Nationaal Lucht- en Ruimtevaartlaboratorium
National Aerospace Laboratory NLR

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Safety aspects of tailwind operations

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Summary

In the present study the safety aspects of aircraft takeoff and landing operations in tailwinds are explored. The study covers a description of legislative instruments that influence preferential runway selection in relation to the maximum tailwind component applied; tailwind certification issues; and relevant safety issues concerning tailwind operations in general. Also a systematic analysis of historical tailwind related overrun accidents and incidents is presented.

Some of the important findings of this study are:

- In many of the analysed accidents the actual tailwind exceeded the approved limit.
- The tailwind component determined by the Flight Management System (FMS) appears to be relatively insensitive to common FMS errors.
- Present-day wake vortex separation criteria for final approach may be insufficient in light tailwind conditions.
- Operating on wet or contaminated runways in combination with a tailwind yields a high risk of an overrun.
- Current certification requirements of operations in tailwinds greater than 10 Knots are limited to guidelines in the Flight Test Guide.

Contents

(26 pages in total)

1 Introduction

The present study will explore the safety aspects of aircraft takeoff and landing operations in tailwinds. Legislative instruments and the maximum tailwind component that influence preferential runway selection at airports are explored. Certification of tailwind operations is reviewed in detail. The relevant safety issues concerning tailwind operations are reviewed and discussed. Finally a systematic analysis of historical tailwind related overrun accidents and incidents is presented. The basic objective of the present study is to get a general understanding of the issues that play a role in the safety of tailwind operations.

2 Legislation, standards and recommendations

2.1 Runway selection

World-wide more than 300 airports have a noise preferential runway system. There are international recommendations regarding the runway assignment process and the maximum tailwind component used in selecting the preferred runway: a recommendation by the International Civil Aviation Organisation (ICAO) and a recommendation by the Federal Aviation Authorities (FAA).

2.1.1 ICAO recommendation for noise preferential runways

In the PANS-OPS[1] document, ICAO recommends a maximum tailwind for runway selection of 5 Knots including gusts (see Appendix A). The guidance material provided in PANS-OPS does not carry the status afforded to *Standards* and *Recommended Practices (SARPs)* adopted by the Council, and therefore does not come with the obligation imposed by Article 38 of the Convention to notify differences in the event of non-implementation. Furthermore SARPs are adopted by the Council as Annexes to the Convention, whereas guidance material such as the PANS-OPS are approved by the Council and are recommended to the contracting states for world-wide implementation.

2.1.2 FAA recommendation for noise preferential runways

The FAA has published an Order that prescribes air traffic control procedures, including runway selection criteria. When no ‘runway use’[2] program is in effect, FAA Order 7110.65L applies, see Appendix B. This Order prescribes the selection of the active runway as the one most

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[1] PROCEDURES FOR AIR NAVIGATION SERVICES-AIRCRAFT OPERATIONS.

[2] Runway use program: A noise abatement runway selection plan designed to enhance noise abatement efforts. These plans are developed into runway use programs. Runway use programs are coordinated with the FAA.

aligned with the wind when the wind exceeds 5 Knots, effectively restricting the tailwind component to 5 Knots through runway selection. No reference is made to gusts.

For runway use programs, FAA Order 7110.65L refers to another publication (FAA Order 8400.9 "National Safety and Operational Criteria for Runway Use Programs", see Appendix C). The purpose of FAA Order 8400.9 is to provide safety and operational criteria for runway use programs. These criteria are applicable to all runway use programs for turbojet aircraft. The Order provides parameters in the form of safety and operational criteria that must be used in the evaluation and/or approval of runway use programs. Regarding tailwind conditions, an important distinction is made here between dry and wet runways: for dry runways a tailwind component of 5 Knots (7 Knots if an anemometer is installed near the touchdown zone) may be present. For wet runways, no tailwind component may be present at all. Again, no instructions are given on how to interpret gusts that may exceed the given values.

2.2 Aircraft certification

Under Federal Aviation Regulations FAR Part 25 or Joint Aviation Requirements JAR Part 25 no specific flight-testing is required for approval of operations in tailwind components of up to 10 Knots. Aircraft certified according to FAR/JAR Part 25 are therefore automatically approved for operations in tailwind components of up to 10 Knots. The origin of this 10 Knots tailwind limit can be found in Federal Aviation Administration (FAA) Civil Air Regulations release 60-14, dated August 9, 1960. Specific flight-testing is required for approval of operations in tailwind components greater than 10 Knots. The requirements for these tests are not provided in the FAR/JAR Part 25. Currently only FAA Advisory Circular AC 25-7A (Flight Test Guide) gives guidance for the certification of tailwind operations greater than 10 Knots (see Appendix D). At present the FAA and the Joint Aviation Authorities (JAA) are trying to harmonise the FAA Flight Test Guide with the JAA equivalent. The section on tailwind certification is also under discussion. Although the work has not been finalised some of the important issues of this discussion are presented here (Ref. [1]):

- For the certification of tailwind operations greater than 10 Knots, the FAA requires that testing is done with a tailwind greater than 150% of the value to be certified. Furthermore the FAA also states that an average tailwind should be used. When certifying tailwind operations of for instance 15 Knots, the "average" tailwind during flight testing must be 22.5 Knots (all wind speeds are measured at a height of 10 meters above the surface). In such conditions the wind is very gusty and the tailwind component can momentarily reach values of 30 Knots or higher. JAA considers such conditions as very severe and therefore proposed to amend the FAA guidelines on the 150% factor.

- The FAA considers that takeoff test flights with one engine inoperative should be conducted to show acceptable handling qualities during tailwind operations. The JAA does not consider this to be critical. Therefore this issue is still subject to discussion.

During tailwind certification flight tests the measured wind data can come from the Inertial Navigation System (INS), tower, or portable ground recording stations (See Flight Test Guide for details). The wind data should be corrected to a 10-meter height. The tower wind contains a mean wind based on a two minute sample and (if high enough) a gusting wind value. Wind derived from the INS can include gusts depending on for instance the way the data are analysed. Among the aircraft manufactures different ways of analysing INS based wind data exist. Also engineering judgement is used in fairing the INS wind data which can introduce subjectivity into the results.

An overview of tailwind limits obtained from available Aircraft Flight Manuals (AFMs) of a number of transport aircraft is given in table 1. The tailwind components are measured at or corrected to a 10-meter height. A large number of aircraft listed in table 1 have a tailwind limit of 15 Knots. This does not mean that all operators have approval to conduct takeoffs or landings with tailwind components greater than 10 Knots. It is not always stated in the AFMs if gusts are included in the tailwind limits. In the AFM the following term is frequently used: *"maximum allowable wind speed"*. Most aircraft have equal tailwind limits for the takeoff and landing flight phase. However, the BAe 146-200 and the DASH 7 listed in table 1 have different tailwind limits for these flight phases. The DASH 7 has a remarkably high maximum tailwind of 20 Knots during normal landing, which is the highest value found in the present study. For steep approaches (glideslope of 4.5 degrees or higher) the tailwind limitation is typically 5 knots, unless test evidence shows that more than 5 Knots is acceptable (See JAA NPA 25B-267). This 5 knot tailwind limit applies to the 146-200 during steep approaches (see table 1).

Table 1: Overview of AFM tailwind limits for a number of transport aircraft.

Manufacturer	Model	Tailwind limit Knots
Aerospatiale	ATR-42	15
Aerospatiale	ATR-72	10
Airbus	A300-600	10
Airbus	A310-200/300	10
Airbus	A319/A320/A321	15
Airbus	A330-300	15
Airbus	A340-200/300	15
Boeing	B737-300/400/500	10*
Boeing	B747-400	15
Boeing	B757-200	15
Boeing	B767-200	15
Boeing	B767-300	15
Boeing	B777-200	15
British Aerospace	RJ70, RJ85, RJ100	15
British Aerospace	146-200 (steep approach)	5
British Aerospace	146-200 (takeoff)	10
British Aerospace	146-200 (landing)	15
Cessna	Citation 550	10
De Havilland	DASH 7 (takeoff)	15
De Havilland	DASH 7 (landing)	20
De Havilland	DASH 7 (landing STOL)	10
De Havilland	DASH 8	10
Embraer	EMB-145	10
Fairchild	SA226	10
Fokker	F100	10
Fokker	F70	10
Fokker	F50	10
McDonnell Douglas	MD80	10
McDonnell Douglas	MD11	10
McDonnell Douglas	MD90	10
SAAB	340	10
SAAB	2000	10

*A tailwind of 15 Knots is sometimes certified for some specific types following customer request through a major change to the type certificate.

2.3 Aircraft takeoff and landing performance information

FAR/JAR 25.105 and 25.125 require that takeoff and landing distance data must include correction factors for not less than 150 percent of the nominal (tail) wind component along the takeoff/landing path. Both JAA and FAA agree that such a margin is sufficient to cover uncertainties in the actual wind condition. The term "nominal" is not defined in the FAR or JAR. So it is unclear whether this is the mean tailwind or the tailwind including gusts. Also in case of a headwind a correction factor is used (50%). The correction factors on head- and tailwind have been in use for many years. Over the years there has been some discussion on the validity of these wind correction factors (Ref. [2]). Especially the uncertainties that arise from the wind reporting systems and the inaccuracies of the wind measuring devices could require higher corrections to the tailwind.

3 Operational issues

Operating in tailwind conditions can have adverse effects on aircraft performance and handling qualities in the critical flight phases of take-off, approach and landing. A number of related issues will be discussed now.

3.1 Effect of tailwind on field performance

Tailwind will increase the required takeoff and landing field lengths. Therefore the takeoff and landing distances are corrected for tailwind. Regulations FAR/JAR 25.105 & 25.125 require that no less than 150% of the reported tailwind is used for computing the field distances (see section 2.3). When determining the takeoff and landing performance of an aircraft the tailwind correction factor is incorporated in the aircraft operating manuals.

Aircraft flying at low approach speeds are relatively more sensitive to variations in tailwind with respect to landing distance than aircraft flying at high approach speeds. This is illustrated in figure 1. The braking action of the runway is also important. On a runway with medium to poor braking action an aircraft is more sensitive to variations in tailwind with respect to landing distance than on a dry runway.

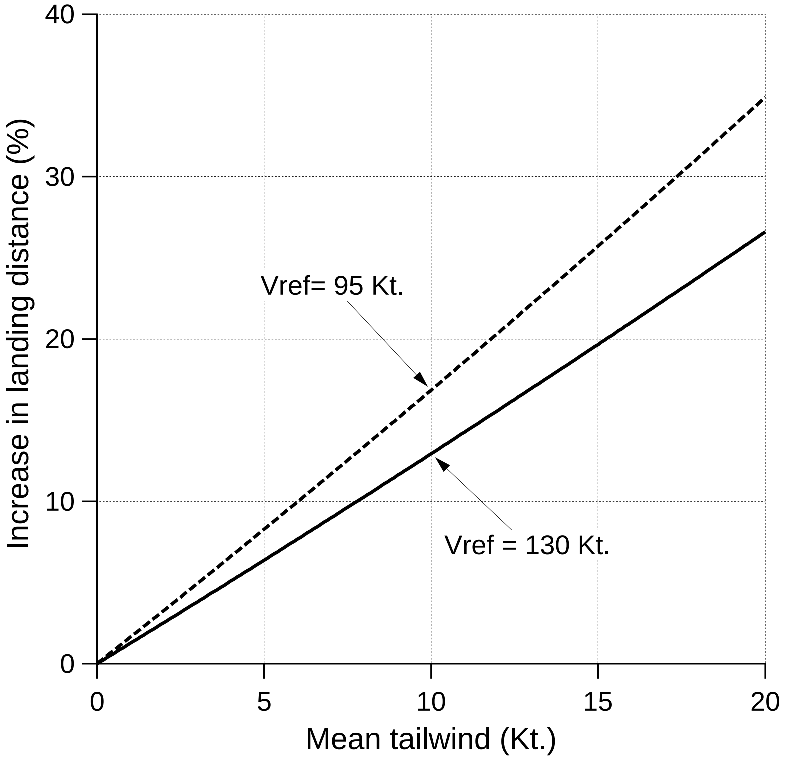

Figure 1: Relative influence of approach speed on the increase in landing distance due to tailwind.

3.2 Tailwind during the approach

3.2.1 Speed, path and configuration control

Aircraft speed on final approach is typically equal to V_{REF} with an addition of 5 Knots or more depending on wind conditions. In still air the glide slope relative to the ground equals the glide slope relative to the surrounding air. When an approach is made with tailwind, the rate of descent has to increase to maintain the glide slope relative to the ground. Especially aircraft with good aerodynamics (high lift-over-drag ratio) can experience problems when approaching under high tailwind conditions. Due to the high lift-over-drag ratio of such aircraft the engine thrust levels have to be low. With a constant approach speed the engine thrust must decrease with increasing tailwind to maintain glide slope. In high tailwind conditions the engine thrust may become as low as flight idle. Flight idle thrust during the approach is undesirable because engine response to throttle input is slow in this condition. Quick response of the engines is necessary when conducting a go-around. With the engines at or near flight idle and the aircraft on a constant glide slope, it will become difficult to reduce to final approach speed and to configure the aircraft in the landing configuration without exceeding flap placard speeds. An unstabilised or rushed approach can be the result.

3.2.2 Rate of descent

On a constant glide slope relative to the ground, a tailwind will increase the rate of descent. Furthermore in a tailwind condition the ground speed will increase. This increase in ground speed will reduce the available time for conducting the proper approach procedures, which in turn may increase workload. A high ground speed may result in excessive rates of descent on a normal 3-degree glide slope. A rate of descent of 1,000 feet-per-minute or more is considered a practical upper limit by many pilots and is often the maximum prescribed by standard operating procedures. In addition, a high rate of descent on final approach may trigger a GPWS 'sink rate' warning at low altitude. For many operators this is a condition that requires the execution of a mandatory go-around. To illustrate the problems of approaches under high tailwinds an example is presented. Assume an aircraft that is conducting an approach with a 3-degree glide slope and a constant (true air) approach speed of 145 Knots. In figure 2 the rate of descent needed to maintain the 3-degree glide slope is given as function of altitude for different tailwind conditions. The variation of tailwind with altitude is incorporated in the results. In tailwind conditions it is difficult to correct for any deviations above glideslope without exceeding the 1000 ft/min rate of descent. Gildeslope deviations are more likely to occur during a non-precision approach than on a precision approach.

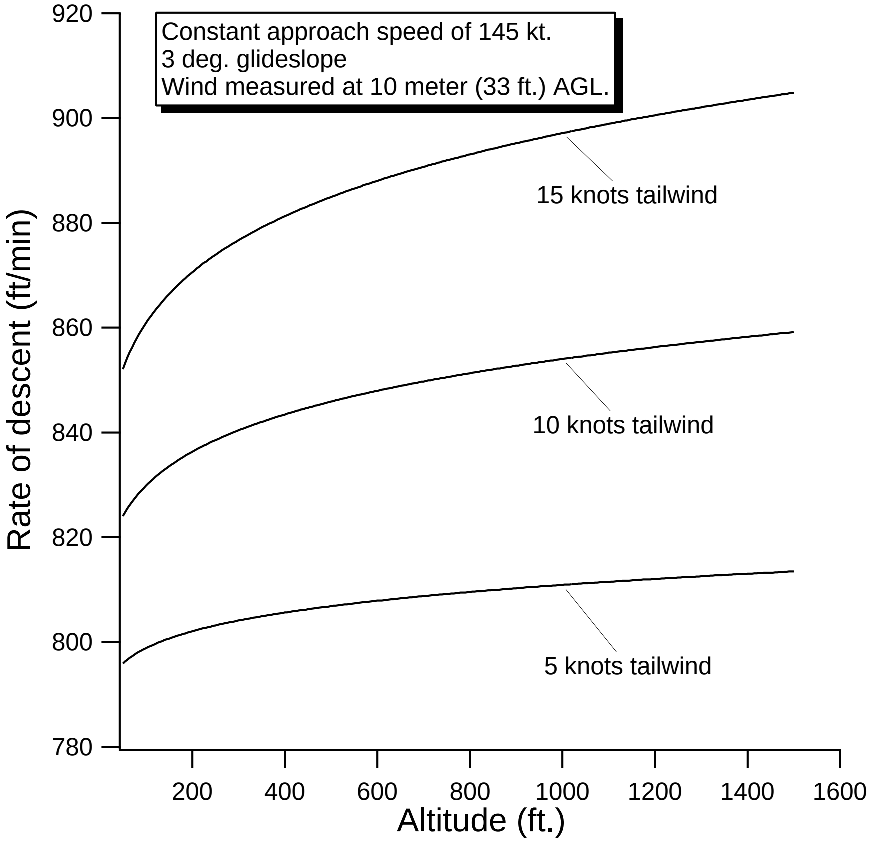

Figure 2: Rate of descent during a tailwind approach.

3.3 Floating during landing

When applying normal landing techniques, pilots who land their aircraft with a higher than normal approach speed tend to bleed off the speed by floating the aircraft. Floating the aircraft just off the runway surface before touchdown should be avoided because this will use a significant part of the available runway. In case of a tailwind operation the associated increase in ground speed will further increase the landing distance. As the aircraft comes closer to the ground the tailwind will normally decrease. This has a temporary lift increasing effect due to the increase in true airspeed (inertial effect) making it more difficult to put the aircraft on the ground, which amplifies floating of the aircraft.

3.4 Wake vortices and tailwind

3.4.1 Approach

Separation criteria for Final Approach are based on Runway Occupancy Time (ROT) on the ground and safe wake vortex separation during approach. The wake behind an aircraft will normally descend below the flight path the generating aircraft has flown. In a tailwind, the wake may be blown back onto the glide slope, making an encounter more likely than under normal headwind conditions. This phenomenon may be observed especially when the wind is not strong enough to decay the wake. Analysis of wake vortex incidents indeed shows that the incident probability during an approach is somewhat higher in light tailwind (1-2 Knots) conditions (See Ref. [3]). When ROT is not a limiting factor, safe wake vortex separation limits the minimum separation distance. Especially in light tailwind conditions, consideration should be given to increase this distance. However, more data should be analysed to confirm the significance of the problem. Obviously, increasing separation will have a detrimental effect on airport capacity.

3.4.2 Landing

Special attention should be given to wake vortex separation criteria in the presence of a light-quartering tailwind. Experience has shown that wake vortices may decay less quickly at the point of flight path intersection, when a quartering tailwind is present. This tailwind condition can move the vortices of the preceding aircraft forward into the touchdown zone (See figure 3). Therefore pilots should be alert to a larger aircraft upwind from their approach and takeoff flight paths. Wake vortex incidents that are attributed to light quartering tailwind are not uncommon. Data from Ref. [3] shows that the wake vortex incident probability is significantly higher in light crosswind conditions compared to higher crosswind conditions. In a light-quartering tailwind this will be even higher.

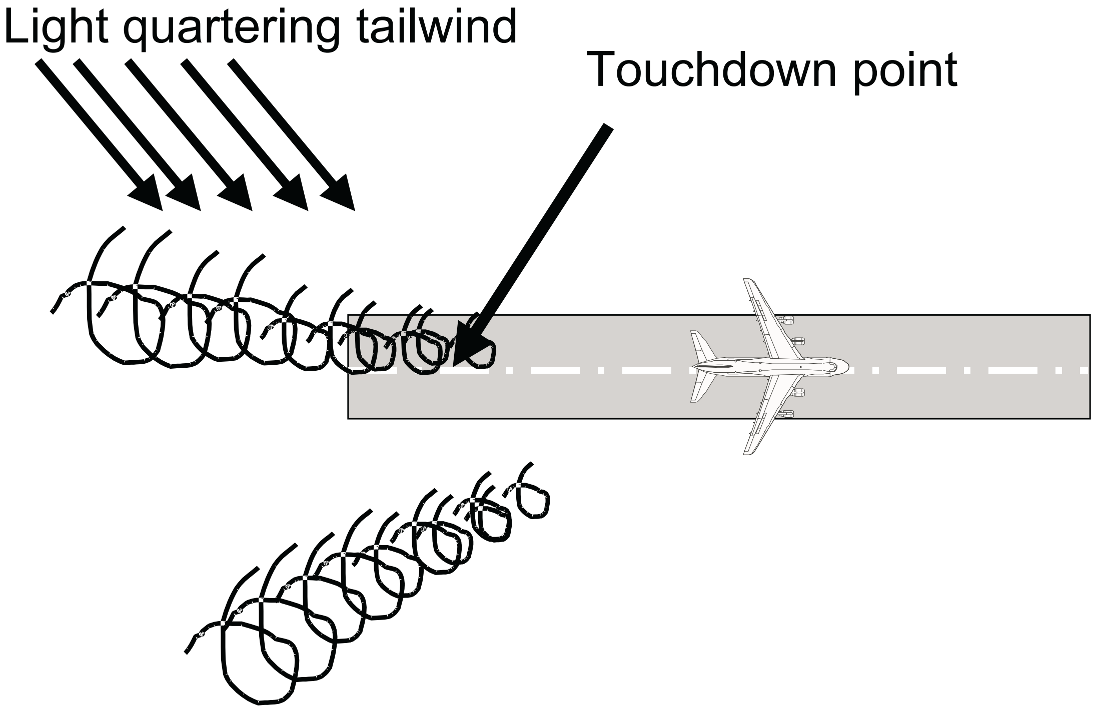

Figure 3: Influence of tailwind on wake vortices.

3.5 Wind information available to the flight crew

Prior to take-off or landing, the flight crew must establish that the actual tailwind component is less than the maximum allowed for the operation. For this assessment the flight crew typically has a number of sources for wind reporting available: Automatic Terminal Information Service (ATIS), tower wind report and/or Flight Management System (FMS) computed wind. For take-off, ATIS and tower wind will normally be available, in the landing phase FMS wind is available as a third -independent- source.

3.5.1 ATIS wind reporting

Before takeoff and landing the pilot can obtain the weather information for the airport from the ATIS. The ATIS message is updated every half-hour unless significant changes occur (See ICAO Annex 3). It contains information on: wind, ceiling, visibility, altimeter setting, runways in use, and other important airport information. The wind information in the ATIS is based on observations from wind sensors located along the runway. Normally a cup anemometer is used for measuring the wind speed. The wind direction can be measured using a weather vane. The wind is normally measured at a 10-meter height. With an ATIS wind report available, the flight crew still has to make the mental effort of decomposing the wind vector into cross- and tailwind components.

3.5.2 Tower wind reporting

On short final and just before takeoff the pilot may obtain a wind report from the tower. This wind report is also based on the same wind sensors as for the ATIS wind. However the tower wind report is more accurate than the ATIS report since it is based on a two-minute period preceding the pilot's contact with the control tower. As is the case for ATIS information, tower wind reports need to be decomposed into cross- and tailwind components by the flight crew.

3.5.3 FMS wind

The FMS wind is computed as a vectorial difference between the airspeed aligned to the aircraft heading and the ground speed aligned to the ground track. The FMS-calculated wind vector is normally displayed on the Navigation Display (ND) or on the Control Display Unit (CDU). Some FMS installations provide a decomposition of the wind vector in cross- and tailwind components. The FMS calculates the wind for the altitude the aircraft is actually flying. Note that tailwind limits and the tailwind used for field performance refer to the wind measured at a 10-meter height. The FMS wind is therefore of little value to the pilot when he makes his decision to land, i.e. at top of descent, during descent and upon initiation of the final approach. Nevertheless many pilots tend to monitor the FMS for exceedance of the maximum tailwind.

Uncertainties exist in the determination of derived inertial quantities (like ground speed and ground track) that will influence the accurate determination of the FMS wind vector. Especially the calculation of the drift angle should be treated with suspect in a dynamic environment like an approach. Secondly, the airspeed is assumed to be aligned with the heading, sideslip is not measured nor incorporated in the calculation of the FMS wind, yielding questionable results once the aircraft has commenced decrabbing in crosswind conditions that might be present as well. Finally, FMS computations are filtered, resulting in a typical time delay of 3-5 seconds. A second relevant effect of this filtering process is that gust values will not be displayed to the flight crew. For these reasons the use of FMS wind is normally accurate only in the cruise phase of the flight. However, it can be shown that, although the crosswind component determined by the FMS can be highly inaccurate in the final phase of the flight, the tailwind component is relatively insensitive to FMS errors in the determination of the drift angle. This is a direct result of the geometry of the speed vectors involved.

4 Analysis of tailwind related overrun events

To get some insight into the factors that are involved in tailwind related events, an analysis of historical overrun events was conducted in which tailwind was a contributing factor. Although tailwind could be a factor in other type of events, tailwind contributes mostly to overrun type of events. Therefore in the present study only overrun accidents are considered in the analysis. Historical data were obtained from the NLR Air Safety Database. The query was limited to civil transport aircraft with a takeoff weight of 5700 kg or higher for the time frame 1980 up to 1999. Both Western- and Eastern built aircraft were considered in the database query. Events related to sabotage and military intervention were excluded. In total 33 events were found that fulfilled the selection criteria.

To get an idea of a typical overrun accident in which tailwind was a factor, the narrative of one of the 33 selected events is presented here (Source: NLR Air Safety Database & Airclaims):

> ***Aircraft**: MD-83*
> ***Location:** Pohang, Republic of Korea.*
> ***Date**: 15-Mar-99*
> ***Weather**: wind 020 deg., variable between 330 and 055 deg., at 17 knots, gusting to 32 knots, visibility 8,000 meters in rain showers and broken cloud at 1,000 ft.*
> ***Narrative**: Following an apparently unstabilised ILS approach to Runway 10 at Pohang, the aircraft touched down at higher than normal speed (158 knots, Vref 144 knots) about 1,500 ft. after the runway threshold. The aircraft subsequently failed to slow down and overran the end of the runway. At the time of the accident the runway was wet, possibly with areas of standing water. The accident happened during the second landing attempt, the first had been broken off at the decision height due to heavy rain and strong winds. It is reported that the crew did not correctly carry out the landing checklist, failed to correctly assess the weather (**landed with a 20 knots tailwind component when the tailwind limit was 10 knots**) and failed to respond to the GPWS 'Sink Rate' warning which activated three times during the approach.*

A number of factors are identified in the sample of 33 overrun events. These are discussed in the following sections.

4.1 Phase of flight

Most of the 33 identified overrun events occurred during the landing phase (91%). This indicates that tailwind operations are apparently more critical during the landing phase than during the takeoff. However, it should be realised that overruns in the takeoff phase are usually related to rejected takeoffs (RTO's) at high speeds. RTO's at high speeds are rare events and even more in a tailwind condition.

4.2 Runway surface condition

Figure 4 shows the distribution of the runway condition at the time of the event. In the vast majority (70%) of the sample the runway was wet or contaminated. Under such conditions the runway braking is reduced compared to a dry runway which results in an increase in ground distance. Realising that the exposure of tailwind operations on wet/contaminated runways is low, the relative risk of operating on such runway conditions in tailwind will be much higher than on a dry runway. The fact that 12% of the overrun events took place on a contaminated runway is surprising. Normally operators do not allow tailwind operations on contaminated runways. Violation of the standard operating procedures was a factor in most of these events.

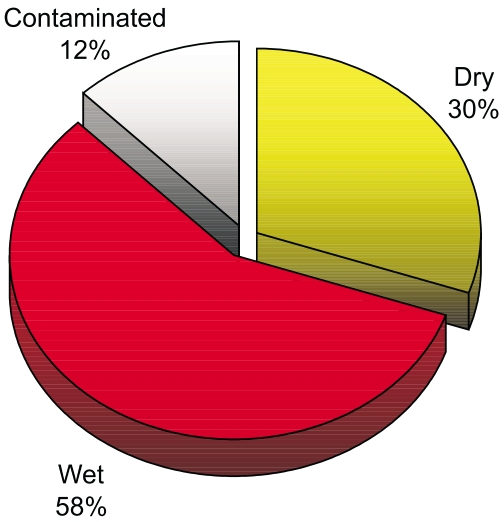

Figure 4: Distribution of runway surface condition in the sample.

4.3 Excessive approach speed

There was an excessive approach speed in thirteen (43% of all landing events) overruns during the landing phase (see figure 5). Excessive approach speed is frequently quoted as a factor in overrun accidents in general. High approach speeds can be critical especially when the available runway length is close to the required length. Combined with a tailwind condition the landing margins will reduce even more. Note that an excessive approach speed may be an indication of an unstabilised approach.

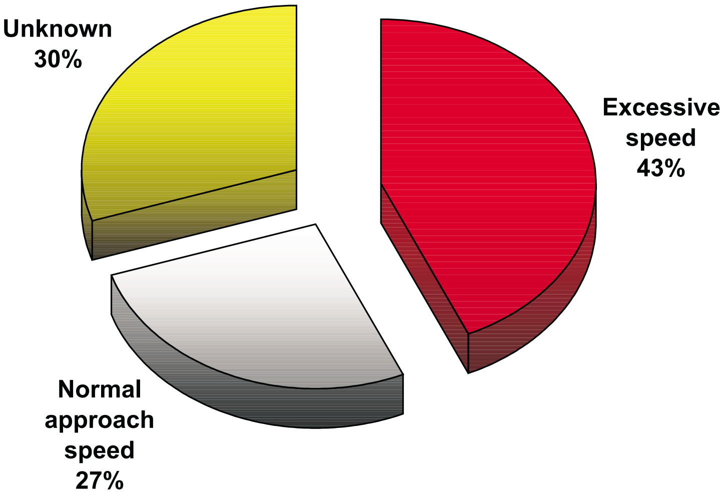

Figure 5: Distribution of approach speed in the sample.

4.4 Floating during landing flare

Floating took place in 54% of all landing overrun events (figure 6). The change of tailwind with altitude can result in an instantaneously increase of the airspeed resulting in an increase in wing lift. With the aircraft in ground-effect this effect will make it more difficult for the pilot to put the aircraft on the runway. As a result the aircraft will float along the runway.

Floating occurred in 67% of all cases with excessive approach speed (see figure 7). It is not a surprise that the combination of high approach speed and floating occurs frequently. The aircraft will float when the pilot applies a normal landing technique in tailwind conditions and/or enters the flare manoeuvre with excessive speed above the Final Approach Speed (FAS).

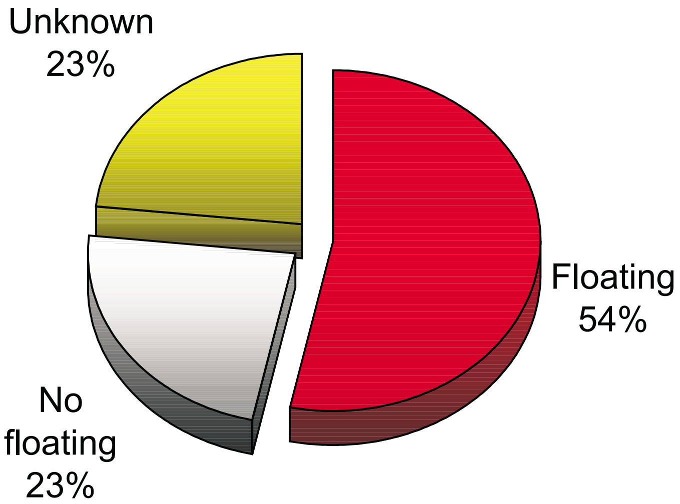

Figure 6: Distribution of floating during landing flare in the sample.

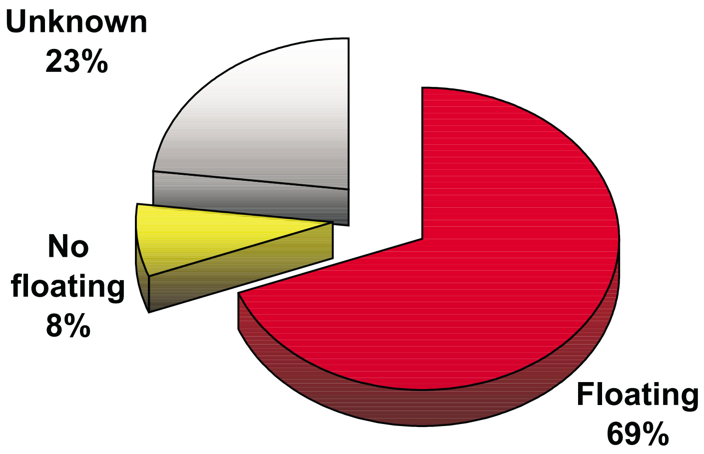

Figure 7: Distribution of floating during landing flare combined with excessive approach speed.

4.5 Tailwind conditions

The distribution of the tailwind conditions at the time of the overrun is shown in figure 8. In 46% of all cases the tailwind was 10 Knots or higher. In the majority of these cases the actual tailwind exceeded the approved limit. Of the events that took place with the high tailwinds of 10 Kt. or more, 47% occurred on a wet or contaminated runway. In most of these cases the pilot violated the company standard operating procedures that prohibited operations on wet/contaminated runways in these high tailwinds.

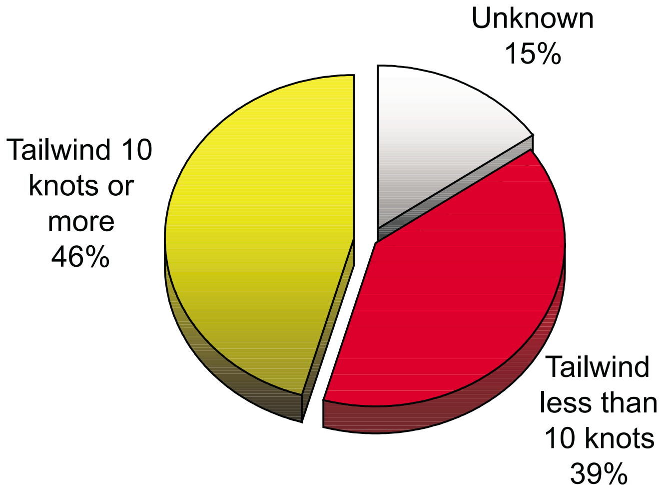

Figure 8: Distribution of tailwind condition in the sample.

5 Conclusions and recommendations

5.1 Conclusions

- The maximum allowable tailwind recommended by ICAO and FAA regarding runway selection for airports with a noise preferential runway system, are lower than the tailwind components most commercial aircraft are certified for.
- In many of the analysed accidents the actual tailwind exceeded the approved limit.
- Although the crosswind component determined by the FMS can be highly inaccurate in the final phase of the flight, the tailwind component is relatively insensitive to common FMS errors.
- The FMS computed tailwind is of little value to the pilot when he makes his/her decision to land at the top of descent, during descent and upon initiation of the final approach.
- Light tailwind conditions increase the wake vortex incident risk.
- Present-day wake vortex separation criteria for final approach may be insufficient in light tailwind conditions.
- Operating on wet or contaminated runways in combination with a tailwind yields a high risk of an overrun.
- The landing is the most critical flight phase regarding overrun risk in a tailwind condition.
- Currently certification requirements of operations in tailwinds greater than 10 Knots are limited to guidelines in the Flight Test Guide which gives a means of compliance with FAR/JAR part 25.

5.2 Recommendations

- It is recommended to further analyse the relation between tailwind conditions and wake vortex incident risk including separation criteria.
- It is recommended to increase crew awareness of high increase in risk when operating on wet or contaminated runway in combination with tailwind.

6 References

[1] Private communication with Eric Poquillon, JAA-DGAC-CEV, Toulouse, France, 2000.

[2] Private communication with Joop Wagenmakers, Aviation Consultant, The Netherlands, 2000.

[3] Critchley, JB & Foot, PB,"UK CAA Wake Vortex Database: Analysis of incidents reported between 1982 and 1990," CAA PAPER 91015, 1991.

Acknowledgements

The authors would like to thank Mr. Eric Poquillon and Mr. Joop Wagenmakers for providing valuable information on tailwind operations and certification. The authors also thank Mr. Franck Iannarelli of EADS Airbus for his help.

Appendix A: PANS-OPS Doc 8168-OPS/611, Chapter 2.1

Noise preferential runways:

§2.1.3 Noise abatement should not be the determining factor in runway nomination:

(c) when cross-wind component, including gusts, exceeds 15 kt

(d) ***when tail-wind component, including gusts, exceeds 5 kt***

See also (A.14, Vol. I, 3.1.2. – PANS RAC, PART V, 5.2.)

Appendix B: FAA Order 7110.65L: Air Traffic Control

Section 5. Runway Selection

3-5-1 Selection

a. Except where a "runway use" program is in effect, use the runway most nearly aligned with the wind when the wind is 5 Knots or more or the "calm wind" runway when the wind is less than 5 Knots (set tetrahedrons accordingly), unless use of another runway:

1. Will be operationally advantageous, or

2. Is requested by the pilot.

b. When conducting aircraft operations on other than the advertised active runway, state the runway in use.

NOTE -

1 - If a pilot prefers to use a runway different from that specified, he/she is expected to advise ATC.

2 - At airports where a "runway use" program is established, ATC will assign runways deemed to have the least noise impact. If in the interest of safety a runway different from that specified is preferred, the pilot is expected to advise ATC accordingly. ATC will honor such requests and advise pilots when the requested runway is noise sensitive.

REFERENCE - FAA Order 8400.9, National Safety and Operational Criteria for Runway Use Programs.

Appendix C: FAA Order 8400.9: National Safety and Operational Criteria for Runway Use Programs

Section 7: OPERATIONAL SAFETY CRITERIA FOR RUNWAY USE PROGRAMS

The following criteria shall be applied to all runway use programs:

…

d. Winds

(1) Clear and dry runways

(a) Unless a greater crosswind component is approved by the applicable Flight Standards office considering local weather factors, facilities and characteristics of aircraft normally using the facility, the crosswind component for the selected runway (including gust values) must not be greater than 20 Knots.

(b) Except for (c) below, the ***tailwind component must not be greater than 5 Knots****.*

(c) Where anemometers are installed near the touchdown zone of the candidate runway for landings, or near the departure end for takeoffs, ***any tailwind component must not be greater than 7 Knots.***

(2) Runways not clear or not dry

(a) The crosswind component (including gust values) must not exceed 15 Knots.

(b) ***No tailwind*** *component may be present except for the nominal range of winds reported as calm (0-3 Knots) may be considered to have no tailwind component.*

(c) Unless otherwise approved by the applicable FAA Flight Standards office based on runway available and field lengths required for aircraft normally using the runway, the runway must be grooved or have a porous friction coarse surface.

Section 9 Applicability

(a) This order applies to FAA personnel who may be called upon to advise, evaluate, or co-ordinate on specific noise abatement plans for runway use programs for particular airports.

(b) This order does not require development or use of a runway program where such a program has not been used or is not needed.

Appendix D: Flight Test Guide FAA AC 25-7A (31/3/98)

Section: AIRPLANE FLIGHT MANUAL CONTENTS.

Maximum tailwind. The maximum allowable tailwind component for takeoff and landing should normally be limited to 10 Knots. If airworthiness approval has been granted for takeoff and landing in tailwinds greater than 10 Knots, the AFM should provide the limiting tailwind value, accompanied by a statement such as the following:

> *The capability of this airplane has been satisfactorily demonstrated for takeoff and manual landing with tailwinds up to ___ Knots. This finding does not constitute operational approval to conduct takeoffs or landings with tailwind components greater than 10 Knots.*

Section: FLIGHT

Tailwind takeoff and landing

(I) Wind velocities of 10 Knots or less - Approval may be given for performance, controllability, and engine operating characteristics for operations in reported tailwind velocities up to 10 Knots, measured at a 10 meter height, without specific flight tests.

(II) Wind velocities greater than 10 Knots

(A) Performance. It is considered that takeoff, rejected takeoff, and landing distances, measured in tailwind conditions greater than 10 Knots, are unreliable for use in determining airplane performance. Wind conditions of such magnitude are generally not sufficiently consistent over the length of the runway or over the time period required to perform the test maneuver. The 150 percent operational tailwind velocity factor, required by 25.105 (d)(1) and 25.125(e), affords a satisfactory method for determination of airplane takeoff and landing performance information and limitations up to a limiting tailwind velocity of 15 Knots when using a flight test data base obtained under zero wind conditions.

(B) Control characteristics. Airplane control characteristics should be evaluated under the following conditions with the center of gravity at the aft limit and the test tailwind velocity equal to the proposed limit factored by 150 percent:

> *(1) Takeoff. At light weight with maximum approved takeoff flap deflection, both all-engines operating and one-engine inoperative takeoffs should be evaluated.*
>
> *(2) Landing. Approach and landing at light weight with maximum approved landing flap deflection.*

(3) Determination of the increased ground speed effect on gear vibration, shimmy, flight director and/or autopilot ILS approaches, GPWS sink rate modes, etc.

(4) If engine idle thrust is increased to account for the increased tailwind velocity, ensure that deviations above the glideslope are recoverable.

(C) Weight limits. In accordance with the requirements of 25.105(d)(1) and 25.125(e), maximum takeoff weight and maximum quick turnaround weight should be determined using brake energies and tire speeds, as appropriate, calculated with the limit tailwind velocity factored by 150 percent.

(D) Engine operating characteristics. Satisfactory engine operation should be demonstrated at the limit tailwind velocity factored by 150 percent. The demonstrations should include:

(1) Zero ground speed operation.

(2) Takeoff power setting procedure used in the AFM performance, both manually and automatically (autothrottle).

(3) Reverse thrust operations.