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'Hurry-up' Syndrome Identified as a Causal Factor In Aviation Safety Incidents

Research indicates that many incidents could have been prevented if the human factors elements of time pressure had been better understood.

by
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Aviation's worst disaster, the catastrophic KLM-Royal Dutch Airlines/Pan American World Airways (Pan Am) accident at Tenerife, Canary Islands, in March 1977, involved time pressure, which contributed to a disregard or a failure to recognize safety hazards by the flight crews.

[Two Boeing 747s, one operated by KLM and the other by Pan Am, collided when the KLM flight was taking off and the Pan Am flight was taxiing on the runway. Both aircraft caught fire and were destroyed; there were 61 survivors. A total of 583 people were killed in the accident. An investigation cited the KLM pilot for not following approved procedures and not aborting the takeoff. Misunderstanding of orders and instructions, and low ceiling and fog were also cited as causal factors.]

The Air Line Pilots Association (ALPA) conducted an 18-month, three-country investigation of the accident, with an emphasis on the human factors of flight crew performance.[1]

ALPA found that the KLM crew members had strong concerns that they would be able to return to Amsterdam that evening and remain within their complex duty-time regulations. Crew members also expressed concern about the weather and its potential to delay the impending takeoff. The cockpit voice recorder indicates the captain said, "Hurry, or else it [the weather] will close again completely."

The Pan Am crew was equally concerned with potential poor-weather delays. They experienced a delay of more than an hour because the KLM flight crew decided to refuel — the KLM aircraft and fuel trucks blocked the taxiway, thus preventing Pan Am's departure. These time-pressure problems set the stage for the Hurry-up catastrophe.

For this article, based on a study of data from the U.S. National Aeronautics and Space Administration (NASA), the Hurry-up syndrome occurs when a pilot's performance is degraded by a perceived or actual need to hurry tasks or duties. These time-related pressures include the need of a

company agent or ground personnel to open a gate for another aircraft; pressure from air traffic control (ATC) to expedite taxi for takeoff or to meet a restriction in clearance time; pressure to keep on schedule when delays have occurred because of maintenance or weather; or the inclination to hurry to avoid exceeding duty-time regulations. Such pressures can degrade human performance.

The overall objective of this study was to identify flight regimes and scenarios that led to time-pressure related (Hurry-up syndrome) pilot errors and deviations, to suggest methods by which pilots may recognize the symptoms and onset of the Hurry-up syndrome and to formulate intervention strategies to achieve higher levels of operational safety.

The following were the study's four specific objectives:

1. Examine and categorize the results of time-pressure incidents;
2. Determine the operational phase in which the error(s) occurred and in which the error(s) were manifested;
3. Examine the human behaviors of time-pressure errors; and,
4. Analyze what specific occurrences precipitated or contributed to time-pressure errors.

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This study was limited to NASA Aviation Safety Reporting System (ASRS) records that cited terms such as "hurry," "rush," "late" or equivalent language in descriptions of problems or incidents. The scope was further limited to air carrier and commuter operations, which, for the purpose of this examination, were considered to be U.S. Federal Aviation Regulations (FAR) Part 121 and Part 135 operations using a minimum of two-person flight crews. All aircraft referenced in this study weighed more than 14,501 pounds (6,578 kilograms).

The ASRS data base contained 1,142 full-form reports with terms implying time pressure — roughly 3 percent of all ASRS full-form records. Of these, 125 pertinent air carrier and commuter reports were extracted for analysis.

A coding form was developed to identify pertinent information from the records. The coding instrument asked the following questions:

1. Does the reporter specifically reference a time-pressure term such as "hurry" or "rush"?
2. What were the results of the incident?
3. In which operational phase did the time-pressure error(s) take place?
4. In which operational phase did the error(s) manifest itself, that is, in what operational phase did the incident *result* take place?
5. Which flight crew members made time-pressure errors?
6. Were these time-pressure errors those of omission, commission, or motor errors?
7. What specific behaviors took place (error categorization)?
8. What contributory factors promoted the time- pressure error(s)?

Development of the coding instrument required several iterations with trial codings to validate coding instrument questions and structure. Subsequent to adoption of the final coding instrument, a coder-reliability test was conducted to validate single coder accuracy.

Findings in the incident results category indicate that a deviation from FAR and/or ATC clearance occurred in 60 of the 125 incidents. Deviation from company policy or procedure accounted for 26 additional citations.[2] As indicated in Table 1 (page 3), the remainder of incident results comprise a fairly broad spectrum of problems.

Operational Phase and the Point of Error Of Time-pressure Human Errors Examined

Each Hurry-up incident had a point where the time-pressure error(s) began. The majority of incidents had their origins in the preflight phase of operations (79 events from 125 reports, or 63 percent). The taxi-out phase accounted for 34 events (27 percent), while all other operational phases combined amounted to less than 10 percent of all incidents.

Operational phase and incident occurrence:

While time-pressure human errors may have their roots in a given operational phase, those errors may not manifest themselves immediately. For example, while most errors occurred in the preflight phase, a large number of events occurred in the takeoff phase (41 events from 125 reports, or 33 percent). The next most common category was the taxi-out phase, with 22 percent of all reports.

Table 1
Incident Results

Based on 203 Citations from 125 Air Carrier and Commuter Reports Involving Time Pressure

Incident Result	Events	Percent
Deviation from air traffic control clearance or U.S. Federal Aviation Regulations	60	48.0
Deviation from company policy or procedure	26	20.8
Runway transgressions	21	16.8
Miscellaneous other	20	16.0
Aircraft equipment problem	15	12.0
Altitude deviation	14	11.2
Fuel errors, including dispatch with incorrect or inadequate fuel loads	13	10.4
Dispatch and paperwork errors	12	9.6
Landing or takeoff below minimums	11	8.8
Track or heading deviation	11	8.8
Total Citations and Percent of Data Set	203	162.4

Note: The coding form used in this study allowed multiple responses for a given question; thus, the number of citations for a given question may be greater than the 125 reports that comprise the data set. Similarly, percentages for these multiple response categories may be expressed as a percentage of the data set and thus can total more than 100 percent.

Source: U.S. National Aeronautics and Space Administration, Aviation Safety Reporting System

Figure 1 compares point of error and incident occurrences in the operational phase.

Attribution of time-pressure human error:

The coding form permitted attribution of the Hurry-up error to either a specific flight crew member or the flight crew as a unit (where the flight crew *collectively* made human errors). In 87 of 127 citations (69 percent), the error was collective. In another 34 citations, the analyst concluded that the captain (pilot-in-command) was primarily responsible for the error, while all other flight crew members were mentioned in only 6 of 127 citations.

Type of time-pressure human error:

Sixty percent (77 of 128 citations) were errors of commission; required tasks were accomplished incorrectly or tasks were executed that were not required, which produced an unexpected and undesirable result. Thirty-eight percent (24 of 128 citations) were errors of omission; some element of a required task was not accomplished.

Human Behaviors and Errors Classified

For the purposes of this study, human errors were categorized as cognitive, perceptual or motor. Cognitive errors were those where task execution was flawed in some manner, such as neglecting or forgetting a required task, or focusing on a task of lesser importance to the detriment or exclusion of a required task. Motor errors were those in which the intent of some action was correct, but an error or problem occurred with physical input to aircraft controls,

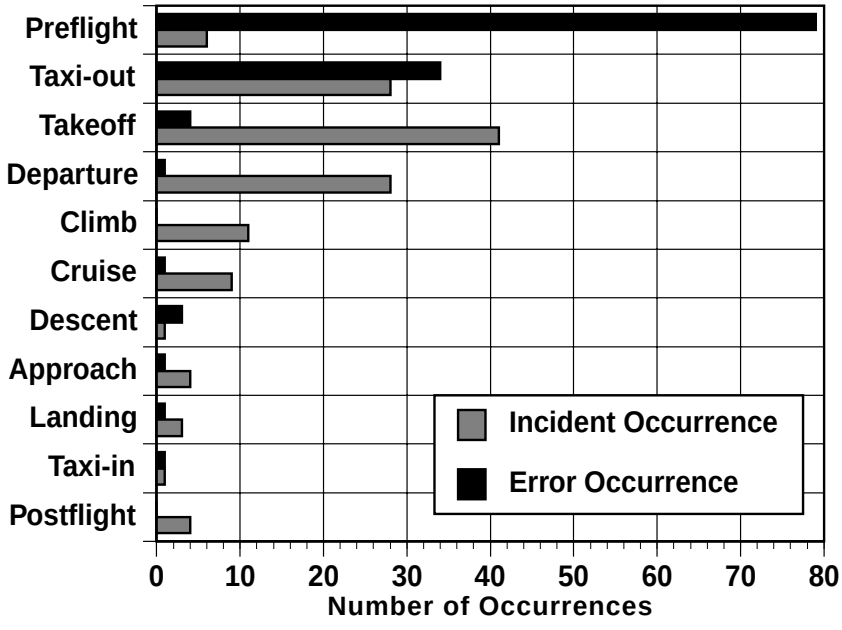

Figure 1

systems or equipment, or in some related physical task. Perceptual errors are those where an individual failed to detect, or incorrectly detected some element of available information.

Where cognitive errors were noted, distraction from a required task appeared to be a significant cause. Distraction accounted for only 26 percent of this category (59 of 230 citations), but was noted as a factor in 47 percent of the 125 record data set. In the case of perceptual errors, a lowered level of awareness was noted in 41 of 63 citations (65 percent) — a significant majority of this category.

In each incident report, one or more contributory or causative events promoted a Hurry-up error by one or more of the flight crew. The coding form provided for four major classifications of contributory situations, and each classification provided for a number of sub-groupings. As noted in Table 2 (page 5), high workload was cited in 80 percent of all incidents. Problems involving physical or motivational states were next with 74 percent of incidents. Delay comprised 55 percent of all records.

It is significant that a mental or emotional predisposition to Hurry-up tasks was cited in 64 percent of incidents, and that time compression because of delays was cited in almost half of all incidents. Also noteworthy is that pressures from gate agents or ground crew personnel were more commonly noted than pressures from company supervisory personnel.

Faced with a complex and sometimes bewildering array of external pressures, pilots hastened to accommodate demands directly and indirectly related to their own operation.

Data indicated that 90 percent of all time-pressure human errors occurred in the preflight and taxi-out phases of operation. There may be a substantial difference in the nature of duties in these phases, particularly the preflight phase, compared with other flight regimes.

Most flight phases of air carrier and commuter operations employ well-designed standard procedures that tend to be linear — a given required task follows another required task. For example, in the takeoff phase the application of power is followed by a check of engine performance or power, which in turn may be followed by a variety of performance checks, depending on the particular aircraft and operator. In contrast, duties in the preflight phase may not be linear; a pilot may need to deal with flight planning, weather information and changes, fuel loading, dispatch manifests and release, last-minute maintenance or minimum equipment list (MEL) items, duty-time requirements and aircraft deicing at much the same time, and often under pressure because of time compression for "late" operations. Further, there may be no standard operating procedure (SOP) for assigning sequence or priority to these tasks, nor does one task necessarily require that another task be previously and correctly completed. Thus, it may be easier to make an undetected error in one or more duties.

Finally, there is the issue of cockpit or crew coordination. In an in-flight phase where the flight crew is seated together with unrestricted capability for interpersonal communication, the practice of crew resource management (CRM) is facilitated by physical proximity and access. In the preflight phase of operation, however, interpersonal communication may be degraded by the physical separation of flight crew members and by distractions from numerous and varying external sources.

Data indicated that events and personnel outside the cockpit are often factors in time-pressure errors. Findings indicated that flight crews often allowed themselves to be rushed or pressured by company dispatchers, ground or maintenance personnel or passenger agents who were themselves experiencing various pressures to achieve on-time operations. Publication of on-time performance figures for various carrier operators may lead to direct or indirect keep-to-the-schedule pressures for flight crews and other company personnel.

ATC may have contributed to some Hurry-up mindsets by requesting an expedited taxi or an intersection departure, or by issuing a "clearance invalid if not off by ..." or other time-sensitive requirement. ATC personnel were under similar pressures to adhere to schedule and/or operational requirements.

Faced with a complex and sometimes bewildering array of external pressures, pilots hastened to accommodate demands directly and indirectly related to their own operation. Thus, checklists were delayed or ignored, flight planning was abbreviated or flawed, and essential tasks were left uncompleted or incorrectly executed.

While it had not been anticipated that the vast majority of time-pressure errors would begin in the first two operational phases, it should not be considered unusual for the results of such errors to manifest themselves either in the phase where the human error occurred, or in the phase immediately following. There are several reasons for this. First, many of the errors detected in this study were of a type where the error result was logically expected to occur in quick succession. For example, if a flight crew misunderstood an ATC taxi restriction while leaving the gate,

that error was going to be manifested in the taxi-out phase, not in some other down-line phase. Second, errors were less likely to be detected in a high-workload, time-compressed flight phase than in a low-workload flight phase encountered after departure.

Finally, error detection by the flight crew was probably exponential in nature—there may be, for example, a 50-percent chance that a pilot will discover an error in the first minute after the error, 50 percent in the second minute, 50 percent the third and so on. According to mathematical odds, a higher percentage of errors should be detected in the first few minutes of operation.

CRM Can Help Reduce Hurry-up Errors

Hurry-up errors appeared most likely to occur in high-workload operational phases, specifically in preflight and taxi-out. In addition, external distractions and schedule pressure were significant predisposing conditions. Pilots should note that such errors were more likely to occur when distractions and schedule pressure combined during a high-workload operational phase.

Companies and flight personnel should consider providing greater structure to preflight activities to reduce the frequency of time-pressure errors. Similarly, when distractions and schedule pressures occur in this flight phase, a reasonable response is to slow down and carry out tasks in as linear a fashion as practical. Where time-pressure is encountered from external sources, pilots may find it a good strategy to calmly explain the nature, probability and typical results of Hurry-up errors to those who "apply the pressure."

No single human behavior is significantly more likely to result in a Hurry-up deviation than another. Applying CRM is likely to yield positive results in many cases.

Table 2

Factors That Promoted the Occurrence of Human Error

Based on 309 Citations from 125 Air Carrier and Commuter Reports Involving Time Pressure

Factors	Citations	Percent of Data Set	Citations	Percent of Data Set
High Workload			**100**	**80.0**
Time compression because of delays	61	48.8		
Other miscellaneous	19	15.2		
High-workload flight phase	18	14.4		
Use of checklist	15	12.0		
Operational procedure	9	7.2		
Loss of positional awareness	5	4.0		
Loss of situational awareness	4	3.2		
Physical or Motivational States			**92**	**73.6**
Mental or emotional predisposition to hurry	80	64.0		
Physically induced predisposition to hurry	26	20.8		
Delay			**69**	**55.2**
Other	31	24.8		
Maintenance on aircraft	17	13.6		
Unspecified	12	9.6		
Air traffic control clearance delays	10	8.0		
Weather	8	6.4		
Ground crew problems	4	3.2		
Deicing/anti-icing	2	1.6		
Dispatch office-related problems	2	1.6		
Social Pressures			**48**	**38.4**
Pressure from gate agent/ground crew	31	24.8		
Peer pressures	17	13.6		
Supervisory pressures	1	0.8		
Total Citations and Percent of Data Set			**309**	**247.2**

Note: Each of the Primary Factor categories (bold face) has two or more subcategories, and multiple responses are permitted. Thus, the total number of subcategory citations for any category will equal or exceed the number of citations noted for that primary category. Percentages for these multiple response categories may be expressed as a percentage of the data set and thus can total more than 100 percent.

Source: U.S. National Aeronautics and Space Administration, Aviation Safety Reporting System

One reporter noted that he "had some CRM training and should have told the captain to stop taxi until they could clarify runway assignment and taxi clearance."

The ASRS study suggested the following recommendations for flight crews:

- Maintain an awareness of the potential for the Hurry-up syndrome in preflight and taxi-out operational phases. Pilots should be particularly cautious if distractions and schedule pressures are encountered in these phases;
- When pressures to hurry occur, particularly in the preflight operational phase, pilots should take the time to re-evaluate and prioritize tasks;
- If a procedure is interrupted for any reason, crew members should return to the beginning of that procedure to reduce the opportunity for error;
- Crew members should use positive CRM techniques — effective crew coordination in rushed situations will prevent many potential errors;
- Crew members should strictly adhere to checklist discipline in preflight and pre-takeoff (taxi-out) phases; and,
- Crew members should defer paperwork and nonessential tasks to low-workload operational phases to reduce the problems of distraction and time compression because of high workload. ♦

[Editor's note: This article was adapted from *Time Pressure as a Causal Factor in Aviation Safety Incidents: The Hurry-up Syndrome*, a Battelle program report for NASA's Aviation Safety Reporting System, May 1993.]

References

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