-side veer	Aer Arann Express	City Ap., Sheffield, GB
203	02/04/01	Learjet 25B	Off-side veer	American Jets Inc	St. Lucie County Intl. Ap., Fort Pierce, Florida, US
204	02/06/01	Dassault Falcon 900	Off-side veer	Compass Foods	Ralph Wenz Ap., Pinedale, Wyoming, US
205	03/09/01	British Aerospace (HS) 125 Srs.3	Overrun	373 Trading Corp	Igor I. Sikorsky Memorial Ap., Bridgeport, Connecticut, US

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206	03/22/01	Airbus A320-210	Overrun	Tunis Air	Melita Ap., Djerba, TN
207	03/23/01	Boeing 707-320C	Off-side veer	Luxor Air	Roberts Intl. Ap., Monrovia, LR
208	04/04/01	Boeing 737-200F Adv.	Overrun	Royal Cargo	St. John's Intl. Ap., St. Johns, Newfoundland, CA
209	04/30/01	Cessna 560 Citation V	Overrun	Tyrolean Jet Service	Peretola Ap., Florence, IT
210	05/17/01	Airbus A300-620R	Off-side veer	Thai Airways International	Bangkok Intl. Ap., Bangkok, TH
211	06/07/01	Learjet 24	Off-side veer	NASA	Southern California Logistics Ap., Victorville, California, US
212	06/10/01	Embraer ERJ-145LR	Overrun	Sichuan Airlines	Capital Ap., Beijing, CN
213	06/18/01	Embraer EMB-121 Xingu	Off-side veer	Jat Aerotaxi	Ceres Ap, Ceres, BR
214	07/10/01	Antonov An-12	Off-side veer	Air Sofia	Exeter Ap., Exeter, GB
215	07/17/01	Fokker F.28-4000	Off-side veer	TAME Ecuador	Tulcan Ap., Tulcan, EC
216	08/01/01	Boeing 727-200 Adv.	Overrun	Yemenia	Asmara Intl. Ap., Asmara, ER
217	08/19/01	Boeing 737-700	Overrun	Hamburg International	Ataturk Ap., Istanbul, TR
218	08/28/01	BAC One-Eleven 400	Overrun	Eagle Aviation	Libreville Ap., Libreville, GA
219	08/28/01	Dassault Falcon 20	Overrun	Grand Aire Express	Detroit City Ap., Detroit, Michigan, US
220	09/07/01	Boeing 707-320C	Off-side veer	HC Airlines	Luano Ap., Lubumbashi, ZR
221	09/16/01	Boeing 737-200 Adv.	Off-side veer	VARIG	Santa Genoveva Ap., Goiania, BR
222	09/25/01	Douglas DC-6BF	Off-side veer	Northern Air Cargo	Alpine Airstrip, 17km N of Nuiqsut, Alaska, US
223	10/16/01	Antonov An-12	Off-side veer	Air Bridge	Henderson Intl. Ap., Honiara, SB
224	10/17/01	Airbus A300 B4-200	Off-side veer	Pakistan International Airlines	Dubai Intl. Ap., Dubai, AE
225	10/18/01	Cessna 550 Citation II	Overrun	Ratti Aviation	Bolzano Ap., Bolzano, IT
226	11/01/01	Boeing 737-300	Off-side veer	Kenya Airways	Jomo Kenyatta Intl. Ap., Nairobi, KE
227	11/22/01	DHC Dash 8-100	Off-side veer	Wideroe's Flyveselskap	Bringeland Ap., Forde, NO
228	11/27/01	Fairchild SA-226TC Metro II	Off-side veer	Aerocassa Servicios Aereos SA	Comandante Espora Ap., Bahia Blanca, AR
229	11/30/01	B.Ae. Jetstream 31	Off-side veer	European Executive Express	Geiteryggen Ap., Skien, NO
230	12/02/01	Fairchild SA-227AC Metro 23	Off-side veer	Air Iceland	Hornafjordur Ap., Hofn, IS
231	12/11/01	Antonov An-32	Overrun	Air Nave	Luzamba Ap., Luzamba, AO
232	01/29/02	Antonov (WSK-PZL Mielec) An-28	Off-side veer	Raul Arias Betancourt	Kavak airstrip, nr. Canaima, VE
233	02/10/02	Mitsubishi Mu-300 Diamond 1	Overrun	Flight Options	Cuyahoga County Ap., Cleveland, Ohio, US
234	03/03/02	Fairchild SA-227AC Metro III	Off-side veer	Provincial Airlines	Goose Bay Ap., Goose Bay, Newfoundland, CA
235	03/18/02	Boeing 727-100QC	Off-side veer	VARIG	Confins Intl. Ap., Belo Horizonte, BR
236	03/25/02	Mitsubishi Mu-300 Diamond 1A	Overrun	Corporate Flight Management Inc	Darlington Field, Anderson, Indiana, US
237	04/26/02	Boeing 707-320C	Off-side veer	Hewa Bora Airways	N'Djili Ap., Kinshasa, ZR
238	05/01/02	Beechjet 400	Overrun	Flight Options	Baltimore-Washington Intl. Ap., Baltimore, Maryland, US
239	05/02/02	Cessna 560 Citation Ultra	Overrun	Netjets	Real County Ap., Leakey, Texas, US
240	06/14/02	Douglas DC-9-14	Overrun	Inter (Colombia)	La Margarita Ap., Neiva, CO
241	06/26/02	Boeing 767-200	Off-side veer	All Nippon Airways	Shimojishima Ap., Shimojishima, Shimoji Island, JP
242	08/07/02	Xian Yun-7-100	Off-side veer	Wuhan Air Lines	Sanxia Ap., Yichang, CN
243	08/13/02	Cessna 551 Citation II/SP	Overrun	Melita Eagle Inc	Big Bear City Ap., Big Bear City, California, US
244	08/16/02	Boeing 737-300	Overrun	China Southwest Airlines	Lijiang City Ap., Lijiang, CN
245	08/28/02	Airbus A320-230	Off-side veer	America West Airlines	Sky Harbor Intl. Ap., Phoenix, Arizona, US
246	08/30/02	Learjet 25B-XR	Overrun	Care Flight International Inc	Blue Grass Ap., Lexington, Kentucky, US

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247	09/04/02	DHC Dash 7	Off-side veer	Asian Spirit	Manila Intl. Ap., Manila, PH
248	10/07/02	Learjet 60	Overrun	American Virginia	Luiz Beck da Silva Ap., Santa Cruz do Sul, BR
249	10/23/02	Ilyushin Il-62M	Off-side veer	Tretyakovo Air Transport Company	Manas Intl. Ap., Bishkek, KG
250	10/31/02	Douglas DC-9-32	Overrun	Aeromexico	Gen. Mariano Escobedo Ap., Monterrey, MX
251	11/02/02	Fokker F.27-500	Overrun	EuroCeltic Airways	Collooney Ap., Sligo, IE
252	11/07/02	Antonov An-12	Overrun	Silk Way Airlines	Kome Ap., Kome, TD
253	12/13/02	Douglas DC-8-62CF	Overrun	Arrow Air	Changi Intl. Ap., Singapore, SG
254	12/18/02	Fairchild SA-226T Merlin IIIB	Off-side veer	FS Air Service	Soldotna Ap, Soldotna, Alaska, US
255	01/06/03	DHC Dash 8-100	Off-side veer	Wideroe's Flyveselskap	Vadso Ap., Vadso, NO
256	01/06/03	Embraer ERJ-145LR	Overrun	ExpressJet Airlines	Cleveland Hopkins Intl. Ap., Cleveland, Ohio, US
257	01/17/03	B.Ae. Jetstream 31	Overrun	Servicio Aereo Vargas Espana (SAVE)	Yacuiba Ap., Yacuiba, BO
258	01/17/03	Fokker 50	Off-side veer	Air Nostrum	Melilla Ap., Melilla, ES
259	01/20/03	Cessna 550 Citation II	Overrun	Sonnig SA	Bassillac Ap., Perigueux, FR
260	01/27/03	Beech Commuter 1900D	Off-side veer	Wasaya Airways	Bearskin Lake Ap., Bearskin, Ontario, CA
261	02/15/03	Boeing 747-200F	Overrun	Evergreen International Airlines	Sigonella AFB, Catania, Sicily, IT
262	02/16/03	Fairchild SA-26AT Merlin IIB	Off-side veer	Merlin Aviation LLC	St. Louis Downtown Ap, Cahokia, Illinois, US
263	03/07/03	Beech 300 King Air	Overrun	Chevron Canada Resources Ltd	Mildred Lake Ap, Mildred Lake, Alberta, CA
264	03/21/03	Boeing 737-400	Off-side veer	Royal Air Maroc	Menara Ap., Marrakech, MA
265	03/24/03	Mitsubishi Mu-300 Diamond 1A	Overrun	Jet Sul Taxi Aereo	Santos AFB, Santos, BR
266	04/28/03	Yakovlev Yak-40	Off-side veer	Dniproavia	Dnepropetrovsk Intl. Ap., Dnepropetrovsk, UA
267	04/29/03	Beech Commuter 1900C-1	Off-side veer	Avirex	N'Djili Ap., Kinshasa, ZR
268	05/11/03	Antonov An-12	Overrun	Pecotox Air	Asmara Intl. Ap., Asmara, ER
269	05/18/03	Beech B300 King Air	Off-side veer	Oso-Rio LLC	West Houston Ap, Houston, Texas, US
270	05/24/03	Boeing 737-300	Off-side veer	Southwest Airlines	Amarillo Intl. Ap., Amarillo, Texas, US
271	05/27/03	Antonov An-12	Overrun	Showa Air	Goma Ap., Goma, ZR
272	06/16/03	Fokker 50	Off-side veer	Mid Airlines	Adaryale Ap., Adaryale, SD
273	06/30/03	Yakovlev Yak-40	Off-side veer	CNG Transavia	Solovki Ap., Solovki, RU
274	07/06/03	Douglas DC-10-30CF	Overrun	Cielos Del Peru	Afonso Pena Ap., Curitiba, BR
275	07/23/03	Cessna 550 Citation II	Overrun	Agua Limpa Transportes Ltda	Sorocaba Ap., Sorocaba, BR
276	08/13/03	Let 410UVP Turbolet	Overrun	Lexus Aviation	Rumbek Ap., Rumbek, SD
277	09/17/03	B.Ae. Jetstream Super 31	Off-side veer	European Executive Express	Kallax Ap., Lulea, SE
278	09/19/03	Learjet 25B	Overrun	Ameristar Jet Charter	Del Rio Intl. Ap., Del Rio, Texas, US
279	09/23/03	Embraer ERJ-145LU	Off-side veer	Luxair	Findel Ap., Luxembourg, LU
280	09/24/03	Antonov An-12	Off-side veer	Sarit Airlines	Wau Ap., Wau, SD
281	10/01/03	Boeing 747-200F	Overrun	Cargo Air Lines	Bierset Ap., Liege, BE
282	10/03/03	Boeing 737-500	Off-side veer	Garuda Indonesia	Achmad Yani Ap., Semarang, ID
283	10/20/03	Fokker F.27-600	Off-side veer	TAVAJ	Tarauaca Ap., Tarauaca, BR
284	11/01/03	Fairchild SA-227AC Metro III	Off-side veer	Key Lime Air	Rawlins Municipal Ap., Rawlins, Wyoming, US
285	11/06/03	Airbus A320-230	Off-side veer	TAM Linhas Aereas	Hercilio Luz Ap., Florianopolis, BR
286	12/07/03	Fokker F.28-4000	Overrun	East African Safari Air	Lokichogio Ap., Lokichogio, KE
287	12/18/03	Douglas DC-10-10F	Off-side veer	FedEx	Memphis Intl. Ap., Memphis, Tennessee, US

Num	Date	Aircraft	Excur Type	Operator	Location
288	12/19/03	Boeing 737-300	Overrun	Air Gabon	Leon M'Ba Ap., Libreville, GA
289	12/20/03	Boeing 737-700	Overrun	GOL Linhas Aereas	Ministro Victor Konder Ap., Navegantes, BR
290	01/21/04	Dassault Falcon 20	Off-side veer	Jet Ex LLC	Pueblo Memorial Ap., Pueblo, Colorado, US
291	02/09/04	Dassault Falcon 900	Off-side veer	Stork Ltd	Stansted Ap., London, GB
292	02/20/04	Learjet 25B	Overrun	Skylink Jet	Fort Lauderdale Executive Ap., Fort Lauderdale, Florida, US
293	03/15/04	Beech Commuter 1900D	Off-side veer	Air Midwest	Manhattan Regional Ap., Manhattan, Kansas, US
294	03/19/04	Learjet 35A	Off-side veer	AirNet Express	Oneida County Ap., Utica, New York, US
295	04/28/04	Douglas DC-10-30F	Overrun	Centurion Air Cargo	Eldorado Ap., Bogota, CO
296	04/29/04	Boeing 737-800	Overrun	THY - Turkish Airlines	Gaziantep Ap., Gaziantep, TR
297	05/09/04	ATR-72-210	Off-side veer	Executive Airlines	Luis Munoz Marin Intl. Ap., San Juan, PR
298	06/01/04	Antonov An-32	Off-side veer	Sun Air Charter	Kanombe Intl. Ap., Kigali, RW
299	06/07/04	Antonov An-26	Overrun	Abadeel Aviation	Geneina Ap., Geneina, SD
300	06/16/04	Fokker F.27-600	Overrun	Pakistan International Airlines	Chitral Ap., Chitral, PK
301	06/17/04	Airbus A300 B4-200F	Overrun	Egyptair	Khartoum Ap., Khartoum, SD
302	07/19/04	Learjet 55	Overrun	Hop-A-Jet	Fort Lauderdale Executive Ap., Fort Lauderdale, Florida, US
303	07/28/04	Rockwell Sabreliner 60	Overrun	Policia Federal Preventiva de Mexico	Mexicali Ap., Mexicali, MX
304	08/25/04	Fokker 50	Off-side veer	Ethiopian Airlines	Bole Intl. Ap., Addis Ababa, ET
305	08/26/04	Embraer EMB-120 Brasilia	Off-side veer	TransAirWays	Beira Ap., Beira, MZ
306	08/28/04	Aerospatiale SE.210 Caravelle 11R	Overrun	Transair Cargo	Gisenyi Ap., Gisenyi, RW
307	09/05/04	Antonov An-12	Off-side veer	Antonov Airlines	Borispol Ap., Kiev, UA
308	09/16/04	Antonov An-24RV	Overrun	Kam Air	Khwaja Rawash Ap., Kabul, AF
309	09/21/04	Fairchild SA-227AC Metro III	Off-side veer	Norcanair Airlines	Barber Field, La Ronge, Saskatchewan, CA
310	10/08/04	Fokker F.28-4000	Overrun	Biman Bangladesh Airlines	Osmany Intl. Ap., Sylhet, BD
311	10/18/04	Airbus A320-230	Overrun	TransAsia Airways	Sung Shan Ap., Taipei, TW
312	11/07/04	Boeing 737-300	Off-side veer	Air Asia	Kota Kinabalu Intl. Ap., Kota Kinabalu, Sabah, MW
313	11/15/04	Yakovlev Yak-40	Off-side veer	ASAP Charters CA	La Carlota Ap., Caracas, VE
314	11/18/04	B.Ae. Jetstream 31	Off-side veer	Venezolana	Simon Bolivar Intl. Ap., Caracas, VE
315	11/28/04	Boeing 737-400	Off-side veer	KLM Royal Dutch Airlines	Barcelona Intl. Ap., Barcelona, ES
316	11/29/04	GA Gulfstream IVSP	Off-side veer	Netjets International	Eagle County Regional Ap., Eagle, Colorado, US
317	11/30/04	Douglas MD-82	Overrun	Lion Airlines	Adi Sumarmo Ap., Solo, Java, ID
318	12/01/04	Beech 350 King Air	Off-side veer	Aviation CMP Inc	St Georges Ap, St Georges, Quebec, CA
319	12/01/04	GA Gulfstream IV	Off-side veer	GAMA Aviation	Teterboro Ap., Teterboro, New Jersey, US
320	12/05/04	Dassault Falcon 200	Overrun	Inland Paperboard & Packaging Inc	Grider Field, Pine Bluff, Arkansas, US
321	01/08/05	Douglas MD-83	Overrun	AeroRepublica Colombia	Alfonso B. Aragon Ap., Cali, CO
322	01/12/05	Beech B300 King Air	Overrun	CBI Inc	Craig Municipal Ap., Jacksonville, Florida, US
323	01/19/05	GA 1159 Gulfstream II	Off-side veer	FG Aviation Inc	Logan Cache Ap., Logan, Utah, US
324	01/24/05	Boeing 747-200F	Overrun	Atlas Air	Dusseldorf Intl. Ap., Dusseldorf, DE
325	01/25/05	Fokker 100	Off-side veer	Montenegro Airlines	Podgorica Intl. Ap., Podgorica, YU
326	01/28/05	Learjet 35A	Overrun	Million Air Salt Lake City	Downtown Ap., Kansas City, Missouri, US
327	02/06/05	DHC Dash 8-300	Off-side veer	Air Senegal International	Tambacounda Ap., Tambacounda, SN
328	02/15/05	Hawker-Siddeley 748 Srs.2	Overrun	African Commuter Services	Oldfangak Ap., Oldfangak, SD

Num	Date	Aircraft	Excur Type	Operator	Location
329	02/25/05	Boeing 727-200 Adv.	Off-side veer	Syrianair	Kuwait Intl. Ap., Kuwait City, KW
330	03/07/05	Airbus A310-300	Overrun	Mahan Air	Mehrabad Intl. Ap., Tehran, IR
331	03/11/05	Canadair RJ 440	Off-side veer	Pinnacle Airlines	General Mitchell Intl. Ap., Milwaukee, Wisconsin, US
332	04/14/05	Boeing 737-200 Adv.	Off-side veer	Merpati Nusantara Airlines	Hasanuddin Ap., Makassar - Ujung Pandang, ID
333	04/20/05	Boeing 707-320C	Off-side veer	Saha Air	Mehrabad Intl. Ap., Tehran, IR
334	04/25/05	Antonov An-12	Off-side veer	ATMA	Kabul Ap., Kabul, AF
335	05/20/05	Dassault Falcon 20	Overrun	Jet 2000	Sheremetyevo Ap., Moscow, RU
336	06/08/05	Saab 340A	Off-side veer	Shuttle America	Dulles Intl. Ap., Washington, Virginia, US
337	06/19/05	Boeing 707-320C	Off-side veer	Mahfooz Aviation	Bole Intl. Ap., Addis Ababa, ET
338	07/01/05	Douglas DC-10-30	Off-side veer	Biman Bangladesh Airlines	Shah Amanat Intl. Ap., Chittagong, BD
339	07/15/05	Learjet 35A	Off-side veer	Aspen Aviation Inc	Eagle County Regional Ap., Vail, Colorado, US
340	08/02/05	Airbus A340-310	Overrun	Air France	Pearson Intl. Ap., Toronto, Ontario, CA
341	08/12/05	Antonov An-140	Overrun	Safiran Airlines	Araak Ap., Araak, IR
342	09/11/05	NAMC YS-11A	Overrun	Phuket Air	Mae Sot Ap., Mae Sot, TH
343	10/09/05	Boeing 737-400	Overrun	Air Sahara	Chhatrapati Shivaji Intl. Ap., Mumbai, IN
344	10/15/05	Lockheed 1329 JetStar 731	Off-side veer	Paloma Angelina Hernandez	Adolfo Lopez Mateos Ap., Toluca, MX
345	10/31/05	Boeing 727-100F	Overrun	MIBA Aviation	Kindu Intl. Ap., Kindu, ZR
346	11/13/05	Fairchild/Dornier 328Jet	Off-side veer	Hainan Airlines	Taiyuan Ap., Taiyuan, CN
347	11/14/05	British Aerospace 146-200	Overrun	Asian Spirit	Catarman Ap., Catarman, PH
348	11/15/05	IAI Gulfstream G100	Overrun	Jetport Inc	Hamilton Intl. Ap., Hamilton, Ontario, CA
349	11/30/05	CASA 212-100	Overrun	Sabang Merauke Raya Air Charter	Lasikin Ap., Sinabang, Simeuleu Island, ID
350	12/08/05	Boeing 737-700	Overrun	Southwest Airlines	Midway Intl. Ap., Chicago, Illinois, US
351	01/05/06	Douglas C-54G (DC-4)	Off-side veer	Buffalo Airways	Norman Wells Ap, Norman Wells, Northwest Territories, CA
352	01/05/06	Cessna 560 Citation Ultra	Off-side veer	Netjets	Noble F Lee Memorial Field, Minocqua, Wisconsin, US
353	01/13/06	Learjet 24F	Off-side veer	Awesome Flight Services	N'Djili Intl. Ap., Kinshasa, ZR
354	01/26/06	Let 410UVP Turbolet	Overrun	United Airlines (Kenya)	Padak Ap., Padak, SD
355	02/05/06	Canadair Challenger 604	Overrun	Premium Aviation GmbH	Luton Intl. Ap., Luton, GB
356	02/15/06	Dassault Falcon 200	Overrun	Jet 2000	Holtenau Ap., Kiel, DE
357	03/04/06	Douglas MD-82	Off-side veer	Lion Airlines	Juanda Ap., Surabaya, ID
358	03/11/06	ATR-72-500	Off-side veer	Air Deccan	Hindustan Ap., Bangalore, IN
359	03/17/06	Hawker-Siddeley 748 Srs.2A	Overrun	Trackmark Cargo	Oldfangak Ap., Oldfangak, SD
360	03/18/06	Boeing 737-600	Off-side veer	Air Algerie	San Pablo Ap., Seville, ES
361	03/29/06	Ilyushin Il-62M	Overrun	Cen-Sad	Domodedovo Ap., Moscow, RU
362	04/16/06	Fokker F.27-400	Off-side veer	TAM - Transporte Aereo Militar	Cap Av Emilio Beltran Ap., Guayaramerin, BO
363	04/20/06	Rockwell Sabreliner 75A	Overrun	Jordan Aviation	El Nohza Intl. Ap., Alexandria, EG
364	04/24/06	Antonov An-32B	Overrun	Air Million Cargo Charter	Bost Ap., Lashkar Gah, AF
365	04/28/06	B.Ae. Jetstream 31	Off-side veer	CaribIntair	Cap Haitien Intl. Ap., Cap Haitien, HT
366	05/24/06	IAI 1124 Westwind	Overrun	Air Ambulance By Air Trek Inc	Exuma Intl. Ap., George Town, BS
367	06/01/06	B.Ae. Jetstream 31	Off-side veer	Air Panama	Bocas de Toro Intl. Ap., Bocas de Toro, Isla de Colon, PA
368	06/04/06	Douglas DC-10-10F	Overrun	Arrow Cargo	Augusto C Sandino Ap., Managua, NI
369	06/05/06	CASA 212-200	Overrun	Merpati Nusantara Airlines	Bandanaira Ap., Bandanaira, Maluku, ID

Num	Date	Aircraft	Excur Type	Operator	Location
370	06/14/06	Learjet 60	Off-side veer	Jetalliance Flugbetriebs	Baneasa Ap., Bucharest, RO
371	06/23/06	Douglas MD-83	Overrun	AMC Airlines	Juba Ap., Juba, SD
372	06/24/06	Cessna 560 Citation Encore	Overrun	Aero Charter Services	Cable Ap., Upland, California, US
373	07/09/06	Airbus A310-320	Overrun	S7 Airlines	Irkutsk Intl. Ap., Irkutsk, RU
374	07/10/06	Cessna 560 Citation Ultra	Overrun	River City Flying Service LLC	Ravalli County Ap., Hamilton, Montana, US
375	07/19/06	Cessna 560 Citation Encore	Overrun	Tomco II LLC	Ellen Church Field, Cresco, Iowa, US
376	08/15/06	Tupolev Tu-154B	Overrun	Air Koryo	Sunan Ap., Pyongyang, KP
377	09/01/06	Tupolev Tu-154M	Off-side veer	Iran Air Tours	Shahid Hashemi Nejad Intl. Ap., Mashad, IR
378	09/07/06	Boeing 727-200F Adv.	Overrun	DHL Aviation	Murtala Muhammed Intl. Ap., Lagos, NG
379	10/02/06	Nord 262A Fregate	Off-side veer	Malu Aviation	Kikwit Ap., Kikwit, ZR
380	10/03/06	Boeing 737-200 Adv.	Overrun	Mandala Airlines	Juwata Ap., Tarakan, Kalimantan, ID
381	10/10/06	British Aerospace 146-200	Overrun	Atlantic Airways (Faroe Islands)	Sorstokken Ap., Stord, NO
382	11/02/06	Yakovlev Yak-40	Off-side veer	InterIsland Airlines	Malay Ap., Caticlan, PH
383	11/08/06	Fairchild SA-226TC Metro II	Off-side veer	Perimeter Airlines	Norway House Ap., Norway House, Manitoba, CA
384	11/16/06	NAMC YS-11A	Off-side veer	Aboitiz Air Transport	Ninoy Aquino Intl. Ap., Manila, PH
385	11/26/06	Learjet 35A	Overrun	Canadian Global Air Ambulance Ltd	Pierre Elliott Trudeau Intl. Ap., Montreal, Quebec, CA
386	11/28/06	ATR-72-200	Off-side veer	Hansung Airlines	Jeju Intl. Ap., Jeju City, KR
387	12/12/06	Dornier 328-100	Overrun	SATENA	El Carano Ap., Quibdo, CO
388	12/12/06	Fokker 50	Off-side veer	Sudan Airways	Heglig Ap., Heglig, SD
389	12/24/06	Boeing 737-400	Overrun	Lion Airlines	Hasanudin Ap., Ujung Pandang, Sulawesi, ID
390	12/29/06	Douglas DC-4	Overrun	Buffalo Airways	Carat Lake airstrip, 49km N of Lupin, Nunavut, CA
391	01/02/07	Fairchild SA-227TT Merlin IIIC	Off-side veer	Inversiones Twing Head	Richard L. Jones Jr Ap, Tulsa, Oklahoma, US
392	01/11/07	CASA 212-200	Off-side veer	Aviastar Mandiri	Tanjung Bara Ap., Tanjung Bara, East Kalimantan, ID
393	01/24/07	Beech Commuter 1900D	Off-side veer	Alsair	Samedan Ap., St.Moritz, CH
394	01/24/07	Cessna 550 Citation II	Overrun	Air Ambulance By Air Trek Inc	Butler County Ap., Butler, Pennsylvania, US
395	02/18/07	Embraer 170 SE	Overrun	Shuttle America	Hopkins Intl. Ap., Cleveland, Ohio, US
396	03/07/07	Boeing 737-400	Overrun	Garuda Indonesia	Adisutjipto Ap., Yogyakarta, Jawa, ID
397	03/23/07	Airbus A300 B4-200	Overrun	Ariana Afghan Airlines	Ataturk Intl. Ap., Istanbul, TR
398	04/12/07	Canadair RJ 200LR	Overrun	Pinnacle Airlines	Cherry Capital Ap., Traverse City, Michigan, US
399	05/20/07	Canadair RJ 100	Off-side veer	Air Canada Jazz	Lester B Pearson Intl. Ap., Toronto, Ontario, CA
400	06/20/07	Beech Commuter 1900D	Overrun	Great Lakes Airlines	Laramie Regional Ap., Laramie, Wyoming, US
401	06/30/07	Rockwell Sabreliner 40	Overrun	AeroDan SA de CV	Plan de Guadelupe Intl. Ap., Saltillo, MX
402	07/06/07	Boeing 737-800	Off-side veer	Air India Express	Cochin Intl. Ap., Cochin, IN
403	07/08/07	ATR-72-210	Off-side veer	Precision Air	Jomo Kenyatta Intl. Ap., Nairobi, KE
404	07/16/07	ATR-42-300	Off-side veer	Pantanal	Congonhas Intl. Ap., Sao Paulo, BR
405	07/17/07	Embraer 190 LR	Overrun	AeroRepublica Colombia	Simon Bolivar Ap., Santa Marta, CO
406	07/17/07	Airbus A320-230	Overrun	TAM Linhas Aereas	Congonhas Intl. Ap., Sao Paulo, BR
407	08/11/07	Learjet 35A	Overrun	World Jet II	Melville Hall Ap., Roseau, DM
408	08/12/07	DHC Dash 8-400	Off-side veer	Jeju Air	Kimhae Intl. Ap., Pusan, KR
409	08/22/07	Antonov An-26B	Off-side veer	SELVA Colombia	Antonio Narino Ap., Pasto, CO
410	08/23/07	Learjet 60	Off-side veer	Aircraft Holding and Leasing LLC	Francis S Gabreski Ap., Westhampton, New York, US

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411	08/29/07	Fokker F.28-4000	Overrun	Myanma Airways	Dawei Ap., Dawei, MM
412	09/07/07	Antonov An-12	Overrun	Galaxy Kavatsi	Goma Intl. Ap., Goma, ZR
413	09/09/07	DHC Dash 8-400	Off-side veer	SAS	Aalborg Ap., Aalborg, DK
414	09/14/07	IAI 1125 Astra SPX	Overrun	Wingstone Toy Co and Hawk Flight Inc	Dekalb-Peachtree Ap., Atlanta, Georgia, US
415	10/11/07	Douglas MD-83	Overrun	AMC Airlines	Ataturk Intl. Ap., Istanbul, TR
416	10/14/07	Rockwell Sabreliner 65	Off-side veer	Sabre 65 LLC	New Century AirCenter, Olathe, Kansas, US
417	10/17/07	Learjet 35A	Off-side veer	Jagee Ventures Inc	Goodland Municipal Ap., Goodland, Kansas, US
418	10/26/07	Airbus A320-210	Overrun	Philippine Airlines	Butuan Ap., Butuan City, PH
419	10/27/07	Cessna 650 Citation III	Off-side veer	Northeast Air & Sea Services LLC	Atlantic City Intl. Ap., Atlantic City, New Jersey, US
420	11/09/07	Airbus A340-600	Overrun	Iberia	Mariscal Sucre Intl. Ap., Quito, EC
421	12/02/07	Cessna 550 Citation II	Off-side veer	CCM Aviation LLC	Coeur D' Alene Air Terminal, Coeur D' Alene, Idaho, US
422	12/16/07	Canadair RJ 200LR	Off-side veer	Air Wisconsin	Theodore Francis Green State Ap., Providence, Rhode Island, US
423	12/25/07	Fairchild SA-227AC Metro 23	Off-side veer	AeroCon	Jorge Henrich Arauz Ap., Trinidad, BO
424	12/31/07	Antonov An-12	Off-side veer	Africawest Cargo	Lungi Intl. Ap., Freetown, SL
425	01/02/08	NAMC YS-11A	Overrun	Asian Spirit	Masbate Ap., Masbate, PH
426	01/03/08	Boeing 737-400	Overrun	Atlas Blue	St Gatien Ap., Deauville, FR
427	01/15/08	Airbus A300-600RC	Off-side veer	Air France	Charles de Gaulle Ap., Paris, FR
428	01/16/08	Grumman 159 Gulfstream I	Off-side veer	King Air Services Partnership	Lubumbashi Intl. Ap., Lubumbashi, ZR
429	01/25/08	Antonov An-12	Off-side veer	Aero Service (Congo Brazzaville)	A Neto Ap., Pointe Noire, CG
430	01/28/08	DHC Dash 8-200	Off-side veer	Aires Colombia	Eldorado Intl. Ap., Bogota, CO
431	02/13/08	B.Ae. Jetstream 31	Off-side veer	SASCA	Los Roques Ap., Los Roques, VE
432	02/22/08	Beech Commuter 1900D	Overrun	Peabody Western Coal Company	Peabody Bedard Field, Kayenta, Arizona, US
433	03/10/08	Boeing 737-400	Off-side veer	Adam Air	Hang Nadim Ap., Batam, ID
434	03/14/08	Airbus A340-200	Off-side veer	South African Airways	Guarulhos Intl. Ap., Sao Paulo, BR
435	03/19/08	Dornier 328-100	Overrun	Cirrus Airlines	Mannheim City Ap., Mannheim, DE