

Loading Errors Study

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This document has been produced to update the UK Flight Safety Committee on the subject of Loading Errors following a presentation made on the same subject in May 2000. The CAA has also issued two Loading Error Dataplus documents (one in December 1998 and the other in July 2000).

1. Overview

There have been 834 loading error occurrences involving UK operators between 1990 - end October 2001 and the distribution of these is shown in the figure 1 below. It can be seen that since 1996 the annual number of loading error occurrences has been increasing. The number of occurrences in the first ten months of 2001 indicates that the total amount this year will be on a level with the previous couple of years.

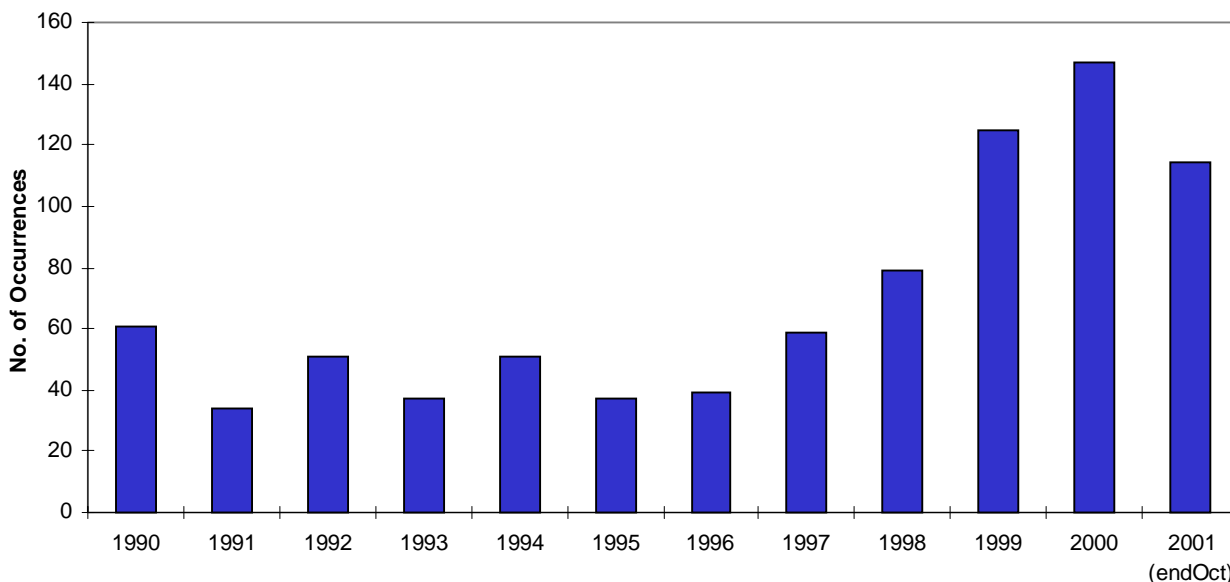


Figure 1 - Loading Error Occurrences 1990 - end October 2001 Involving UK Operators

Absolute numbers of occurrences can be misleading and it is more meaningful to see the data normalised by the number of flights performed by UK operators. Figure 2 shows the rate of loading error occurrences per 100,000 flights flown. It can be seen that the rate follows the same pattern as the chart above, i.e. an upward trend in recent years. The loading error rate chart only shows data for the first six months of 2001. The events of September 11th 2001 have affected the airline industry to an as yet undetermined extent and any estimates of the data for the period after September 11th would be greatly subject to error. The reason why the utilisation data lags behind the occurrence reports by four months (June - October) is that there are delays in the collection of the utilisation data from the airlines. The dotted line on the chart shows a three year moving average of the data which smoothes out some of the variation of the rate over the time period.

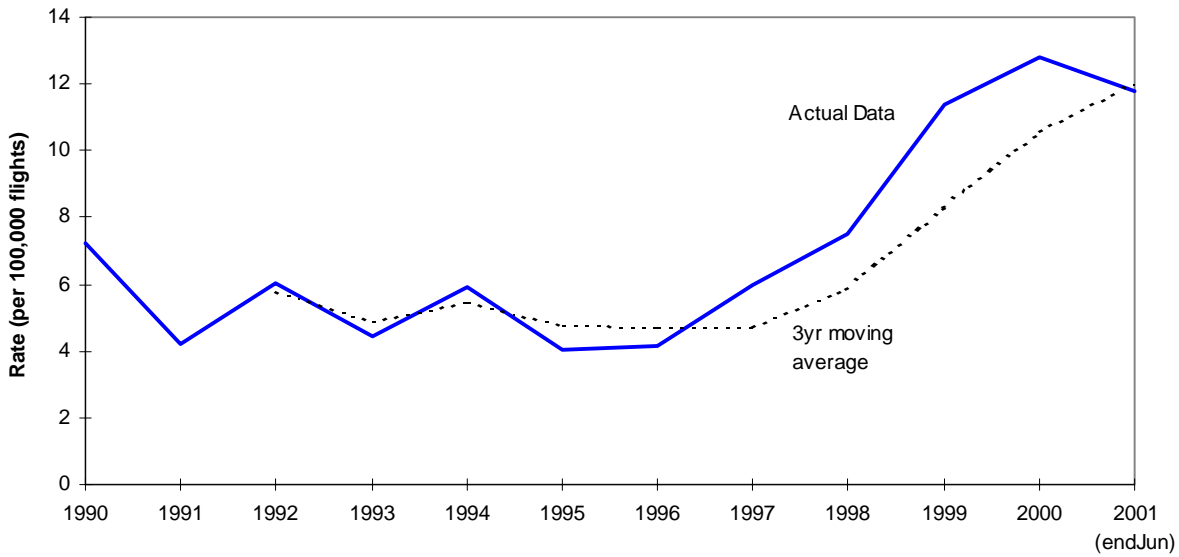


Figure 2 - Rate of Loading Error Occurrences Involving UK Operators

One possible hypothesis for the increase in the rate of loading errors could be due to a general increase in occurrence reporting in the aviation industry. To see whether this hypothesis is true, the rate of all occurrences for UK airlines is shown in figure 3. Using a linear trend-line on this chart, between 1990 and 2000, it can be shown that the total occurrence rate has increased 88%. Using the same method on the loading error rate chart (figure 2), it can be seen that they have increased 174%. Therefore, it is incorrect to assume that loading errors have been increasing only because of a general increase in reporting. However, it should be noted that the problem of loading errors was highlighted in 1998 and again in 2000. The level to which this would affect the reporting level is difficult to estimate.

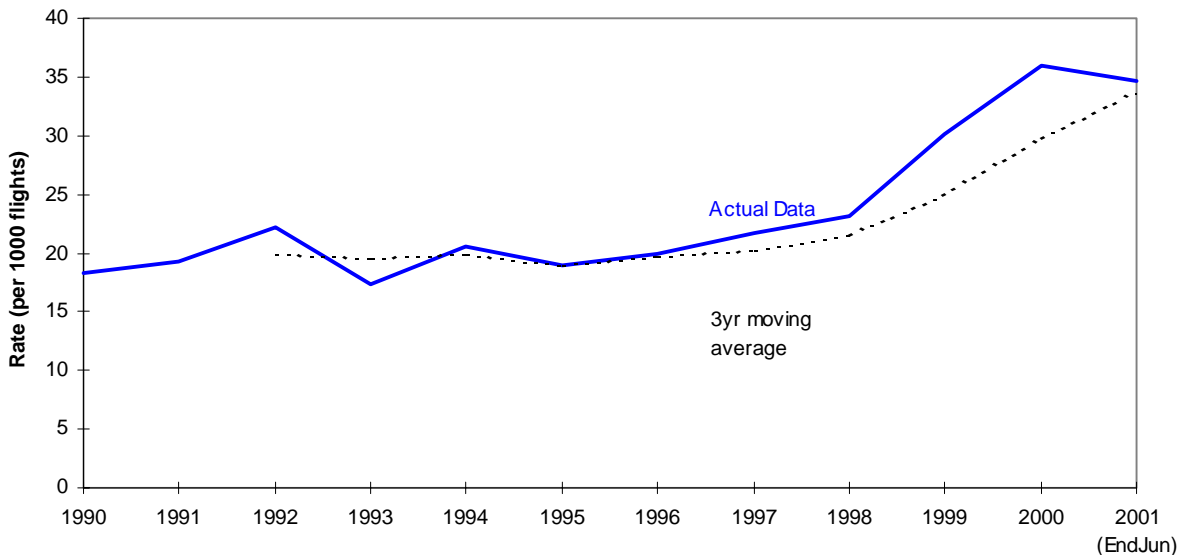


Figure 3 - Rate of Total Occurrences involving UK Operators

A severity/risk grading system has been applied to occurrences by the CAA since 1996. Since this system came into place, only 2% of occurrences have been classed as "High Risk". Details of these occurrences are shown below.

- January 1998 - aircraft departed with the baggage for two flights after 50 bags (700kg) were left in the hold by mistake.
- January 1998 - aircraft over rotated on take-off due to load control error (passengers seated in wrong position)
- March 1998 - undeclared dangerous goods found in consignment of cargo
- March 1998 - rear hold overloaded, aircraft operated in excess of aft trim limit.
- April 1998 - aircraft overloaded, led to take-off over MTOW
- June 1998 - aircraft made forced landing on beach after engine failure. Aircraft was over MTOW due to loading error.
- June 1998 - aircraft handling compromised by unsafe trim condition and MTOW exceedance. it was found that the total rear hold weight was 343kg and not the 151kg recorded on the loadsheet.
- November 1998 - due to loading error, aircraft was operated out of trim.
- January 1999 – during approach, the aircraft pitched up, stalled and crashed. The aircraft had been incorrectly loaded.
- December 1999 - oxygen chemical generators carried as cargo
- June 2000 - aircraft took off 62,279lbs over the weight declared on the loadsheet due to cargo being entered in kilos and not lbs.
- September 2001 - aircraft had difficulty getting airborne after confusion over payload/load distribution. Actual load distribution was different from that stated on load form.

2. Details of the Loading Error Occurrences

The following section shows some of the specific details of the 834 loading error occurrences identified between 1990 and end October 2001, involving UK operators.

2.1 Nature of Flight

Figure 4 indicates the type of operation involved when the loading errors took place. It can be seen that the majority of loading error occurrences involved passenger flights.

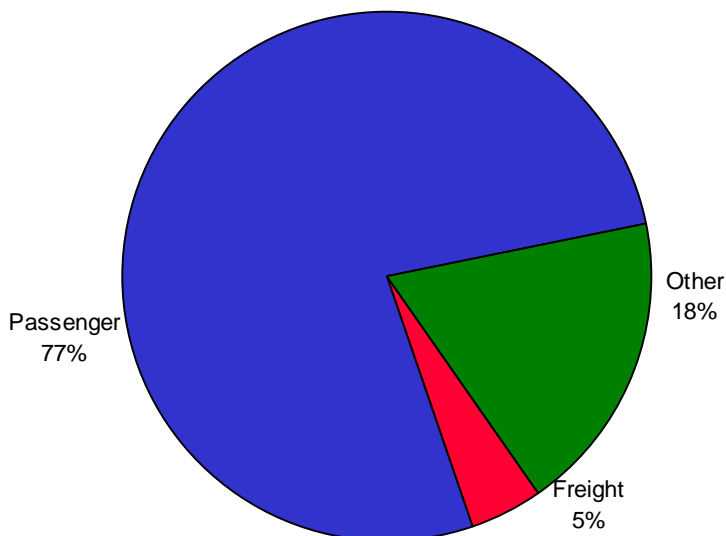


Figure 4 - Nature of Flight Involved in the Loading Error Occurrences

Although 77% of the loading error occurrences involved passenger operations, it should be noted that in 2000, passenger operations accounted for 97% of the total flights made by the UK airline fleet. To put the data into perspective, figure 5 shows the rate of loading error occurrences, separating out passenger and freight operations. The rate of loading error occurrences involving freight operations has varied significantly over the time period of the study, mainly due to the low amount of utilisation involved. Three year moving average trend lines have been used to smooth these fluctuations for both the passenger and the freight rate. These trendlines show that, on average, the loading occurrence rate involving freight operations has remained almost consistently above the rate involving passenger operations.

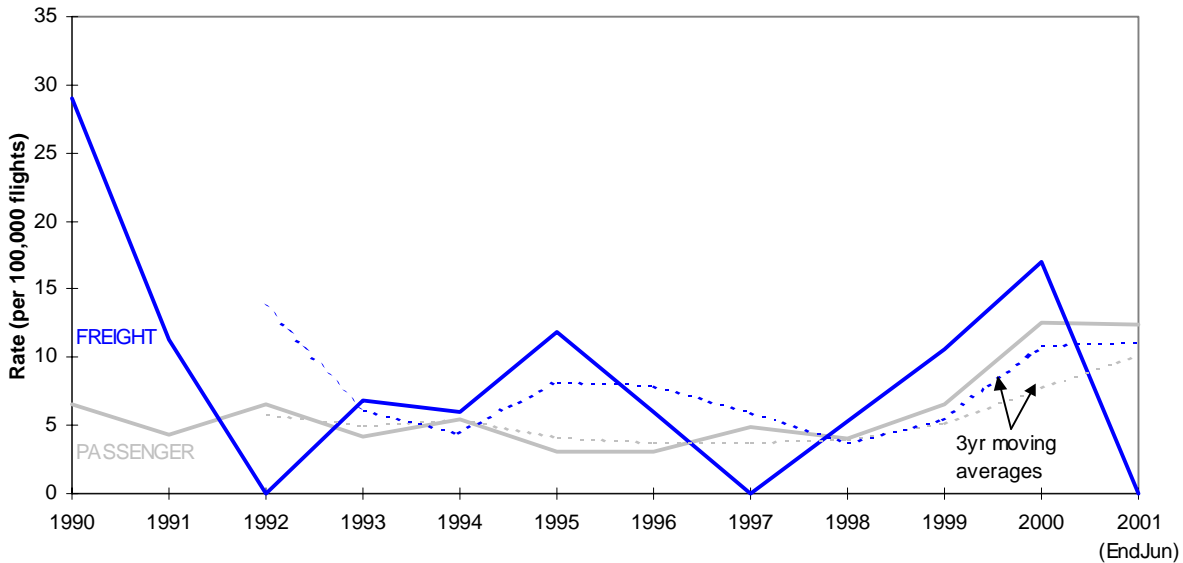


Figure 5 - Rate of UK Airline Freight and Passenger Loading Error Occurrences

2.2 Period of Day

Figure 6 illustrates the time of day at which the loading errors took place. The chart shows that nearly a quarter of the occurrences did not state the period of day. However, it was found that the majority of the loading errors, for which the period was ascertained, occurred during the day.

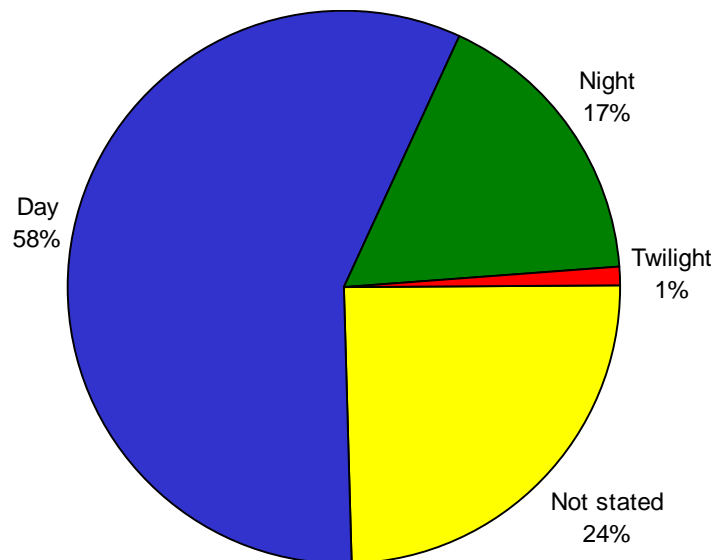




Figure 6 - Period of Day Involved in Loading Error Occurrences

2.3 Class of Aircraft

Figure 7 shows the class of aircraft involved in the loading error occurrences. It can be seen from the chart that the majority of loading error occurrences involved jet aircraft.

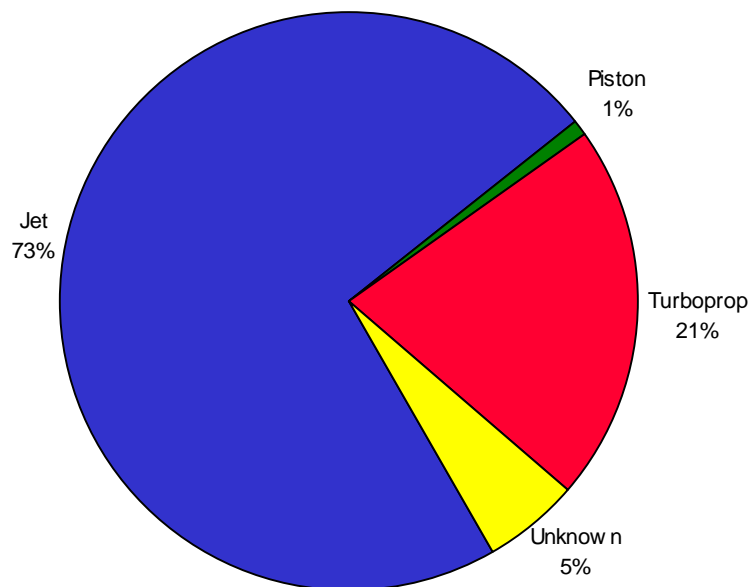


Figure 7 - Class of Aircraft Involved in Loading Error Occurrences

2.4 Location of Loading Errors

Figure 8 shows the location of the loading error in terms of whether they occurred inside the UK or outside of the UK. It can be seen that the number of occurrences occurring inside the UK is only slightly larger than the number occurring outside of the UK.

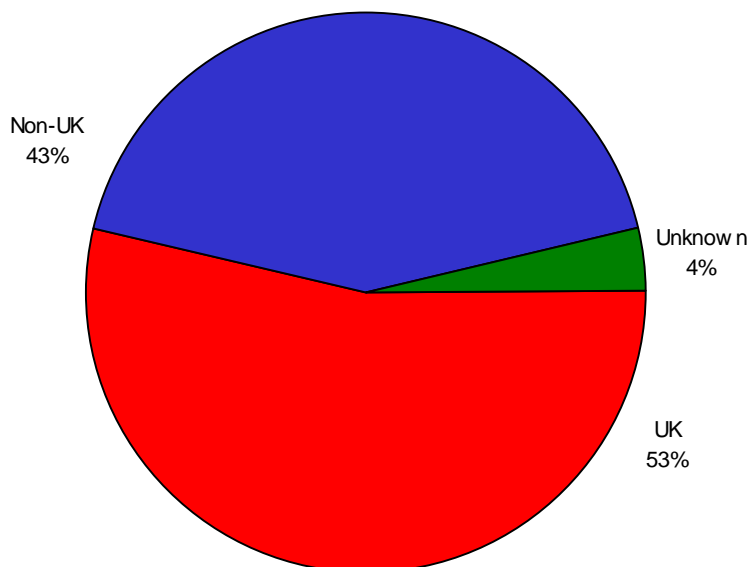


Figure 8 - Location of Loading Error Occurrences

Figure 9 expands on the chart above to show how the percentage of occurrences inside, and outside, the UK has changed over the time period of the study. It can be seen that in 1991, 1992 and 1994, there were a higher number of loading errors occurring outside of the UK. Since 1995, the number of loading errors has been higher inside the UK than outside the UK. 1995 and 1999 showed particularly sharp differences between the number of occurrences inside and outside of the UK.

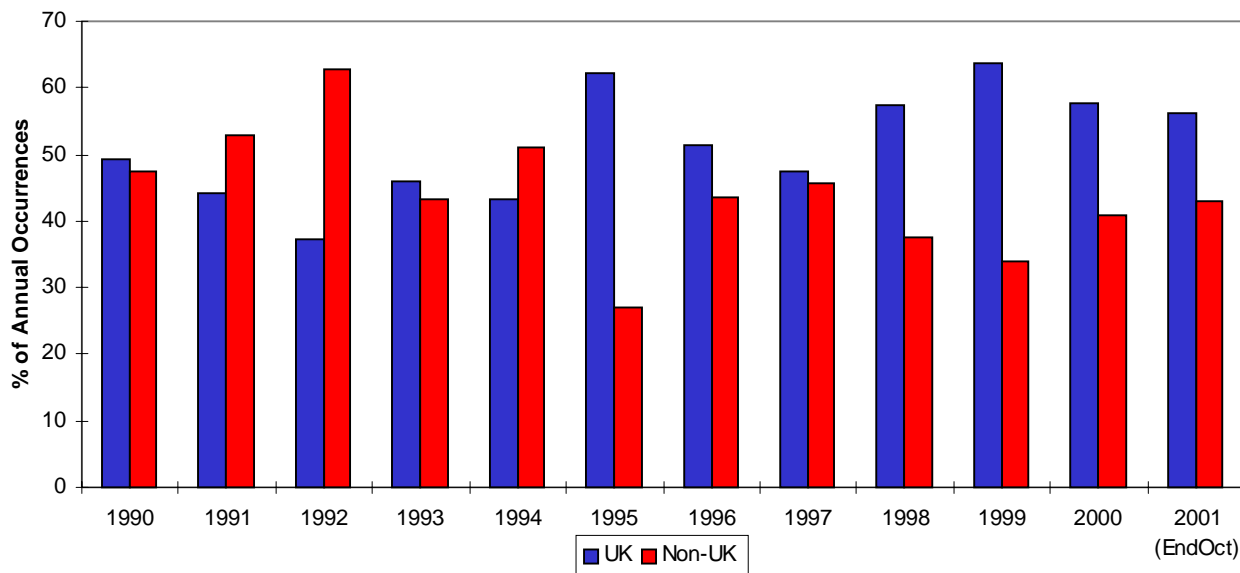


Figure 9 - Location of Loading Error Occurrences 1990- End October 2001

2.5 Point at which error was found

Figure 10 shows the point at which the loading error was discovered. It can be seen that most of the loading errors were discovered after departure. In addition to this, 7 occurrences (0.9% of the total amount) resulted in rejected take-offs and in 4 occurrences (0.5% of the total amount) the aircraft diverted or returned.

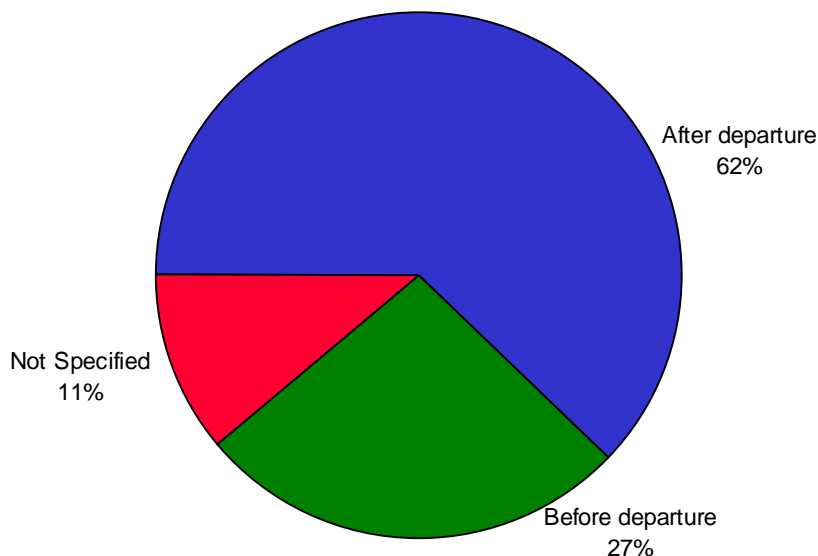


Figure 10 - Point At Which Loading Error Was Discovered

2.6 Month of Occurrence

The month of occurrence of the loading errors between 1990 and 2000 is shown in figure 11. The number of occurrences each month has been shown as a percentage of the total number of occurrences. It can be seen that most loading errors occur during June. The first 10 months of 2001 have not followed this general trend as the majority of occurrences occurred in January and the second highest month has been July.

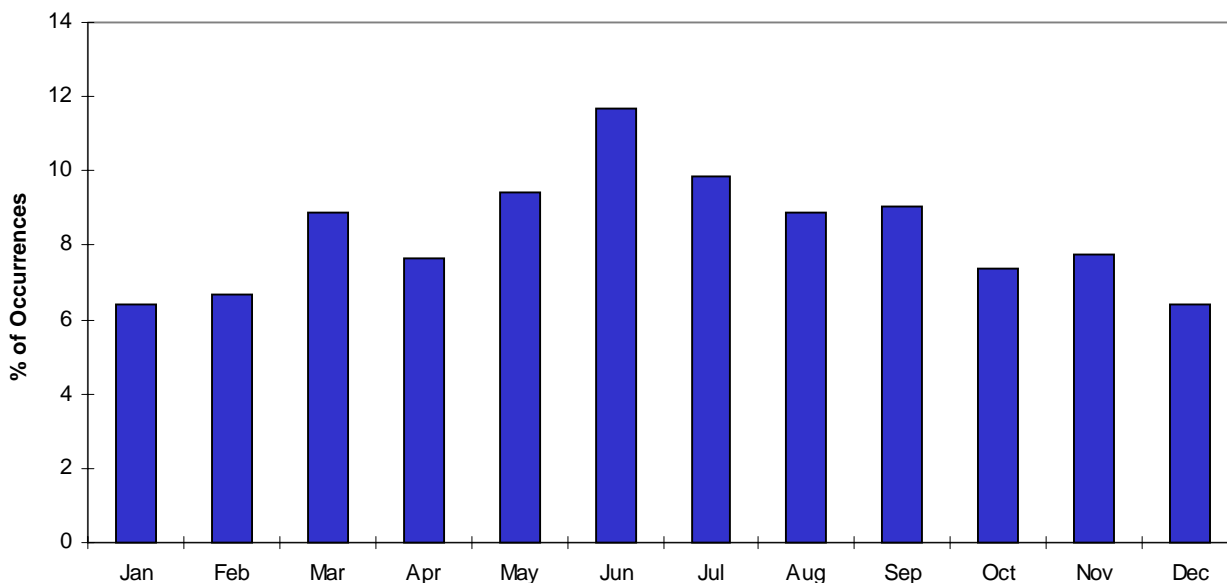


Figure 11 - Month of Loading Error Occurrence (1990-2000)

2.7 Cause of Loading Errors

Figure 12 shows the causal factors that result in what is generally referred to as a 'loading error' in terms of the percentage of occurrences involving a particular cause. It should be noted that an individual occurrence could have more than one causal factor attributed to it. The first six causes displayed on the chart account for 87% of the loading error occurrences. The remainder of the loading error occurrences have been put in the "other" category. This category contains occurrences that did not have specific errors that could be categorised, or had errors that were uncommon. It can be seen that the biggest causal factor was problems involving the loadsheet.

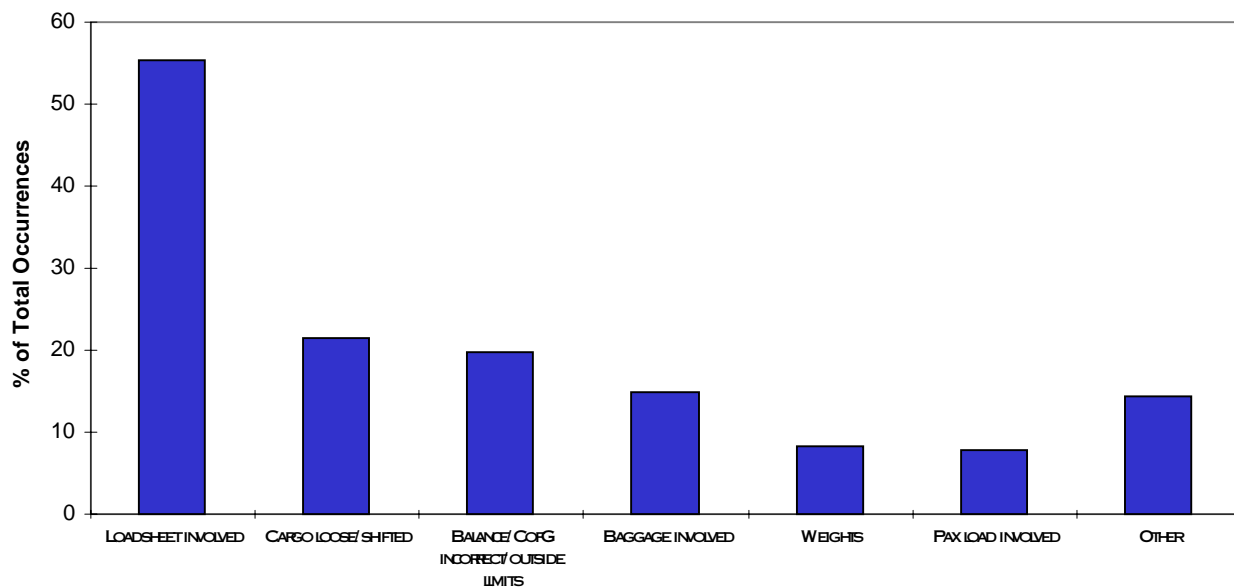


Figure 12 - Type of Loading Error Involved

As the loadsheet appears to be the greatest cause of loading errors, occurrences with a loadsheet problem were investigated to see if this could be broken down further. Figure 13 looks in more detail at specific loadsheet errors. As with the previous chart, there is an “other” category which contains non-specific loadsheet errors and there could be more than one loadsheet specific error per individual occurrence. It can be seen that the largest loadsheet specific error was “items missing from loadsheet”. This means that there were loads (baggage, passenger etc) which were on the aircraft and were not reflected on the loadsheet.

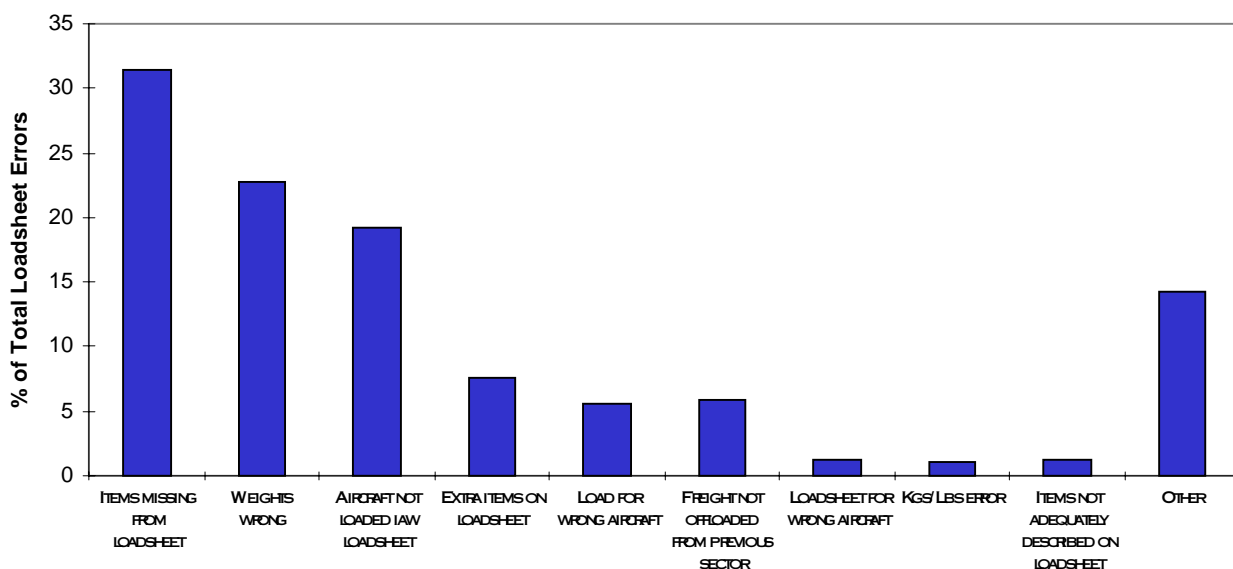


Figure 13 - Specific Loadsheet Error Involved



Presented to UK Flight Safety Committee, 4th December 2001

3. Summary

This study has shown that the problem of loading errors does not appear to be diminishing. The number of occurrences involving UK Operators, as well as the rate, has been increasing in recent years and the level in 2001 seems set to be comparable with 2000. It was noted that the majority of the loading errors are classed as low risk using a grading system which has been in place at the CAA since 1996. The following conclusions were also drawn from the data:

- the majority of loading errors involved passenger operations. However, when the number of loading errors was normalised, it was noted that the rate of loading errors involving passenger flights was lower than that for freight operations.
- loading errors have occurred more often during the day
- the majority of the occurrences involved jet aircraft
- more loading errors have occurred inside the UK than outside of the UK and this has consistently been the case for the last seven years
- most loading errors occur in the summer months but so far in 2001, January has been the worst month
- the loadsheet itself caused the majority of the loading errors involved and more specifically, the problem appears to be due to items being loaded onto the aircraft without being listed on the loadsheet.