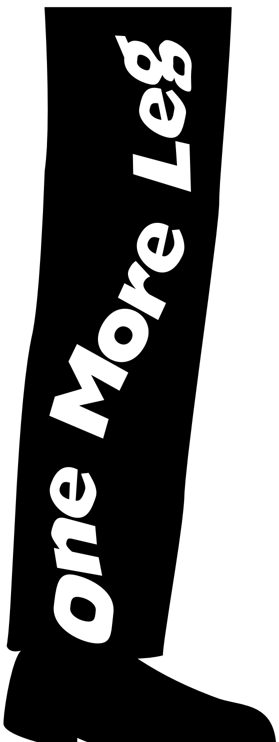
ASRS Directline

PDC's
…the problems with Pre-Departure Clearances



Hurry Up Syndrome

Air Carrier Ground Icing

Issue Number 5

The Aviation Safety Reporting System is a cooperative program established by the Federal Aviation Administration's Office of The Assistant Administrator for Aviation Safety, and administered by the National Aeronautics and Space Administration.

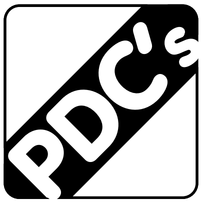
ASRS Directline

Issue Number 5

March 1994

Welcome to issue five of ***ASRS Directline***. Two of the articles that follow are adaptations of research papers that were presented at the Ohio State University (OSU) 7th International Symposium on Aviation Psychology. Future issues of ***Directline*** will feature additional research articles. In every issue of ***Directline***, we strive to improve both the content and the format. Some users have noted that the ASRS report narratives can be difficult to read when set in italics, so we have set reporter narrative blocks in roman text with a writing hand symbol (✍) to help you identify those passages. We will continue to set reporters' remarks that are imbedded in other textual sections in italics — so you are sure whose comments they are. It is these report narratives that make ***Directline*** and **CALLBACK** what they are — thanks to you, the users and supporters of the ASRS program. Here are the articles in this issue:

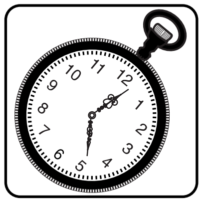
In an effort to reduce radio frequency congestion problems at busy airports, most air carriers have cooperated with the FAA to implement Pre-Departure Clearances (PDC's). PDC's have been effective in reducing radio traffic volume, but there have been some growing pains. Read this article to find out how to avoid the pitfalls of PDC's.



Captain Sumwalt is back again — this time to talk about ground deicing and anti-icing issues in air carrier operations. This is a distillation of the paper presented in April, 1993 at the OSU Symposium on Aviation Psychology. We have noted that *Directline* articles tend to show up in other publications six months or more after they appear here. Include this article in your publishing plans for the fall — just in time for the next season of ice and snow.

Air carrier duty and flight scheduling has been a hot topic for pilots since the first departure of a commercial flight. In this article, Bob Matchette takes a look at the flight and duty schedule problems faced by crews in **commuter** operations. We hope the information contained in this article can help pilots and operators avoid some of the pitfalls inherent in "One More Leg."

Here is another OSU presentation, "*Hurry-Up* Syndrome." This is an examination of issues and problems that occur when flight crews are pressured, by themselves or others or by circumstance, to hurry their tasks and duties. Our primary finding was quite a surprise for us — see if it is a surprise for you, too. This review can help you identify and avoid potential hurry-up errors.



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Charles Drew, *ASRS Directline* Editor

PDC's
…the problems with Pre-Departure Clearances

by Charles Drew

New solutions to old problems sometimes result in a few new problems. Such is the case with Pre-Departure Clearances (PDC's). Getting an IFR route clearance has often been difficult during busy times at major airports, with pilots competing on a congested clearance delivery frequency, and controllers having to read involved, often lengthy instructions. Solution: PDC's.

With a pre-departure clearance, the flight crew of a cooperating air carrier can get their IFR clearance from their company rather than directly from an ATC facility. ATC still issues the clearance, of course, but the transfer of information is directly to the air carrier's dispatch department via teletype, computer link, or other method, rather than by voice communication on an ATC frequency. The air carrier then provides the clearance to the flight crew in the form of a printed message, or via ACARS. But, there have been a few problems.

Don't Leave Home Without It

Some flight crews have departed without an IFR route clearance:

> ✍ "After takeoff, I switched to Departure Control as instructed. When I got no response I tried to verify the frequency by retrieving the clearance from ACARS…When I saw there was no PDC message stored I asked my First Officer for the correct frequency from his verbal PDC and he said, eventually, 'Oh-oh, I forgot to get our clearance.' " (ACN 198736)

And from another reporter:

> ✍ "Shortly after takeoff, ATC told us to change transponder code. We complied, then checked pre-departure clearance (PDC) for assigned squawk. Couldn't find paper, even though all other paperwork was located. We either lost the PDC or never received it." (ACN 208027)

Wrong, Wrong, Wrong

Sometimes flight crews misread or misinterpret PDC's.

Wrong Flight

One variation of the PDC problem is getting a PDC meant for another flight:

> ✍ "We receive our PDC's with our flight packets containing release, weather, NOTAMS, and flight data sheet. During review of the packet, I did not notice that our PDC did not match our flight. After takeoff, Departure Control gave us a correction to our transponder code. We corrected the code as requested and the PNF checked the code on the PDC and showed it to me…I did not notice the wrong flight number, having my…attention on flying…the Controller notified us that the code originally used was for…flight XXX — the PDC in our possession, but not our flight YYY. The mix-up was verified and the flight continued without incident. The mix-up was also not noticed by the other crew. Therefore, the error went undetected by the original agent and four crew members." (ACN 192294)

Wrong Leg

Pilots of flights with multiple legs face another potential problem:

> ✍ "Our flight (BOS-PWM) received the wrong departure (PDC) clearance in BOS. It had the proper flight number and date, but was the PDC for the ATL-BOS leg. When transponder code was reported wrongly off the PDC, they only said, 'change squawk to read xxxx,' thus not alerting the crew to the error. After takeoff, crew found out altitude cleared to was wrong also, but did not violate any altitudes. Coordinated with…ATC, company flight control and…operations to find error causes and correct." (ACN 179596)

Wrong Day

It's even possible to get a PDC for the correct flight number, but the wrong day:

> ✍ "I picked up our pre-departure clearance at the counter in the terminal area about 15 minutes before departure…I reviewed the clearance as I fought my way through the packed jetway to the cockpit. As I entered my seat and began to review the departure and planned route of flight, the APU shut down on its own. There was no external power plugged in and no ground personnel in sight. I let the F/O continue cockpit setup and went in to operations to get ground power hooked up and a mechanic to look at the APU. When I got back to the cockpit, we ran the pre-departure checklist, started engines, and taxied for takeoff. …after takeoff when Tower cleared us to Bay Departure Control with a turn to 030 degree heading, we questioned which departure we were assigned. Tower impatiently informed us we were on the San Francisco 6 which we then complied with. Later, reviewing our pre-departure clearance, I found the problem was [that] the pre-departure clearance I was given was for March/**Sunday**, not March/**Monday**…There's no excuse for my missing the date on the pre-departure clearance, but I thought this was another example of how a series of events can lead to a hazardous situation." [Emphasis added.] (ACN 236984)

Changes Not Noted

Another of the problems noted in PDC incidents is that flight crews fail to note changes on the PDC to their filed or "usual" route:

> ✍ "Climbing out of SLC enroute to LAX. ATC cleared us direct to FFU, flight plan route. After passing FFU and proceeding on what we thought was our flight plan route, ATC asked us what our routing was. We doubled checked our PDC and realized we had misread the clearance." (ACN 218473)

Here is a problem where the flight crew amended their route for operational considerations, but didn't catch the fact that ATC apparently didn't have the requested change:

> ✍ "…The original aircraft never left the hangar due to a mechanical problem. We were about an hour late when maintenance switched planes. The new aircraft was not overwater equipped, so the computer flight plan changed from overwater to an inland routing. Although the aircraft had several items inoperative and an originating pre-flight [inspection] had to be done, I felt we could still make the connecting complex at our destination hub if we moved right along. The clearance came out of the aircraft printer. It started out the same as filed and the route [was] loaded into the aircraft [FMS]. What I failed to see was the clearance went out over the water down-line, diverging from the filed inland route. We received direct clearance to a fix past the point where the filed and the clearance route split. Approaching our clearance limit, the next controller was unable to take us. We quickly verified our filed routing with controller and were then cleared as filed. During preflight I had thought the filed routing and the printed clearance were the same because, at first glance, they looked identical. It's what a fellow thinks he knows that hurts him." (ACN 235894)

PDC's — The Problems with Pre-Departure Clearances

Confusing Format

Some reporters claim that the format or structure of their printed or ACARS downloaded PDC has led to misinterpretations, or to overlooking important amendments to their filed route. One Captain notes the format problem following a track deviation after takeoff:

> ✍ "…as we inspected the pre-departure clearance more carefully, we found that on or near the top [of the printed PDC] was the filed route. Several lines down we found the [actual] clearance. Because of other pressures on the crew at departure time, i.e., checklist completion, ACARS entries, cockpit to ground crew communications, etc., there was a tendency to give a higher priority to the top line of the pre-departure clearance message than to lines farther down where the clearance routing is located…We hope that the PDC can contribute to safety and smooth flow instead of degrading them." (ACN 193587)

Even the physical printing of the PDC can lead to problems:

> ✍ "The pre-departure clearance (PDC) was received with the filed clearance on it and further down a change of route…Received PDC late (at push time) and attached to another report (final weather or weight and balance). The report had the ATC clearance printed at the perforation in the paper. Just below was the filed clearance. Read filed [route] vice ATC [clearance]." (ACN 207371)

And finally:

> ✍ "…initial heading, altitude and squawk are buried among other nonessential verbiage. Need better format to highlight critical information since readback is no longer required." (ACN 195504)

ASRS Analysis

In order to develop a better understanding of the frequencies with which these events occur, we reviewed 42 reports that described problems with PDC's. We also examined the consequences of PDC errors.

PDC Error Consequences

In 20 instances in 42 reports, a track or heading error resulted from a PDC error, while an altitude deviation was cited in 7 instances. There were 14 instances where the flight appeared to depart without an IFR route clearance. Thirty-three of 42 reports provided some evidence that a breakdown in cockpit coordination contributed to the incident.

Who Caught the Error

One of the factors we looked at was whether the error was discovered before departure or after. In 37 of 42 incidents, the PDC problem was discovered after departure. Perhaps this shouldn't be surprising, in that errors discovered before departure may be considered non-incidents by pilots and therefore unworthy of reporting to the ASRS.

A PDC error was more likely to be caught by the controller (17 of 42 incidents) due to a route or altitude discrepancy than for any other reason. The second most frequent means of error detection was by the flight crew due to a transponder code discrepancy (11 of 42 reports).

Types of PDC Problems

Figure 1 shows the types of problems and human errors experienced by flight crews in PDC incidents. Note that this category allowed multiple responses to a single question, so there are more citations (69) than reports (42) in the data set. The biggest problem appeared to be failure on the part of the flight crew to adequately read the PDC, and/or to note changes in the PDC.

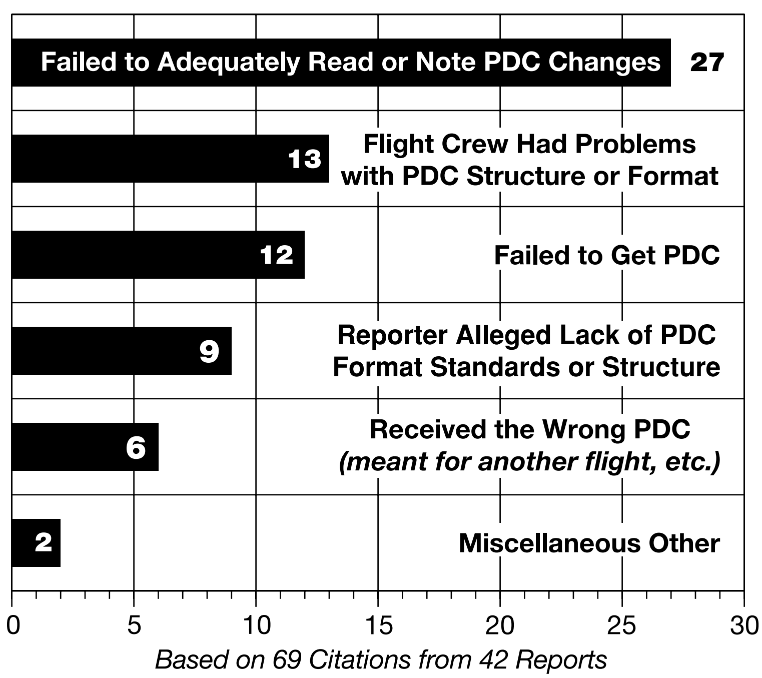


Figure 1 — PDC Problems

Transponder Verification

In an effort to ensure that a flight has received the proper IFR clearance, some facilities require the flight crew to read back the PDC transponder code on Clearance or Ground frequency prior to departure — this can catch many potential PDC problems. Other ATC facilities, however, do not use this verification procedure. In 17 of 18 instances in which data was available, there was no transponder code verification procedure. Table 1 provides further detail.

Table 1—Transponder Code Verification	
Transponder Code Verification Used	1
Transponder Code Verification **NOT** Used	17
Ambiguous, Not Stated, or Unknown	24
Total Reports	*42*

Many pilots are confused about the "chain-of-responsibility" in the pre-departure clearance process. Note the following ASRS report:

> ✍ "Forgot to get ATC route clearance through ACARS…taxied out on Ground Control. No mention of lack of clearance! Took off …on Tower frequency. No mention of lack of clearance! Switched to Departure Control. Again no mention of lack of clearance! They told us to squawk yyyy as compared to zzzz. We did. That was our first clue that something wasn't right. I checked our ACARS messages and found no ATC PDC. Nothing was ever said to us one way or the other!" (ACN 205530)

It is important to remember that ATC, having issued the PDC to the company, may or may not get an acknowledgment of the company's receipt of the PDC. ATC certainly will not know if the flight crew has received the PDC from company dispatch unless they (ATC) use some sort of verification procedure.

PDC's — The Problems with Pre-Departure Clearances

Recommendations
Review of these PDC incident reports leads to a number of suggestions for all parties involved in PDC transactions.

Pilots

★ **Check for Clearance:** PDC's introduce a new variable in cockpit management — how and when a clearance is received. As one reporter notes, *"…many airports do not have PDC's, so it is not an acquired habit to check for a PDC…"* (ACN 218886) Adding an "ATC clearance received and reviewed" item to the written checklist may help assist pilots' memory until the process is routine.

★ **Look for Errors:** Is the PDC for the right flight number? For the right trip segment? For the right day and month? Scanning carefully for such errors may prevent an embarrassing incident.

★ **Look for Changes:** Are the PDC and the filed route the same? Sometimes PDC formatting and presentation, whether on ACARS or a printed sheet, can make detecting such changes difficult, so it is important to review the PDC carefully.

★ **Practice CRM:** Good cockpit management and crew coordination techniques can help catch potential errors. In the words of one reporter: *"I have now selected a place in the cockpit preparation flow where the PDC message (or radio delivered clearance) will be reviewed by both pilots, and critical information set in proper windows for departure."* (ACN 194740) Are flight crew members in total agreement on what the clearance is? If not, stop the flow and resolve the discrepancy.

★ **Query ATC:** Getting a transponder code change from ATC shortly after departure might be an indication that there is a PDC clearance misunderstanding. If there is any question about the clearance, ask your friendly controller for help.

★ **Reset The Transponder:** Resetting the transponder to **0000** (four zeros) **after** landing can help you, or the next crew, detect lack of a PDC. Additionally, should a flight depart without setting an appropriate IFR code on the transponder, ATC will be more likely to quickly detect the problem. (Setting 1200 on the transponder may lead a controller to believe the target is normal VFR traffic.)

Air Carrier Flight Departments

★ **Review PDC Format:** Is the PDC (whether using ACARS or a printed message) readable, clear, concise, and consistent, or do flight crews need to look in different places to "piece together" their clearance. Perhaps having the clearance displayed in a linear, cohesive manner will reduce the opportunity for misinterpretation. It may be possible to highlight changes to the filed route in bold type or in some other manner. Similarly, placing the **actual, full route** clearance at or near the top of the message could help.

★ **Provide PDC Training:** It is recommended that air carriers provide instruction to flight crews (during scheduled initial and recurrent training sessions) in the use and interpretation of PDC's.

FAA/ATC Facilities

★ **Transponder Code Verification:** Use of clearance verification by requiring the flight to read the transponder code appears to be effective where used. In the words of one pilot:

✍ "…one thing that might be done to prevent departing without a PDC would be to standardize the way PDC's are acknowledged, such as in ORD where you relay your assigned transponder code to Clearance Delivery." (ACN 207872)

Air Carrier Ground Icing

by Robert L. Sumwalt

Ground Deicing and Anti-Icing Issues in Air Carrier Operations

In the past 25 years there have been 35 air carrier accidents worldwide that have been attributed to inadequate ground deicing/anti-icing.[1] Nineteen of these accidents have occurred in the United States. Following an air carrier ground-based icing-related accident in March 1992 at New York's LaGuardia Airport, renewed attention was cast upon the issue of air carrier deicing and anti-icing. Major symposia were held to discuss the subject. New regulations were implemented, along with revised air carrier operating procedures.

This increased attention motivated ASRS analysts to conduct a detailed study of ASRS reports involving air carrier deicing incidents. This study analyzed 52 reports that were submitted to ASRS between January 1986 and January 1993. Eighty-one percent of the reviewed reports involved air carrier jet aircraft and 19 percent involved air carrier turboprops. Although the reports reviewed by our analysts were limited to air carrier operations, the findings of this research should be beneficial to all operators and pilots.

Findings

A takeoff with contaminated wing/tail surfaces occurred in 52 percent of the reports in this study. Reporters described ensuing problems such as engine damage and/or failure due to ice ingestion, aircraft control difficulties and rejected takeoffs. Revealed one reporter after a takeoff with contaminated wings:

> ✍ "…the tower supervisor…said he [had] observed 2 bright flames coming from the rear of our 2 engines. He [then] immediately closed Runway 13 and called Departure Control to see if we were airborne and in radar contact. He said he was ready to alert emergency personnel and equipment if he did not get a positive report from Departure Control." (ACN 81196)

Others also described the narrow margins that kept their flight from becoming an accident statistic. For instance:

> ✍ "Upon liftoff (V_R) on Runway 14, aircraft immediately went into right roll…Full left aileron required to stop roll…Stick shaker occurred [at] approximately V_2 + 10 KIAS (157 KIAS)." (ACN 51525)

The majority of the problems found in this study could be classified into three major categories:

1. Problems with detecting/inspecting for ice during preflight inspection;
2. Problems with ice removal, or with initially verifying successful ice removal after deicing; and
3. Difficulties assuring that aircraft critical surfaces were free of frozen contamination before takeoff.

Following is a brief look at each of these categories and some of the problems we found.

[1] Deicing is the removal of ice from aircraft surfaces, while anti-icing means prevention of ice formation. However, in some reports used in this article "deicing" and "anti-icing" are used interchangeably.

Air Carrier Ground Icing

Problems Detecting Ice During Preflight

Hey, I'm Only 6 Feet Tall

One quarter of the problems noted in our study were the result of difficulties detecting ice on aircraft wings during preflight. This ASRS report excerpt exemplifies one such problem:

> ✍ "The Captain and I both made one last walkaround [inspection]…We both agreed there was no frost. The takeoff was normal. However, as the flaps [were] retracted the control wheel began to shake."
>
> The crew decided to make a precautionary landing.
>
> "On the base turn the flaps were lowered…All vibration and control wheel shake went away. The landing was normal…Inspection of the horizontal stabilizer found frozen snow/ice on both sides near the fuselage, approximately 1 inch thick and about 12 inches from the fuselage outboard. This area cannot be seen from the ground." (ACN 104785)

We found six other reports in the data set that cited the elevated height of wing and tail surfaces as a major factor in ice inspection/ detection difficulties. The solution is obvious, but essential to flight safety: Operators must ensure that ladders and work stands are readily available for ice inspections. For those areas that cannot otherwise be accessed, consideration should be given to using "cherry pickers."

Ice Hard to See

Shortly after rotation, the crew of one transport jet heard several loud engine compressor stalls. Following a precautionary landing the crew discovered engine foreign object damage (FOD). From the ASRS report:

> ✍ "F/O had inspected wings (tops) for ice and could see none, however it was dark during preflight." (ACN 79693)

In this instance, the suspected culprit was undetected clear ice that had peeled off of the wings at rotation and was ingested by the engine. Clear ice that forms on upper and lower wing surfaces on some aircraft as a result of supercooled fuel lowering the temperature of adjacent wing surfaces, can be a serious problem because it is difficult to see with the naked eye.

Eleven percent of the reports in this study cited ice detection problems such as crews being unable to see ice due to poor lighting conditions, the transparent nature of clear ice, or ice that was otherwise hidden from view. Not being able to reach ice during a tactile wing inspection was also cited.

When looking for clear ice, the surest detection method is a close visual examination combined with a "hands on" check of the wing. This, combined with vigilance, proper lighting and ice-inspection equipment should ensure a high probability of detecting clear ice.

Schedule Pressure

> ✍ "This is another case of a Captain thinking she is helping the company out by cutting corners in an attempt to save time on a flight that is operating behind schedule…I was outside, ready to perform the preflight walkaround. I immediately noticed that the aircraft had picked up considerable ice [on the inbound] flight. I informed the Captain of my findings and suggested [that] she take a look and have it deiced before departure. She went outside, came right back in and to my amazement said, 'It looks OK to me.' " (ACN 107073)

A sound corporate safety philosophy, reinforced by clearly written policies, procedures, and management attitudes, can help relieve a crewmember's self-imposed (or management imposed) schedule pressure. It is human nature for many people to hurry their tasks in order to "get the job done," so it is imperative that management establish a corporate culture that encourages crews to set safety as their top priority.

Problems with Ice Removal

Half the reports in our study mentioned problems with ice removal and/or verification of ice removal. Thirteen reports cited problems of ice still remaining on aircraft critical surfaces after deicing was completed.

> ✍ "…the first officer discovered that even after deicing was accomplished there was ¼ inch of ice adhering to the…flaps (trailing edge) so he called the appropriate parties and requested that the…wings be done again. The deicing procedure was repeated…and upon inspection we found that they had again missed the [ice] on the flaps." (ACN 61983)

In another incident, the aircraft was reportedly deiced three times. But as evidenced by this narrative, the third time is not always a charm:

> ✍ "The takeoff acceleration was normal and at about 105 knots we heard a pop and the ENG FAIL lights illuminated…The Captain initiated an abort…[At the ramp] maintenance looked at the number 3 engine and found damage and chunks of metal missing from several compressor blades…Later a passenger informed us that it appeared that the deicing crew had trouble removing ice from the…right wing. He said that 1 or 2 long strips of ice were left on the wing after the deicing crew failed to remove them." (ACN 78762)

Checks and Balances

We noted 12 cases where the flight crew relied on the deicing crew's statement or hand signals that deicing had been completed, and therefore, failed to verify ice removal for themselves. Relying on the deicing crew's assessment sometimes led to takeoff with contaminated wings. In other cases of improperly deiced airplanes, the situation was caught before takeoff.

One solution is to have an additional post-deicing/anti-icing check accomplished by someone other than the deicing crew. This quality control measure is similar to maintenance practices, where one mechanic performs work, but final inspection of the work is accomplished by another person. The following report narrative illustrates the need for an independent post deicing/anti-icing inspection.

> ✍ "It is company policy to accept the deicing crew's inspection when deicing is accomplished…[After deicing and] enroute to the runway a flight attendant…advised me that…the left wing had not been deiced…I went back to personally view the left wing. I was incensed to find [it] encrusted with approximately 1/2 inch of rime ice." (ACN 103567)

Similar as this next report is to the previous report, they nonetheless occurred four years and some thousand miles apart:

> ✍ "…deicing personnel via external intercom advised aircraft had been deiced and all surfaces were 'clean…' Before we…[reached] the runway…a passenger notified the flight attendant [that] the left wing was never sprayed." (ACN 229944)

Can this happen at your airline? Without a system of "checks and balances," the answer is…???

Procedural Problems

> ✍ "Number 3 engine failed at rotation. Strongly suspect improper glycol procedure caused failure…We now believe untrained personnel used improperly prepared solution to remove ice from aircraft." (ACN 79411)

Procedural problems were noticed in 13 reports. Referenced were problems such as failure of deicing crews to follow prescribed procedures, inadequately designed procedures for deicing and/or post deicing checks, poor communication between deicing crews and flight crews, improperly prepared deicing fluids, lack of reliable equipment, and inadequate staffing to conduct deicing. Another report excerpt:

> ✍ "The local policy is to use [an] unheated mixture of glycol in a 2.5 gallon garden sprayer to apply to the wing surfaces. This procedure does not have the heat to remove and melt ice formed on the wing…" (ACN 198247)

As for staffing, the following report addresses the hazards of *understaffing:*

> ✍ "Following deicing…the deicing unit hit the [aircraft's] horizontal stabilizer…throwing the driver out of the [deicing] vehicle. The vehicle continued to ram into the stabilizer for approximately 10 seconds until the driver was able to climb back in and regain control…The deicing was accomplished by only one [person], contributing to the likelihood of a mistake." (ACN 82502)

Assuring Wings are "Clean" Before Takeoff

Before takeoff, the pilot-in-command is required by Federal Aviation Regulations (FARs) to ascertain that his/her aircraft critical surfaces are free of frozen contamination. One-quarter of the reports in this study referenced problems with making this determination.

Oh, Say Can You See

> ✍ "The value of inspecting the wing for ice from inside the cabin, especially at night, is questionable. Type II deicing fluid is the consistency of warm honey and when it covers the cabin windows, very little can be seen through them." (ACN 229944)

Air Carrier Ground Icing

In another ASRS report, a pilot commented:

✍ "[After being deiced with Type I fluid and then anti-iced with Type II fluid]…we started engines and taxied to Runway 4L. Five minutes prior to takeoff…the First Officer [went]…to the cabin to inspect the wings, as now required by FAA regulations. When the First Officer returned, he said it was impossible to see through the Type II fluid on the cabin windows. Not only could you not tell if there was snow on the wings, but you couldn't tell if the wings were on the aircraft…The requirement to look at the wings from the cabin five minutes prior to takeoff, and [having] deicing fluid on cabin windows, are not compatible. This is a requirement that cannot be accomplished by cockpit crew members from inside the aircraft." (ACN 235382)

As these reports indicate, inspecting wings from inside the aircraft can be difficult, sometimes impossible. To take the "guess work" out of making this determination, FARs require that the "pre-takeoff contamination check" be conducted from outside the aircraft. However, many airlines have received FAA approval to conduct this check from inside the aircraft. ASRS reports indicate two problems with requiring flight crewmembers leave the flight deck to check the wings. First is the previously cited problem of not being able to see the wings adequately. The following report highlights the second potential problem:

Cockpit Distraction

✍ "[After deicing and] approaching Runway 9…sent F/E aft to inspect wing and control surfaces. Tower cleared [our large turbojet transport] onto Runway 9 for takeoff. F/E absent. F/O responded to tower, 'need 2 minutes.' Tower responded with 'position and hold'…F/E returned with wings clear report as we positioned on Runway 9…To my best recollection, [we] received takeoff clearance… Advanced power toward takeoff thrust. F/O released brakes. Aircraft moved with slow forward movement…Then received transmission from tower…to discontinue takeoff."

As it turns out, this aircraft had begun an unauthorized takeoff—a takeoff that risked collision with a landing aircraft on a one-half mile final to an intersecting runway. In retrospect, the reporters reflected:

"We were busy, occupied with [checking] deiced surfaces…Crew was trying to get aircraft out shortly after deicing and was apparently too centered on that task." (ACN 135674)

He's OK, We're OK: The Ice-Status Myth

Three reports indicated that some pilots try to gauge the amount of snow/ice accumulation on their wings by simply observing the wings of other aircraft. One of these reporters, a 20,000-hour air carrier pilot, was deadheading in the passenger cabin when he learned that his passenger seat gave him a better vantage point of the wings than those seats in the cockpit.

✍ "[After deicing] we then took our position in line and waited perhaps 45 minutes …before the pilot announced we were number 2 for departure. I…stared closely at both wings…until I could make out that the wings were completely covered with a blanket of snow and ice, or both."

The airplane was then flown, apparently without incident, to its destination. But the reporter decided to ask a few questions.

"As I got off the plane…I asked if the Captain would…talk to me for a minute…I said that I just wanted to know how they knew that they were free of ice and snow without a crewmember checking. He replied…[that] they were observing the wings of the aircraft in front of them, and [that aircraft] was clean, so [his aircraft] had to be clean, also…I asked if he would be surprised to learn that his wings were completely covered when he made his takeoff…" The reporter concluded, "There would be no way for a crew to determine their own condition by trying to see what was on another plane 150-500 feet in front of them…**Each crew [should] check [their] own situation before attempting takeoff**." [Emphasis added.] (ACN 133082)

Other Findings

Oh, It's Just a Little Snow

Twelve reports indicated that sometimes pilots see snow/ice on their aircraft surfaces but erroneously believe that its amount is inconsequential, or that it will blow off during taxi or takeoff.

> ✍ "We elected to taxi out and takeoff believing the snow would quickly blow off when the takeoff roll began." (ACN 194669)

Another pilot report reveals the same line of thinking:

> ✍ "It was a dry, powdery snow which would easily blow off during taxi and takeoff and not adhere to the wings…We determined we did not need to get deiced." (ACN 199436)

In both of these reports, the pilots learned after takeoff that their assumptions were incorrect. The safest policy is to have all contamination removed before takeoff. Often, loose dry snow will not blow off during takeoff roll but may instead freeze solidly onto wings. Due to the venturi effect, airflow accelerating over the wing's upper surface will sustain a rapid temperature drop. Thus, loose snow may be quickly transformed into frozen wing contamination.

Crew Resource Management

This study also highlighted that Crew Resource Management (CRM) can have a valuable application for ground icing situations. In ASRS reports where ground icing problems were caught after the aircraft had left the ramp, **usually it was the cabin crew who notified the cockpit crew of the problem**. To increase the likelihood that problems are caught before takeoff, consideration could be given to training cabin crewmembers to recognize wing ice formation. Furthermore, all crewmembers could be taught and encouraged to clearly voice their concerns. Consideration could be given to developing an easily remembered "statement of concern" that could be employed by any crew -member. As an example, "Captain, I am concerned that ice is on the wings." Once this "statement of concern" was voiced by any crewmember, the Captain would be required to fully appraise the situation before takeoff.

Summary

Preparing an aircraft for takeoff when icing conditions exist or are suspected requires vigilance, careful planning and adherence to prescribed procedures. Awareness of potential pitfalls is also helpful by knowing what to expect. Hopefully this study will help to enlighten the unsuspecting.

Management must resolve to help flight crews and deicing crews by providing them with suitable tools for them to perform properly. These tools come in the form of hardware such as equipment and supplies, but also includes such things as well thought-out policies and procedures. And a healthy, well-advertised, and consistently practiced corporate philosophy of total commitment to safety is absolutely, positively essential.

Cocktail Resource Management?

The ASRS receives more than a few reports detailing unusual and interesting events. In the following report, the flight crew of a U.S. air carrier landed at a Russian airport on a scheduled flight only to find that ice had formed on the upper surfaces of the wings due to fuel cold-soak. Perhaps because it was June, the Russian ground crew didn't have deicing fluids available — but they did have another kind of solution — and it worked to Absolut Perfection. The Captain's story:

> ✍ "…upper wing ice formed due to fuel cold-soak. No glycol at airport…[Airport] possessed no fluid as well…So, had Russian ground crew spray wings with hot water, then immediately sprayed 25 bottles of Russian vodka on top of wings…[with] garden sprayer. Wings were subsequently checked, they were clear of ice. Normal takeoff." (ACN 244197)

Is this Crew Resource Management (CRM), or what?

One More Leg

by Bob Matchette

The Commuter Pilot's Conundrum

"I had an 11.6 hour duty day with 8 legs. That night I had a reduced rest scheduled to exactly 8 hours. On the second day we were scheduled for 6.3 hours of duty with 5 legs. Both my F/O and myself awoke the next morning still feeling very fatigued and sleepy. On the last leg of the day, my F/O was flying as we were descending into the airport area for the approach. I fell asleep for about one minute and woke up so disoriented that for 500 feet I watched the altimeter unwind and wondered why we were climbing. This is not the first such incident. I have had altitude busts, missed checklist items, etc., following reduced rests." (ACN 203509)

✍ "Common in commuter flying are long duty days, multiple legs and low level IFR in very congested airspace…By the fourteenth hour and tenth leg of 200 [foot ceiling] and ½ [mile visibility] all day, with reduced rest ahead of you, neither pilot really gives a damn. Safe? Of course not. Everyday reality? Unfortunately, yes." (ACN 168469)

ASRS receives many reports from pilots of commuter aircraft alleging that fatigue induced by long duty schedules, compounded by inadequate rest, is often a primary factor in aviation safety incidents.[1]

Major Carrier or Commuter?

Major air carriers and commuter operators tend to serve different segments of the air transport market. Major carriers usually operate larger aircraft over greater distances, while commuter carriers operate smaller aircraft over short, regional route structures with greater frequency of service. Each are governed by different provisions of the Federal Aviation Regulations (FARs). **Part 121** of the FARs applies to aircraft of **more than 30 seats** operated in scheduled commercial air service, while in this review we examine **FAR Part 135** as it applies to aircraft of **30 seats or less** operated in scheduled commercial air service with two pilots.

[1] This is not to say that flight crews of large transport aircraft in major air carrier operations do not also face the fatigue and other related problems of difficult flight and duty schedules — they can and do. (See *Last Leg Syndrome*, by Capt. William Monan, *ASRS Directline* Issue # 2.)

Duty Time Requirements

Many of the rules and flight duty requirements differ between major air carriers (Part 121) and commuters (Part 135). Table 1 summarizes differences in the duty time requirements of these respective carriers.

Table 1 — FAR Major and Commuter Carrier Flight Time Limitations

Time Period	FAR 121 Max	FAR 135 Max	The 135 Difference
1 Calendar Year	1,000 flight hours	1,200 flight hours	200 hours per year
1 Calendar Month	100 flight hours	120 flight hours	20 hours per month
7 Consecutive Days	30 flight hours	34 flight hours	4 hours in 7 days

Fatigue

Dr. R. Curtis Graeber[2] summarized his findings on fatigue in air transport operations in the Proceedings of the Flight Safety Foundation 38th International Air Safety Seminar in 1985 as follows:

"An initial analysis of NASA's Aviation Safety Reporting System (ASRS) in 1980 revealed that 3.8 percent (77) of the 2006 air transport crew member error reports received since 1976 were directly associated with fatigue (Lyman and Orlady, 1980). This may seem like a rather small proportion, but as the authors emphasize, fatigue is frequently a personal experience. Thus, while one crew member may attribute an error to fatigue, another may attribute it to a more directly perceived cause such as inattention or a miscommunication. When all reports which mentioned factors directly or indirectly related to fatigue are included, the percentage increases to 21.1 percent (426). These incidents tended to occur more often between 00:00 and 06:00 [local time] and during the descent, approach or landing phases of flight. Furthermore, a large majority of the reports could be classified as substantive, potentially unsafe errors and not just minor events."

The Situation for Commuters

Why should there be any difference in the rules for major carriers and commuters? When Part 135 regulations were drafted, the equipment used in commuter operations was relatively slow and unsophisticated. Some of the equipment used in commuter operations is becoming more advanced, with commuters utilizing Electronic Flight Instrument Systems (EFIS), Traffic Alert and Collision Avoidance System (TCAS II) and autoflight equipment previously installed on larger turbojets. However, much of the equipment used by these commuter carriers is older-style technology, having primary navigation and instrumentation as compared to more advanced air carrier counterparts, and this often translates to a higher workload. In addition, aircraft having 19 or fewer passenger seats do not require flight attendants, further increasing the duties and workload of the crews operating them.

Commuter flight crews, unlike their Part 121 counterparts, often spend more of their flight time operating below 10,000 feet in busy terminal environments where there can be many changes to speed, altitude and heading assignments, such as New York, Los Angeles, San Francisco, Atlanta, Chicago, and Washington/Baltimore. To make matters more difficult, commuter aircraft may spend a greater percentage of flight time in instrument meteorological conditions (IMC) than turbojet equipment due to their lower cruising altitudes. These factors certainly aggravate the effects of acute and chronic fatigue. Consider the following pilot report:

> ✍ "…The entire day is scheduled for 7 hours and 20 minutes of flight time, which is a very unrealistic estimate when flying in and out of a New York hub, especially on an IFR day. Also, I believe someone should look into revising the maximum duty and flight time limits to include the amount of flight segments. Doing 10 ILS approaches to minimums and flying 7 hours is not the same as 1 round trip, New York to Denver, and doing 1, maybe 2 approaches and flying seven hours…" (ACN 176041)

[2] Dr. Graeber, now with the Boeing Company, is a former research scientist with the NASA-Ames Research Center.

One More Leg

A Sample Schedule

Below is a de-identified copy of an actual daily series of scheduled flights flown by a commuter carrier. To preserve anonymity, flight numbers and destinations have been removed (see note 1). This trip was constructed in accordance with FAR 135.265. In this example, note that CITY B is one of the busy terminal environments discussed above, and the crew flies into AND out of this hub five times. (See note 2.)

The crew flying this trip was to report for duty one hour prior to the first departure, and would remain on duty for fifteen minutes after arrival at CITY D at the completion of the last leg. It is important to note that delays during the day may become cumulative, so that completion of the trip may be much later than scheduled. The following graphic (Figure 1) summarizes the day's activities.

If this trip is flown as scheduled, 8 hours and 45 minutes is available for: 1) traveling to and from lodging, 2) eating evening and morning meals, and, 3) preparing for and arising from sleep. If transportation to and from lodging takes 30 minutes, and evening and morning meals can be consumed in one hour, and one hour is devoted to preparing for and arising from sleep, then only 6 hours and 15 minutes remain for sleep (assuming one can immediately drop off to sleep). Any delays in ground transportation or eating of meals will of course reduce the time available for sleep.

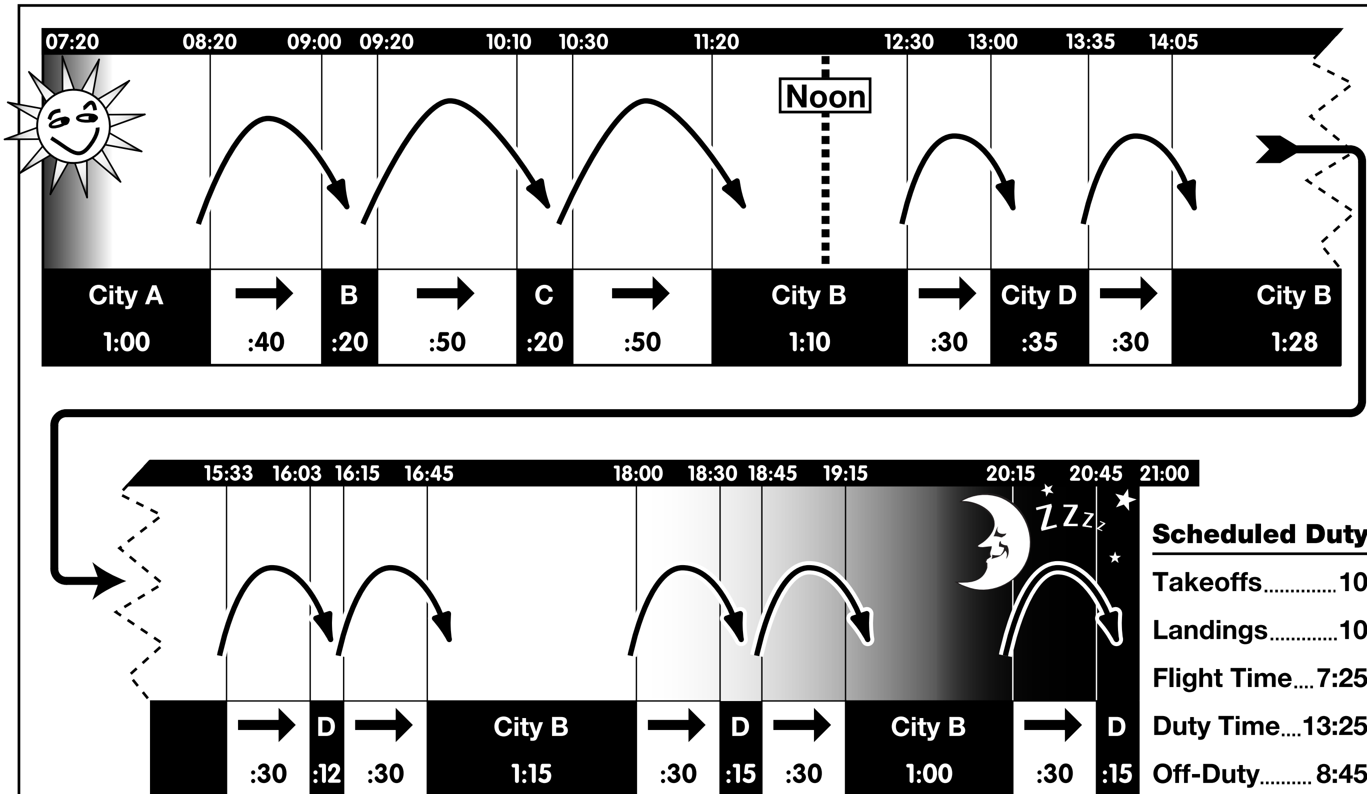


Figure 1 — A Sample Commuter Carrier Schedule

Note 1: This schedule was reproduced from a House Sub-Committee hearing on Government Affairs in Washington, D.C., April 1, 1992, chaired by then-Representative Barbara Boxer.

Note 2: Times shown in the top bar are scheduled departure and arrival times, while times appearing below "City" and the right arrow in the bottom bar are scheduled ground and flight times, respectively.

Changing Schedules

Unlike most 9-to-5 jobs, commuter airline schedules can change monthly, and within a given month, report for duty and off-duty times change as well. Such changes can reduce the amount of useful rest regardless of the length of layover, as this reporter notes:

> ✍ "Somehow we are supposed to shift from a morning to late schedule in 11 hours layover time…I never get more than 4 hours sleep, usually less…I hate to think how many accidents have occurred due to this type of scheduling." (ACN 92578)

Nightmares

The rest time between scheduled duty segments is of paramount concern to many commuter pilots. Writes one tired Captain:

> ✍ "I completed a minimum crew rest, and the next day my duty was 13:45 hours. Both my First Officer and myself are showing signs of fatigue. I am unable to concentrate, cannot repeat clearances back if they contain more than 2 bits of information, and I cannot even remember my flight number. I have fixation on simple tasks. I am going to take some time off without pay because these effects seem to be cumulative and intensifying each stressful day. Commonly, I have had to go 18 to 24 hours without eating. Attempts to ensure sleep needs and eating patterns is met with counseling and disciplinary action." (ACN 123033)

Standup Overnights

Another scheduling procedure used at regional carriers is known as the continuous duty or "stand-up" overnight. These schedules typically begin in the late evening hours and involve a one or two-leg flight from a hub city to an outlying destination where the crew remains on duty continuously throughout the night until returning to the hub city, sometimes at first light. While the crew is often supplied lodging, there is little time for sleep. As many as three of these stand-up overnights may be scheduled in consecutive days resulting in what some reporters describe as chronic fatigue. One reporter notes:

> ✍ "We were inbound to Atlanta on the MACY 1 Arrival at 11,000 feet about 60 miles out. ATC told us to cross 40 miles out at 9000 feet. The Captain was flying. I was the First Officer, working the radios. I read back the crossing restriction. The Captain dialed in 9000 feet in the altitude alerter. Both the Captain and myself simply forgot to descend. At about 38 DME, ATC asked us our assigned altitude. We then realized [that] we failed to descend. I read back our altitude and we descended immediately…A possible contributing factor could be the lack of adequate rest. We were finishing a continuous duty overnight and had 4 ½ to 5 hours sleep the night before. This was my second continuous duty in a row." (ACN 200478)
>
> The Captain of the same flight adds:
>
> ✍ "Was not able to sleep after going to bed. Got about 4 hours of sleep. Mentally, I was brain dead." (ACN 200735)

Another reporter describing an incident while on a continuous duty overnight claims:

> ✍ "…only 3 hours rest…the crew was very fatigued yet legal according to the FARs. I feel this kind of scheduling of stand-up overnight duty is an attack on safety. No one can maintain a high level of safety with only 3 to 5 hours rest at third shift. We [pilots] and the airlines should stop taking chances with people's lives." (ACN 175515)

A reporter admitting to falling asleep at the controls, adds:

> ✍ "I feel falling asleep at the controls or on duty has become almost commonplace, this is especially true on 8 leg days with 12 hours of duty or more. I also find this problem with so-called stand-up overnights. I believe these scheduling practices of 8 [or more] legs and stand-ups have made it almost impossible to be rested for maximum efficiency, safety and coherency. I feel this situation could be solved by outlawing stand-up overnights and increasing the required rest period. I also feel there should be a maximum number of takeoffs and landings, legs and trips that could be scheduled per month." (ACN 172229)

One More Leg

Quick Review

Let's review the problems many commuter pilot reported to the ASRS:

1. Commuter flight crews may experience greater workload because their aircraft are often less sophisticated than their Part 121 counterparts.
2. Flight schedules may have many legs, with pilots often returning again and again to high-density, high-workload airports.
3. Due to shorter trip segments and aircraft of lower performance, commuter flights are often required to operate IN the weather, not above it.
4. Commuter pilots often encounter duty schedules with minimum rest between duty periods.
5. Standup overnights and oft-changed schedules can lead to chronic fatigue due to sleep disruption and deprivation.

In spite of these operating conditions, commuter (FAR Part 135) flight crews have less restrictive duty schedule regulations than pilots for major air carriers. One reporter states:

> ✍ "The [FAR] 135 regulations do not protect the pilots flying at the commuter level in terms of rest and maximum hours flown per day. Pilots' decision making skills deteriorate at a much faster rate when flying the typical commuter environment (TCAs, high density traffic areas, approach and landing phase a majority of the time). If the regulations had a special clause for those operators who spend a majority of their time flying the approach/landing phase, then fatigue would be reduced considerably and the flying obviously safer…" (ACN 180664)

Looking for Solutions

One possible solution to the potential problems associated with fatigue in the commuter carriers could be to simply "cut and paste" the duty and rest requirements of part 121 into Part 135. Indeed, one senior FAA official has been quoted in *Aviation Week & Space Technology*[3] as predicting "…a leveling, and it would be in an upward direction…" to improve duty schedule standards for FAR Part 135 carriers and pilots.

Recommendations

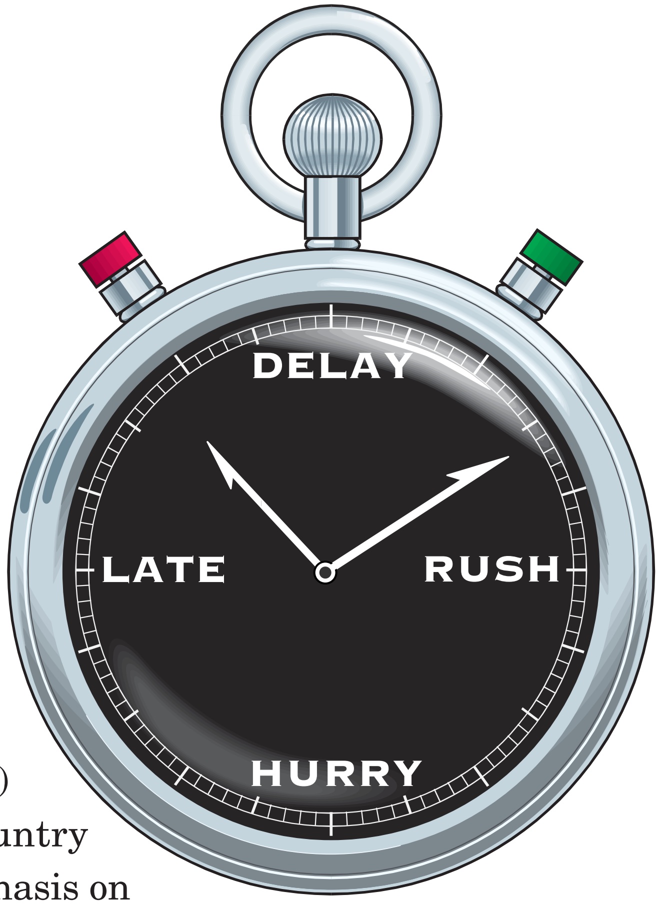
Notwithstanding possible changes to FAR Part 135 duty regulations, there are a few suggestions that can help reduce the impact of stress and fatigue-related problems faced by commuter pilots faced with demanding flight and duty schedules. In fact, these recommendations are good ones for all pilots.

- ✔ **Planning**: For most of us, encountering the unexpected translates to increased stress, and increased stress results in increased fatigue. Many veteran pilots "mentally fly" their flights before showing up for duty, attempting to identify potential problems and possible solutions — this can help reduce the stress of the unexpected.
- ✔ **CRM**: Effective sharing of cockpit workload can also reduce stress and fatigue. Flight crews should review Crew Resource Management techniques before flight, and critique their performance afterwards to identify those areas where change or improvement is possible.
- ✔ **Rest**: Getting adequate rest is difficult if a duty schedule calls for periods of reduced rest or stand-up overnights it is recommended that pilots limit their activities and get adequate rest **before** reporting for difficult duty schedules. This can help reduce the impact of chronic (accumulated) fatigue.
- ✔ **Physical Fitness**: Being physically fit will also reduce the impact of arduous duty schedules. It is recognized that moderate exercise reduces the effect of stress; taking a brisk walk (or some other form of exercise) after a long day, or between flight segments if time permits, means feeling better and sleeping better.
- ✔ **Nourishment**: The benefits of proper and regular diet are well known, but many reporters to the ASRS note the difficulty in obtaining adequate nourishment during extended duty periods or following late arrivals. (Adequate nourishment doesn't mean a hamburger and coffee, either.) Millions of workers take lunch to work, so pilots with schedules that may preclude a good restaurant meal should do the same. Take a sandwich, and pack fruit and vegetables.

[3] *Washington Outlook,* Aviation Week and Space Technology, 23-Aug-93, page 21.

Hurry-Up Syndrome

by Jeanne McElhatton and Charles Drew



Aviation's worst disaster, the terrible KLM / Pan-Am accident at Tenerife[1], was due in great part to schedule pressure problems experienced by both flight crews. The Air Line Pilots Association (ALPA) conducted an eighteen-month, three-country investigation of this accident, with an emphasis on the human factors of flight crew performance.[2]

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

Pan Am's crew was equally concerned with potential weather delays. They were detained for more than an hour due to the KLM flight crew's decision to refuel — the KLM aircraft and fuel trucks blocked the taxiway, thus preventing Pan Am's departure. These schedule-related problems set the stage for the catastrophe that followed.

Hurry-Up Study

This review of the Hurry-Up Syndrome is an adaptation of a research study in which we examined 125 ASRS incident records that involved time-related problems.[3] We define *Hurry-Up* Syndrome as any situation where a pilot's human performance is degraded by a perceived or actual need to hurry or rush tasks or duties for any reason. These time-related pressures include the need of a company agent or ground personnel to open a gate for another aircraft, pressure from ATC to expedite taxi for takeoff or to meet a restriction in clearance time, the pressure to keep on schedule when delays have occurred due to maintenance or weather, or the inclination to hurry to avoid exceeding duty time regulations.

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1 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 583 fatalities and only 61 survivors.

2 *Airline Accident Report*, Pan American 747, KLM Boeing 747, Canary Islands, 03/27/77, Air Line Pilots Association.

3 The study, titled *"Hurry-Up Syndrome — Time Pressure as a Causal Factor in Aviation Safety Incidents"* was presented at The Ohio State University 7th International Symposium on Aviation Psychology, April 1993.

Hurry-Up Syndrome

Errors and Incidents

Each time-pressure incident had a point where the error occurred (Point of Error Occurrence), and another point, either immediately or further downstream, where the result(s) of the error(s) actually manifested themselves (Point of Incident Occurrence). Figure 1 shows the relationship between the error and incident occurrence for various flight phases.

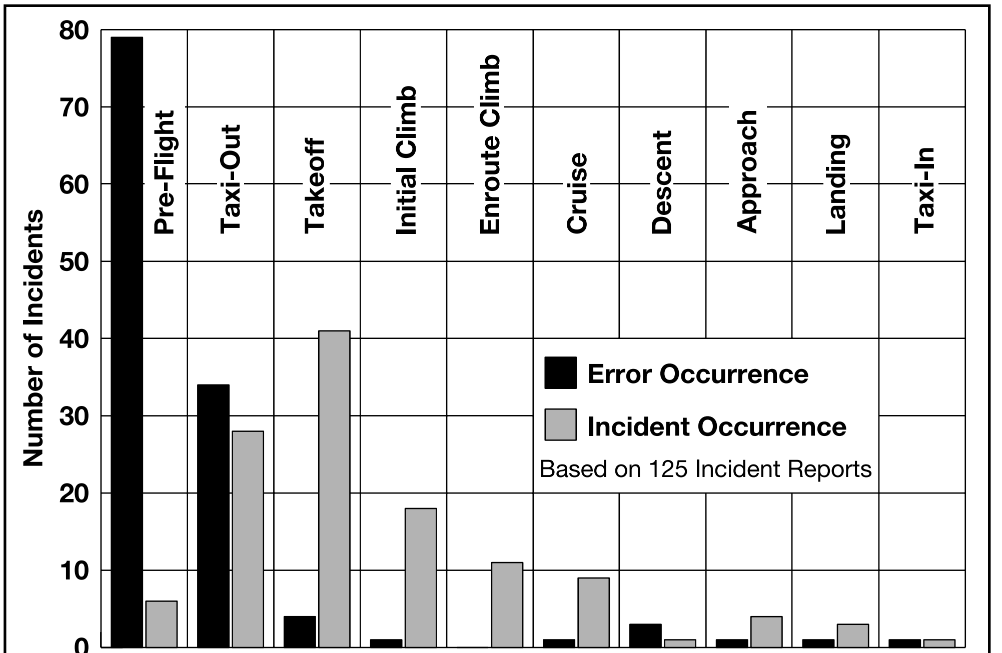


Figure 1 — Most "Hurry-Up" Errors Occur During Pre-Flight

Point of Error

A large majority of incidents (63 percent) had their origins in the pre-flight phase of operations. For example:

> ✍ "…Inbound flight was late and we were rushed because of the scheduled out time report card mentality…It turns out that the clearance I got on ACARS was for the inbound flight. The squawk was incorrect, the altitude was wrong and so was the departure frequency…" (ACN 200800)

The taxi-out phase accounted for the second highest number of error occurrences, while all other operational phases combined amounted to less than 10 percent.

Point of Incident Occurrence

The errors made in pre-flight and taxi-out often manifested themselves later, during takeoff and departure. One reporter writes:

> ✍ "…we were busy with checklists and passenger announcements, while changing to Tower frequency. [The] Tower cleared us for immediate takeoff, and even though we had not finished our checklists, I taxied our aircraft into position and started to advance the power for takeoff…After about 1,000 feet of takeoff roll, Tower canceled our takeoff clearance…[we] asked the Tower why we had our takeoff clearance canceled…the F/O said [that] we're not on the runway. At that point I realized we had started our takeoff roll on an active taxiway." (ACN 134919)

The next most common category for incident occurrence was the taxi-out phase with 22 percent of all reports:

> ✍ "Aircraft expediting taxi after an extended maintenance delay, failed to follow cleared routing and ended [up] on the active runway…F/O busy with checklist…Captain rushed due to schedule pressure…" (ACN 55009)

Who Made The Error?

Errors can be made by one individual, or they can be made by the flight crew as a collective unit. The majority (68 percent) of errors appeared to be collective. Collective error on the part of a three-person flight crew is well illustrated by the following report:

> ✍ "…I am relatively new at this position as Second Officer…We had a tailwind which precludes reduced power [for takeoff] in this aircraft, but they [Captain and F/O] didn't notice and I was so rushed that I didn't back them up and notice. So we took off with reduced power…We were just in too big of a hurry to get everything down and do it correctly." (ACN 67122)

Doing Something Wrong,
Or Maybe Not At All

Human errors may be categorized as errors of commission or omission. Errors of **commission** are those in which pilots carried out some element of their required tasks incorrectly, or executed a task that was not required and which produced an unexpected and undesirable result. Errors of **omission** are those in which the pilot neglected to carry out some element of a required task.

Errors of Commission

Sixty percent of human hurry-up errors were errors of commission. In the following example, the flight crew erred in not adequately examining the airport surface chart:

> ✍ "Takeoff was made from displaced threshold instead of beginning of paved runway. I feel some contributing factors were: Not studying airport runway chart closely enough to realize. We had an ATC delay and were at the end of our takeoff release time..." (ACN 96427)

Errors of Omission

In 38 percent of instances, pilots made errors of omission. In the following report, the flight crew neglected an important element of pre-flight preparation — with annoying and unnecessary results:

> ✍ "Got a pod smoke warning from central annunciator in cruise enroute between Fresno and Ontario...Diverted to BFL...no evidence of fire...we found a placard, which showed the pod smoke detection system as deferred and inoperative...We were pressured to hurry, and in the process, failed to check the aircraft log prior to departure." (ACN 129764)

What Led to the Error?

In each incident report, one or more contributory or causative events promoted a Hurry-Up error on the part of one or more of the flight crew. As noted in Table 1, high workload was cited in 80 percent of all incidents, while problems involving physical or motivational states were next with 74 percent of incidents.

Table 1 — Factors that Promoted Error

Factors	Citations	Percent Data Set
High Workload	100	**80%**
1) Time Compression due to Delays – 49%		
2) Other Miscellaneous – 15%		
3) High Workload Flight Phase – 14%		
4) Preoccupation with Checklist Use – 12%		
5) Operational Procedure – 7%		
6) Loss of Positional Awareness – 4%		
7) Loss of Situational Awareness – 3%		
Physical or Motivational States	92	**74%**
1) Mental/Emotional Predisposition to Hurry – 64%		
2) Physically Induced Predisposition to Hurry – 21%		
Delay (Source of Delay)	69	**55%**
1) Other Factors Not Listed Below – 25%		
2) Maintenance on Aircraft – 14%		
3) Nature of Delay Unspecified by Reporter – 10%		
4) ATC Clearance Delays – 8%		
5) Weather – 6%		
6) Ground Crew Problems – 3%		
7) Deicing/Anti-icing – 2%		
8) Dispatch Office Problems – 2%		
Social Pressures	48	**39%**
1) Pressure from Gate Agent/Ground Crew – 25%		
2) Peer Pressure – 14%		
3) Supervisory Pressure – 1%		
Totals	309	**247%**

Note 1: This table is based on 309 citations from 125 reports.
Note 2: Each of these primary factor categories has two or more sub-categories, and multiple responses are permitted. Thus, the total number of sub-category citations for any category will equal or exceed the number of citations noted for that category. Similarly, the number of citations will exceed the number of records in the data set.

Hurry-Up Syndrome

Various Schedule Pressures

FAA publication of on-time performance figures air carriers leads to "keep-to-the-schedule" pressures for flight crews and other company personnel. Similarly, conducting quick turnarounds (typically for economic reasons), can also lead to schedule-pressures for pilots. In the following narrative, the reporter attributes his emergency to company schedule pressures:

> ✍ "Engine cowling became unlatched after takeoff, oil pressure was lost and precautionary shutdown was completed. Emergency was declared. Uneventful landing and taxi to gate…My company is very concerned with on-time departures, however, they do not give enough time in scheduling to turn the aircraft [around] safely…everyone involved was rushed." (ACN 147822)

ATC may contribute to the "hurry-up" mindset by requesting an expedited taxi or an intersection departure, by issuing a "clearance invalid if not off by…," or other time-sensitive requirements. (Of course, ATC personnel are similarly under pressure to maximize traffic flow.) In this example, the flight crew clearly felt pressured by ATC:

> ✍ "Our inbound aircraft was late arriving and upon receipt of our ATC clearance for our outbound leg, we were informed we had an xx:xx wheels-up time. Needless to say, we were rushed…about 100 yards before reaching the end of the runway we were cleared for takeoff on Runway 12…I taxied onto what I thought was 12R, but what was actually Runway 17." (ACN 102290)

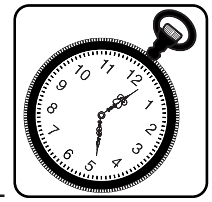
The End Result

What types of incidents result from hurry-up errors? Deviations from Federal Aviation Regulations and/or ATC clearances are most common, while deviation from Company Policy or Procedure was next. As indicated in Table 2, the remainder of incident results comprise a fairly broad spectrum of problems.

Table 2 — Incident Results

Factors	Citations	Percent
Deviation from ATC Clearance or FAR	60	48
Deviation from Company Policy/Procedure	26	21
Runway Transgressions	21	17
Miscellaneous Other	20	16
Aircraft Equipment Problem	15	12
Altitude Deviation	14	11
Fuel Errors	13	10
Dispatch and Paperwork Errors	12	10
Landing or Takeoff Below Minimums	11	9
Track or Heading Deviation	11	9
Totals	**203**	**163**

Note 1: This table is based on 203 citations from 125 reports.
Note 2: Multiple responses are permitted for each category, thus there can be more citations than the total number of reports.



Predicting and Avoiding Hurry-Up Errors

Hurry-Up errors appear most likely to occur in high workload operational phases, specifically in pre-flight and taxi-out. External distraction and schedule pressure are significant predisposing conditions — but why here and not in other flight phases?

Most flight phases of air carrier and commuter operations employ well designed standard procedures that are **linear** in nature — **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 performance check at 80 knots, and V_1, V_R, V_2, gear and flap retraction respectively, depending on the particular aircraft and operator.

In contrast, duties in the pre-flight phase may be **non-linear,** i.e. **there may be no logical or prescribed sequence**. A pilot may need to deal with flight planning, weather information and changes, fuel loading, dispatch manifests and release, last-minute maintenance or MEL items, duty time requirements, or aircraft deicing at pretty much the same time. There may be no standard operating procedure (SOP) for assigning sequence or priority to these tasks, nor does one task necessarily or obviously require that another task be previously and correctly completed — thus it may be easier to make an undetected error.

On the other hand, tasks or duties in the taxi-out phase **should** be linear, yet this was the second most common flight phase for error occurrence. It is possible that many flight crews have not cleanly transitioned from one flight phase to the next, and may be trying to complete pre-flight duties during taxi-out. Another thought is that pilot's may experience difficulty in the transition from the non-linearity of pre-flight activities to the linear duties of the taxi-out phase.

Returning to the issue of pre-flight activities, it may be appropriate to examine 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 pre-flight phase of operation, interpersonal communication may be degraded by physical separation of flight crew members, and by distraction from numerous external sources.

Recommendations:

It is suggested that companies and flight personnel consider providing greater structure to pre-flight activities in order to reduce the frequency of time-related errors. Similarly, when distraction and schedule pressure are seen to 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-related 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."

- ✓ Maintain an awareness of the potential for the Hurry-Up Syndrome in pre-flight and taxi-out operational phases.
- ✓ When pressures to "hurry-up" occur, particularly in the pre-flight operational phase, it is a useful strategy for pilots to take the time to prioritize their tasks.
- ✓ If a procedure is interrupted for any reason, returning to the beginning of that task and starting again will significantly reduce the opportunity for error.
- ✓ Practicing positive CRM technique will eliminate many errors — effective crew coordination in "rushed" situations will catch many potential problems.
- ✓ Strict adherence to checklist discipline is a key element of pre-flight and taxi-out task execution.
- ✓ Defer paperwork and nonessential tasks to low workload operational phases.