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Runway Friction Accountability Risk Assessment
Results of a Survey of Canadian Airline Pilots

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Prepared by:

D.C. Biggs and G.B. Hamilton
SYPHER:MUELLER International Inc.
Ottawa, Ontario

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16. Abstract

A survey of Canadian commercial airline pilots was conducted as part of a study to better understand the use of the currently available guidance material related to runway condition and develop an economic rationale for making greater use of runway friction information. The results of the survey indicate which guidance material for operating on slippery runways is currently being used and how the material is being used, and provide feedback on the perceived risks of slippery runways and the actions being taken by pilots to reduce the risks. The pilots' views on the need for additional measures to reduce the risks and the preferred form of those measures were obtained. The survey also provides information for use in evaluating the reduction in risks as a result of specific measures.

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16. Résumé

Ce rapport présente les résultats d'une enquête menée auprès de pilotes professionnels canadiens dans le cadre d'une étude qui visait à mieux comprendre comment sont utilisées les lignes directrices actuelles concernant l'état des pistes et à élaborer des arguments économiques en faveur d'une plus grande utilisation de ces données. L'enquête a permis de déterminer quelles lignes directrices consultent les pilotes avant d'atterrir sur des pistes glissantes et comment ils utilisent ces données, et de mieux connaître leur perception des risques que posent les pistes glissantes et les mesures qu'ils prennent pour atténuer ces risques. Elle a également permis de recueillir le point de vue des pilotes sur la nécessité de mettre en place des mesures supplémentaires pour atténuer les risques et sur la forme que devraient prendre ces mesures. L'information colligée servira en outre à évaluer jusqu'à quel point les risques sont atténués par la mise en place de mesures précises.

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Executive Summary

Introduction

Transport Canada (TC), in association with the Federal Aviation Administration, the National Aeronautics and Space Administration and National Research Council Canada, implemented a five-year program for winter runway friction testing in 1995. The program expanded in 1996 to include other North American and European organizations, and has become a concerted international effort known as the Joint Winter Runway Friction Measurement Program. The program has led to the collection of a substantial database of aircraft and ground vehicle friction measurement data from various runways, and to the development of a greater understanding of the factors affecting runway friction, its measurement, and the relationship between runway friction and aircraft braking. For runways with shallow contaminant depth and therefore very little or no drag (wet or covered with compacted snow or ice contamination), the runway friction measurements were found to be consistent and the correlation between runway friction and aircraft braking high.

With this improved knowledge of runway friction, Transport Canada is looking at improving the use of runway friction information in practice to reduce the risks and possibly aircraft operating costs.

TC contracted Sypher:Mueller International Inc. to conduct a study to better understand the use of the currently available guidance material related to runway condition and develop an economic rationale for the changes being considered. As part of the study, Sypher conducted a survey of commercial pilots in Canada to obtain their perspective on the issue. The purpose of the survey was:

- to understand how guidance material for operating on slippery runways is being used;
- to obtain feedback on the perceived risks of slippery runways, the need for additional measures to reduce the risks and the preferred form of those measures; and
- to obtain information for use in evaluating the reduction in risks as a result of specific measures.

Survey of Pilots

The survey of commercial pilots was supported by the Air Canada Pilots Association (ACPA), the Air Line Pilots Association (ALPA) and TC. The questionnaire was developed with input from TC, ACPA and ALPA.

The survey questionnaire was distributed to 1,000 randomly selected airline pilots from ACPA and to all (approximately 2,450) pilots in ALPA (Canada). A

French version of the survey was also distributed to predominantly Francophone councils in ALPA. A total of 393 pilots completed the questionnaire, a response rate of 11.4%. The survey was distributed in July and this was likely a factor in a lower response rate than was anticipated. The deadline for responses was extended to improve the response rate.

The survey covered a good cross section of pilots of commercial aircraft operating in Canada in terms of experience as a pilot and aircraft type flown. The survey provides a good picture of the use of runway friction information in Canada and of the types of improvements pilots would like to see. With the response rate being just over 11%, those that responded will likely be those with more interest in the topic.

Summary of Findings

The major findings on the availability and quality of runway friction information in Canada and its use by commercial pilots are summarized below.

- Most commercial pilots (95%) in Canada are aware of guidance material for operating on slippery runways.
- Most pilots (85%) have guidance material available to determine landing distances and crosswind limits when runways are slippery, although some of this material does not specifically use runway friction values such as the Canadian Runway Friction Index (CRFI) or the James Brake Index (JBI).
- Many pilots lack guidance material for determining accelerate-stop distances and adjustments to V1/VR, and would like to have this material available to them.
- Most pilots find the guidance material very useful and make use of it when runway and crosswind conditions warrant. However, many do not consult the charts each time and often rely on experience in similar conditions.
- Pilots find that the current format of the guidance material makes it confusing and difficult to use. They would like the material to be presented in simple, easy-to-use lookup charts specific for each aircraft type in the company's fleet.
- Most pilots monitor the runway friction values closely, but do not consider it the only source of information on runway slipperiness. Many consider pilot reports (PIREPS) to be as good a source of information, or better, and would like to see greater use made of PIREPS. However, the consistency in the levels of braking effectiveness reported in PIREPS could be improved and the aircraft type should be included in the report.
- For landings on runways that are icy or covered with compacted snow, most pilots apply the 15% increase in landing distances, which is a requirement

for many aircraft on wet runways, or a greater factor. However, 20% of pilots do not apply an adjustment. About 5% of pilots indicated the 15% adjustment is a requirement for their aircraft on wet runways, but that they don't apply it, or a greater factor, on icy/compacted snow runways where it is not a requirement.

- Pilots adjust their procedures when landing on slippery runways to reduce the risks. Actions included: "firm" touchdown (don't float), applying reverse thrust aggressively and quickly, using a higher autobrake setting and applying autobrake quickly, using high landing flap settings, and ensuring airspeed is not above VREF.
- Pilots currently adjust their flight plans to account for slippery runways. Last winter about half the pilots either remained airborne until runway friction improved, or diverted to another airport because of low runway friction. Reductions in weight prior to take-off or while en route were far less common.
- Pilots indicated that the quality of runway friction information provided by airports varies between airports. Generally the quality is better at large airports, but each airport differs depending on various factors.
- Pilots indicated that improvements are needed to the runway friction information provided by the airports. Friction values need to be updated more frequently, particularly at small airports, and steps taken to ensure out-of-date values do not result in unnecessary risks. The timeliness with which information is distributed is a concern; improvements in the methods of distributing the information quickly and alerting pilots of low runway friction should be investigated, possibly through the use of the Automatic Terminal Information Service. Accuracy of CRFI is also a concern, although perceived inaccuracies could be the result of variability along and across the runway, changes in friction since the last measurement, or differences in braking under the same conditions between aircraft types.
- Training for accounting for low runway friction needs improvement for many pilots. Over 20% of pilots of large jet aircraft have not received any formal training on the use of runway friction information, and only half have received training in the last 12 months. Of those that received training, 20% indicated that training on the use of runway friction values was covered "poorly". Many indicated that the format of the material is too complicated to be covered in the short time allotted.
- Despite the low number of accidents in recent years due to slippery runways, pilots report frequent occurrences of safety concerns such as significantly reduced braking (12 per 1000 landings), slipping sideways due to crosswinds (3 per 1000 landings) and being close to not stopping on the runway (0.4 per 1000 landings).

- The majority of pilots feel that the current runway friction information could be better used.
- Most pilots would like to see CRFI values used in determining landing distances/weights. Pilots are split on whether to include the procedures in aircraft operating manuals or as guidance material. Either way, the charts must be simple, easy-to-use and type-specific.
- Although there is significant variation between pilots, the large majority feel the landing distances/weights determined using the CRFI values should be recommended values only, and that flexibility should be allowed for pilots to take into account other information. Generally, they feel that the CRFI values available to them at present are not accurate enough for their use in setting maximum allowed landing weights.

Sommaire

Introduction

En 1995, Transports Canada (TC) s'est associé à la Federal Aviation Administration, à la National Aeronautics and Space Administration et au Conseil national de recherches du Canada pour lancer un programme quinquennal d'essais de frottement sur les chaussées aéronautiques l'hiver. Dès 1996, le programme accueillait de nouveaux participants d'Amérique du Nord et d'Europe et devenait une initiative concertée à l'échelle internationale, connue sous le nom de Programme conjoint de recherche sur la glissance des chaussées aéronautiques l'hiver. Le programme a permis de réunir une importante base de données constituée de résultats de mesure du frottement à l'aide d'avions et de véhicules au sol sur différentes pistes, et de mieux comprendre les facteurs influant sur la glissance des pistes et sur la mesure de celle-ci, et sur le rapport entre la glissance des pistes et le freinage des avions. Ainsi, lorsqu'une piste est recouverte d'une mince couche de contaminants, et que, par conséquent, la traînée est très faible (piste mouillée ou couverte de neige tassée ou de glace), les mesures du coefficient de frottement sont cohérentes et la corrélation entre les données de glissance et la distance de freinage est forte.

Comme cette connaissance approfondie de la glissance des pistes peut mener à une réduction des risques, voire des coûts, des opérations aériennes, Transports Canada cherche des façons d'inciter les pilotes à utiliser davantage les données sur la glissance des pistes.

TC a donc chargé Sypher:Mueller International Inc. de mener une étude qui vise à mieux comprendre comment sont utilisées les lignes directrices actuelles concernant l'état des pistes et à élaborer des arguments économiques en faveur de nouvelles procédures éventuelles. C'est en marge de cette étude que Sypher a mené une enquête auprès de pilotes professionnels du Canada, afin de connaître leur point de vue sur la question. Le but de l'enquête s'énonçait comme suit:

- comprendre comment sont utilisées les lignes directrices mises à la disposition des pilotes concernant les atterrissages sur pistes glissantes;
- connaître la perception des pilotes quant aux risques que posent les pistes glissantes et leur point de vue sur la nécessité de prendre des mesures supplémentaires pour atténuer ces risques et sur la forme que devraient prendre ces mesures;
- recueillir des données qui serviront à évaluer jusqu'à quel point la mise en place de mesures précises mène à une atténuation des risques.

Enquête auprès des pilotes

L'enquête auprès des pilotes professionnels a reçu l'appui de l'Association des pilotes d'Air Canada (APAC), de la Air Line Pilots Association (ALPA) et de TC. TC, l'APAC et l'ALPA ont collaboré à l'élaboration du questionnaire.

Le questionnaire a été envoyé à 1 000 pilotes de ligne choisis de façon aléatoire parmi les membres de l'APAC et à tous les pilotes de l'ALPA-Canada (environ 2 450). Une version française du questionnaire a également été envoyée aux conseils de l'ALPA réunissant une majorité de membres francophones. Au total, 393 pilotes ont répondu au questionnaire, ce qui représente un taux de réponse de 11,4 %. L'enquête a eu lieu en juillet, ce qui peut expliquer le taux de réponse relativement faible. La date limite de retour des questionnaires a été repoussée, pour tenter d'obtenir le maximum de réponses.

Les pilotes qui ont répondu au questionnaire constituent un échantillon représentatif des pilotes professionnels du Canada, tant pour ce qui est des années d'expérience que du type d'avion piloté. Les résultats donnent une bonne image de l'utilisation que font les pilotes canadiens des données sur la glissance des pistes, et des améliorations qu'ils aimeraient voir apporter à ces données. Avec un taux de réponse qui dépasse à peine 11 %, on peut penser que les pilotes qui ont répondu sont particulièrement intéressés par la question.

Sommaire des résultats

Voici les principales conclusions de l'enquête quant à la disponibilité et à la qualité des données sur la glissance des pistes au Canada et à l'utilisation de ces données par les pilotes professionnels :

- La plupart des pilotes professionnels du Canada (95 %) sont au courant de l'existence de lignes directrices pour l'atterrissage sur piste glissante.
- La plupart des pilotes (85 %) ont à leur disposition des lignes directrices qui les aident à déterminer les distances d'atterrissage et les limites de vent de travers sur piste glissante, même si ces lignes directrices ne se fondent pas toujours sur des valeurs de glissance des pistes, comme l'Indice canadien de la glissance des pistes (CRFI, *Canadian Runway Friction Index*) ou le coefficient de freinage James (JBI, *James Brake Index*).
- De nombreux pilotes déplorent l'absence de lignes directrices qui les aideraient à déterminer les distances d'accélération-arrêt et les rajustements des valeurs V1/VR.
- La plupart des pilotes trouvent les lignes directrices très utiles et les utilisent lorsque l'état des pistes et les vents de travers le justifient. Mais ils

sont nombreux à ne pas consulter chaque fois les tableaux, préférant se fier à leur expérience dans des conditions similaires.

- Les pilotes trouvent que les données, telles qu'elles sont actuellement présentées, prêtent à confusion et sont difficiles à utiliser. Ils aimeraient que des tableaux simples et faciles à consulter soient établis pour chaque type d'avion qui compose le parc aérien du transporteur qui les emploie.

- La plupart des pilotes vérifient consciencieusement les valeurs de glissance des pistes, mais ne les considèrent pas comme la seule source d'information sur la glissance des pistes. Beaucoup considèrent les comptes rendus de pilote (PIREP) comme une source d'information aussi bonne, voire meilleure, et estiment qu'on devrait leur accorder une plus grande importance. Ils estiment toutefois que les comptes rendus du niveau d'efficacité des freins devraient être plus cohérents et que le type d'avion devrait être mentionné.

- Lorsqu'ils atterrissent sur des pistes glacées ou couvertes de neige tassée, la plupart des pilotes augmentent la distance d'atterrissage de 15 % (ce qui constitue une obligation pour beaucoup d'avions sur pistes mouillées), ou même plus. Mais 20 % des pilotes ne le font pas. Environ 5 % des pilotes ont indiqué que le coefficient d'augmentation de 15 % est obligatoire pour leur avion lors d'un atterrissage sur piste mouillée, mais que, comme aucun coefficient n'est obligatoire sur des pistes glacées ou couvertes de neige tassée, ils n'en appliquent pas.

- Les pilotes modifient leurs procédures d'atterrissage lorsque la piste est glissante, de façon à atténuer les risques. Voici quelques-unes des stratégies utilisées : prise de contact «ferme» (ne pas planer), appliquer tôt et énergiquement l'inversion de poussée, régler le freinage automatique pour qu'il assure une décélération maximale et l'appliquer tôt, descendre au maximum les volets, et faire en sorte que la vitesse anémométrique ne dépasse pas la VREF.

- Les pilotes modifient leur plan de vol lorsque les pistes sont glissantes. L'hiver dernier, environ la moitié des pilotes ont soit attendu en vol que l'état de la piste s'améliore ou se sont déroutés vers un autre aéroport. Des mesures comme l'allégement de l'avion avant le décollage ou en route sont relativement rares.

- Selon les pilotes, la qualité des données sur la glissance des pistes fournies par les aéroports varie d'un aéroport à l'autre. La qualité est généralement meilleure aux grands aéroports, mais la situation diffère d'un aéroport à l'autre en fonction de divers facteurs.

- Les données sur la glissance des pistes fournies par les aéroports doivent être améliorées. Ainsi, il y a lieu de mettre à jour plus fréquemment les données sur la glissance, surtout aux petits aéroports, et de supprimer les valeurs périmées pour qu'elles ne posent pas de risques indus. On s'inquiète du retard à diffuser l'information et à signaler aux pilotes des pistes

glissantes; à cet égard, le service automatique d'information de région terminale pourrait offrir une solution. On s'inquiète aussi de l'imprécision du CRFI, même si ce qui passe pour de l'imprécision peut être dû à la variabilité de l'état de la piste, longitudinalement et transversalement, au changement d'état de la piste depuis la dernière mesure, ou aux différences de comportement en freinage des divers types d'avions, dans les mêmes conditions.

- De nombreux pilotes sont d'avis qu'il faut améliorer la formation portant sur l'atterrissage sur piste glissante. Plus de 20 % des pilotes de gros porteurs n'ont reçu aucune formation formelle sur l'utilisation des données de glissance des pistes, et seulement la moitié ont reçu une telle formation au cours des 12 derniers mois. Et selon 20 % de ceux qui ont reçu la formation, la question de l'utilisation des valeurs de glissance des pistes a été abordée de façon «médiocre». Beaucoup ont indiqué que la présentation des données est trop complexe, compte tenu du peu de temps accordé à ce sujet.
- Même s'il y a eu peu d'accidents attribuables à des pistes glissantes ces dernières années, les pilotes signalent fréquemment des incidents où la sécurité a été mise en cause, comme une efficacité de freinage grandement réduite (12 par 1 000 atterrissages), des dérapages latéraux dus à des vents de travers (3 par 1 000 atterrissages) et des quasi-dépassements de piste (0,4 par 1 000 atterrissages).
- La majorité des pilotes estiment qu'il y aurait moyen de faire meilleur usage des données actuelles sur la glissance des pistes.
- La plupart des pilotes souhaitent que le CRFI soit utilisé pour déterminer les distances d'atterrissage/poids à l'atterrissage. Les pilotes sont partagés sur l'opportunité d'inclure les procédures dans les manuels d'utilisation des aéronefs ou d'en faire des lignes directrices. Quoi qu'il en soit, ils insistent pour que les tableaux soient simples, faciles à consulter et spécifiques aux types d'avions.
- Malgré des divergences d'opinion importantes entre les pilotes, la grande majorité estime que les distances d'atterrissage/poids à l'atterrissage déterminées à partir du CRFI ne devraient être que des valeurs recommandées, et que les pilotes devraient avoir la possibilité de prendre en compte d'autres données. Règle générale, ils croient que les valeurs CRFI actuellement publiées ne sont pas assez précises pour qu'on puisse les utiliser pour établir les limites de poids à l'atterrissage.

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Glossary of Terms

AC	Advisory Circular
ACPA	Air Canada Pilots Association
AFM	Aircraft Flight Manual
AIP	Aeronautical Information Publication
ALPA	Air Line Pilots Association
AOM	Aircraft Operating Manual
ATIS	Automatic Terminal Information Service
CRFI	Canadian Runway Friction Index
FAA	Federal Aviation Administration
FOM	Flight Operating Manual
JBI	James Brake Index
LAA	Local Airport Authority
METAR	Aviation Routine Weather Report
PIC	Pilot in command
PIREPS	Pilot reports
QRH	Quick Reference Handbook
RFI	Runway Friction Index
TC	Transport Canada
V1	Aircraft speed at go/no go decision on take-off run
VR	Aircraft speed at rotation on take-off
VREF	Reference Velocity

1. INTRODUCTION

1.1 Background

Transport Canada (TC), in association with the Federal Aviation Administration, the National Aeronautics and Space Administration and National Research Council Canada, implemented a five-year program for winter runway friction testing in 1995. The program expanded in 1996 to include other North American and European organizations, and has become a concerted international effort known as the Joint Winter Runway Friction Measurement Program. The program has led to the collection of a substantial database of aircraft and ground vehicle friction measurement data from various runways, and to the development of a greater understanding of the factors affecting runway friction, its measurement, and the relationship between runway friction and aircraft braking. For runways with shallow contaminant depth and therefore very little or no drag (wet or covered with compacted snow or ice contamination), the runway friction measurements were found to be consistent and the correlation between runway friction and aircraft braking high.

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- to obtain feedback on the perceived risks of slippery runways, the need for additional measures to reduce the risks and the preferred form of those measures; and
- to obtain information for use in evaluating the reduction in risks as a result of specific measures.

1.2 Survey of Pilots

The survey of commercial pilots was supported by the Air Canada Pilots Association (ACPA), the Air Line Pilots Association (ALPA) and TC. The questionnaire was developed with input from TC, ACPA and ALPA and is attached as Appendix A. The Air Transportation Association of Canada was informed of the survey and given the opportunity to comment on the questionnaire. ACPA and ALPA assisted in the distribution of the questionnaires. Pilots' responses are confidential and they were asked not to identify themselves or their employer.

The survey questionnaire was distributed to 1,000 randomly selected airline pilots from ACPA and to all (approximately 2,450) pilots in ALPA (Canada). A French version of the survey was also distributed to predominantly Francophone councils in ALPA. A total of 393 pilots completed the questionnaire, a response rate of 11.4%. The survey was distributed in July and this was likely a factor in a lower response rate than was anticipated. The deadline for responses was extended to improve the response rate.

As shown in Figures 1.1 to 1.3, the survey covered a good cross section of pilots of commercial aircraft operating in Canada. The bars in the figures give the percentage of the respondents in each segment and the actual number of responses in each is given above the bar. Jets under 41 t include the regional jets: CRJ, F-28 and BAe146.

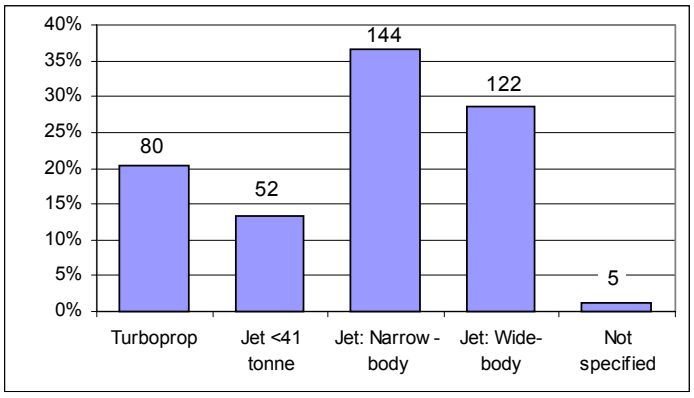


Figure 1.1 Percentage and Numbers of Responses by Aircraft Category

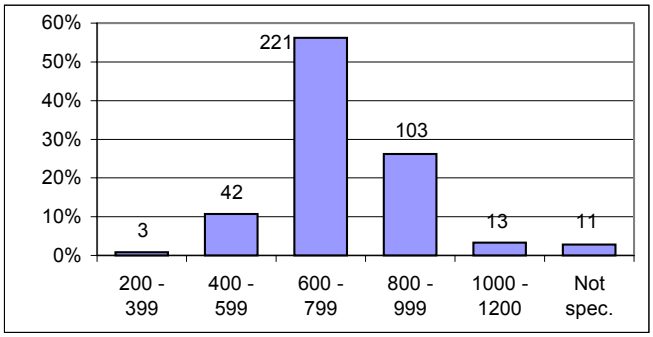


Figure 1.2 Percentage and Numbers of Responses by Annual Hours Flown

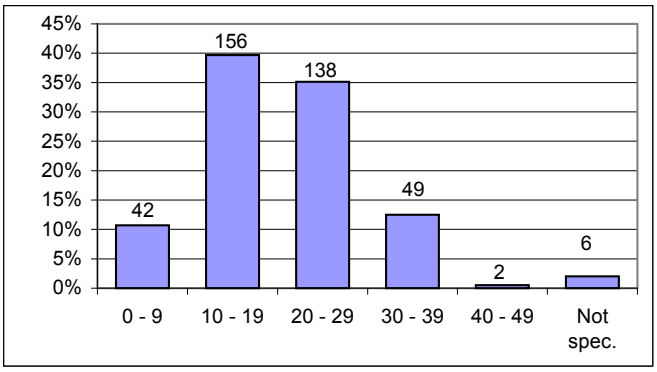


Figure 1.3 Percentage and Numbers of Responses by Years as a Commercial Pilot

Statistical Considerations

The survey provides a good picture of the use of runway friction information in Canada and of the types of improvements pilots would like to see. The degree to which the results reflect the views and experiences of all airline pilots in Canada is primarily influenced by the number of responses and how representative the pilots responding were of the total population. There is no way of controlling which pilots respond and which do not, and those who respond will generally be those with more interest in the topic. If the responding sample were essentially a random sample drawn from the population, then the confidence intervals for responses to the survey questions can be determined. These depend on the number of responses in each segment, the population size of the segment and the expected proportion of "Yes" answers to the particular question. The confidence intervals are summarized in Table 1.1 for various aircraft types the pilots fly.

Table 1.1 Sizes of 95% Confidence Intervals for Various Aircraft Categories and Probabilities of a "Yes" Response*

Aircraft Category	Sample Responses	Probability of Yes Response	95% Confidence Interval		
			Width	Low	High
All	393	50%	±4.8%	45.2%	54.8%
All	393	30%	±4.4%	25.6%	34.4%
All	393	20%	±3.8%	16.2%	23.8%
All	393	10%	±2.9%	7.1%	12.9%
Turboprop	80	50%	±11%	39.4%	60.6%
Jet <41 t	52	50%	±13%	36.8%	63.2%
Jet Narrow-body	144	50%	±8%	42.1%	57.9%
Jet Widebody	122	50%	±8%	41.5%	58.5%
Turboprop + Jet <41t	132	50%	±8%	41.8%	58.2%
Jet >41 t	266	50%	6%	44.2%	55.8%

* Assuming respondents are a representative cross section of pilot population

For example, considering all aircraft types (393 responses), if the probability of a "yes" response equaled 50%, then 95 times out of 100 the sample response would be accurate to within ±4.8% of the true value. If the probability of a "yes" response is much lower, say 10% (5th row in table), the confidence interval is much narrower at ±2.9%. Confidence intervals are wider when individual categories of aircraft are considered because of the lower number of responses in each segment. The 95% confidence interval for an expected "yes" response of 50% ranges from ±13% for pilots flying jets under 41 t, down to ±8% for pilots flying narrow-body jets. Combining the turboprop and small jets (under 41 t), the confidence interval is reduced to ±8%, while combining the narrow-body and widebody jet categories, the confidence interval is reduced to ±6%.

When comparing the percentages of pilots giving the same response between pilots flying different types of aircraft, the following differences could be considered as significant:

- Between turboprop and jet – differences greater than 12%.
- Between turboprop/jet (< 41 t) and jet (> 41 t) – differences greater than 10%.
- Between narrow-body jet and widebody jet – differences greater than 12%.

The responses to the survey are summarized in Section 2. Detailed results, including comments made by the pilots, are given in Appendix B.

2. SURVEY RESULTS

2.1 General

Pilots were asked whether they felt comfortable with the current regulations concerning take-off and landing on icy and compacted snow-covered runways. As shown in Figure 2.1, only 10% indicated they were very comfortable with this aspect of the current regulations and half indicated they were moderately comfortable. The main areas of concern are:

- the lack of regulation and guidance material concerning take-off;
- the frequency of update and accuracy of reported runway friction values; and
- the ease of use of Canadian Runway Friction Index (CRFI) values in determining performance limitations.

The lack of international standardization of runway friction measurement was noted by a number of pilots. The need for aircraft-specific data was also highlighted, especially for the Dash 8, which accounts for a large proportion of the take-offs and landings in Canada.

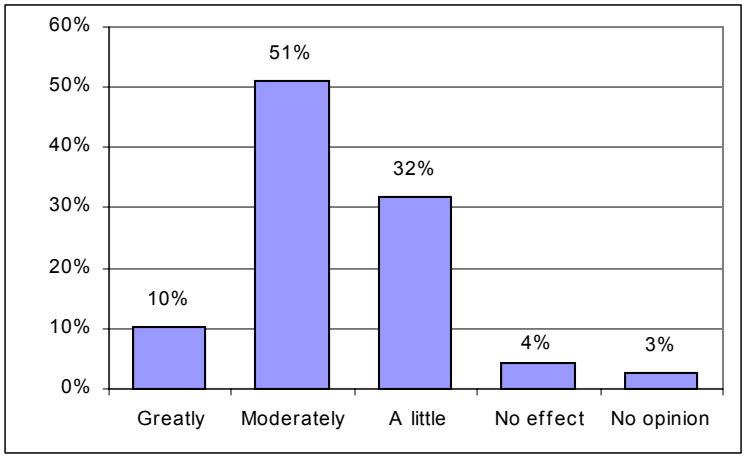


Figure 2.1 Level of Comfort with Current Regulations Concerning Take-off and Landing on Icy and Compacted Snow-Covered Runways

The points raised by pilots are covered in detail in Sections 2.2 to 2.7.

2.2 Guidance Material

Overall, 95% of pilots indicated that they are aware of guidance material for operating on slippery runways for their aircraft. As shown in Figure 2.2, this varies from 94% for pilots operating turboprop aircraft to 97% for pilots of narrow-body jet aircraft. Figure 2.3 shows that less experienced commercial pilots are less likely to be aware of the guidance material. This is consistent with the lower percentage of turboprop pilots being aware of the material as they start their career path piloting smaller turboprops and move to the larger jet aircraft as they gain experience.

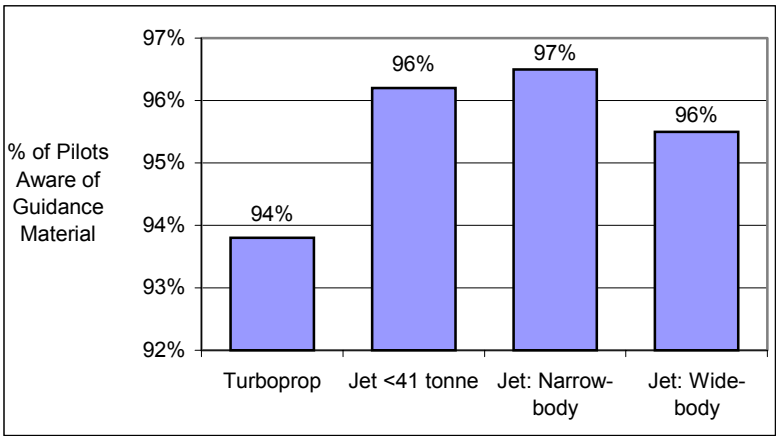


Figure 2.2 Pilots Aware of Guidance Material for Operating on Slippery Runways for their Aircraft by Aircraft Category

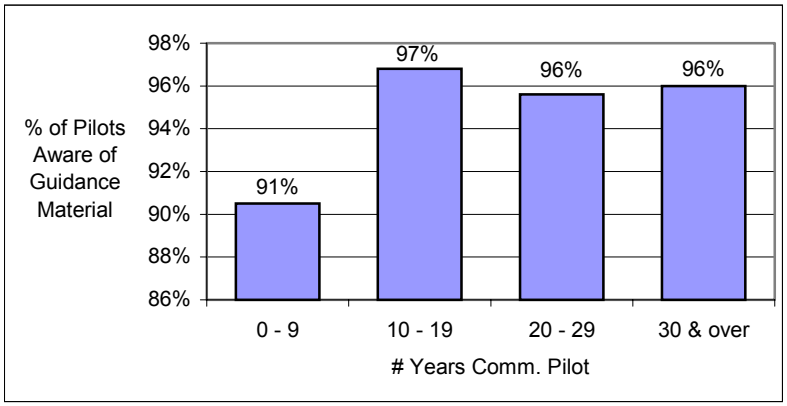


Figure 2.3 Pilots Aware of Guidance Material for Operating on Slippery Runways for their Aircraft by Pilot Experience

Most pilots obtained the information from a number of sources, primarily company material, the aircraft operating manual (AOM) and TC. Figure 2.4 shows the percentages of pilots obtaining guidance material from each source by the category of aircraft flown. The sources do not differ greatly by aircraft category, although operators of the smaller jet (under 41 t) and turboprop aircraft rely more on material from their company and other sources, while the pilots of the larger jet aircraft rely more on the AOM and TC material. Other sources mentioned by a number of pilots included:

- the Jeppesen manual;
- industry and association journals, magazines and safety material; and
- aircraft manufacturer material.

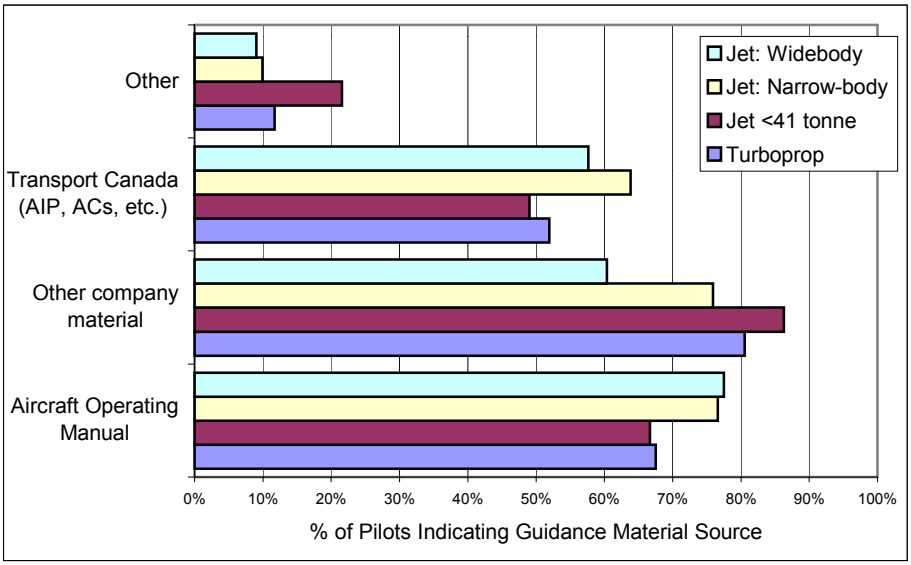


Figure 2.4 Source of Guidance Material

Types of Information Included

Most pilots (76%) indicated that the material specially referred to the runway friction (CRFI) value, although most pilots obtained the material from several sources and some material may mention the value and some may not. Eighty percent of pilots indicated that the material outlines how to determine landing distances and crosswind limits for slippery runways, while just under 50% indicated that the material outlines how to adjust take-off weights.

As shown in Figure 2.5, the topics covered by the guidance material differ significantly by aircraft category. Specific mention of the runway friction value varied from 85% for pilots of turboprops and smaller jets to 70% for pilots of the larger jet aircraft (greater than 41 t). About 85% to 90% of pilots of the turboprop and small jet aircraft could use the material to determine landing distances and crosswind limits; however, this percentage dropped to 75% to 80% for the larger jet aircraft. For take-off, the availability of information was reversed, with the pilots of widebody jet aircraft being most likely to be able to use the material to adjust allowed take-off weights.

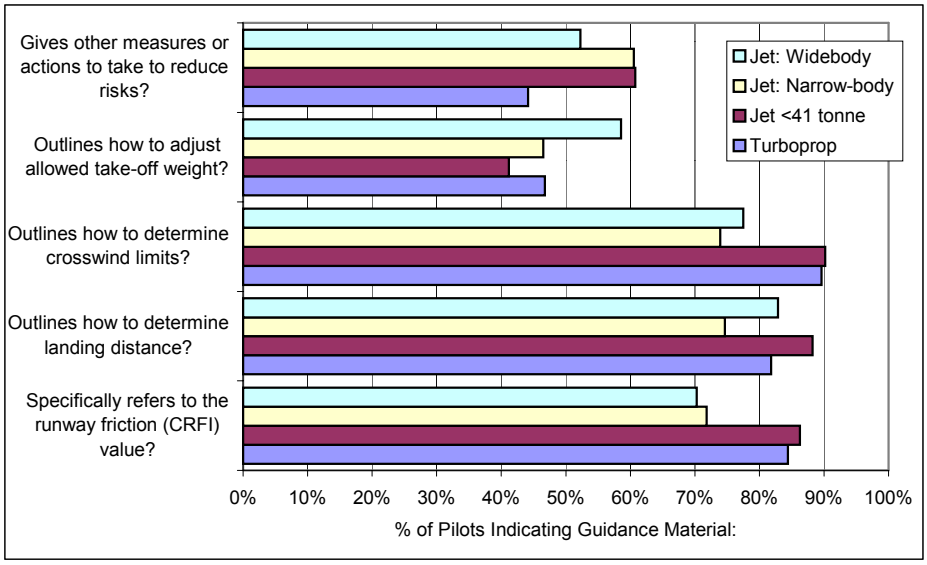


Figure 2.5 Types of Information Given in the Guidance Material by Aircraft category

Many pilots indicated that their aircraft manuals and company material refer to reported braking action as “good”, “medium” or “poor” and do not refer specifically to runway friction. Some pilots indicated that their material only referred to contaminant type and the amount and degree of contaminant.

Many of the pilots commented that they use the CRFI charts, but would like them to be easier to use, preferably customized to their aircraft type. Some of the material still refers to the old James Brake Index (JBI) system and some pilots are confused by the new CRFI. One pilot even commented, “CRFI is useless. The old system JBI was much superior”, unaware they are the same measure.

Over half the pilots indicated that the guidance material also gave other measures or actions to take to reduce the risks. These included using a

higher flap setting, the longest runway, headwind direction and maximum take-off thrust.

Use of the Guidance Material

Most pilots indicated that they make use of the guidance material when runway and crosswind conditions warrant it, although the conditions under which it is warranted varies among pilots. For example, some pilots indicated that they use it when the runway is contaminated with frozen precipitation; others indicated that they use it when the CRFI is less than 0.5 or less than 0.3. Approximately 12% of pilots indicated that they rarely or never use guidance material for take-off, while only 6% rarely or never use it for landing. Many pilots indicated that, because of their experience gained in operating their specific aircraft in the same conditions, they do not always refer to the guidance material, but don't hesitate to refer to it if they feel the need. Many indicated that, in most cases, the runway length available gives an adequate safety margin, while others indicated that they use it primarily for determining crosswind limits. Common reasons given for not using the information included the following:

- Lack of material available for their aircraft, particularly for take-off
- Material not easy to use and time-consuming to calculate
- Material is for guidance only, information is conservative and validity is questioned (not based on data for their specific aircraft)
- Lack of training on its use

Generally, the pilots indicated that they find the information very useful, as shown in Figure 2.6. Excluding the 5% of pilots who indicated that they are not aware of any guidance material, 85% find it very or extremely useful, while only 1% said it was of no use. The usefulness of the material, as indicated by the pilots, did not vary significantly across aircraft categories. The pilots made many suggestions for improving the guidance material. Since the material comes from various sources, improvements suggested by some pilots may not be applicable to material used by other pilots. The most frequently suggested improvements were as follows:

- Develop quick, easy-to-use lookup charts for specific aircraft types.
- Develop charts for take-off, including V1/VR reductions.
- Correlate CRFI with other friction measures used, such as the Airbus measure and "good/medium/poor" braking.
- Standardize runway friction measures used internationally.

Other suggested improvements included having more information on aircraft handling, incorporating material that refers to CRFI specifically, ensuring all information is in one place to reduce cross-referencing, and not publishing uncorrected distance charts (always use "wet" distances to start from). Several pilots mentioned that the distances available on the CRFI chart need to be increased.

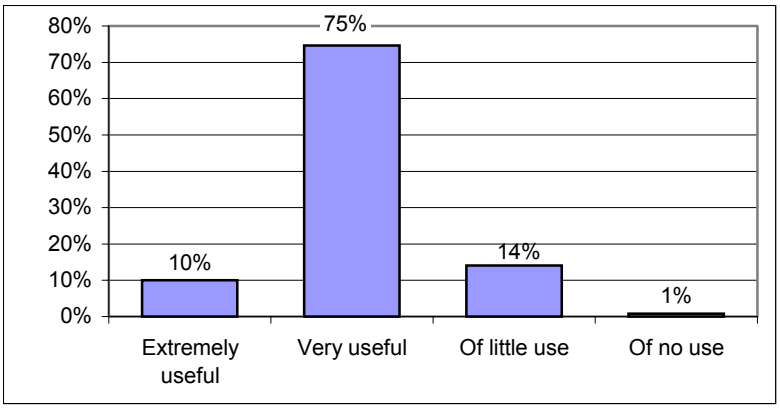


Figure 2.6 Usefulness of Guidance Material

The common theme of the pilots' comments is that the CRFI charts should include landing and take-off distances, V1/VR adjustments and crosswind limits tailored to each specific type of aircraft, and be presented in an easy-to-use format in the AOM or company guidance material for that aircraft. If the charts were made type-specific for a particular airline, this would make them much easier and less confusing to use.

2.3 Use of Runway Friction Information

The majority of pilots (59%) indicated that they consider the runway friction information provided by the airport to be "very important", as shown in Figure 2.7. Another 38% indicated that the information is "important" and only 3% indicated that the data was of "low importance". Fewer pilots of turboprop aircraft indicated that friction information was "very important" – 44% compared to 61% to 70% for pilots of jet aircraft.

Generally, pilots indicated that they monitor the runway friction value closely, but seldom have to make adjustments based on its value. Several pilots of aircraft without reverse thrust (e.g., Fokker F-28) indicated that they place very high importance on friction values. Comments on the

importance of runway friction information varied considerably. Examples included:

- "it's the best way to know runway conditions"
- "it's all we have to go on"
- "key value for decision making"
- "(1) PIREPS (2) Experience (3) CRFI"
- "often find value doesn't accurately reflect braking action"

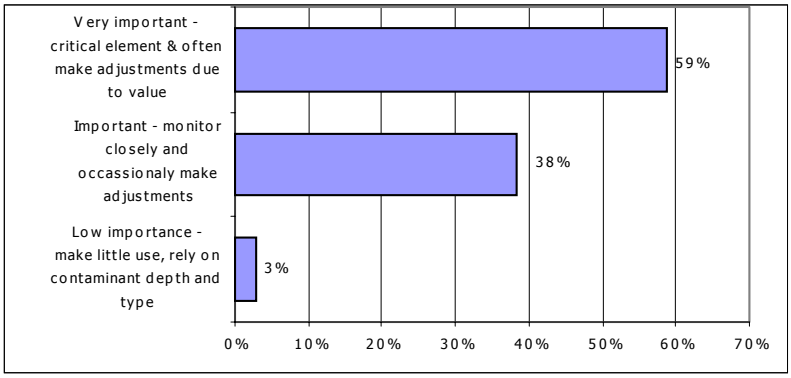


Figure 2.7 Importance of Runway Friction Information

The percentage of pilots making use of the CRFI values for determining landing and take-off weights/distances and crosswind limits are given in Figure 2.8. The greatest use of CRFI values is in the determination of crosswind limits – 91% of pilots used them for this purpose. Almost all pilots (98-99%) of the smaller aircraft – turboprop and jets under 41 t – use the CRFI values for determining crosswind limits.

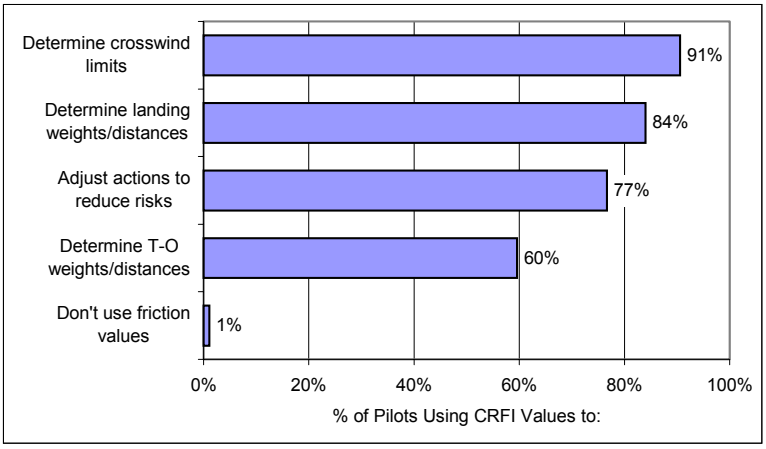


Figure 2.8 Percentage of Pilots Making Use of CRFI Values

Use of CRFI values is high for determining landing distances/weights (84% of pilots) and for adjusting actions to reduce the risks (77%), but much lower for determining take-off parameters (60%) because of the unavailability of information relating CRFI to performance on take-off.

Common reasons given for not using CRFI values include the following:

- Company manuals do not use CRFI.
- The pilots have experience with use of JBI values, but no CRFI.
- CRFI data is consistently dated or inaccurate.
- "Guidance only – CRFI values seem overly conservative."

Use of 15% Factor for Landing on Wet Runways

Pilots were asked to indicate whether the procedure of increasing the landing distance by 15% for landing on wet runways is a requirement for the aircraft type they fly and, if not, whether they apply it anyway. Figure 2.9 summarizes their responses broken down by aircraft category. Around 90% of pilots of the larger jet aircraft indicated that the 15% adjustment is a requirement, and a third of those for which it is not a requirement apply it anyway. The percentage of pilots applying the 15% factor is much lower for the smaller jets (74%) and turboprops (65%).

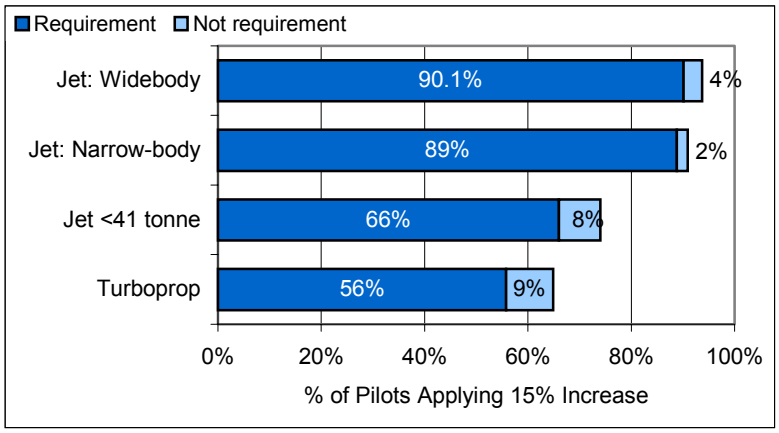


Figure 2.9 Pilots Applying 15% Increase in Landing Distance for Wet Runways

The percentages of pilots applying a 15% or greater increase to the landing distance for landings on runways that are icy or covered with compacted snow are presented in Figure 2.10. Overall, 82% of pilots indicated that they apply a 15% or greater adjustment to the landing distance in these situations. However, disturbingly, 5% of pilots indicated

that, while the 15% factor on wet runways is a requirement for their aircraft, they do not apply a 15% or greater factor for landings on runways that are icy or covered with compacted snow. For small jet aircraft (under 41 t), the percentages of pilots applying the increase on wet and icy/compact snow runways are similar, and for turboprop aircraft the percentage is higher for icy/compact snow runways (75%). Of those applying an adjustment, the majority (62%) apply an adjustment of greater than 15%.

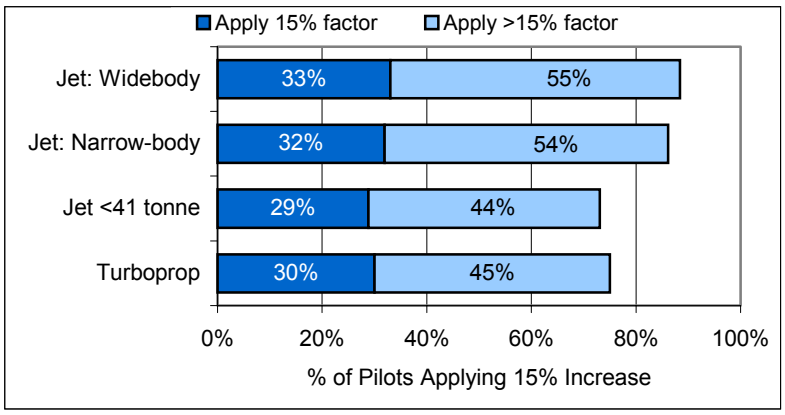


Figure 2.10 Pilots Applying 15% Increase in Landing Distance, or Greater, for Runways that are Icy or Covered with Compacted Snow

The comments made by the pilots indicated that most follow the information provided to them in the AOM, the Flight Operating Manual, the Quick Reference Handbook (QRH) and/or the Aircraft Flight Manual (AFM). Several pilots mentioned that the aircraft manufacturer (Airbus and Bombardier) provided performance data for runways contaminated with ice, slush or snow. Many indicated that they used the CRFI charts. A number that mentioned the size of the increase they apply gave values in the range of 25% to 100%. Several pilots mentioned that there is some company pressure not to be too conservative in making adjustments for runway contamination.

Low Runway Friction Reported

Pilots were asked to indicate what actions they took when low runway friction values were reported at the destination airport. The percentages of pilots indicating particular actions are presented in Figure 2.11. Most pilots (86%) indicated that they re-calculate the runway distance required and many commented that they check the crosswind limits and, if necessary, consider diverting to an alternate airport. Others commented

that they use the longest runway available (presumably taking crosswind risks into account), ask for pilot reports (PIREPS) on runway condition, and request measures to improve runway friction (e.g., sanding).

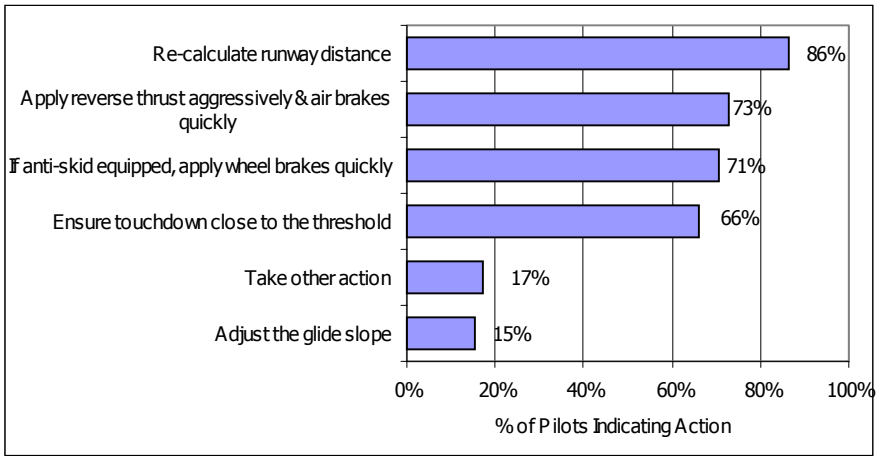
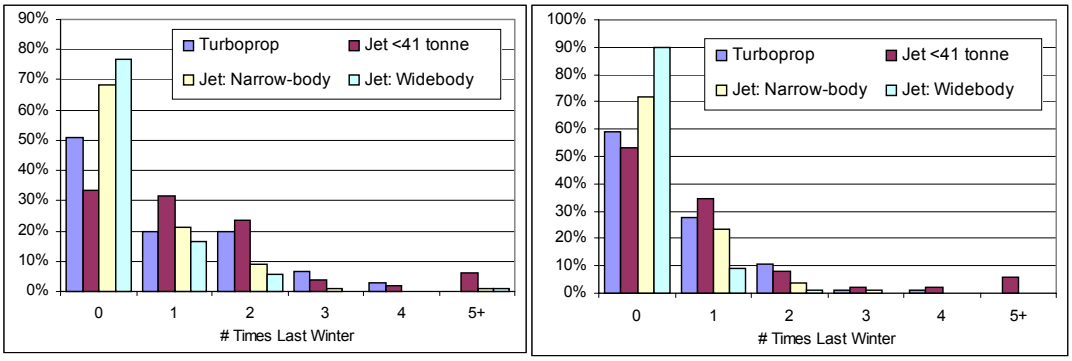


Figure 2.11 Actions Taken when Low Runway Friction is Reported En Route

Almost all pilots (95%) indicated that they take some action when landing the aircraft to reduce the risks associated with the low runway friction. Most pilots indicated that they take one or more of the following actions: firm touchdown (don't float), higher autobrake setting (typically medium), quick application of maximum reverse thrust (once directional control maintained), high landing flap setting, and airspeed at or slightly below VREF. A number indicated that they try to touch down at the 1,000 ft. mark or a little before. Many pilots mentioned that their aircraft manuals give procedures to follow for landing on slippery runways. These actions are important when considering the reductions in risk as a result of the implementation of any landing distance requirements on slippery runways.

Once the flight is en route, there are a limited number of options open to the pilot when runway friction below acceptable limits is reported. These are to remain airborne until the friction has improved, reduce landing weight en route (burn or dump fuel) or divert to another airport. The number of times pilots indicated that they remained airborne or diverted last winter (2000-2001) is summarized in Figure 2.12. Overall, 38% of pilots indicated that they had remained airborne while the runway improved, but that this occurred only once or twice. Similarly, 28% of pilots indicated that they diverted to another airport last winter because of low runway friction, but again only once or twice for most pilots. Pilots of turboprop and small jet aircraft were far more likely to remain airborne (56%) or divert (43%) than pilots of larger jet aircraft. It

was noted in the pilots' comments that crosswind in combination with low friction is a big factor in deciding whether to divert. Other weather conditions at the destination airport, such as visibility and freezing precipitation, often also influence the decision to divert the flight, or delay or cancel the flight prior to departure.



a) Remain Airborne Until the Runway had been Treated and Friction Improved

b) Diverted to Another Airport

Figure 2.12 Frequency of Pilot Choosing to Remain Airborne until Friction Improved or Divert to Another Airport

Reducing aircraft weight because of low runway friction was far less common than remaining airborne or diverting. Less than 4% of pilots indicated that they reduced landing weight while en route last winter because of low friction and most were pilots of turboprop and smaller jet aircraft. Reductions in landing weight are more often made prior to departure when reports of low friction values at the destination airport are available. About 15% of pilots indicated they had reduced the landing weight prior to departure last winter, the percentage being lowest for pilots of turboprop aircraft (6%). Five pilots commented that, rather than reduce weight, they delayed departure on receiving a low friction report from the destination airport. Four pilots said that they had cancelled flights in these situations last winter. Availability of friction information at the destination airport and concerns about the validity of the information at the time of arrival influence its use prior to departure.

Several pilots commented that reducing payloads for runway conditions is not acceptable to their management unless regulated.

Combining the above frequencies with information on the pilots' workload,[1] estimates can be made of the frequency of occurrence of remaining airborne until friction improved, reducing weight and diverting to another airport. These are presented in Table 2.1.

Table 2.1 Frequency of Occurrence of Flight Changes to Reduce Risks (per 1000 flights)

Flight change to reduce risks	Turbo-prop	Jet <41 tonne	Jet: Narrow-body	Jet: Wide-body	Overall
Remain airborne until runway improved	1.3	2.8	1.4	2.1	1.8
Divert to another airport	0.86	1.2	1.02	0.68	0.96
Reduce landing weight prior to departure	0.35	2.8	0.92	2.2	1.2
Reduce landing weight en route	0.04	0.26	0.17	0.06	0.13

2.4 Quality of Runway Friction Information in Canada

The pilots indicated that the runway friction information provided to them by the airports varies between airports and generally needs improvement. Figure 2.13 shows the percentage of pilots indicating that particular improvements are required. These percentages do not vary significantly between the types of aircraft flown by the pilots.

The area of biggest concern, noted by 79% of pilots, is the frequency with which the reports are updated. This problem appears to be greatest at small airports. One pilot mentioned that "airports will leave old CRFI published after the runway has changed significantly. This has resulted in overruns." Another said that "our system automatically deletes reports if not updated within a time period. Therefore the runway appears to be bare and dry." A number of pilots said that reports should be updated at least hourly, especially if conditions are changing. Many pilots feel that the runway reports are too old and that this limits their value.

[1] Reported number of departures or, if departures not given, estimated departures given hours flown and aircraft category.

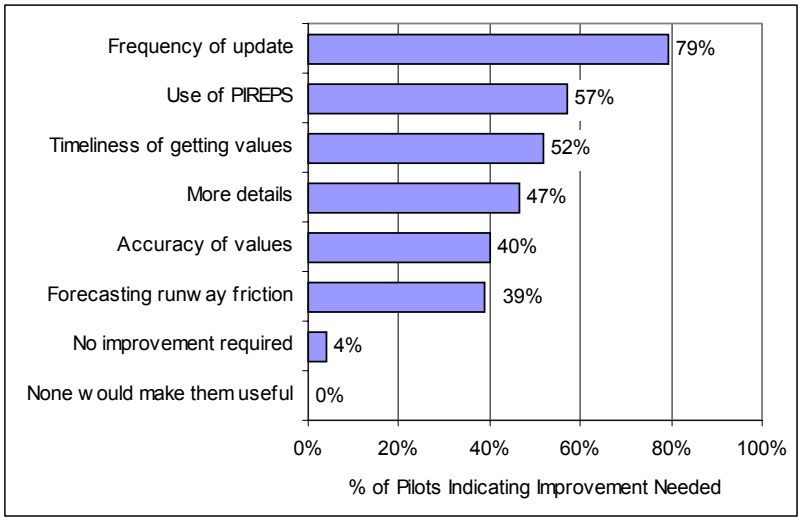


Figure 2.13 Aspects of Runway Friction Information Needing Improvement

Better use of PIREPS was indicated by 57% of pilots. The pilots see the PIREPS as "an excellent source of info", but note that "too often pilots do not make them", that their accuracy varies and that consistency in reported braking effectiveness needs to be improved. Several pilots noted that when providing an assessment of runway friction and/or braking action, the pilot should always include the aircraft type because braking effectiveness can vary significantly between aircraft types (e.g., Dash 8 and B767).

Improvement in the timeliness of getting reports was noted by 52% of pilots. A number of pilots suggested that reports be posted on the Automatic Terminal Information Service (ATIS) with frequent updates. One pilot suggested PIREPS be put on the ATIS if braking action is given as "fair" or less, while others suggested that it be added to the latest weather reports (METAR) to bring low CRFI to pilots' attention without having to specifically call up CRFI reports. Regarding format, one pilot commented: "need better reporting than a long ATIS message that is not easily copied." A suggested improvement to the format of runway surface condition reports was that they would be easier to read if each runway was reported on a separate line.

Almost half the pilots (47%) noted that they would like more details on the runway friction information. As noted by one pilot, "an overall CRFI is misleading. Need CRFI for touchdown and rollout as well as for turnoff to taxiway at runway exits." CRFI values on taxiways would also be useful if they were worse than the runway. Inclusion of data such as "snow over top of freezing rain" and the temperature of the runway (as

well as outside ambient temperature were also noted. Although many pilots asked for more detailed information, a number commented that the reports need to be "more brief", "more user friendly" and "standardized". If more detailed information is made available, presentation will be very important.

Improvements in accuracy of runway friction information were noted by 40% of pilots. Pilots commented they have been surprised how often runways with relatively good CRFI values were actually quite slippery and, vise versa, the number of times the CRFI value was low but braking action was good. These occurrences could be the result of a number of factors mentioned by the pilots, including: variation along and across runway, differences in braking under the same conditions between aircraft types, and changes in runway friction since CRFI was measured.

Almost 40% of pilots indicated that they see forecasting of runway friction (e.g., likely friction in 2 hours' time) as a needed improvement. Forecasting would be of use for flight planning so that adjustments to the load or departure time could be made prior to departure to better account for expected improvements or deterioration in the runway conditions on arrival. Several pilots indicated that even a forecast of the trend in the CRFI value would be helpful.

The availability of runway friction information to the pilot when required, as shown in Figure 2.14, could also be improved. Only 11% of pilots indicated that the information is always available when required, and over a quarter indicated it was only sometimes or rarely available.

A number of pilots mentioned that CRFI values are not provided for some contaminated runway conditions (e.g., slush). The runways are slippery in these conditions and they want some way of calculating crosswind limits and landing distances.

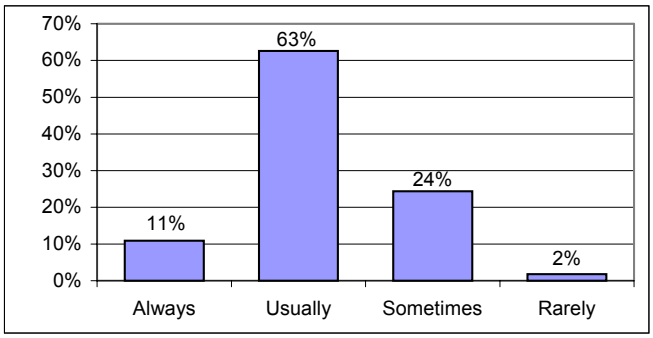


Figure 2.14 Availability of Runway Friction Information when Required

A small proportion of pilots (4%) indicated that they felt no improvement to the runway friction information was necessary, while all pilots agreed that, with the improvements suggested, the runway friction information would be useful and should be provided to the pilot. Despite the improvements discussed above, it should be noted that providing consistently accurate, up-to-date friction values is near-to-impossible and, as one pilot noted, "Canada leads the world in cold weather operations." This should not, however, prevent improvements being made, but should be taken into account when making use of the information.

Variation Between Airports

Almost two-thirds of pilots indicated that they find the quality of runway friction information varies between airports (see Figure 2.15). Half indicated that quality varies with the size of the airport, and almost all of those indicated that quality is better at larger/major airports. About 17% indicated that quality varies with the type of owner, and most of those indicated that quality is better at airports operated by TC than those operated by local airport authorities (LAAs) or municipalities. However, many of these pilots may not be aware of who operates the airport. Most of the pilots indicating that TC-operated airports are better also indicated that large airports are better; however, all the largest airports are now operated by LAAs. When asked whether they felt quality varied by region, 17% of pilots indicated that it does, but there was no clear trend in their responses as to which region(s) were the best.

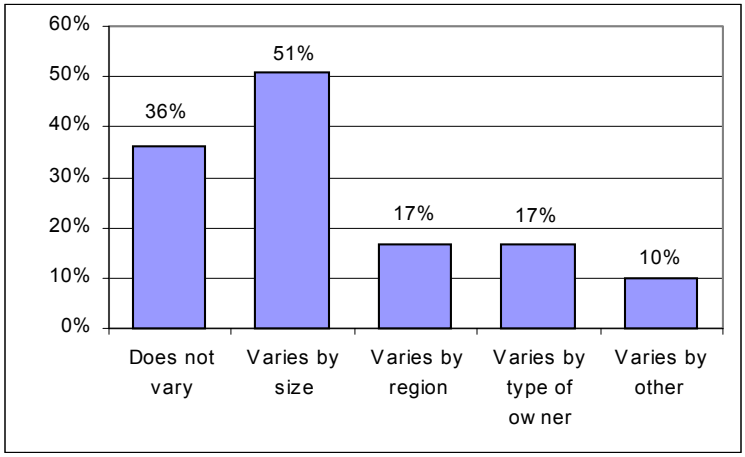


Figure 2.15 Variation of Runway Friction Information Between Airports

Some generalizations can be made, but based on the comments made by pilots, each airport is different. Characteristics affecting the quality noted by pilots included:

- hours runway maintenance staff are available at the airport;
- level of funding provided (affects equipment, training, staffing, etc.);
- how proactive local airport staff are at updating CRFI values; and
- whether airport has a control tower (those without tend to leave old CRFI reports in effect).

One pilot noted that "smaller (low budget) airports often take CRFI measurements just prior to arrival making it difficult to plan and prepare in advance", and another requested that "small airports get CRFI out earlier in the morning."

2.5 Training

The frequency with which pilots receive training on the use of runway friction values varies greatly by the type of aircraft they fly. Figure 2.16 presents the percentages of pilots indicating that they have received training in the past 12 months and the percentages that have never received training. Almost all the pilots of the smaller regional jets have received training, most in the last 12 months. In contrast, around a quarter of the pilots of the larger jets have never received any training on the use of runway friction values.

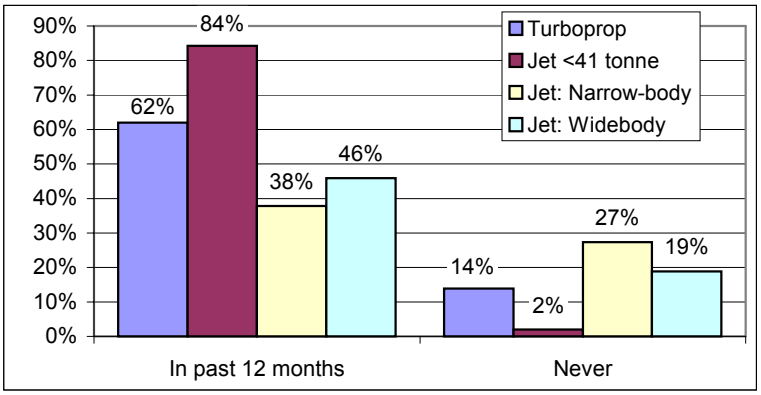


Figure 2.16 Period Since Last Receiving Training on Use of Runway Friction Information

Of those that have received training, 20% felt that the training they received covered the use of runway friction "poorly". The most common concern raised by the pilots was the format of the runway friction

material and charts, which makes them confusing and difficult to use. They indicated that the CRFI charts need to be company- and aircraft-specific – this would greatly simplify their use and eliminate the need to jump from one chart to another. It would also allow pilots to become conversant with their use in the limited training time available. Availability of information on accelerate-stop distance on a rejected take-off and training on its use was mentioned by a number of pilots. Suggestions for specific types of improvements to the training included:

- more practical lectures, working through more examples;
- spending more time on the subject so it can be covered in more detail;
- better training of the instructors;
- more contamination scenarios during recurrent and simulator training; and
- better explanations (e.g., of effect of temperature on CRFI).

A number of pilots mentioned that training on the use of CRFI values should be covered as part of annual recurrent training. One pilot suggested that the winter simulation session should have an extensive briefing on procedures for runway contamination and low friction, including examples, along with aircraft handling techniques.

2.6 Frequency of Safety Concerns

Pilots were asked to indicate how often they have experienced loss of control when landing on a runway that was icy or covered with compacted snow. Figure 2.17 shows the frequency with which pilots felt that braking was significantly reduced. Most pilots (90%) experienced significant loss of braking on landings last winter, typically between one and five times. Pilots of turboprop and small jet aircraft experienced these situations more often than pilots of larger jet aircraft, partly because of the greater number of landings they perform.

Figure 2.18 presents the frequency with which pilots indicated that their aircraft slipped sideways due to crosswinds while landing on low friction runways last winter. Occurrences of slipping sideways occurred much more frequently for pilots of smaller aircraft than for pilots of larger aircraft. Occurrences of the aircraft slipping sideways were much less frequent than occurrences of significant reductions in braking, especially for larger jet aircraft.

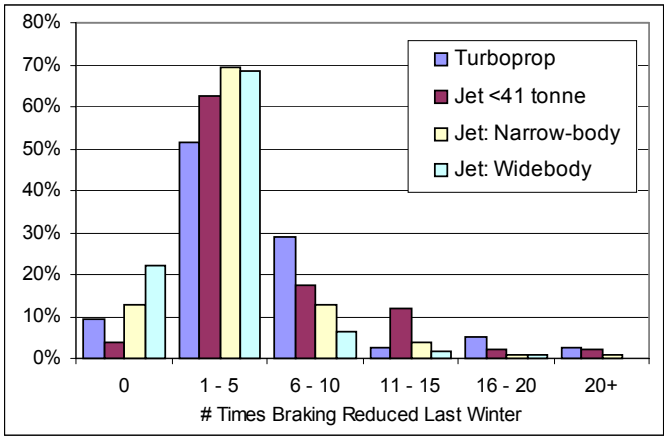


Figure 2.17 Frequency with which Pilots Indicated Braking Was Significantly Reduced on Landing

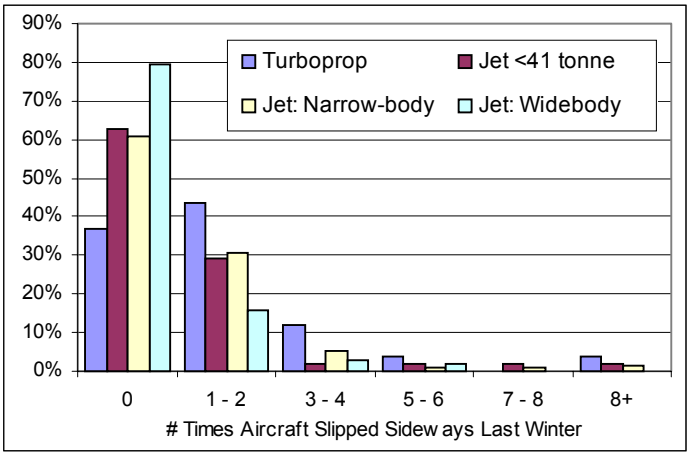


Figure 2.18 Frequency with which Pilots Indicated Aircraft Slipped Sideways while Landing

Ten percent of pilots indicated that on at least one occasion while landing last winter they were close to not being able to stop on the available runway. For most of these pilots (85%), this occurred once last winter. A small number of the pilots responding to the survey (2%) had experienced situations in the previous five years where their aircraft had run off the side or end of the runway because the runway was slippery. Several pilots commented that they had slipped sideways many times on taxiways.

The numbers of incidents reported by the pilots, given above, were combined with their reported numbers of flights to estimate the frequency of occurrence of these safety concerns. The estimates are provided in Table 2.2. When the frequencies of landings are taken into

account, the likelihood of these types of occurrences are similar for the different categories of aircraft. The pilots' experiences clearly indicate that low runway friction does lead to numerous safety concerns in current operations despite the small number of accidents that have occurred in recent years.

Table 2.2 Frequency of Occurrence per 1000 flights of Safety Concerns on Landing

Safety Concern	Turbo-prop	Jet <41 tonne	Jet: Narrow-body	Jet: Wide-body	Total
Braking significantly reduced	9.4	11.2	12.5	17.3	11.7
Slipped sideways due to Xwinds	2.8	1.7	3.8	2.7	2.9
Close to not stopping on runway	0.18	0.53	0.47	0.37	0.36
Ran off side or end of runway	0.02*	0.01*	0.01*	0.03*	0.015

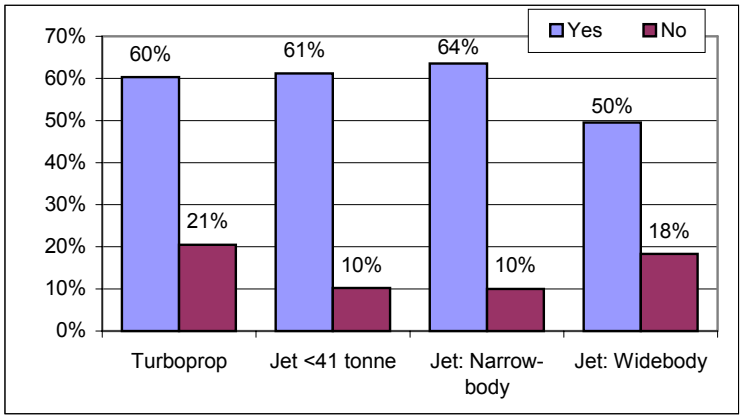
* Very approximate as they are based on small number of incidents

2.7 Improvements in the Use of Runway Friction Information

The majority of pilots (60%) feel that the runway friction information currently provided by airports could be better used, while about 15% indicated that it could not (see Figure 2.19). Many of those indicating that better use could be made commented on improvements required to the data rather than improvements to uses of the data. Comments regarding the improvements in the use of the data included the following:

- Data should be used for determining take-off performance (charts required).
- Charts must be simple and easy-to-use, suitable for quick reference.
- Runway friction information should be better correlated with aircraft performance data, especially for turboprop aircraft.
- Distribution of information should be improved, possibly regular CRFI updates on ATIS or METAR reports, and relevant PIREPS included.
- There should be more standardization, both of reporting runway friction and use of data.

A typical sentiment of those indicating that better use could not be made is that CRFI is only one piece of information to be considered and its current usage is adequate given its accuracy.



Note: % indicating "No opinion" not shown

Figure 2.19 Pilots Indicating Better Use Could be Made of Runway Friction Information Currently Provided by Airport

Pilots were asked whether they would like to see CRFI values used specifically in the calculation of allowed landing weights and, if so, whether in the AOM or guidance material. The results are summarized in Figure 2.20. Almost 80% of pilots indicated they would like CRFI values to be used in the landing calculations. However, the pilots were split evenly between including them in the AOM or in guidance material. Many pilots favouring the AOM commented that they like to see "firm limitations". One pilot noted that even though he favours this option, "do you believe that Boeing and Airbus are going to come up with these charts? Never. So, Transport has to do it with a Falcon 20." Whether the charts are included in the AOM or guidance material, the pilots favour having them specific to their aircraft type.

Many of the pilots favouring use of guidance material commented that "there are too many variables" and therefore guidelines that recommend landing distances/weights and leave some flexibility to the pilot are better. They note that CRFI values will have to become more consistent and reliable before they are used for setting allowed landing distances. Those pilots indicating they would not like to see CRFI values used to set allowed landing weights commented that the data is not accurate enough and should be used for guidance only.

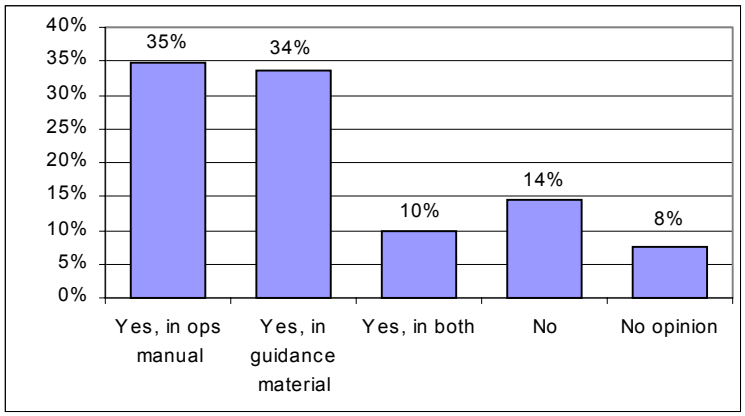


Figure 2.20 Pilots Indicating CRFI Values Should be Used Specifically in the Calculation of Allowed Take-off Weights

The major concern expressed by pilots favouring inclusion of the use of CRFI to determine allowable landing weights in the AOM was the adverse effect on operations (delayed flights, cancellations, etc.) and the costs to the airlines. Use of the CRFI values in this way could "become very operationally restrictive when conditions don't warrant such restrictions."

Of pilots favouring inclusion in guidance material, a common concern was the accuracy of CRFI values and the effect inaccurate values would have on their operations. Provided the adjusted landing distances are only recommendations and the final decision is with the pilot-in-charge, many pilots saw no problem with using the CRFI value. Problems with use in this way noted in the survey included the possible lack of use of the material if it is not a requirement, misuse by inexperienced pilots and economically penalizing those operators who take a more conservative, safety conscious approach.

Other Uses of Runway Friction Information

The most frequently mentioned other use of the CRFI values was for use in calculating accelerate-stop distances and/or V1 reduction for take-offs. Ten percent of pilots suggested this use of the CRFI in this way without any prompting by the question. As noted earlier, many pilots do not have access to any material for adjusting take-off distances for runway friction and there is a need for this type of guidance material.

Several pilots mentioned that issues associated with runway friction under other contaminated runway conditions (wet, snow, slush, standing water) also need to be addressed. Several suggested that the CRFI be used to set a minimum acceptable friction level, below which the airport would be closed.

3. SUMMARY OF FINDINGS

The major findings on the availability and quality of runway friction information in Canada and its use by commercial pilots are summarized below.

- Most commercial pilots (95%) in Canada are aware of guidance material for operating on slippery runways.
- Most pilots (85%) have guidance material available to determine landing distances and crosswind limits when runways are slippery, although some of this material does not specifically use runway friction values such as CRFI or JBI.
- Many pilots lack guidance material for determining accelerate-stop distances and adjustments to V1/VR, and would like to have this material available to them.
- Most pilots find the guidance material very useful and make use of it when runway and crosswind conditions warrant. However, many do not consult the charts each time and often rely on experience in similar conditions.
- Pilots find that the current format of the guidance material makes it confusing and difficult to use. They would like the material to be presented in simple, easy-to-use lookup charts specific for each aircraft type in the company's fleet.
- Most pilots monitor the runway friction values closely, but do not consider it the only source of information on runway slipperiness. Many consider PIREPS to be as good a source of information, or better, and would like to see greater use made of PIREPS. However, the consistency in the levels of braking effectiveness reported in PIREPS could be improved and the aircraft type should be included in the report.
- For landings on runways that are icy or covered with compacted snow, most pilots apply the 15% increase in landing distances, which is a requirement for many aircraft on wet runways, or a greater factor. However, 20% of pilots do not apply an adjustment. About 5% of pilots indicated the 15% adjustment is a requirement for their aircraft on wet runways, but that they don't apply it, or a greater factor, on icy/compacted snow runways where it is not a requirement.
- Pilots adjust their procedures when landing on slippery runways to reduce the risks. Actions included: "firm" touchdown (don't float), applying reverse thrust aggressively and quickly, using a higher

autobrake setting and applying autobrake quickly, using high landing flap settings, and ensuring airspeed is not above VREF.

- Pilots currently adjust their flight plans to account for slippery runways. Last winter, about half the pilots either remained airborne until runway friction improved, or diverted to another airport because of low runway friction. Reductions in weight prior to take-off or while en route were far less common.
- Pilots indicated that the quality of runway friction information provided by airports varies between airports. Generally the quality is better at large airports, but each airport differs depending on various factors.
- Pilots indicated that improvements are needed to the runway friction information provided by the airports. Friction values need to be updated more frequently, particularly at small airports, and steps taken to ensure out-of-date values do not result in unnecessary risks. The timeliness with which information is distributed is a concern; improvements in the methods of distributing the information quickly and alerting pilots of low runway friction should be investigated, possibly through the use of ATIS. Accuracy of CRFI is also a concern, although perceived inaccuracies could be the result of variability along and across the runway, changes in friction since the last measurement, or differences in braking under the same conditions between aircraft types.
- Training for accounting for low runway friction needs improvement for many pilots. Over 20% of pilots of large jet aircraft have not received any formal training on the use of runway friction information, and only half have received training in the last 12 months. Of those that received training, 20% indicated that training on the use of runway friction values was covered "poorly". Many indicated that the format of the material is too complicated to be covered in the short time allotted.
- Despite the low number of accidents in recent years due to slippery runways, pilots report frequent occurrences of safety concerns such as significantly reduced braking (12 per 1000 landings), slipping sideways due to crosswinds (3 per 1000 landings) and being close to not stopping on the runway (0.4 per 1000 landings).
- The majority of pilots feel that the current runway friction information could be better used.
- Most pilots would like to see CRFI values used in determining landing distances/weights. Pilots are split on whether to include the procedures in aircraft operating manuals or as guidance material. Either way, the charts must be simple, easy-to-use and type-specific.

- Although there is significant variation between pilots, the large majority feel the landing distances/weights determined using the CRFI values should be recommended values only, and that flexibility should be allowed for pilots to take into account other information. Generally, they feel that the CRFI values available to them at present are not accurate enough for their use in setting maximum allowed landing weights.

APPENDIX A

SURVEY QUESTIONNAIRE

AIR LINE PILOTS ASSOCIATION, INTERNATIONAL CANADA
180 ATTWELL DRIVE, SUITE 200 □ TORONTO, ONTARIO M9W 6A9 □ 416-679-8210
FAX 416-679-8212

July 12, 2001

TO: ALL ALPA MEMBERS IN CANADA

Transport Canada, in association with the FAA, NASA and NRC, implemented a 5-year program for winter runway friction testing in 1995. The program expanded to include other North American and European organizations and has become a concerted international effort which is known as the Joint Winter Runway Friction Measurement Program (JWRFMP). The program has led to the collection of a substantial database of aircraft and ground vehicle friction measurement data from various runways and to the development of a greater understanding of the factors affecting runway friction, its measurement and the relationship between runway friction and aircraft braking.

With this improved knowledge of runway friction, Transport Canada is looking at better utilizing runway friction information in practice to reduce the risks and possibly operating costs. The types of changes being considered relate to:

- the standardized reporting of runway friction in Aerodrome Standards;
- the provision of material relating to aircraft braking coefficients to take-off and landing performance in the Aircraft Flight Manual; and
- the use of runway friction information in Operating Standards for Commercial Aviation.

Changes related to accountability for contaminated runways have been very slow in coming, especially in North America.

Transport Canada has approached Sypher:Mueller International Inc. to conduct an analysis of the risk reductions, costs and benefits of accounting for runway friction on take-off and landing. It has become evident that the views of pilots on this matter and the current availability and use of guidance material on wet and contaminated runways are very important and should be included in the study. Transport Canada was very impressed with the results of the survey of clean wing inspection and de/anti-icing issues that Sypher:Mueller conducted with your input and assistance in 1996 and would like to conduct a survey as part of the current study.

ALPA supports Transport Canada's efforts and would encourage all ALPA pilots in Canada to complete and return the enclosed questionnaire in a timely fashion. ALPA will be provided with a report summarizing the results and including results tables and all pilots' comments.

Yours truly,

Captain Bob Perkins
Air Safety Coordinator, Canada

Appendix A: Survey Questionnaire

RUNWAY FRICTION ACCOUNTABILITY RISK ASSESSMENT

QUESTIONNAIRE

The subject of accountability of runway conditions on take-off and landing has been the subject of intense study and debate for many years. Current Transport Canada (TC) and US (FAA) regulations require an additional 15% runway length for landing when the destination runway is forecast to be wet at the time the aircraft is dispatched. For take-off, accountability for wet runways and guidance material for contaminated runway conditions are required for newly certified aircraft.

Airports measure the runway friction using standardized methods across Canada and reported it using the Canadian Runway Friction Index (CRFI). However, the Canadian regulations and guidance material do not provide the pilot with the necessary information to make full use of the CRFI values. Is there a direct correlation between the friction measure (CRFI) and stopping performance? Could the CRFI values be better used to improve safety?

TC, in association with the National Research Council Canada (NRC), US and European organizations, has been conducting the Joint Winter Runway Friction Program in North Bay since 1995 to try to answer these types of questions. The program has led to the collection of a substantial database of aircraft and ground vehicle friction measurement data, and to the development of a greater understanding of the factors affecting runway friction, its measurement, and the relationship between runway friction and aircraft braking. For slippery runways (compacted snow or ice contamination with shallow contaminant depth and therefore very little or no contaminant drag), the runway friction measurements were found to be consistent and have a high correlation with aircraft braking.

With this improved knowledge of runway friction, Transport Canada is looking at better utilizing runway friction information in practice to reduce the risks and possibly operating costs. Transport Canada feels that it is important to obtain the views of pilots on this issue before proceeding with any changes. This survey is intended to provide that feedback.

Purpose of the Questionnaire

- To better understand how guidance material for operating on slippery runways is being used
- To obtain feedback on the perceived risks of slippery runways and the need for additional measures to reduce the risks and the preferred form of those measures
- To obtain information for use in evaluating the reduction in risks due to specific measures

How You Can Assist

Within this background, your input is being requested by means of the attached questionnaire. The questionnaire has been reviewed by the Air Line Pilots Association, International (ALPA), the Air Canada Pilots Association (ACPA), the Air Transport Association of Canada (ATAC), the Canadian Federal Pilots Association (CFPA) and TC, and is being distributed by the pilot associations on behalf of Transport Canada.

Please do not identify yourself or your employer

Please insert the completed questionnaire in the pre-paid business reply envelop in which you received the questionnaire and post by Sep 7, 2001. Thank you very much for your assistance

A. GENERAL

A1. Do you feel comfortable with the current regulations concerning take-off and landing on icy and compacted snow covered runways?

❑ Greatly ❑ Moderately ❑ A little ❑ No effect ❑ No opinion

Comment:_____

_____

B. GUIDANCE MATERIAL

B1. Are you aware of guidance material for operating on slippery (contaminated) runways for your aircraft? ❑ Yes ❑ No

If no, go to Section C.

B2. Where did you obtain this guidance material: *(tick all that apply)*

❑ Aircraft operating manual
❑ Other company material
❑ Transport Canada (A.I.P, Advisory Circulars, etc.)
❑ Other, please specify: _____

B3. Does the guidance material:

a) Specifically refer to the runway friction (CRFI) value? ❑ Yes ❑ No ❑ Don't know

b) Outline how to determine, for a given CRFI value, the:
(i) landing distance? ❑ Yes ❑ No ❑ Don't know
(ii) cross-wind limits? ❑ Yes ❑ No ❑ Don't know

c) Outline how to adjust allowed take-off weight for given runway friction information? ❑ Yes ❑ No ❑ Don't know

d) Give other measures or actions to take to reduce the risks when runway friction values are low? ❑ Yes ❑ No ❑ Don't know

_____

_____

B4. Do you make use of the guidance material:

a) For take-off: ❑ Always ❑ Usually ❑ Sometimes ❑ Rarely ❑ Never

b) For landing: ❑ Always ❑ Usually ❑ Sometimes ❑ Rarely ❑ Never

If not always, please give reasons and any decision criteria for its use:_____

_____

_____

B5. How useful do you find the guidance material?

❑ Extremely useful ❑ Very useful ❑ Of little use ❑ Of no use ❑ Don't know

How could it be improved?_____

_____

C. YOUR USE OF RUNWAY FRICTION INFORMATION

C1. How important is the runway friction information to you?

- ❑ Very important – critical element and often make adjustments due to the value
- ❑ Important – monitor closely and occasionally make adjustments due to the value
- ❑ Low importance – make little use of it, rely mostly on type & depth of contamination
- ❑ Do not use

Comment:_____

_____

C2. How do you make use of the runway friction (CRFI) values provided by the airport?

- ❑ Use in determining landing weights and/or distances *(tick all that apply)*
- ❑ Use in determining cross-wind limits
- ❑ Use in determining take-off weights and/or distances
- ❑ Adjust actions to reduce associated risks
- ❑ Don't use friction values – Please give reasons why?

_____

_____

_____

C3. Regarding the procedure of increasing landing distance by 15% for landing on wet runways:

a)	Is this a requirement for your aircraft type?	❑ Yes	❑ No
	<u>If not a requirement</u>, do you apply it anyway?	❑ Yes	❑ No
b)	Do you apply it for landing on runways that are icy or covered with compacted snow?	❑ Yes	❑ No
c)	Do you ever apply a greater factor for landing on runways that are icy or covered with compact snow? If yes, elaborate:	❑ Yes	❑ No

Comment:_____

_____

C4. If a low runway friction value is reported for the arrival runway, do you: *(tick all that apply)*

- ❑ Re-calculate the runway distance required based on the friction value (while enroute)
- ❑ Adjust the glide slope
- ❑ Ensure that the aeroplane touches down close to the threshold
- ❑ If anti-skid equipped, apply the wheel breaks quickly
- ❑ Apply the reverse thrust aggressively and air brakes quickly
- ❑ Other action, please specify:

Comment:_____

_____

_____

C5. How many times during the last winter did you, due primarily to a low friction report:

a) Remain airborne until the runway had been treated and friction improved? _____

b) Reduce landing weight (i) prior to departure? _____ and (ii) enroute? _____

c) Divert to another airport? _____

Comment:_____

_____

D. QUALITY OF RUNWAY FRICTION INFORMATION IN CANADA

D1. Are the runway friction (CRFI) values available to you when required:

❑ Always ❑ Usually ❑ Sometimes ❑ Rarely ❑ No opinion

D2. What aspects of the current runway friction information need improvement? *(tick all that apply)*

❑ Timeliness of getting values to pilot (e.g., delay between measurement & pilot receiving it)

❑ Frequency of update (e.g., if last measurement taken hours ago)

❑ Accuracy of values (e.g., even if just measured, it does not reflect how slippery the runway is)

❑ More details (e.g., provide values for each third of the runway)

❑ Forecasting of runway friction (e.g., forecast likely CRFI in 2 hours time)

❑ Use of pilot reports on slippery runways

❑ No improvement required

❑ None of the above improvements would make them useful – please explain

Comment:_____

_____

D3. Does the quality of runway friction information vary between airports? If yes, in what way:

❑ No - quality does not vary *(tick all that apply)*

❑ Varies by size of airport, which is better: _____

❑ Varies by region, which are better: _____

❑ Varies by type of owner (TC/Local authority), which is better: _____

❑ Varies by other characteristic, please specify: _____

Comment:_____

_____

E. TRAINING

E1. When did you last receive training specifically on the use of runway friction values?

❑ In last 12 months ❑ Over 12 months ago ❑ Never

E2. If you received training, In your opinion, how well was the use of runway friction values, specifically, covered in your last training course?

❑ Very well ❑ Well ❑ Adequately ❑ Poorly ❑ No opinion

Comment on how could it be improved?:_____

_____

_____

F. FREQUENCY OF SAFETY CONCERNS

F1. In the time period given, how often did you experience situations when landing on a runway that was icy or covered with compacted snow where you felt that the aircraft:

a) braking was significantly reduced? (last 12 months)_____

b) was slipping sideways due to cross-winds (last 12 months)_____

c) was close to not stopping on the available runway? (last 12 months)_____

d) ran off the side or end of the runway? (last 5 years) _____

G. IMPROVEMENTS

G1. Do you feel that the runway friction information currently provided by the airport could be better used?

❑ Yes ❑ No ❑ No opinion

Comment:_____

_____

_____

G2. Would you like to see runway friction (CRFI) values used specifically in calculation of allowed landing weights?

❑ Yes, in ops manual ❑ Yes, in guidance material ❑ No ❑ No opinion

Comment:_____

_____

_____

G3. What problems do you foresee with their use in this way?

_____

_____

G4. Are there other ways you like to see the runway friction (CFRI) values used?

_____

_____

H. PILOT EXPERIENCE

H1. Please indicate the configuration of aircraft you currently fly:

❑ Turboprop ❑ Jet under 90,000 lb (41 t) ❑ Narrow-body Jet ❑ Wide-body Jet

H2. How frequently do you fly: number of departures per year _____

number of hour flown per year _____ hours

H3. How many years have you been a commercial pilot? _____ years

Please insert the completed questionnaire in the pre-paid business reply envelop in which you received the questionnaire and post by Sep 7, 2001. Thank you very much for your assistance

APPENDIX B

DETAILED SURVEY RESULTS

A. GENERAL

A1. Do you feel comfortable with the current regulations concerning take-off and landing on icy and compacted snow covered runways?

		Configuration of aircraft you currently fly:				
		Turboprop	Jet under 90,000 lb (41 t)	Narrow-body jet	Widebody jet	Total
Do you feel comfortable with the current TO & landing regulations for icy/compact snow runways?	Greatly	8	4	8	19	39
		10.1%	7.8%	5.8%	17.8%	10.4%
	Moderately	39	32	68	53	192
		49.4%	62.7%	49.3%	49.5%	51.2%
	A little	26	15	51	27	119
		32.9%	29.4%	37.0%	25.2%	31.7%
	No effect	5		5	6	16
		6.3%		3.6%	5.6%	4.3%
	No opinion	1		6	2	9
		1.3%		4.3%	1.9%	2.4%
Total		79	51	138	107	375
		100.0%	100.0%	100.0%	100.0%	100.0%

Comments:

Greatly - After 22 yrs of airline flying, I have always been comfortable with these regs. The final decision always rests with the Captain and my airline supports this.

Greatly - Don't need excessive regulatory interference in operation of aircraft, ie. government reaction to Dryden

Greatly - Experience is the most important regulation that you can use for safety plus existing regulations.

Greatly - No requirements for JBI on take-off acceleration-stop distance

Greatly - The current regulations are very conservative

Greatly - This is little concern most flights

Moderately - Airport operator should be faster to apply urea and have bigger equipment to spread the product on a wider track than just the width of the gears!

Moderately - At major airports - yes. I suspect the accuracy or maintenance of runways at smaller airports

Moderately - ATC or Airport Authority will not close an airport/runway when several a/c have reported zero braking. I think they should

Moderately - Ça demande beaucoup de discipline car je trouve que c'est très complexe la manière que c'est présenté

Moderately - C'est moins précis en régions

Moderately - Crainte d'une application trop arbitraire

Moderately - Currently RFI info can only be applied to landing for the a/c I operate. I would like to be able to apply this info to accelerate, stop distance

Moderately - Greater frequency of surface testing would be helpful.

Moderately - I am moderately comfortable when it comes to landing; however, since we have no regulations concerning take-off, I am not comfortable

Moderately - I feel that the available info, while good, is incomplete, therefore some unknown risks remain.

Moderately - I have a feeling that both regulatory authorities and science folks still do not fully understand extreme conditions.

Moderately - I think the restriction "do not take off on an icy runway" should be identified a lot more boldly, and the definition of icy runway made more clear

Moderately - I use X-wind info all the time - T/O & landing. But T/O info not yet addressed on CRFI. Landing charts very good.

Moderately - I would like to see more (some) regulation concerning take-off on icy and compacted snow covered runways.

Moderately - I'm comfortable with what's available when considering A/C type and areas of operation.

Moderately - It appears that, specially at some airports, the rwy contamination reports are not accurate because they are not updated.

Moderately - J'ai des réserves tant à la qualité de nettoyage de la piste part forts rents.

Moderately - La réglementation actuelle est confuse et difficile d'application.

Moderately - L'appareil que je pilote ne possède pas beaucoup d'information graphyque concernant les indices de freinage.

Moderately - Material is considered advisory only (CRFI)

Moderately - More Regulations will not change bad Airmanship choices

Moderately - Need more information for take-off

Moderately - Need to know a cut off number where a runway condition is unacceptable.

Moderately - New Airport Authority's are not spend enough effort on doing the job properly

Moderately - No performance info for take-off our a/c in AFM, or SOP. Up to pilots to set limits for take-offs.

Moderately - Not at all up weight for departure

Moderately - OK for Canada but one international (ICAO) RFI system would be better

Moderately - Our company requires more info so we can start doing reduced V1 take-offs

Moderately - Require strict(er) guidelines or possibly strict(er) requirements for airports to maintain equipment & provide timely reports

Moderately - Rules for dispatch are fine. I'm not too happy about lack of guidance for t/o accelerate/stop distance on contaminated runway

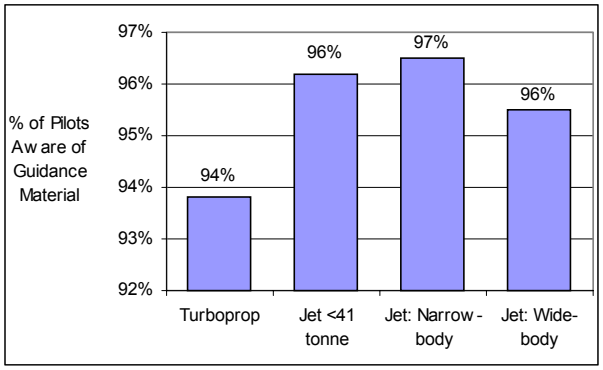
Moderately - There are little to no guidelines for take-off

Moderately - There is a big difference between wet snow and dry snow in braking distance. If its wet enough to make a snow ball it should be classified as slush.
Moderately - There is a lack of information on contaminated runways.
Moderately - We fly a lot of Dash 8 in Canada; I would like you to pass on the data on Dash 8 to Air Nova, Air Canada Regional
Moderately - We need charts that correlate accelerate stop distance with CRFI
Moderately - Would like more aircraft specific data - otherwise rely on experience.
A little - Aircraft certified under old criteria should be updated to current standard
A little - At best data covers best case scenarios. Reality is often little different.
A little - CRFI is useless. The old system JBI was much superior
A little - Coastal B.C. ie. YVR-YZP are terrible
A little - Except for the 15% factor, which isn't restricting to 99% of all landings, I don't know of any regulations
A little - For Fokker 28 - No data on reducing GTOW
A little - Have a problem with runway conditions if no runway or FSS info is available upon arrival (Facility closed - after hrs.)
A little - I am expected to operate in areas close (including outside but near tolerance) to published "recommended" or "suggested" limits, but will be held accountable and faulted for a failure to exercise sound judgment in case of a poor outcome.
A little - I find guidance on V1 reduction/weight restrictions too general when determining take-off requirements. Furthermore, company data does not directly correlate with CRFI values or even suggest equivalents.
A little - I find the reg is vague and leave too much room for interpretation
A little - Icy runways cause the greatest concern - don't feel there is any really good indication for braking effectiveness on ice - cold ice, warm ice, wet ice, crosswind, patchy - all questions that greatly affect braking efficiency.
A little - Landing data is well documented. Take-off data is limited - it doesn't take CRFI nor obstacle clearance into account.
A little - More accurate reporting, more frequent reporting and more accountability required, particularly during changes in weather condo.
A little - More info required from manufacturers regarding low CRFI take-offs
A little - Most regional airports lack support for runway conditions early morning or late night.
A little - Need more info about CRFI and how it relates to JBI for rejected T/O distances. Low CRFI values .2 and below
A little - Need more update conditions and PIREPS without asking
A little - Never read the regulation (or CARS)
A little - No charts, graphs nor tables show accel/stop or balance fields length
A little - No definitive rule whether to go or not.
A little - No guidance for accelerate/stop on T/O
A little - No report for icy runway, ie. how much extra distance will be required
A little - Not always accurate or updated.
A little - Only a little since you shouldn't rely on these things without taking all other factors into account
A little - Operationally, it is very much a pilot call as to conditions. Regulations may be a disemboweling call if the landing has gone wrong.
A little - Pilots need proper up to date information to be able to make the decision to take-off land.
A little - Put CRFI, JBI, MU into one simple chart
A little - Reduced VI procedure is not used as much as it should be; not only contaminated runways but on wet runways as well
A little - Regulations are insufficient
A little - Reject near V1 on contaminated runway would result in high speed departure off the end of the runway
A little - Take-off regulations are poor.
A little - The decision of IF and HOW to operate on contaminated runways should always rest on the flight deck. A simpler presentation of information would be appropriate
A little - The runway friction reported (especially on Canada's east coast airports) is often wrong. Typically the rwy is in worse condition than reported.
A little - The transition from JBI to CRFI has been poorly handled with lack of info from D.T.
A little - These are not regulations, it is guidance material; that is until you have an incident or accident and then T.C. and the lawyers, will and do treat it as law!
A little - Too difficult to use when workload high
A little - Too vague. Should be more cut & dry on if you should attempt an approach
A little - Updates not current enough.
A little - Very difficult to regulate this. What we need is more useful information for pilots to make decisions
A little - Very little info on take-off
A little - Very uncomfortable
A little - We don't look at them often
A little - We have no data for use on take-off
A little - What regulations concerning T/O on icy runways? CRFI (for older A/C)

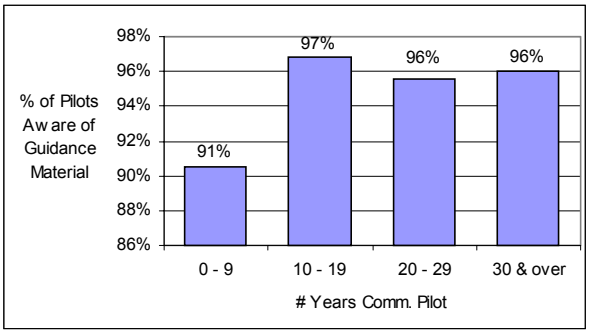
A little - When runways are contaminated readings are not taken often enough to reflect current conditions.
A little - Worldwide uniformity of units (CRFI/RCR/JBI) would help a great deal.
A little - Would like more info on R.T.O. performance figures
No - Aircraft limitations not regulations
No - Considered to be for operational guidance only.
No - I fly an aircraft certified before 1995, so I am not covered by take-off limitations
No - Present info is vague and has little or no correlation to our performance manuals
No - What are you asking?
No opinion - Ultimately at Captain's discretion

B. GUIDANCE MATERIAL

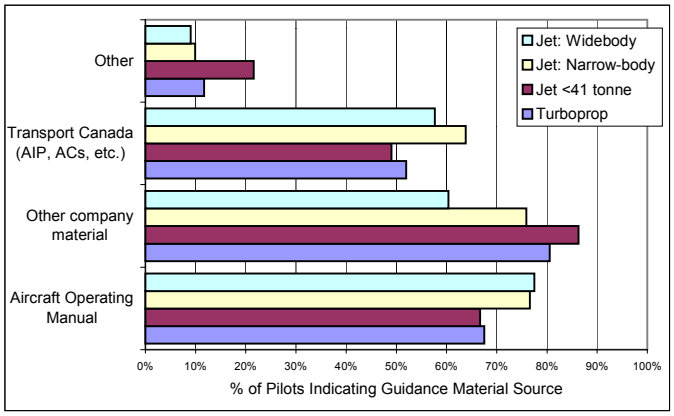
B1. Are you aware of guidance material for operating on slippery (contaminated) runways for your aircraft?



[Valid responses: 391, Missing 2]



B2. Where did you obtain this guidance material:

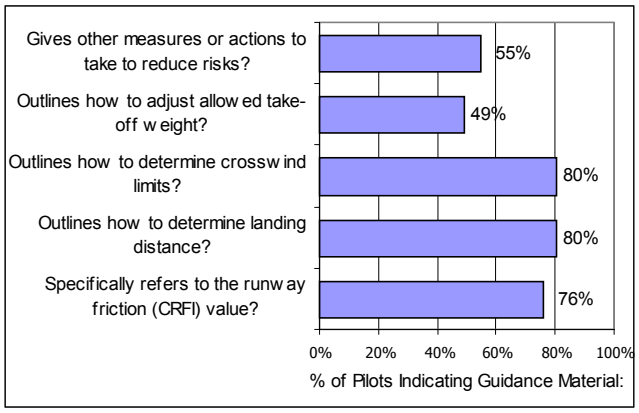


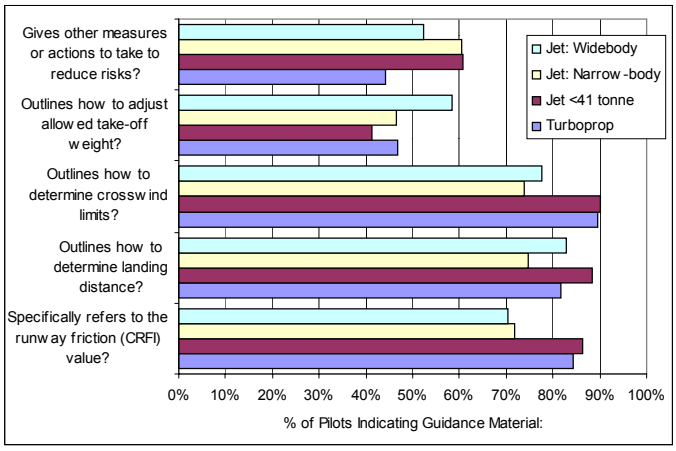
[Valid responses: 380]

Comments made to prompt: *Other, please specify*:
580 supplement & company WAT data
A.O.M.
Aircraft manufacturer's material
Aircraft material
Any article written on subject
Association Safety Material/Magazines
Aviation journals/magazines
Boeing Articles
Boeing Flight Training Manual - QRH
Canada Flight Supplement
Canadian Forces info (437 T SQW)
Company Bulletins
Company chart
Cours donné par la compagnie
Experience on type & rwy surfaces
FAA info
Flight Safety Pubs
Flight supplement
Friends experience
Industry & Association publications
Jeppesen
Jeppesen
Jeppesen
Jeppesen
Jeppesen Airway Manual
Jeppesen friction tables
Jeppesen Manual
Jeppesen/CRFI Landing Distance table
JEPRESSON Charts
Magazines
PIREPS
Post Company charts
Previous employer airline

Professional pilot magazine (Article provided by our safety rep)
Professional pilot magazines + other monthly aviation magazines
Refresher
Route manual supplement
Route manual
Runway surface analysis chart
SPL Publications & Aviation Magazines
Union Circulars/Publications; Other Aviation Publications

B3. Types of Information given in the guidance material:





[Valid responses: 381]

Comments:

(response to each question, Y=Yes, N=No and __= don't know/no response, is given in order prior to comment)

_,_,_,_,_ - For the above it is not user friendly.
Y,Y,Y,_,N - Aucune info pour décollage interompu.
Y,Y,Y,Y,_ - Need more definitive info for specified rwy conditions.
Y,Y,Y,Y,_ - PIREPS, experience, drive (in a car) on the runway
Y,Y,Y,Y,Y -
Y,Y,Y,Y,Y - A "clear cut" go/no go chart for each aircraft type & runway conditions.
Y,Y,Y,Y,Y - B3a Transport Canada (yes); All other manuals (no)
Y,Y,Y,Y,Y - e) Reduce weight is only advised option
Y,Y,Y,Y,Y - Give me a % increase that I can use when I go to my landing/to charts
Y,Y,Y,Y,Y - In my opinion, all values tabulated at best a guess.
Y,Y,Y,Y,Y - Material given by airline without the support of standard training application and usage is not standard
Y,Y,Y,Y,Y - Most info refers to landing distance only. Numbers for T/O dist, accelerate stop etc. need to be improved.
Y,Y,Y,Y,Y - Reduce V1 on take-off.
Y,Y,Y,Y,Y - Reduce VI procedures
Y,Y,Y,Y,Y - Reduces V1 speeds - Max thrust (no derated T/O's)
Y,Y,Y,Y,Y - Some of this info is very basic and not Aircraft Specific except Boeing info.
Y,Y,Y,Y,Y - Too many different ways of reporting, ie. Fair etc. & aircraft manuals leave a lot of room for interpretation
Y,Y,Y,Y,N - AIP refers to CRFI. AOM does not. Both contain useful information
Y,Y,Y,Y,N - I have not read any advice on reducing flap setting after touchdown or on how best to judge safety of go around vs max braking after TD
Y,Y,Y,Y,N - Land elsewhere
Y,Y,Y,Y,N - Some specifically refer to runway friction value, some do not
Y,Y,Y,Y,_ - I have not reviewed my material lately and don't remember!
Y,Y,Y,Y,_ - Transport Canada tables (published in AIP/CPS and reproduced in company guidelines) should be simpler to use ie. regulatory authorities should require operators to customize tables for each particular type.
Y,Y,Y,N,_ - Most into wind as possible, highest flap/slat able, reduce weight.
Y,Y,Y,N,_ - Require more info for t/o and reduced t/o weights and V1
Y,Y,Y,N,Y - AOM has take-off data for contaminated runways but no in reference to CRFI
Y,Y,Y,N,Y - d) Takeoff weight determined (reduced) by contaminant type & depth not based on friction information
Y,Y,Y,N,Y - e) Minimal additional info eg. higher flap setting, max t/o thrust, etc.
Y,Y,Y,N,Y - Guidelines are too vague for proper use.
Y,Y,Y,N,Y - Little information available for RTO. Only and added factor for runway on take-off.

Y,Y,Y,N,Y - No specific info - given for take-offs (cross wind only). (Type specific - may involved testing & liability)
Y,Y,Y,N,Y - Only AIP offer guidance on how to apply CRFI value to aircraft operations
Y,Y,Y,N,Y - Since there is no guidance concerning take-offs we only have half of the picture.
Y,Y,Y,N,Y - Some specifically refer to runway friction value, some do not
Y,Y,Y,N,N - Charts given refer to "unfactored landing distances", our manuals use "factored" distances.
Y,Y,Y,N,N - If we're too heavy we take weight off
Y,Y,Y,N,N - Info is given for take-off on contaminated runways but not specific to slippery runways that are not contaminated ie. snow, slush, rain
Y,Y,Y,N,N - Would like limits as ops will second guess a guide. The other company is operating till they slide off the rwy!
Y,Y,Y,N,_ - A.O.M. deals more with handling skid conditions
Y,Y,Y,N,_ - e) Longest runway? Into wind? Alternate airport? D) the ACARS "WAT" feature calculate this.
Y,Y,Y,_,Y - Rated thrust, flap selection, longest runway
Y,Y,N,Y,N - B3d Info & data found in AOM
Y,Y,_,N,N - The material might be there, but take forever to find it on short notice, ie. not user-friendly
Y,N,Y,Y,N - B3d yes but vaguely. Also grey area for prior to V1 reject stopping distance for reduced CRFI.
Y,N,Y,N,N - I'd say less than 1/2 the pilots know how to work out landing/take-off distance (I can't either remember). Perhaps step-by-step instructions located beside the charts will help.
Y,N,N,N,Y - In some circumstances corrected values do not go high enough for very heavy aircraft given the runway contaminant.
Y,N,N,N,Y - Some specifically refers to CRFI, some doesn't
Y,N,N,N,N - It refers to the old JBI system.
Y,N,N,N,N - Simply stated RFI equates to Good-Fair or Poor braking action.
N,_,_,_,_ - Company material does not use CRFI.
N,_,_,_,_ - I need to use "equivalents" when using AOM charts
N,Y,Y,Y,Y - Calculations for reducing weight and/or VI speeds can be time consuming & can be complex. A simpler program is warranted
N,Y,Y,Y,Y - Manuals talk of JBI not CRFI
N,Y,Y,Y,N - Pour la question a) donne une valeur de "Reported Braking Action" - good, medium, poor. Au lieu de CRFI
N,Y,Y,N,_ - Reduce V1
N,Y,Y,N,N - We fly Dash 8 in Canada; most pilot fly 10,000 t/o and landing in 10 years, but CRFI does not give us 2000 data. Please pass on data to Air Canada Regional, Air Nova
N,N,_,N,Y - Boeing manuals do not use CRFI, they use JBI
N,N,N,Y,Y - a) Boeing utilise poor-medium-fair. b) même que a d) le Boeing Training manual discusses the different techniques
N,N,N,Y,Y - Material is based upon braking action: good, medium or poor.
N,N,N,Y,Y - The above 3 questions are pertaining to ?????
N,N,N,N,Y - Aircraft op. Manual only differentiates between dry/wet/contaminated
N,N,N,N,Y - Airline contaminates runway performance tables are governed by amount and/or degree of contaminant primarily standing water, wet/dry snow equivalents to slush and slush.
N,N,N,N,Y - The answer to section B3 are given relative to the information provided in the Operating Manual, clearly the AIP does give information relative to CRFI readings
N,N,N,N,Y - There is no “type specific" data to correlate CRFI to aircraft performance
N,N,N,N,N - Airbus manuals to not correlate to CRFI values
N,N,N,N,N - Most pubs still refer to JBI - although CRFI & JBI are comparable - the answers would then all be yes
N,N,N,N,N - Use AIP charts

B4. Use of the guidance material for take-off and landing:

[Note - 5% of pilots are not aware of guidance material]

Use of Guidance Material for Take-off

		Configuration of aircraft you currently fly:				
		Turboprop	Jet under 90,000 lb. (41 t)	Narrow-body jet	Widebody jet	Total
B4A	Always	21	24	75	62	182
		28.4%	51.1%	55.1%	58.5%	50.1%
	Usually	21	11	26	22	80
		28.4%	23.4%	19.1%	20.8%	22.0%
	Sometimes	21	6	17	12	56
		28.4%	12.8%	12.5%	11.3%	15.4%
	Rarely	9	4	9	8	30
		12.2%	8.5%	6.6%	7.5%	8.3%
	Never	2	2	9	2	15
		2.7%	4.3%	6.6%	1.9%	4.1%
Total		74	47	136	106	363
		100.0%	100.0%	100.0%	100.0%	100.0%

Use of Guidance material for Landing

		Configuration of aircraft you currently fly:				
		Turboprop	Jet under 90,000 lb. (41 t)	Narrow-body jet	Widebody jet	Total
B4B	Always	30	36	66	60	192
		40.0%	72.0%	47.8%	56.6%	52.0%
	Usually	17	13	46	27	103
		22.7%	26.0%	33.3%	25.5%	27.9%
	Sometimes	22		16	14	52
		29.3%		11.6%	13.2%	14.1%
	Rarely	5	1	8	5	19
		6.7%	2.0%	5.8%	4.7%	5.1%
	Never	1		2		3
		1.3%		1.4%		.8%
Total		75	50	138	106	369
		100.0%	100.0%	100.0%	100.0%	100.0%

Comment made to prompt: *If not always, please give reasons and any decision criteria for its use:*

Always,Sometimes - à l'atterisage lorsque 6 CRFI est .4 et moins je vérifie les limites de vent de travers.

Always,Usually - Always for take-off on wet or contaminated runways. Usually on landing if doubt about stopping distance exists

Always,Always - Always use when runway conditions warrant

Always,Always - Always used company guidance but it does not refer to the CRFI for take-off

Always,Always - Always when the runway is contaminated otherwise never

Always,Always - As above when rwy bare & dry or bare & damp use past experience & general guidelines.

Always,Always - B4a - As best as I can - i.e. x wind chart. Pireps are very useful - especially if same A/C type. NIL braking means - No T/O or landing

Always,Always - Decision is made in discussion with FO.

Always,Always - Eg. Always reduce speeds, use max thrust, higher autobrake settings, etc. We do not reduce t/o weights for runway condition

Always,Sometimes - En faisant les calculs souvent, j'en suis venu à savoir par coeur où les limites de mon type d'avion se situent.

Always,Sometimes - Experience tells me when we are approaching limitations which is seldom because of long runways most of the time

Always,Usually - Extra long runway - no need

Always,Usually - For landing I sometimes rely on landing comments from similar type aircraft that have just landed.

Always,Sometimes - For landing phase, runways are usually much longer than the contaminated requirements for my aircraft type

Always,Always - I like to extrapolate as much guidance as possible including from pubs such as the AIP (x-wind component; CRFI etc.) to enhance my airlines' guidelines.

Always,Usually - If rwy length is "lots" & condition is bare & dry with no appreciable crosswind = no use of guidance material.

Always,Always - If there is any contamination we use all info we can get

Always,Usually - If WAT Chart avail your material redundant

Always,Usually - Knowledge of when a/c is within the envelope for given conditions. If conditions poor - look it up

Always,Always - La sécurité

Always,Usually - Lack of info about the landing surface, ie. did not fully appreciate the surface condition

Always,Sometimes - Less critical for landing

Always,Sometimes - Most decision criteria comes from experience in the past, not from AIP low friction index charts at all.

Always,Never - Our runway surface analysis charts have a "landing" page but the weight restriction DOT weighs our max landing weight by over 2000 lbs and is never used on the line.

Always,Usually - Runway length gives adequate safety margin in most cases.

Always,Sometimes - Situation serrée.

Always,Sometimes - Take-off are often limited by weight and RTO consideration while on landing there is an adequate margin for safety on most airport (more rwy than require)

Always,Usually - The Time when we don't use it it's a Captain decision and base on his experience he or she choose to skip that check

Always,Always - There are no runway distance required figures for t/o only for landing

Usually,Usually - A Falcon Jet has been used to give a reference, the actual airplane in question is not a Falcon

Usually,Always - Again as above T/O info lacking and in some cases (AIP) RFI references landing dist only

Usually,Usually - Amount of contamination not always available.

Usually,Usually - Crosswind limitations only for take-off.

Usually,Usually - Degré de contamination, poids de l'avion.

Usually,Usually - Depending on the type and severity of contamination.

Usually,Usually - Dry runways

Usually,Usually - Excess runway length is usually available over "worse case" scenarios

Usually,Usually - Experience gained operating a specific aircraft means that in some conditions I no longer reference the guidance material

Usually,Usually - Experience personnel

Usually,Usually - Experience when I feel length is not limiting.

Usually,Usually - For ……. CRFI values, not normally on bare and dry runways[1]
Usually,Always - Guidance information is not always as specific for T/O data
Usually,Usually - Guidance material is used when the runway is contaminated.
Usually,Usually - I only use it when CRFI values are low
Usually,Usually - I use the crosswind charts as they seem to be the limiting charts.
Usually,Usually - If I'm aware of a CRFI value of .6 or below for the airport runway I intend to use, then I reference the material
Usually,Usually - If JBI less than 0.5 or x-wind greater from 10 knots
Usually,Usually - If runway is long or other factors that I feel comfortable and I have no doubts, I don't use it but I don't hesitate to use it when I feel that I need it
Usually,Always - Info ambiguous - CRFI not applicable to t/o run ASP
Usually,Always - It is guidance material. Most important are PIREPS. Next is experience. If you followed CRFI per the letter you would not land a lot of the time
Usually,Usually - Length of runway + approach environment - if marginal, I'll hold for new information. If unavailable - I'll get company aircraft reports & then decide
Usually,Usually - Must be operating in icing conditions
Usually,Usually - Not always applicable
Usually,Sometimes Not required, ie. summer day dry
Usually,Usually - Only to determine if performance is within acceptance parameters.
Usually,Usually - Operating into runways > good 9000' and aircraft stopping distance with reverse.
Usually,Usually - Other aircraft reports on prior landings
Usually,Always - Poor info for accelerate-stop distances required
Usually,Usually - Quand il est évident qu'il n'y a pas de risque je ne les consulte pas. Dans le doute je consulte.
Usually,Usually - Runway length is a factor, ie. over 9000 feet and no significant crosswind I may not consult the guidance material
Usually,Sometimes - Short haul, repetitive operations and widely variable weights. Based on experience - don't always look in books
Usually,Usually - Si avion très léger.
Usually,Usually - Sometimes aircraft data is too difficult to get given the time.
Usually,Usually - Sometimes the CRFI for an airport is not given or is old data.
Usually,Usually - Through experience at particular airports, guidance materials don't always need to be consulted
Usually,Usually - Time consuming or information to at fingertips.
Usually,Usually - TJME at busy airports. Rely on other similar aircraft reports
Usually,Usually - Use of data where runway is reporting slippery/wet conditions.
Usually,Usually - Using past experience and knowledge and common sense to determine the CRFI chart and x-wind limitation chart need not be consulted for every t/o and landing
Usually,Usually - We use the material that we have available. Only time that we wouldn't check landing info is if runway is bare & dry, and we are familiar with runway requirements
Usually,Usually - When runway length is in excess of min. requirement by 50%.
Usually,Usually - When the airport is used very often
Usually,Usually - Whenever values provided - always check & use & show FO
Sometimes,Sometimes - a) guidance material is not easy to use and is not directly related to the CRFI. a) and b) for my turboprop runway length is rarely the issue.
Sometimes,Sometimes - Aircraft flown is a STOL turboprop, rwy length is rarely a factor.
Sometimes,Usually - B4a) Data found in AOM; contaminated runway B4b) cross-check with CRFI table
Sometimes,Always - B4a) For crosswinds only
Sometimes,Sometimes - Bad weather
Sometimes,Sometimes - Condition de piste, longueur de piste, vents de surface, conditions météorologiques au T/O pour landing.
Sometimes,Usually - Depends on CRFI value given & amount of x-wind/headwind
Sometimes,Sometimes - Experience & knowledge
Sometimes,Sometimes - Experience & PIREPS.
Sometimes,Usually - For take-off it never seems to be an issue on B747-400 a theory or application I disagree with for planning purposes.
Sometimes,Always - For take-off I can only look at cross wind limits.
Sometimes,Sometimes - I believe all test were done on a Falcon 50 not on narrow or widebody jets
Sometimes,Sometimes - I do not use reference material if the rwy condition is more than 80 percent bare & dry and rwy is not close to limiting for AC type.
Sometimes,Usually - I rely on other aircraft reports, as I feel they tend to provide more reliable info than CRFI.

[1] Where part of a comment written by the pilot is illegible, "……." is given.

Sometimes,Sometimes - I will refer to it if there is any doubt for required distance on landing or T/O. Short rwy - always.
Sometimes,Sometimes - If the CRFI is -30 or less
Sometimes,Usually - It is not always considered due to lack of applicability (aircraft type) and unfortunately, lack of being part of the regulations (mandatory)
Sometimes,Always - Lack of info. Use my own limitations by assessment.
Sometimes,Usually Material is badly written and doesn't cover all circumstances
Sometimes,Sometimes - Most runways on company routes allow huge safety margins for a/c type
Sometimes,Always - No data for take-off accel - stop, X-wind only
Sometimes,Always - No guidance material exists for take-off on slippery runways. Some value can be interpolated from landing charts for take-off.
Sometimes,Sometimes - Only use when CRFI is low
Sometimes,Rarely - Only used if runway is contaminated with frozen precip/heavy rain perhaps only <5% of the time
Sometimes,Sometimes - Only when ATIS/TWR broadcast CRFI
Sometimes,Usually - Only when CRFI is reported
Sometimes,Sometimes - Only when slippery and weight is high enough to be a concern.
Sometimes,Sometimes - Only when very low CRFI values or heavy aircraft
Sometimes,Always - Take-offs: no info given except crosswind limitation.
Sometimes,Always - The only guidance for T/O requires a long and drawn out procedure.
Sometimes,Sometimes - Too complicated a process for tight turn arounds
Sometimes,Rarely - Unless the conditions approach limits, it is rarely necessary to consult it.
Sometimes,Usually - Use if CRFI is on ATIS for landing. For T/O use if conditions appear slippery.
Sometimes,Sometimes - When conditions warrant use.
Sometimes,Sometimes - When going in and out of the same airports day in and day out, you get to know at which point you have to start referencing the charts
Sometimes,Rarely - Where use should be aircraft specific, info not clear enough
Sometimes,Sometimes - WX
Sometimes,Sometimes - WX
Sometimes,Usually - Years of experience on slippery runways and aircraft type
Rarely,Rarely - 90% of operations on non-limiting runways.
Rarely,Usually - Any CRFI greater than .50 does not generally concern me except in strong crosswind. Therefore above .50 I do not refer to the chart.
Rarely,Usually - Au décollage on utilise des cartes Jeppesen pour les vitesses mais il n'y a pas de distances.
Rarely,Sometimes - Calculations too complex therefore easier to use ……. Off & higher flap setting
Rarely,Rarely - Company took out AFM, put on abbreviated performance material, having nothing on board to connect for contamination.
Rarely,Rarely - Don't often operate on runways that are contaminated, and when I do, the runway is seldom critical & performance of aircraft is very good.
Rarely,Rarely - Experience and judgment often enough in these circumstances.
Rarely,Sometimes - For T/O conditions are more often better appraised and not time limited as for landing.
Rarely,Usually - For T/O last minute runway occur regularly. Most data relates to landing distances for quick reference.
Rarely,Sometimes - Generally use company WAT charts
Rarely,Always - Have received no formal training on use of information provided.
Rarely,Rarely - Information is chopped into parts in various manuals, not/single reference CW instructions.
Rarely,Rarely - It would greatly reduce operating requirements
Rarely,Usually - Length of runway and element of risk
Rarely,Rarely - My particular operations are rarely on contaminated runways
Rarely,Rarely - Not consulted because conditions rarely affect a/c I operated. Data provided is not user friendly.
Rarely,Usually - Poor rwy conditions & x-winds
Rarely,Rarely - Rarely encounter icy runway conditions.
Rarely,Rarely - Runways are long, conditions rarely poor. I believe they are guidance only, conservative & time consuming to refer to while in flight.
Rarely,Usually - T/O for x-wind only
Rarely,Usually - Take-off is unproven & advisory only.
Rarely,Usually - The a/c type I operate has very little published info on take-off and rejected take-off
Rarely,Rarely - The manuals cannot take into account pilot experience. Each pilot has a different view of his abilities from his or her past flying experience.
Rarely,Always - There is no rwy distance correlation that is computed for take-off thus the only material you can check for is crosswind limit.
Rarely,Sometimes - Usually consult with JBIs lower than .3
Rarely,Always - When runway limited, the company makes no allowances for a wet runway

Rarely,Always - Would like to have rejected T/O stopping distances and reduced acceleration to V1 applied to avoid possibly rwy excursions.
Rarely,Rarely - X-wind with low CRFI.
Never,Always - Again, it's never used for take-off because it doesn't exist for our aircraft. It is purely a judgment call which is merely an educated guess and therefore inadequate.
Never,Always - Aware of the existence of any material that relates t/o data to CRFI
Never,Never - Because the information in the aircraft operating manual provides technique on how to recover from a side-slip on the contaminated rwy only.
Never,Usually - Can't be effectively used for T/O. Landing - used if runway length makes it a question.
Never,Never - Just introduced to material while doing performance manual rewrite for training dept.
Never,Rarely - Material not user friendly, hard to find relevant material
Never,Always - No data available for type.
Never,Always - No good info.
Never,Usually - No material available for t/o with CRFI
Never,Usually - None available
Never,Usually - Use for crosswind information only
Never,Usually - X-wind situations or shorter landing runways

B5. How useful do you find the guidance material?

	Configuration of aircraft you currently fly:				
	Turboprop	Jet under 90,000 lb (41 t)	Narrow-body jet	Wide-body jet	Total
Extremely useful	6 8.1%	6 12.5%	12 8.7%	13 12.4%	37 10.1%
Very useful	56 75.7%	39 81.3%	102 73.9%	75 71.4%	272 74.5%
Of little use	12 16.2%	3 6.3%	22 15.9%	14 13.3%	51 14.0%
Of no use			1 .7%	2 1.9%	3 .8%
Dont know			1 .7%	1 1.0%	2 .5%
Total	74 100.0%	48 100.0%	138 100.0%	105 100.0%	365 100.0%

Comments made to prompt: *How could it be improved?*

Extremely - AIP crosswind/JBI table incorporated to aircraft specific, transport category performance data with reference to headwind/tailwind components. Info should also be contained in one table or graph.
Extremely - Aucun changement. Pour une grande sécurité dans un domaine il faut le moin de changement possible. L'expérience acquise de nombreuses années avec les même avion, même graphique, même tableau, contribue à la sécurité. Les pilotes ou l'activité humaine devient plus douteuse due au fait qu'ils ont perdu leurs bonnes vieilles références du passé. L'homme (femme) est plus stressé(e) dans un nouvel environnement. Nouveau = inconnu = risque élevé.
Extremely - By showing an upward or downturn trend at the end of the report
Extremely - Mettre en place un système uniformisé partout dans le monde avec les manuels d'aéronefs qui correspondent à la même norme.
Extremely - Quick reference chart.
Extremely - The data info studied & guidance produced.
Extremely - The value is an average on the entire runway; it could be good information to know if a portion of the runway is low value (rejected t/o)
Extremely - They could present figures of balance field length v/s CRFI.
Extremely - Uniformity of units of measure.
Very - Crosswind limitations binding for air carrier CPS
Very - A single, international standard for reporting and portraying the effects of contamination would be very useful.
Very - Accelerate-stop graphs should be provided for reduced braking conditions
Very - Accuracy.
Very - Always look for improvement.
Very - Be aircraft specific and runway specific. More accurate CRFI values (ie.) better equipment for measuring values
Very - Be more specific to categories of aircraft. More manufacture testing. Operators need to demand more info before purchasing.
Very - Better explanation of how to use it. Also better explanation of how to interpret "unfactored" = "factored" landing distances table.
Very - Better info required for t/o case. How do we reference CRFI to other world standards?
Very - By being more specific on aircraft type. Tire type high or low pressure
Very - By correlating aircraft performance (AOM) with CRFI data
Very - By referencing to CRFI values and a better company explanation of the wet runway computer generated data, especially the max wt on wet runway data
Very - Charts for take-off!
Very - Contaminated runway performance adjustments (any aircraft type) are somewhat complicated and very time confusing to use. On a 30 min. turn around we often spend ten minutes working on the performance for a single take-off.
Very - Correlate or standardize reported rwy friction info worldwide or at least in North America (CRFI vs friction coefficient Airbus)
Very - Correlating good, medium or poor braking to loss subjective CRFI values

Very - CRFI's are measured at approx. 30 m.p.h. An A/C makes contact at approx. 110 Kts. Hydroplaning should also be taken into account. I've seen very slippery runways at a CRFI of .33 braking action was nil.
Very - Current company/aircraft material only refers to surface conditioning, reference to CRFI would be better.
Very - Data dissemination is not user friendly - find creates lots of uncertainty.
Very - Data required for take-off
Very - Detailed landing and take-off distances for each CRFI index, for aircraft type.
Very - Displayed better.
Very - Don't know where to find landing distance for given CRFI for my aircraft type, but the RMS provides a quick reference, in simplified format re landing & take-off.
Very - Dovetailed with aircraft manufacturer's data & therefore, airline performance data.
Very - Ease of use. For my aircraft, I have landing distance info in 5 different places. Sometimes you apply CRFI values, sometimes not. The stage for error is set
Very - Easier to use
Very - Enclose information on landing & take-off technique, cross wind effect
Very - Establish firm limits (even if a grey area must remain)
Very - Further study & training as alluded to.
Very - Get more info for t/o
Very - Give me the data for "turbo prop" and give me the data for "jets"
Very - Give more info for take-off, also provide a cross reference chart between CRFI + JBI + "runway friction coefficient" (used in some Airbus manuals).
Very - Graphs could be a little bigger
Very - Guidance material does not refer to CRFI.
Very - Harmonize Canadian, U.S. and Western Europe methods
Very - Has any of this testing involved gravel runways?
Very - Have more empirical data
Very - Have world standard.
Very - I am not sure how applicable CRFI is to large turbojet aircraft (heavy a/c)
Very - I have seen very little take-off accelerate/stop distance information that would help determine stopping distance when take-off rejected at various speeds (especially over 100 kts)
Very - I would like to see a JBI/CRFI comparison chart
Very - If CRFI values could be used in take-off calculations as well (eg: effect on V1/VR speeds)
Very - In my company CRFI is not harmonized into the t/o decision with contaminated runways ……. reject criteria/location of penalties for contamination is predicated or verbal description leaving room for interpretation
Very - Include info/guidance for B3 d) & e) (above)
Very - Include T/O data specific to CRFI values.
Very - Increase information more specifically addressing variations in rwy friction values.
Very - Info de distance d'arrêt en cas de décollage interrompu.
Very - Info for accelerate/stop distances.
Very - Info on braking coefficient & reverse thrust landing distances slippery runways related to aircraft types - use reduced V1.
Very - Information should be consolidated onto fewer (or a single) charts, that are easier to use.
Very - It is too cumbersome and as it is not specific, it leaves a lot of room for interpolation.
Very - It would be better if all the info was in one place instead of having to cross-reference
Very - It's only a guide - too many other conditions will affect calculated results
Very - K.I.S.S. principal
Very - Keep it simple! Stop publishing uncorrected distance charts, ie. always use "wet" distances to start from
Very - Less confusing charts
Very - L'information devrait être plus simple à utiliser ie: chartes de performance - JBI 0.4, JBI 0.3, JBI 0.25
Very - Major carriers should be more aggressive in using more effective programs
Very - Make CRFI charts for each aircraft type based on testing of each type
Very - Make it good outside of Canada.
Very - Make it simpler
Very - Make it specific to the aircraft I fly. The material is geared toward stopping distance for an aircraft that is landing, the accelerate-stop distance needs to be addressed and clarified. Right now I have to derive that information.
Very - Manufacturer should have to publish specific charts for CRFI values rather than interpreting between coefficient values and weak verbal descriptions of braking conditions
Very - More aircraft specific (by weight and/or type)
Very - More company training.
Very - More data re: specific aircraft & simpler use.
Very - More in depth coverage.
Very - More info on aircraft handling
Very - More info on t/o
Very - More info re take-off!
Very - More quick reference charts instead of big charts in manual.
Very - More R.T.O. info.
Very - More specifics in definition
Very - More user friendly re quick reference format
Very - Must be more timely for the information to be passed on to the pilots.
Very - No material available for t/o with CRFI
Very - OK But runway ATIS gives % covered, material is for 100% covered tough to interpolate.

Very - On Airbus equip. the AOM is very clear. On Canadair CRJ the AOM is difficult and cumbersome because all performance calculations are not in one location
Very - Once again it's guidance material only. Most important are PIREPS. Next is experience. If you followed CRFI per the letter you would not land at lot of the time
Very - Plus de rapports sur l'état des pistes. Ex. Un à chaque ATIS.
Very - Produce information for accelerate stop distance calculations on low CRFI runways
Very - Prove that the data is valid (at least help us trust it).
Very - Provide factored charts.
Very - Publish take-off data.
Very - Reference to JBI or CRFI (one standard for the world, better data for take-off on wet runways
Very - Relate performance charts in AOM to CRFI values; better charts for CRFI equivalents with various types of contamination.
Very - Relate to CRFI
Very - Require accelerate-stop info for take-offs.
Very - Should be a direct correlation between reported CRFI and AOM performance charts
Very - Should be more clearer
Very - Simplifier un peu le tout
Very - Simplify values
Very - Small plastic card with values and quick graph
Very - Standardized by ICAO, or at least throughout North America
Very - Streamline the information to make it less laborious & more user friendly
Very - Summarized in one area for your specific aircraft type.
Very - Tailor material for each aircraft type
Very - Take-off distances /guidance added (type specific) - each pilot must estimate the risk for take-off at each runway ie. Limit CRFI to 0.2 or 0.3 for example to allow stopping after reject.
Very - Take-offs modified by CRFI
Very - TC tables (published in AIP/CPS and reproduced in company guidelines) should be simpler to use ie. regulatory authorities should require operators to customize tables for each particular type.
Very - Tell me how much runway I need, ie. feet, to stop the aircraft under any circumstance. Again it must be "type specific"
Very - Try to see the actual braking effect of reversers only and compare it to braking effect of brakes only during low CRFI ops. What percentage of stopping action is each applying to make the aircraft stop.
Very - Type specific cards or charts which each pilot could carry as a handout would be much more convenient than digging through manuals for each required use!
Very - Uncomplicate it.
Very - Under one heading and book with a flow from T.O. to landing
Very - Uniformisation
Very - Use specific JBI #s.
Very - Very useful for landing, of little use for TO
Very - Very useful for short runways; of little use for long runways; I don't know if it could be improved
Very - Video course correlating info would make it more comprehensible.
Very - We need to be better trained on how to use it. Also, I think the landing section should take into account runway friction to be used in conjunction with ref speeds
Very - When required it is too difficult to interpret - graph charts are generally easier to use for a quick answer
Very - Why does the CRFI have to be so complicated. Make it more simple. Good 10-8, Fair 7-6, Poor 5-4, Nil 3-below
Very - Yes. Takeoff info is well covered, but landing info must be individually figured out when i8t comes to how to apply the available charts
Of little use - A.O.M. use is broad in scope.
Of little use - Aircraft type specific and wheel/tire size, psi specific. Relate accel/stop to CRFI. Type specific CRFI crosswind data!
Of little use - As above make it user friendly.
Of little use - Because rwy condition are usually at their worst on "wet ice" and under those circumstances airports usually will not report a CRFI.
Of little use - CRFI is different than FSS & different than AOM therefore lots of conversion, accuracy??
Of little use - Direct information concerning t-o distance + landing, I mean no interpolation, no calculation, clear diagram
Of little use - Doesn't provide data for B-747 required landing distances
Of little use - Give #'s applicable to turboprop aircraft in general. I hate dealing with "rough" #'s or "advisory only". This won't stand up at court!
Of little use - Go airplane type specific
Of little use - Have approach/ departure manuals incorporate charts (a/c specific) for each runway. Might be expensive but info would be at your fingertips.
Of little use - Have performance data for contaminated runways. All we do is full thrust take-off.
Of little use - Have tests done on transport aircraft
Of little use - Information is chopped into parts in various manuals, not/single reference CW instructions.

Of little use - It is far too vague & general. Get more specific & detailed, especially x-wind effect on contaminated t/o & landing
Of little use - It should receive TC blessing as a definitive guide/index
Of little use - It would be helpful to have the CRFI info incorporated as guidance in our FOM and AOM
Of little use - Keep it simple & in a quick reference format.
Of little use - Limitations on maximum landing weight & maximum crosswind & minimum CRFI limits would be a major improvement.
Of little use - Make all references & standards equal to each other without requiring numerous charts to correlate the data ie keep only one name for all countries why RSC, JBI, CRFI …….Let one name/value = one standard
Of little use - Make chart specific to a/c type
Of little use - Make it aircraft specific and don't leave it up to the PIC. Make it black & white.
Of little use - Material should reflect the differences between a/c type, weight, performance, etc.
Of little use - More accuracy, better standardization, the attitude among many of my peers is the CRFI is not a true representation
Of little use - Must be able to quick reference & compute calculations in short turn-around time.
Of little use - Need accurate data to correlate for heavy aircraft requiring long runway lengths. ie. old data based on data collected using a biz jet. How applicable is that really for A340-600 or B747-400? Not!
Of little use - Not aircraft specific
Of little use - Not referenced to CRFI - Correlation approximated
Of little use - Not sure - inexact science up till now (at least)
Of little use - Our system to calculate the normal required landing & take-off distances is very cumbersome
Of little use - Provide info as per Q B3 a) b) & c)
Of little use - Put all charts in 1 place in AOM
Of little use - Quick reference format, flight ops needs to be clearer on their policy
Of little use - Return the JBI system
Of little use - Simplify
Of little use - Souvent c'est le AFM qui prime.
Of little use - Specific to type. All reference referring to same indexes (comparable).
Of little use - Update
Of little use - Used more as a "safety net" for legalities.
Of no use - Company took out AFM, put on abbreviated performance material, having nothing on board to connect for contamination.
Of no use - Plus claires plus faciles.
Don't know - Specific landing & T/O distances with CRFI vs specific a/c weights

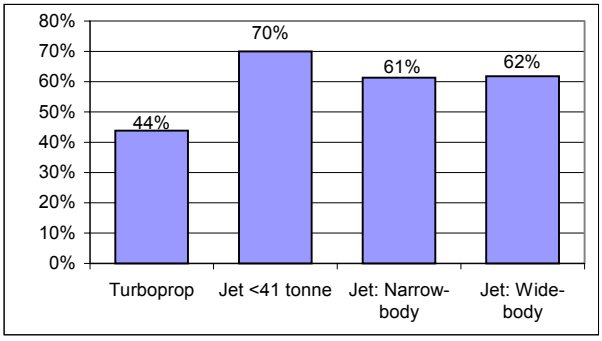
C. YOUR USE OF RUNWAY FRICTION INFORMATION

C1. How important is the runway friction information to you?

All aircraft types

How important is the runway friction information to you?	Configuration of aircraft you currently fly: Turboprop	Jet under 90,000 lb (41 t)	Narrow-body jet	Widebody jet	Total
Very important-critical element & often adjust	35	35	87	68	225
	43.8%	70.0%	61.3%	61.8%	58.9%
Important-monitor closely & occasionally adjust	40	14	51	41	146
	50.0%	28.0%	35.9%	37.3%	38.2%
Low importance-make little use rely on contam.depth & type	5	1	4	1	11
	6.3%	2.0%	2.8%	.9%	2.9%
Total	80	50	142	110	382
	100.0%	100.0%	100.0%	100.0%	100.0%

Very important – critical element and often adjusted by aircraft type



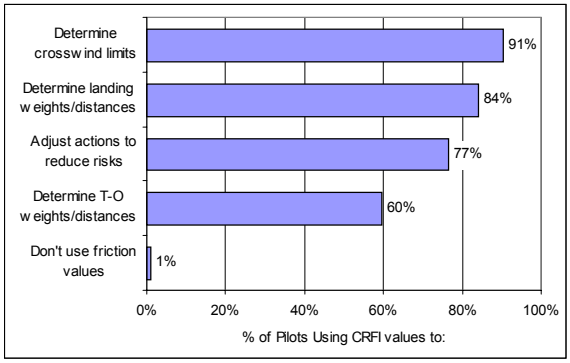
[Valid responses 382]

Comments:

Very important - A must for operating at smaller strips in the North
Very important - Adjustments for landing
Very important - AIP chart is used as only reference for go/no go decision when rwy limited.
Very important - Apart from pilot report (often not same aircraft type) there is no other information that makes CRFI A MUST
Very important - Beneficial to have some measure of friction, realizing that it's probably not uniform.
Very important - Best way to know runway conditions for take-off and landing
Very important - For my type of aircraft, the crosswind element of runway friction becomes critical far more often than runway length
Very important - For take-offs; a quick calculation of ground run to V1 speed would be helpful
Very important - For the specific it's the decisive factor for ability to land at critical runways.

Very important - Fortunately, it is not always reliable for transport category aircraft
Very important - Have approach/departure manuals incorporate charts (a/c specific) for each runway. Might be expensive but info would be at your fingertips.
Very important - However, as a general use we tend to rely mostly on type and depth of contamination
Very important - I consider it very important but we don't usually have to make adjustments "often"
Very important - I find the CRFI values to be conservative. Thus I have confidence in using them to adjust ops as required.
Very important - I have canceled flights due to JBI (CRFI)
Very important - Info is only as good as the measuring device
Very important - It use to make a go/no go. If the runway friction is low don't land
Very important - It's all I have to go on!!
Very important - It's all we have other than obvious snow or ice cover or falling on my ass on walk to aircraft
Very important - Key value for decision-making
Very important - More frequent and accurate reports required under a greater range of conditions, ie. in the rain, above 0C.
Very important - No reverse thrust
Very important - No reverse thrust on the Fokker F-28
Very important - On a jet a/c it's critical
Very important - Still only comfortable with JBI values to make judgments, regarding X-wind limits
Very important - Très important pour garder l'avion à l'intérieur du Balance field length en cas de RTO.
Important - (1) PIREPS (2) Experience (3) CRFI
Important - Again - only as conditions warrant.
Important - Aircraft manufacturers know the limits, ie. weight, controllability, hydroplane speed
Important - Aircraft specific info would be valuable.
Important - CRFI is valid for the test Falcon 20. Data derived is not type specific and seems to be very conservative for a Dash 8.
Important - Due to the fact that the test a/c was a Falcon 20 it is good as a guide only
Important - Experience on aircraft type and use of material
Important - For example dispatch safety factor for landing is 1.67 x 15% (wet) ~= 1.92 ~= CRFI .45 so above .45 (20 knt X-wind), I don't worry about it
Important - For landing distance & x-wind limits, very useful.
Important - Landing distance less of a problem in my type
Important - Less of a concern on very long runways
Important - Like J.B.I. Better
Important - Mostly for crosswind
Important - Professional judgment & experience still rules but CRFI info and its use will keep us out of newspaper & chief pilot office.
Important - Seldom are adjustments required.
Important - Take-off: We have performance charts for contaminated runway but none based on CRFI. We tend to be conservative with CRFI values for landing. (We don't gamble below 3)
Important - Use to help determine landing technique, flap selection.
Important - Very important, however in any company tend to only make occasional adjustments due to value
Important - Very seldom, on routes that I fly, does rwy length become limiting… x-wind can be a problem.
Important - We do monitor the value but I often find that the value doesn't accurately reflect current braking action
Low importance - CRFI values have a different effect on different a/c types.
Low importance - Not available everywhere, and especially not available in Northern Canada strips
Low importance - Of no use for take-off. Use to aid in landing decisions.

C2. How do you make use of the runway friction (CRFI) values provided by the airport?



[Valid responses: 382]

Use made of runway friction data	Turbo prop	Jet <41 tonne	Jet: Narrow -body	Jet: Wide -body
Determine landing weights/distances	81%	94%	84%	82%
Determine crosswind limits	99%	98%	90%	82%
Determine T-O weights/distances	62%	47%	54%	70%
Adjust actions to reduce risks	81%	78%	76%	74%
Don't use friction values	0%	2%	0%	3%

Comments *Yes responses to each use are indicated (L=Landing, X=X-wind, T-Take-off, A=Adjust actions, D=Don't use) in order prior to comment:*

L,X,_,A,_ - (1) PIREPS, (2) Experience, (3) CRFI

L,X,_,_,_ - At small Canadian airports - airport data limited after normal airport hours.

_,X,T,A,_ - C22) Somewhat. Comment: Would like to be able to use it to determine landing weights/distances + x-wind more accurately. At this time it is an approximation. I know ice will increase my landing roll + therefore adjust approach accordingly.

L,X,T,A,_ -C24) Positive landing, use of reverse, selection of auto-brake, selection of flaps. Also useful for flight planning (ex. Choosing an alternate vs another)

_,_,_,_,D - Company manuals do not use CRFI. Occasionally checked for comparative purposes.

L,X,T,_,_ - CRFI data is consistently dated when called upon from flight crew.

L,X,_,_,_ - For us no t/o standing water due hydroplaning/potential eng flame out, account for wet by adding weight (…….) no idea of empirical data (CRFI .3?) Contaminated defined by residual slush, …….standing water? 15% snow/ice cover on ……. 100' rwy. Inferred that by this definition one would apply slush correction but no hard definition

L,X,_,A,_ - For x-wind use 20 knt max for wet/slippery, 10 knt for icy runway. T/O weights and/or distances are adjusted using Airbus database contaminated runway data

L,X,_,A,_ - Guidance only - the CRFI values seem overly conservative (95% probability) - why not tell us what the aircraft can really do (test pilot) and then apply a safety %?

L,_,_,_,D - Have approach/departure manuals incorporate charts (a/c specific) for each runway. Might be expensive but info would be at your fingertips.

_,_,_,_,D - I have 25 years experience with JBI values not CRFI values

_,_,_,A,_ - If available

L,X,T,A,_ - Most commonly used for crosswind limits

L,X,_,_,_ - My aircraft operating manual has landing distances but lacks T/O distance. We use "WAT" charts. Who knows what the actual T/O distance in feet? C23 - I look at what my landing distance would be if I had to do an immediate return.

L,X,T,A,_ - Need more accurate info.

_,X,_,A,_ - No a/c specific charts for TO and landing

L,X,T,A,_ - Often CRFI reports available are many hours old, and under such conditions pireps of "good" braking are more relevant.

_,_,_,_,_ - Our manuals do not make use of CRFI (Boeing 757). If necessary I would use the flight supplement but the need is rare

_,_,_,_,D - Pas standard avec le AFM

L,X,_,_,_ - They are my main guidelines if I should attempt an approach

L,X,T,A,_ - Use for take-off is limited.

_,X,_,_,_ - Use to cross check aircraft specific info.

_,_,_,_,_ - Used to determine stopping likelihood at airport in question.

_,X,_,A,_ - Using CRFI Recommended landing distance chart table A or B + RSC - JB1 equivalent

L,X,T,A,_ - We use the values for x-wind limits & reduce risks all the time but the other 2 are only used when operating on a short runway (5000' or less)

L,X,_,A,_ - We used to have a JBI vs max landing weight chart for specific airports. Outdated but still the best reference available.

_,_,_,_,_ - With the old JBI system yes.

C3. Regarding the procedure of increasing landing distance by 15% for landing on wet runways:

Is it a requirement for your aircraft type?

		Configuration of aircraft you currently fly:				
		Turboprop	Jet under 90,000 lb. (41 t)	Narrow-body jet	Widebody jet	Total
Increase landing dist. 15% on wet runways: Is this a requirement for your aircraft type?	Yes	43	33	127	100	303
		55.8%	66.0%	88.8%	90.1%	79.5%
	No	34	17	16	11	78
		44.2%	34.0%	11.2%	9.9%	20.5%
Total		77	50	143	111	381
		100.0%	100.0%	100.0%	100.0%	100.0%

If not, do you apply it anyway?

		Configuration of aircraft you currently fly:				
		Turboprop	Jet under 90,000 lb. (41 t)	Narrow-body jet	Widebody jet	Total
Increase landing dist. 15% on wet runways: If not a requirement, do you apply it anyway?	Yes	7	4	3	4	18
		20.0%	22.2%	17.6%	40.0%	22.5%
	No	28	14	14	6	62
		80.0%	77.8%	82.4%	60.0%	77.5%
Total		35	18	17	10	80
		100.0%	100.0%	100.0%	100.0%	100.0%

Do you apply a 15% or greater increase in landing distance on runways that are icy or covered with compacted snow?

a) Apply 15% increase

		Configuration of aircraft you currently fly:				
		Turboprop	Jet under 90,000 lb. (41 t)	Narrow-body jet	Widebody jet	Total
Increase landing dist. 15% on wet runways: Apply it for landing on icy/compact snow runways	Yes	46	25	92	81	244
		63.0%	52.1%	69.2%	76.4%	67.8%
	No	27	23	41	25	116
		37.0%	47.9%	30.8%	23.6%	32.2%
Total		73	48	133	106	360
		100.0%	100.0%	100.0%	100.0%	100.0%

b) Apply > 15% increase

		Configuration of aircraft you currently fly:				
		Turboprop	Jet under 90,000 lb. (41 t)	Narrow-body jet	Widebody jet	Total
Increase landing dist. 15% on wet runways: Apply greater factor for icy/compact snow runway	Yes	36	23	78	62	199
		50.7%	52.3%	58.6%	59.6%	56.5%
	No	35	21	55	42	153
		49.3%	47.7%	41.4%	40.4%	43.5%
Total		71	44	133	104	352
		100.0%	100.0%	100.0%	100.0%	100.0%

Comments: *Preceded by response Yes/No to 4 questions*
Y,Y,Y,Y

|_|_|__|___ *Is it a requirement for your aircraft type?*
|_|__|___ *If not, do you apply it anyway?*
|__|___ *Do you apply it on icy/compacted snow rwys?*
|___ *Do you apply greater factor on these rwys?*

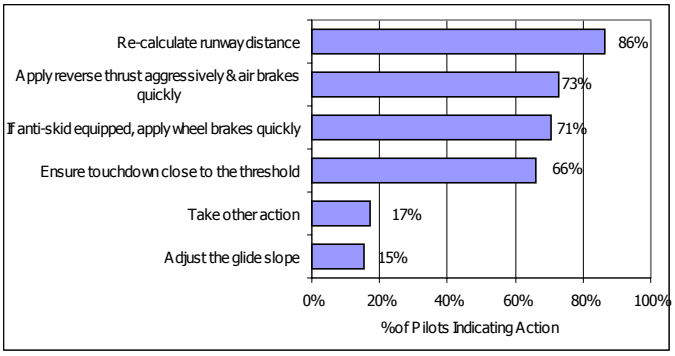
Y,_,N,Y - "Ball park" factoring ref reported braking action vs type - CRFI - precip etc. since report etc.
Y,_,N,Y - "Guess" factor
N,N,N,Y - "Mental fudge factor" applied by feel (Tactile & visual as well as info [CRFI value etc.]) This is the "unknown" from A1.
Y,_,Y,N - (a) Already incorporated
Y,_,_,_ - (b) & (c) use other data to calculate required distances 15% only applied to wet runways
Y,_,Y,Y - 15% for wet & more for icy/slippery
Y,_,Y,Y - 15% is a minimum criteria.
Y,_,_,Y - 15% is not enough if rwy is ice covered.
Y,_,N,Y - 15% is not enough, but there is little guidance material available - mainly use experience and more reverse/braking
Y,_,N,Y - 15% margin + factor in landing chart (ie. Reversers not accounted in calculations)
Y,_,Y,N - 60% factored for F-28. C3c) The company will argue with you if you are more conservative.
N,N,_,Y - a) b) pour pistes movillar notre compagnie a des restrictions plus élevées que 15%, plus proches de 30% c) on utilise la recommandation du CRFI chart.
Y,_,Y,Y - A.O.M. and MEL's
Y,_,Y,Y - A/C performance data has charts for Landing Distance on contaminated runways
Y,_,Y,Y - A320 QRN has more accurate and more restricted charts
Y,_,Y,Y - Above a certain level, we must divert
Y,_,Y,Y - Add extra for 'mom & the kids' because the data does not appear to apply to heavy aircraft.
Y,_,N,Y - Add more distance than 15% to be safe
Y,_,N,Y - Again no a/c type specific charts avail. Use AIP generic charts for "guess estimate"
Y,_,Y,Y - Airbus performance data provides landing data in such conditions - a real plus.
Y,_,N,Y - Aircraft AOM applies
Y,_,Y,Y - Aircraft increased performance - Greater flap selection for low target speed - Auto brake - May reverse - 1/2 DOT low on G/S
N,Y,N,Y - Airmanship
Y,_,Y,Y - Airmanship dictates what is safe and also comfortable
Y,_,Y,N - Ajoute automatiquement dans le plan de vol
Y,_,_,_ - Any type of surface contamination we require a CRFI.
Y,_,Y,_ - AOM and FOM have no requirement or formula for such case (Captain's discretion)
Y,_,Y,Y - AOM spec increase distance
Y,_,Y,Y - AOM/QRH/Route Manual
Y,_,Y,Y - Apply factor suggested by CRFI
Y,_,N,Y - As per AIP, apply dry landing distance to CRFI chart. Use this as a tool in decision-making.
N,Y,Y,Y - As per airbus manuals
Y,_,N,Y - As per AOM and Transport Canada CRFI distance increment chart
Y,_,Y,Y - As per AOM/SOP's
Y,_,N,Y - As per charts in FOM
Y,_,Y,Y - As per QRH
Y,_,_,Y - As per QRH charts
Y,_,Y,Y - As required by AOM type
N,N,N,Y - At smaller Canadian airports YFC YSJ data often old with rapid change in EX (temp + precip) after normal airport hours
Y,_,N,N – b) & c) Use route manual supplement (RMS) to adjust landing distance required for a given CRFI.
Y,_,N,Y - B: 15% quite insufficient for icy rwy. C: I use CRFI correction tables.
Y,_,N,Y - Bombardier published specific charts for runways contaminated with ice or slush or snow (AOM)
Y,_,Y,Y - Braking action reports from line types can be most useful
Y,_,Y,N - C3c) No, but double check runway length for safety. If any doubt, request works on runway
Y,_,N,N - C3c) Use CRFI/AOM Data for ice/snow. Comment: Generally no additional factor required since an adequate amount of "slush" already added for margin of error
Y,_,N,Y - CRFI Charts
Y,_,Y,Y - Common sense
Y,_,Y,Y - Common sense fudge factor
N,N,N,Y - Company limits
N,N,Y,Y - Company SOPs
N,N,N,Y - CRFI Chart
N,Y,Y,Y - CRFI or equivalent estimate of SFC.
N,N,N,N - Dash-8 performance are very good
Y,_,Y,Y - Depending on the CRFI and from other a/c braking reports
Y,_,N,Y - Depends on circumstances based on changing conditions & time report taken.
Y,_,N,Y - Dispatch requirement only … actual distance required is used in practice
Y,_,N,Y - Especially when friction reports are old and you don't trust the airport you are going to.
Y,_,N,Y - Estimated factor based on aircraft manual & limitations

Y,_,Y,Y - Experience factor, adjusted by condition.
Y,_,Y,Y - Factor based mostly on experience rather than known data.
N,N,N,N - Factor is applied with use of separate wet/dry runway charts.
Y,_,N,Y - FCOM's will have a factor to apply for landing distance Airbus product.
Y,_,Y,Y - Feel it is too conservative
Y,_,_,Y - Follow AFM & co. process. Often greater than 15%
Y,N,N,Y - Follow guidelines from AOM & ORH for specific runway conditions.
Y,_,Y,Y - Follow guidelines of AOM.
Y,_,N,Y - FOM tables/AOM tables
Y,_,N,Y - From CRFI tables
Y,_,Y,Y - From Vol 3, cockpit check list
Y,_,Y,Y - Fudge factor
Y,_,Y,Y - Gust vent en rafale V ref + élevé
Y,_,Y,Y - Have used personal limits to refuse to T/O or land
Y,_,_,Y - I always check CRFI and crosswind limit for landing runway and landing weight
Y,_,N,Y - I can't recall the increased value
Y,_,N,Y - I have had experience at some remote airports where the CRFI seems to have been inaccurate, at these locations I will sometimes apply a greater correction. (CYHY, CYSM, CYTH, CYQD)
Y,_,Y,Y - I keep in mind a small added % for Mother
Y,_,Y,Y - I like to allow a margin for long landings or bounced landing
Y,_,N,N - I refer to charts/tables rather than use a standard factor
N,N,N,Y - I use "Canadian CRFI recommended landing distances" as published in AIP + company manuals.
Y,_,Y,Y - I use (as a guideline) distances published in AP they are conservative and useful
Y,_,Y,Y - I use AIP CRFI additives
Y,_,N,Y - I use CRFI
Y,_,N,Y - I use the charts for CRFI adjusted for A/C weight and landing distance.
Y,_,Y,Y - I use the CRFI (Table 2)
Y,_,N,Y - I use the manufaturer's charts in concert with the CRFI to make an "educated guess".
N,N,N,Y - I use the material to determine what my actual landing field length requirement is for the given CRFI value and then compare it to the length available
Y,_,Y,Y - IAW CRFI tables
Y,_,Y,Y - IAW manuals
Y,_,N,Y - IAW performance manual type specific.
Y,_,Y,Y - If "the numbers" are close - it's nice to have an additional buffer.
Y,_,N,Y - If CRFI dictates factor higher than 15%
Y,_,Y,Y - If CRFI indicates more is required.
Y,_,Y,Y - If conditions warrant such as a low CRFI
Y,_,Y,Y - If de-ice equipment is on.
Y,_,Y,Y - If I have reason to believe that the current conditions based on environmental conditions will effect landing distances, ie. snow over ice, I will add additional distance for t/o & landing
N,Y,N,Y - If runway contaminated we use CRFI info and consider the length available
N,N,Y,Y - If the x-wind component is high
Y,_,Y,Y - In some cases it is possible to use little or no braking, ie. very long runway and strong headwind
Y,_,Y,Y - Increasing landing distance 15% is far too vague and will vary on conditions and a/c type
N,N,N,Y - Info provided in company manual and ATOGS
Y,_,Y,Y - It depends on the conditions on the runway, for an added safety factor because we aren't flying brand new aircraft in top-notch condition and we are not test pilots.
Y,_,N,Y - Je dispose de charte qui tiennet compte du CRFI
Y,_,N,Y - Leave room for error, fast touchdown or slight long touchdown
N,N,Y,Y - Local knowledge. Less visits to check pilots office
Y,_,Y,Y - Lorsqu'il y a condition de givrage en vol ou lorsque nous avons utilisé des liquides dégivrant au sol.
Y,_,Y,Y - Lower crosswind limits (10 kts)
_,_,N,N - Many runways we operate to are short and gravel at a high landing weight, there is little room to spare
Y,_,Y,Y - May increase factor based on local knowledge of rwy & airport
Y,_,Y,Y - MEL - anti skid in op - reverser info etc.
Y,_,Y,Y - met requirements
Y,_,N,N - No corrections for landing beyond the increases recommended on the CRFI charts.
Y,_,Y,Y - No magic formula but I'd consider at least an extra 25%
Y,_,N,Y - Normally use large airports when CRFI values are available & apply correction based on those values
N,Y,Y,N - Not a requirement, but already applied in shown data
Y,_,N,N - Not very well laid out in operations.
Y,_,Y,Y - Often airport information is over 1 hour old. Useless
N,N,N,N - On scheduled service I know before I land the distance I need for take-off - This exceeds generously the distance required for landing.
Y,_,Y,Y - Once airborne
N,N,Y,Y - Only on very short (less than 4000') runways.
Y,_,Y,Y - Our charts contain the 15% already added. From this distance we add additional distance, based on JBI reported, to the AIP distance chart.
Y,_,Y,Y - Our charts use 60% factor, so distances are increased by 40%

N,N,_,N - Our company uses the 60% factored landing distance value (CRFI chart)
N,N,N,Y - Our manual has an increased factor for contaminated runways. Exact % is not given
Y,_,N,Y - Parfois on exige plus de 15% selon les chartes.
Y,_,Y,Y - Personal limits may be lower
Y,_,Y,Y - Piste très glissante
Y,_,Y,Y - Prevention
Y,_,Y,Y - Previous landing aircraft results i.e. turn off point, tracking, etc.
N,N,Y,N - Rarely operate on length limited runways.
Y,_,N,Y - Refer to the CRFI and then use 14 yrs. Experience on type.
N,Y,Y,Y - Regarding with the winds that is a very important factor.
Y,_,Y,Y - Runway condition, icy, wet, bare on centre line, crosswind, ……. damper, nosewheel steering
Y,_,N,N - Runways are too long for the 15% to matter
Y,_,Y,Y - Safety.
Y,_,Y,Y - Si la piste est très limité et que les obstacles en bout de piste soient mortels (falaise, plan d'eau, etc.)
N,N,N,Y - Si les valeurs sont trop juste.
Y,_,N,Y - Since the CRFI is not reliable I use it plus an additional value depending on other info, PIREPS
N,N,N,Y - Some malfunctions require application of factors of 2 or greater ie. > 100% increase.
Y,_,Y,Y - Sometimes drifting or poor drainage make amounts of contaminant vary unevenly for an average CRFI (conditions also change rapidly!)
Y,_,N,Y - Sometimes we double the 15% if we can to be safe
N,Y,_,Y - Tables de performance existantes
N,N,N,Y - The AFM gives tables for various conditions, ie. wet/snow/slush etc.
Y,_,_,_ - This is catered to by our AOM Data
Y,_,Y,Y - Temperature and presence of water film
Y,_,Y,Y - Too many variables take the safest course. Almost always quick decisions
Y,_,N,Y - Try not to delay landing and apply brakes quickly to assess braking quality
Y,_,Y,Y - Turbulence, x-wind, type of app. Night, viz, runway lights
N,Y,Y,N - Under these conditions I give myself more room than with only a wet runway. But as we do not use 15% exactly, it is difficult to answer accurately.
Y,_,N,Y - Use aircraft operating values (FCOM)
Y,_,Y,Y - Use Boeing info
Y,_,N,Y - Use CRFI. If not avail., use AOM charts.
Y,_,Y,Y - Use chart in AIP air 1-13 or 1-14
N,N,_,N - Use company and aircraft recommendations
Y,_,_,Y - Use Company approved charts for landing weights & CRFI
Y,_,Y,Y - Use CRFI
Y,_,Y,Y - Use landing distances associated with autobrake on/autopilot on (Autoland)
Y,_,_,Y - Use longest runway
Y,_,N,Y - Use MOT CRFI - Landing distance charts to factor actual landing distances
Y,_,N,Y - Use runway analysis charts to determine extra distance required.
Y,_,Y,Y - Use tables of landing distance based on CRFI
N,N,Y,Y - Use the CRFI as a main guideline. Other airplane specific factors are brought in.
Y,_,N,Y - Use type & depth tables provided in QRH.
Y,_,Y,N - Using AIP figures
Y,_,_,Y - Using CRFI Recommended landing distance chart table A or B + RSC - JB1 equivalent
Y,_,Y,Y - Using chart in AIP
Y,_,Y,Y - Using CRFI chart from AIP
Y,_,Y,Y - Usually landing distance is not a factor at airports where I operate. I will check landing distance if JBI/CRFI are low
Y,_,Y,Y - Usually look at a worst case scenario to ensure ample distance or safety factor
Y,_,Y,Y - Vents variables, turbulences, pente de la piste, vent travers, vent de dos.
Y,_,_,Y - We apply tables values according to CRFI for landings distances.
Y,_,Y,_ - We have charts to follow.
Y,_,Y,Y - We have tables that use CRFI values to adjust landing distances.
Y,_,N,N - We use a 60% factored landing distance chart.
_,_,N,Y - We use our published data for landing on contaminated runways which is generally more than 15% restrictive.
N,N,N,Y - Wet ice requires more than 15%
Y,_,Y,Y - Wet ice vs dry ice, depth of snow
Y,_,Y,Y - What is available. What is required. The closer the "required" is to the "available" the closer you look at it
Y,_,Y,Y - When conditions are deteriorating rapidly or if information available is "old"
Y,_,N,Y - When it comes to CRFI for ICC - I add about 30% additional rwy to rwy required.
Y,_,Y,Y - When you use manufacturer landing dist., it is valued with max brake on landing. Obviously you come up with very short dist. on pretty long runway in use (almost everywhere) so you have lots of bare runway
Y,_,Y,Y - Whenever I can relate a runway condition to a CRFI value I apply the factors (distances) defined by the CRFI chart (located in AIP)
Y,_,Y,Y - Wind conditions, weight, performance
Y,_,Y,Y - With ref to the JBI index

Y,N,N,Y - With the corresponding CRFI I will find the landing distance required from the unfactored landing distance
Y,_,Y,Y - Worst case scenario numbers
Y,_,Y,Y - Yes as other factors exist weather, winds or gust factors.
Y,_,N,Y - Yes, according to applicable CRFI and CRFI table in Canada Flight Supplement.
Y,_,Y,_ - Yes, if wet snow, or if r/w is used for T/O's by other a/c with anti-icing fluids sheared off on r/w at rotation end

C4. If a low runway friction value is reported for the arrival runway, do you:



[Valid responses: 382]

Actions on arrival if runway friction is low	Turbo-prop	Jet <41 tonne	Jet: Narrow-body	Jet: Wide-body
1. Re-calculate the runway distance required enroute	82%	94%	87%	85%
2. Adjust the glide slope	21%	25%	10%	14%
3. Ensure touches down close to the threshold	71%	76%	63%	61%
4. If anti-skid equipped, apply wheel brakes quickly	55%	80%	75%	71%
5. Apply reverse thrust aggressively & air brakes quickly	65%	53%	80%	78%
6. Other action	21%	12%	20%	13%

Comments: *(Preceded by response to each action given above)*

Y,_,_,_,_,_ - (C43) Ensure a/c does not land longer than normal. Comment: Use higher autobrake and additional reverse thrust, normal auto speedbrake
Y,_,Y,Y,Y,_ - (C45) (Air brakes) ?Reverse + Spoilers?
Y,_,Y,Y,Y,_ - (C45) Apply reverse thrust aggressively but not air brakes quickly
Y,_,Y,_,Y,_ - (C45) Depends on r/w avail, x-winds etc. & reverse coming in even
Y,_,Y,Y,Y,Y - Apply prop "deicing". Keep reverse as last pitch backup
_,_,Y,Y,_,Y - 1) I land a bit harder to take the forward momentum out of the aircraft. 2) I prepare myself for the possibility of using differential power to maintain directional control
Y,_,_,_,_,_ - Adjust the glide slope???
Y,_,_,Y,Y,_ - Aircraft type flown is equipped with autobrakes - medium instead of low selected if slippery, but brake application is automatic on touchdown. Also, ground spoilers automatic on touchdown.
_,_,Y,Y,Y,_ - All actions above are done slowly with safety + aircraft control in mind. C43 I touch down between 1000' & 500' markers.
Y,_,Y,Y,Y,_ - Also, use a higher landing flap setting to reduce approach & Vref speeds.
Y,_,Y,_,Y,_ - Always use Auto brakes 3 or 4 if poor conditions & Max flaps. Touchdown 1000' marks
Y,_,_,Y,Y,_ - AOM lists specific technique for slippery/contaminated runway "ducking" below the slope not part of this technique
Y,_,_,_,_,Y - Applique les freins avec une force plus élevée.
Y,_,Y,Y,Y,_ - Apply "deliberately", then go to max reverse when directional control established.
_,_,_,_,_,_ - Apply reverse thrust slowly - check for asymmetry + effectiveness of anti-skid wheel braking.
Y,_,Y,Y,Y,Y - Arm autobrakes to highest setting (Med.) consider diverting to a more suitable airport. Land flaps full to reduce touchdown speed. C44 - (autobrakes); C45 - (Normal procedure at all times); C46 Pick a better rwy if available (ie. Longer, more into wind, better CRFI)
Y,_,Y,Y,Y,_ - As recommended in aircraft manual
Y,_,Y,Y,Y,_ - Attempt firm landing to minimize hydroplaning. Ensure a headwind component (not a tailwind).
Y,_,_,Y,Y,Y - Auto brake medium + full reverse
Y,_,_,_,_,Y - Auto brake, être délicat avec frein, reverse
_,_,_,_,_,_ - Auto brakes and spoilers. Never use short runways where this is a factor.
Y,Y,Y,Y,Y,_ - Autobrake is helpful. Max flap reduces speed
Y,_,Y,Y,Y,_ - Auto-brake max or med
Y,_,Y,_,Y,_ - Autobrakes, runway selection delay + request sand, urea
Y,Y,Y,_,Y,Y - Brief touch & go if reverse not applied
Y,Y,Y,Y,Y,Y - C41) Would do this if I was trained for it. C44) More reverse first, once slowed then brakes. Comment: Increase landing ref speed up to 10 kts.
_,Y,Y,Y,_,_ - C41. Calcul automatique avec prudence selon les conditions
Y,_,Y,Y,Y,_ - C42 - No - experience has taught me to stay on G/S. Maybe did below at last little bit to

get onto the runway early - but not a big deviation below.

Y,_,_,Y,Y,Y - C42&C43) In my experience (12000 hours) pilots which "duck below the glide slope" in an attempt to touchdown early (less than 1000' from threshold) increase the indicated airspeed and do not touchdown until 1500 to 2000' down the runway. Airspeed control (ie reference & target) during the approach/landing flare is critical)

Y,Y,Y,Y,_,_ - C42) once visual & safe to do so, no less than 1 dot below within 500' C44) (approximately)

Y,_,Y,_,Y,_ - C44) Dash-8 we don't touch the brakes, C45) reverse slowly, brake slowly if needed.

Y,_,Y,_,Y,_ - C44) N/A - autobrake used. C45) automatic deploy mostly

Y,_,Y,Y,Y,_ - C45 - dépendement

Y,_,Y,_,_,_ - Calculate effect of x-wind before attempting landing or planning to that airport

_,_,Y,Y,Y,Y - Calcule d'atterisage avant de partir. remettre les ailerons au neutre sur appareil concerné, conseil du fabriquant pour garder la traîne égale sur les ailes.

Y,_,Y,Y,Y,Y - Capt. lands

Y,_,Y,Y,Y,_ - Caution: glide slope most be referenced at least 500' AIM point from threshold or you will leave your wheels in the dirt. With poor visual cues these must be tested with caution. (My Eutt~ 20') AOM recommends on glideslope, although tendency is to adjust visual arm-point from GPI of 985, to 500+ > TCH of 30+ (Safety Margin) with no prolonged float/firm touchdown for wheel spin up. Obviously IFR/poor cues, ILS glideslope/PAPI/VOSIS in that order are primary.

Y,_,Y,Y,Y,Y - Check CRFI crosswind guidance. Fly at precise airspeed (no extra speed). Firm landing. Have runway treated if possible.

_,_,_,_,_,_ - Check our manuals (which do not use CRFI) and make necessary adjustments (they are advisory only) If all the above actions were necessary I may reconsider landing & divert

Y,_,Y,Y,Y,_ - Check x-wind.

Y,_,Y,_,Y,Y - Come to a complete stop before turning off runway as aircraft can skid even at very low speeds

Y,_,_,_,_,_ - Consider crosswind. Cautions on landing for stopping/turning.

Y,_,Y,Y,Y,Y - Consider not landing

Y,_,Y,Y,Y,Y - Consider safer runways or divert to safer airport.

Y,_,_,Y,Y,_ - Consideration given to another runway or possible other airport

Y,Y,Y,Y,Y,_ - Depending on runway length

Y,Y,Y,Y,Y,_ - Depends on the length of runway if 9000' definitely do all the above. If 11,000'+ perhaps only 1 or 2 items. Also depends on strength of headwind

Y,_,Y,Y,Y,Y - Develop and use general visual cues of how fast a/c is decelerating on rwy (ie. approx. speed by halfway point, 3/4 rwy etc.) to reconfirm performance is close to that calculated from guidance material. C43 - touchdown point 1000'. C44 - or higher auto-brake setting.

Y,_,_,Y,Y,Y - Divert

Y,_,Y,Y,Y,Y - Divert if required

Y,Y,Y,Y,Y,Y - Divert to alternate if JBI value places rwy required at a greater distance than rwy available.

Y,Y,Y,Y,Y,_ - Do all you can to stop early - you don't really know if you're to decelerate till you touch down

Y,_,_,Y,Y,_ - Don't float, touchdown firmly.

Y,_,_,Y,Y,_ - Early use of wheel brake brakes to establish wheel brake effect.

Y,_,_,Y,Y,_ - Effort made to touch down by 1000' markers so that calc are accurate

Y,_,_,_,Y,Y - Ensure a positive touchdown, in other words don't "float" in attempting to grease the landing.

Y,_,Y,Y,Y,_ - Ensure AC not allowed to float & as close to RCL as possible

Y,_,Y,Y,Y,Y - Ensure airspeed is at or slightly below VREF

Y,Y,Y,Y,_,Y - Ensure firm touchdown & prompt _____ of nose.

Y,_,_,_,_,Y - Ensure positive T/down action, medium autobrake, prompt reverse.

Y,Y,Y,Y,_,_ - Ensure positive touchdown ie. little or no "hold-off" and lower nose wheel quickly.

Y,_,_,Y,Y,_ - Ensure rev thrust comes in evenly

Y,_,_,Y,Y,_ - Ensure touchdown is firm, and do not allow a/c to float after flare

Y,_,_,Y,Y,_ - Ensure touchdown is touchdown area.

Y,Y,Y,Y,Y,Y - Firm contact at touchdown, nose down stick force to increase NWS effectiveness.

Y,_,Y,Y,_,_ - Firm landing

Y,_,_,Y,Y,_ - Firm landing with very little flare.

Y,_,Y,Y,_,Y - Firm landing. If data questionable - go to alternate

Y,_,Y,Y,Y,Y - Firm touch down

Y,_,Y,Y,Y,Y - Firm touchdown

Y,_,_,Y,Y,Y - Firm touchdown (without floating).

Y,Y,Y,Y,Y,_ - Firm touchdown D44) Autobrake

Y,_,_,Y,_,Y - Firmer touchdown to deploy spoilers sooner and power levers to disc.

Y,Y,Y,Y,Y,_ - Fly bug speed exactly 1-3 Vs with firm landing, immediate deployments of air and anti-skid breaking and nose lowering quickly.

Y,_,Y,Y,Y,_ - Fly normal g/s unless day visual but ensure proper speed & touchdown point

_,_,Y,Y,Y,Y - Full flap, on speed

Y,_,Y,Y,Y,Y - Get the a/c "on" (Don't try to "grease" it)

Y,_,Y,Y,Y,_ - Give PIREPS
_,_,Y,_,Y,_ - Good & diligent use of autobrake
Y,_,Y,Y,Y,_ - Good use of aerodynamics until about 60 kts using smooth inputs
Y,_,_,Y,Y,Y - Ground spoilers. Also look closely at crosswinds
Y,Y,Y,Y,Y,_ - Have APU operating prior to landing to provide electrical + hydraulic power in case we need to shut down both engines to prevent an overrun. (Fokker F-28 no reverse thrust)
Y,_,_,_,_,_ - I adjust autobraking system from low to medium. This applies braking evenly but rapidly after touchdown. It works very well I also try to not "finesse" the landing for a softer touchdown as I want the spoilers and autobrake to engage promptly.
Y,_,Y,Y,_,_ - I am cautious with reverse thrust (in case of asymmetry)
Y,_,_,Y,Y,_ - I calculate a minimum CRFI and maximum crosswind to the rwy/landing weight so that recalculating is not necessary if conditions change.
_,_,Y,_,Y,_ - I get the aircraft slowing down using drag surfaces until I get it slowed down enough to start testing the braking effectiveness
Y,_,_,Y,Y,_ - I make sure that we touch the ground very firmly
Y,_,_,_,_,Y - I will use autobrake system in medium level + apply reverse gently
Y,_,_,Y,Y,_ - If CRFI really low, I look for evidence of surface treatment (urea, sand). If treatment not done in last 30 mins (or at all), I consider holding or diversion. Policy of my employer, Air Canada, applies.
_,_,_,_,_,_ - If decision is made to land then no adjustments are made.
Y,_,Y,Y,Y,_ - If length critical - fly app and landing myself vs allowing f/o to complete same. "Negotiate" with ATC for longest into-wind runway where available
Y,_,Y,Y,Y,_ - If low enough divert or hold until CRFI values increase
Y,_,_,_,_,Y - If too low, go to alternate aggressive use of brakes/reverse depends on rwy reports/x-wind value/pireps - etc.
Y,Y,Y,Y,Y,_ - Increase flap (max log flap) no tailwind APP. Consider slope on runway
Y,Y,Y,Y,_,_ - Increase flap selection beyond normal ops. Select reverse tentatively based on winds.
Y,_,_,_,_,_ - La procédure d'atterrissage est la même pour une piste sec ou glissante, sauf s'il y a vent de travers ou un atterrissage en crab est possible et même recommandé par Boeing.
Y,_,Y,Y,_,_ - Land aircraft firmly and possibly use nosewheel steering earlier in the Landing Roll.
Y,_,Y,Y,_,Y - Land at lowest speed possible given aircraft weight and wind gust factors
_,_,_,_,Y,Y - Land on the longest into-wind runway
Y,_,Y,Y,Y,Y - Land to break surface tension to avoid possibility of hydroplaning when appropriate.
_,Y,Y,_,_,Y - Let the plane settle down on rwy firmly, let it decelerate by itself using de-icing and a bit of reverse as necessary. Increase the use of reverse as necessary slowly than check the brakes slowly.
Y,Y,Y,Y,Y,_ - Light APU so that elec is available in case of need to reduce idle thrust after landing by shutting down both engines (residual thrust = 800 lbs per engine)
_,_,Y,Y,Y,_ - Lowest possible approach speed
Y,_,Y,Y,_,_ - Maintain maximum braking until a/c comes to a complete stop on runway
Y,_,_,Y,Y,Y - Make a firm landing on wet runways.
Y,_,_,Y,Y,Y - Max landing flap
Y,_,Y,Y,Y,Y - Maybe go to alternate.
Y,_,_,Y,Y,Y - Medium auto brakes (max for landing) plant the aircraft firmly on touchdown with auto spoilers and full rev thrust.
Y,_,Y,_,Y,_ - Medium autobrakes
Y,_,Y,Y,Y,Y - Min approach speed as per AOM, use of auto-braking.
_,Y,Y,Y,Y,_ - Most runways have conservative length for the type of aircraft we fly.
Y,_,_,Y,Y,Y - Never (1) turn off beyond the usual turn off taxiway. Never get onto the "virgin" snow that has not been cleared from the runway or you could be in trouble
Y,_,_,_,_,_ - Never touch down past the touchdown point
Y,_,Y,Y,_,_ - No reverse thrust
Y,_,_,_,_,Y - Normal landing technique with moderate to conservative application of reverse/braking application.
Y,_,_,_,Y,_ - Once wheels firmly on ground, wheel brakes are applied, air brakes immediately start reverse spool up immediately to be in full reverse when nose wheel touches.
Y,_,_,Y,Y,Y - Other a/c, ie. DC9 - due to its mechanical reverse thrust selection is done diligently & evenly. Added time to ensure directional control is maintained thus this translates into greater landing distance.
Y,_,_,_,_,_ - Perform normal landing being careful when applying brakes and reverse thrust
_,Y,Y,Y,Y,Y - Plan a harder than usual touchdown to have a fast and positive wheels spin-up for auto skid sys. & to have the spoilers come up faster
Y,_,Y,_,_,_ - Positive touchdown and prompt but cautious application of brakes and reverse thrust. C41: Friction value - and/or type & depth tables.
Y,_,Y,Y,Y,_ - Possibly consider diverting to very marginal runway/rwy length.
_,_,Y,Y,Y,_ - Pray!!

Y,_,_,Y,Y,Y - Request better works on runway. If doubt about safety change runway if avail otherwise proceed to the alternate?
Y,Y,Y,Y,Y,Y - Request runway sanding if required
Y,_,Y,Y,_,_ - Reverse thrust use with caution with x-wind landings
Y,_,Y,_,_,Y - Slow controlled braking
Y,_,Y,_,_,Y - Smooth braking, better crosswind correction
Y,Y,Y,Y,Y,_ - Sometimes will wait for ground crew at airports to sand or treat landing runway
Y,_,Y,_,_,Y - Stop aircraft on the runway before exiting on taxiway/apply reverse smoothly and evenly, bare winter caution but continuously
Y,_,Y,Y,Y,_ - Take advantage of longest rwy and ask for landing comments from similar type aircraft
Y,Y,Y,Y,Y,_ - Take into account the x wind. Also take into account the smoothness of the runway surface. A rough runway reduces the cornering force on the tires as the A/C goes over the bumps. YTH Manitoba is a prime example. Frost heaves are common.
Y,_,Y,_,_,_ - Touchdown early, then for turboprop - deicing and then brakes and finally reverse when slowed down if necessary.
Y,_,Y,Y,_,Y - Touchdown firmly
Y,_,_,Y,Y,_ - Touchdown firmly in the touchdown zone
Y,Y,Y,Y,_,_ - Try for a "firm"
_,_,_,_,Y,_ - Try not to use brakes.
Y,_,_,Y,Y,_ - Try to touchdown not later than 1000' but is a risk of undershoot if aim for just after threshold
Y,_,Y,_,Y,_ - Try to use the aerodynamic braking of aircraft.
Y,_,_,Y,Y,Y - Use auto brake setting at higher value use more flap to reduce Vref
_,_,_,_,_,Y - Use auto brake to medium (A320)
Y,_,Y,Y,Y,Y - Use auto brakes
Y,_,Y,_,Y,Y - Use auto brakes
Y,_,Y,_,Y,_ - Use auto-brake medium (4-320) works very well on slippery runways.
Y,_,Y,_,_,_ - Use autobrakes - medium
Y,_,Y,_,Y,_ - Use autobrakes works best for us
Y,Y,Y,_,Y,_ - Use brake last.
Y,_,Y,Y,Y,_ - Use full flap
Y,_,Y,Y,Y,Y - Use high flap setting
Y,_,Y,Y,Y,Y - Use higher landing flap setting which reduces touch down speed.
_,_,Y,Y,Y,Y - Use more flap for lower touchdown speed
Y,_,_,Y,Y,_ - Use normal TCH and touchdown in normal area with spoilers, autobrake, & max. reverse and antiskid
Y,_,Y,Y,Y,Y - Use of full flap
_,_,Y,_,Y,Y - Use of full flaps to reduce approach speed.
Y,_,Y,Y,Y,_ - Use of maximum flap & best runway/wind combination
Y,_,_,Y,Y,Y - Use of MED or Max autobrake
Y,Y,Y,_,_,Y - Use of reverse thrust only.
Y,_,Y,_,Y,_ - Use the autobrake function in the manner recommended by the manufacturer and as stipulated in our SOP's
Y,Y,Y,Y,Y,_ - Use: full flap & auto brakes.
Y,_,_,_,_,Y - Watch the crosswind
Y,_,Y,Y,_,_ - We will generally not dispatch into a runway that is considered to be in poor condition due to contamination
Y,_,Y,Y,_,Y - We wish we had reverse thrust! We check tire tread before departure.
Y,_,Y,Y,Y,_ - Will only adjust touchdown point on a short runway
Y,_,_,Y,Y,_ - With low CRFI I utilize both AOM precedents and compare distances with CRFI increased distances and use the most limiting of the two. A PIREP is, I find, much more indicative of runway conditions than the CRFI.

C5. How many times during the last winter did you, due primarily to a low friction report:

a) Remain airborne until the runway had been treated and friction improved?

		Configuration of aircraft you currently fly:				
		Turboprop	Jet under 90,000 lb. (41 t)	Narrow-body jet	Widebody jet	Total
# times last winter, due primarily to a low friction: Remain airborne until the runway improved	0	38 50.7%	17 33.3%	91 68.4%	79 76.7%	225 62.2%
	1	15 20.0%	16 31.4%	28 21.1%	17 16.5%	76 21.0%
	2	15 20.0%	12 23.5%	12 9.0%	6 5.8%	45 12.4%
	3	5 6.7%	2 3.9%	1 .8%		8 2.2%
	4	2 2.7%	1 2.0%			3 .8%
	5		1 2.0%		1 1.0%	2 .6%
	6			1 .8%		1 .3%
	10		2 3.9%			2 .6%
Total		75 100.0%	51 100.0%	133 100.0%	103 100.0%	362 100.0%

b(i) Reduce landing weight prior to departure?

		Configuration of aircraft you currently fly:				
		Turboprop	Jet under 90,000 lb. (41 t)	Narrow-body jet	Widebody jet	Total
# times last winter, due primarily to a low friction: Reduce landing weight prior to departure	0	66 94.3%	35 76.1%	105 84.7%	85 82.5%	291 84.8%
	1	1 1.4%	5 10.9%	6 4.8%	8 7.8%	20 5.8%
	2		3 6.5%	9 7.3%	6 5.8%	18 5.2%
	3	1 1.4%		2 1.6%	2 1.9%	5 1.5%
	4	1 1.4%	1 2.2%	1 .8%	1 1.0%	4 1.2%
	5			1 .8%	1 1.0%	2 .6%
	10	1 1.4%	1 2.2%			2 .6%
	50		1 2.2%			1 .3%
Total		70 100.0%	46 100.0%	124 100.0%	103 100.0%	343 100.0%

b(ii) Reduce landing weight enroute

		Configuration of aircraft you currently fly:				
		Turboprop	Jet under 90,000 lb. (41 t)	Narrow-body jet	Widebody jet	Total
# times last winter, due primarily to a low friction: Reduce landing weight enroute	0	62 96.9%	39 95.1%	114 95.0%	97 99.0%	312 96.6%
	1	2 3.1%		5 4.2%	1 1.0%	8 2.5%
	2			1 .8%		1 .3%
	3		1 2.4%			1 .3%
	4		1 2.4%			1 .3%
Total		64 100.0%	41 100.0%	120 100.0%	98 100.0%	323 100.0%

[Mean = 0.053 times]

d) Divert to another airport

		Configuration of aircraft you currently fly:				
		Turboprop	Jet under 90,000 lb. (41 t)	Narrow-body jet	Widebody jet	Total
# times last winter, due primarily to a low friction: Divert to another airport	0	45 59.2%	26 53.1%	92 71.9%	90 90.0%	253 71.7%
	1	21 27.6%	17 34.7%	30 23.4%	9 9.0%	77 21.8%
	2	8 10.5%	4 8.2%	5 3.9%	1 1.0%	18 5.1%
	3	1 1.3%	1 2.0%	1 .8%		3 .8%
	4	1 1.3%	1 2.0%			2 .6%
Total		76 100.0%	49 100.0%	128 100.0%	100 100.0%	353 100.0%

[Mean = 0.37 times]

Frequency of Occurrence per 1000 flights

Flight change to reduce risks	Turbo -prop	Jet <41 tonne	Jet: Narrow-body	Jet: Wide-body
Remain airborne until runway improved	1.34	2.83	1.42	2.10
Reduce landing weight prior to departure	0.35	2.83	0.92	2.17
Reduce landing weight enroute	0.04	0.26	0.17	0.06
Divert to another airport	0.86	1.21	1.02	0.68

Comments: *(Preceded by the number of times indicated for each)*

2, _, _, 1 - (2) requested a more into wind runway
1, 0, 1, 1 - (a) Freak snow storm (b) ii Stronger tail winds enroute (d) Ottawa
0, 0, 0, 0 - (E) 2 cancelled flights. Major airports are well equipped and staffed, It's the out of the way places you have to watch ie. Fort St. John, Thompson, Fredericton etc.
0, 0, 0, 0 - ….a good winter!!!
0, 0, 0, 0 - 5a) Would love to. But we do not tanker fuel
0, 0, 0, 1 - A) & B) Never
0, 0, 0, 0 - Above condition never applicable
1, 0, 0, 1 - Airport closed due to "nil" braking report, delayed landing due to low CRFI & x-wind, never reduce landing weight
3, 3, 1, 3 - All these things happened however I did not keep track of exactly how many times it happened.
0, 0, 0, 0 - Almost need to divert
0, 1, 0, 0 - Argued & dispatch
0, 0, 0, 0 - Autobrakes work like a charm
1, 0, 0, 0 - B) Une réduction de poids avant décollage aurait pu être requise à quelques occasions sur des pistes plus courtes que celles utilisées.
0, _, 0, _ - C52. Penalité ajoutée, mais aucune incidence sur le poids actuel
0, 0, 0, 1 - C5d due x-wind limits on contaminated runway using TC chart
1, 2, 0, 1 - C5d) Once but in combination with reported poor weather
0, 1, 0, 0 - Cancelled departure once
2, 0, 0, 0 - C'est l'ATC qui m'ont donné des circuits d'attente pour permettre aux véhicules de nettoyer la piste.
0, _, 0, 0 - Chose appropriate runway long & ….
0, 0, 0, 0 - Coincidentally, no exposure last winter to extreme low CRFI values.
0, 0, 0, 0 - Company tends to be conservative regarding dispatch to slippery runways. I have cancelled flights due poor runway condition. Approx. 3
4, 0, 0, 2 - Crosswind a big factor
1, 0, _, 1 - Decided not to land due CRFI.
0, 0, 0, 0 - Delayed departure to allow rwy treatment.
1, 1, _, _ - Delayed departure until friction index improved.
0, 0, 0, 0 - Departure delays only last winter to allow for runway treatment. Most operations into warm climate destinations
0, 0, 0, 0 - Did happened in a more distant part
0, 0, 0, 0 - Did not depart due to low values at the airport of arrival
0, 0, 0, 2 - Did not divert, actually cancelled scheduled due low friction & 90 degrees x/w @ 40 kts on 4000' gravel Arctic strips

0, 0, 0, 0 - Did not land on contaminated runways last year
_, _, _, _ - Did not operate out of contaminated runways last year (mainly Asia)
0, 0, _, 0 - Didn't fly much during bad/worst winter months
0, 0, 0, 1 - Diversion was also due to 0/0 conditions in freezing precipitations.
0, _, _, 2 - Diversions due to extreme crosswinds and low visibilities along with extremely low friction indexes
1, 0, 0, 0 - Don't really remember
0, 0, 0, 0 - Due to x-wind we almost had to divert over. However wind changed and we could land & t/o
1, 2, _, 2 - E) did not depart = 2x
0, 0, 0, 0 - En aucun cas, cette situation ne s'est présenté.
0, 0, 0, 0 - En général les quelques fois que l'indice etait bas cela entrait dans nos normes pour ce qui est de la longueur de piste (Y2 YMX YUL)
0, 0, 0, 0 - En réserve, vol a 100 heures dans l'hiver.
2, 0, 0, 0 - Field length is often not the issue with a Dash 8.
0, 0, 0, 0 - Flying mainly to Europe
_, _, _, 2 - Dispatch to ensure rwy being treated before departure
0, 0, 0, 0 - Fortunately fly a great aircraft into major airports where runways are long & generally well cleaned
10, 0, 0, 3 - Fredericton
_, _, _, _ - Frequently chose a different alternate a/p due to x-wind effects when alt a/p only had one r/w
1, 0, 0, 0 - Good season got lucky, never reduce landing weight
0, 0, 0, 0 - Got lucky last winter!
0, 0, 0, 0 - Had a good winter
_, 2, _, _ - I can't remember how many times but using data compensated for low CRFI's is a common take-off and landing occurrence
0, 0, 0, 0 - I fly widebody almost exclusively out of well maintained runways.
0, 0, 0, 0 - I guess I was lucky!
0, 0, 0, 0 - I had an easy winter due to operating our of large airports. My previous experience in commuter ops was much more significant in this regard.
0, 0, 0, 0 - I operate into larger airports where snow removal is effective
0, 0, 0, 0 - I usually only go VR, YZ and UL; and have not encountered very slippery runways recently
2, 0, 0, 0 - I worked during every major snowstorm this past winter. The runways were either open + you went or they weren't + you don't
0, 0, 0, 0 - If conditions presented themselves (a) or (d) might be used but not (b)
0, 0, 0, 0 - If I did that, I'd lose my job
0, 0, 0, 0 - In a couple instances should have, but overridden by captain
0, 0, _, 0 - In one case in FYH the CRFI was indicating the crosswind would be too strong. However, a similar type landed ahead despite the CRFI and reported good conditions. We landed and found same.
_, 3, _, _ - It seems to happen infrequently so I can't quantify, however, per winter, a few times
0, 0, 0, 0 - Just lucky
0, 0, 0, 0 - Last winter I did not fly in many affected areas.
2, 4, _, 1 - Left departing airport with less fuel - usually minimum to achieve reduced landing weight at destination. Sometimes not the best course of action. No contingency available.
0, 0, 0, 0 - Les avions à long rayon d'action ont un poids max au décollage élevé dû à la quantité de carburent qu'il peut Transporter, donc sur des vols domestique le poids maximum après réduction n'est presque jamais atteint.
0, 0, 0, 0 - Les circumstances ne le justifiaient pas (longueur de piste adéquate et vents dans les limites).
0, 0, 0, 0 - Lucky, I guess!
0, 0, 0, 0 - Mainly concerned with crosswind limits. Will cancel flight if crosswind is too strong with slippery contamination
3, 0, 0, 0 - Major airports generally well maintained
0, 0, 0, 0 - Managed to avoid all nasty weather last winter
0, 0, 0, 0 - Many opportunities came close but a) b) c).
0, 0, 0, 0 - Mild winter
1, 0, 0, 0 - Most often cancelled trip if rwy not suitable.
0, 0, 0, 0 - Never
0, 0, 0, 0 - Never
0, 0, 0, 0 - Never
0, 0, 0, 0 - Never reduce landing weight
0, 0, 0, 0 - Nice winter or just lucky
0, 0, 0, 0 - None
1, 0, 0, 0 - Not a bad winter last year.
_, _, _, _ - Not applicable to any flights I operated
0, 0, 0, 0 - Not common to divert. Most airports have very good facilities for r/w treatment
0, 0, 0, 0 - Not necessary last winter for my flights
1, 2, 0, 0 - Numbers showed here are # after a full preflight preparation, ie. they don't include cancellations
0, 0, 0, 0 - Occasion never occurred
0, 0, 0, 0 - Often last minutes info is ignored due to complexity of info (ie. Buried in manuals).
0, 0, 0, 0 - Only use airport with long runways that always proved suitable even if slippery. CRFI never less than .25 last winter.

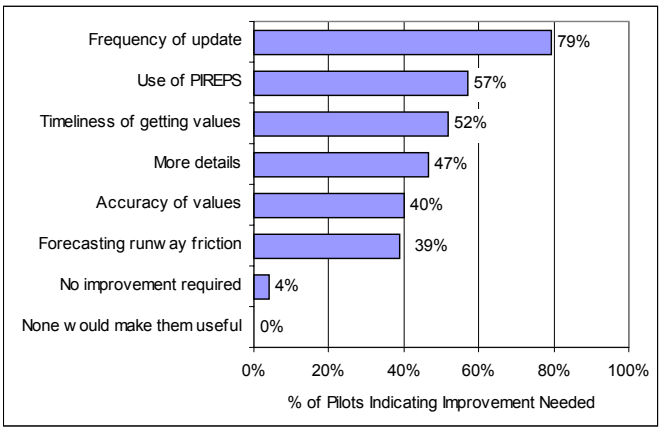
0, 0, 0, 0 - Operate mainly off large international airports. Usually have 50-100% extra runway available.
0, 0, 0, 0 - Our dispatch take into account everything is determining t/o weight and the type of aircraft I fly gives us a large margin of operation
0, 0, 0, 1 - Preceding A/C reported great difficulty in stopping despite much less momentum.
0, 0, 0, 1 - Rapidly deteriorating conditions due to freezing rain
1, 0, 0, 0 - Reducing payload for runway condition is not acceptable to management unless regulated!!
2, _, _, _ - Runway lengths adequate for all but ridiculous conditions
0, 0, 0, 1 - Runways snow covered - inadequate fuel for holding
0, 0, 0, 0 - Seldom operate on runways that are contaminated and/or critical for take-off or landing.
0, 0, 0, 0 - Several times did not depart until runway treated.
2, 0, 0, 1 - The use of the chemical urea (unsure of spelling) is very frustrating (needs time & mild temps to have any effect at all)
3, 0, 0, 0 - Typically runways are maintained well.
1, 0, 0, _ - Waited for CRFT JBI to be improved to .4 before landing due to crosswind.
2, 2, 0, 0 - Was a "mild" winter - not many instances of poor rwy conditions
0, 0, 0, 2 - Was in training during winter 00/01
0, 0, 0, 0 - Was not faced with any situation/conditions that warranted excellent handling
0, 0, 0, 0 - We have always been able to land safely with the existing conditions using all of our common senses.
0, 0, 0, 0 - Winter ops are primarily to warmer destinations & from major western hubs
0, 0, 0, 0 - Zero due to reserve status & moderate conditions.

D. QUALITY OF RUNWAY FRICTION INFORMATION IN CANADA

D1. Are the runway friction (CRFI) values available to you when required?

		Configuration of aircraft you currently fly:				
		Turboprop	Jet under 90,000 lb. (41 t)	Narrow-body jet	Widebody jet	Total
Are the runway friction (CRFI) values available to you when required	Always	6	5	13	17	41
		7.7%	9.6%	9.3%	15.3%	10.8%
	Usually	48	28	95	70	241
		61.5%	53.8%	67.9%	63.1%	63.3%
	Sometimes	23	18	29	21	91
		29.5%	34.6%	20.7%	18.9%	23.9%
	Rarely	1		3	3	7
		1.3%		2.1%	2.7%	1.8%
	No opinion		1			1
			1.9%			.3%
Total		78	52	140	111	381
		100.0%	100.0%	100.0%	100.0%	100.0%

D2. What aspects of the current runway friction information need improvement?



[Valid responses: 380]

Improvement Needed	Turbo prop	Jet <41 tonne	Jet: Narrow -body	Jet: Wide-body
Timeliness of getting values	48%	71%	49%	50%
Frequency of update	82%	88%	82%	70%
Accuracy of values	39%	49%	35%	42%
More details	35%	47%	54%	46%
Forecasting runway friction	47%	45%	38%	32%
Use of pilot reports	53%	53%	55%	65%
No improvement required	4%	0%	6%	5%
None would make them useful	0%	0%	1%	0%

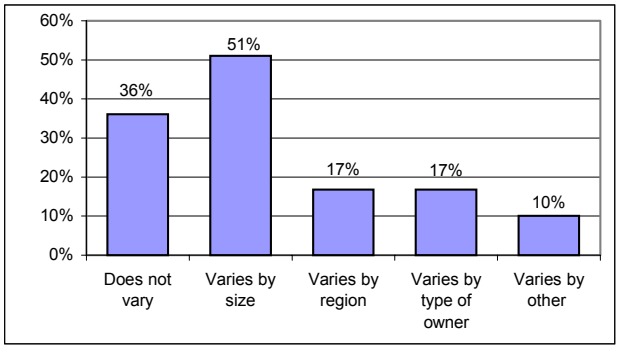
Comments: *Yes responses to each use are indicated (T=Timeliness, fr=frequency of update,A=Accuracy, M=More details, fo=Forecast, P=Pilot reports, N=No improvement) in order prior to comment:*

T,fr,A,M,fo,P,__,_ - A big beef for me is wet snow. The weight of a/c tires squeezes the water out of wet snow and its comparable to landing on wet ice if the runway is cold, soaked & frozen.
T,fr,_,_,fo,_,__ - A forecast trend would be helpful. A combination of weather and manpower.
T,fr,A,_,_,P,__ - A truck does not possess the braking ability of an airplane
_,fr,A,M,_,P,__ - Accuracy & frequency are most important.
_,_,A,_,_,_,__ - Accuracy at some airports is poor.
T,fr,A,_,_,P,__ - Accuracy is very important and PIREPS are the best reports in my opinion
T,fr,A,_,_,_,__ - Accuracy of values is a "biggy"! I can't believe the number of times the CRFI value is low but braking action is good

_,fr,_,M,fo,P,__ - Accuracy of values: This may be true but I have no way of knowing
_,fr,A,_,fo,P,__ - Accuracy of values is of biggest concern
T,fr,A,M,fo,P,__ - Add to latest METAR (to bring a low CRFI to pilots attention without having to specifically call up CRFI reports)
T,fr,_,_,_,P,__ - After hours of operation availability for IROPS
_,fr,_,M,_,_,__ - Airports will leave an old CRFI published after the runway has changed significantly. This has resulted in overruns
_,_,_,M,_,_,__ - An overall CRFI is misleading. Need CRFI for touchdown and rollout as well as turnoff to taxiway for rwy exit.
_,fr,_,_,_,_,__ - ATIS values used have been up to two hours old!
_,fr,A,_,_,P,__ - Both CRFI & surface condition reports frequently hours old & inaccurate
_,fr,A,_,fo,P,__ - Calculation is made with truck or car with vehicular tires which are different of a/c tires (zero grooves in tires for a/c)
_,_,_,_,_,_,__ - Canada leads the world in cold weather operations
T,fr,A,M,_,_,__ - Center portion often different from sides
T,fr,_,_,_,_,__ - CYFC - needs to have better frequency with CRFI.
T,fr,A,_,fo,P,__ - D2: Forecasting rwy friction: Can it be done?
_,fr,A,_,_,_,__ - D22 - Depends on condition
_,fr,_,_,_,_,__ - D22 - Our system automatically deletes reports if not updated within a time period. Therefore the rwy appears to be bare &dry.
T,fr,A,M,fo,P,__ - D22. This is extremely important!
_,_,_,M,_,_,__ - D24 - Dernier tier très utile en cas de "reject" le bout de piste est souvent plus glissant, puisque pas utilisé.
T,fr,_,M,_,P,__ - D26- Maybe advertise reports on ATIS, more. More details- Good idea.
T,fr,A,_,_,_,__ - D26 to D28) I find that pilot reports lack consistency & accuracy. Also a pilot flying a turboprop might call the braking fair, while a crew flying a jet may call it poor or nil (ie aircraft type makes a difference)
T,fr,_,M,_,P,__ - D26. Nobody will take a chance with this; unrealistic
T,_,_,_,_,_,__ - Easier to work with. More user friendly
T,fr,A,M,fo,P,__ - Entire program needs to be improved
T,fr,A,_,fo,P,__ - Especially the accuracy. TC should take more responsibility for its accuracy. They are considered "Advisory" yet we are expected to base landing and take-off decisions on them
_,fr,A,M,fo,_,__ - Forecasting of runway friction would be very welcome!
T,fr,_,_,_,_,__ - Format of RSC could be made easier to read = break it down, dedicate one line to each runway.
T,fr,_,_,_,P,__ - Fréquence de mise à jour lorsque les conditions changent rapidement/différent pour certain types d'appareils.
_,_,A,M,_,P,__ - I do not think CRFI is too accurate
_,fr,A,_,_,_,__ - I have been surprised by several very slippery rwy that had relatively good CRFI values. Some were old, some just wrong.
T,fr,_,_,fo,P,__ - I like the forecast CRFI idea
_,_,_,_,_,_,__ - I would like to have CRFI as landing distance charts
_,fr,_,_,_,_,__ - If the equipment is available at the airport, the pilot needs IMMEDIATE and frequent checks. MORE important than weather check
_,fr,_,_,_,P,__ - Il faut souvent questionner les contrôleurs pour avoir l'information
T,fr,_,_,_,P,No - Increase distances available on JBI chart
_,fr,_,M,fo,P,__ - Increase reporting on Northern airports
T,fr,_,M,_,P,__ - Include taxiway & ramp info often land successfully only to slide on taxiways
T,fr,A,M,_,P,__ - Informatique devraient être pertinentes au type d'appareil
_,fr,_,_,_,P,__ - Les PIREP sont très utiles.
T,fr,_,_,fo,P,__ - More detailed CRFI with snow over top of freezing rain
T,fr,A,M,_,_,__ - More frequent updates on ATIS.
_,fr,A,_,_,_,__ - Need better frequency at small airports & the affect temperature has on CRFI
T,fr,_,_,_,_,__ - Need CRFI on demand mostly too old to be of value
T,fr,A,M,fo,P,__ - Need some way to measure braking effectiveness on wet rubber deposited turnoff areas. Need better reporting than a long ATIS message that is not easily copied.
_,_,_,_,_,_,__ - No opinion. Use of CRFI is not part of current SOPs.
_,_,_,_,_,_,__ - Overall the CRFI info is OK
_,fr,A,_,fo,P,__ - Pilot report accuracy is generally poor. Some call it "poor" but make "normal" cut off???!!!
_,fr,_,_,fo,P,__ - Pilot reports are always available and often passed to ATC but only occasionally passed to aircraft on approach.
T,fr,_,M,_,_,__ - Pilot reports from appropriate types the best info.
_,fr,_,_,_,_,__ - Pilot reports should always state aircraft type, ie. R.J. info not really valid for DC-10 etc.
T,fr,_,_,_,P,__ - PIREPS are most important
_,fr,_,M,fo,P,__ - PIREPS on ATIS if braking action fair or less
T,fr,_,M,fo,P,__ - Put on ATIS

_,fr,_,_,_,P,__ - Reluctance to create inaccuracy of report @ small airports.
_,_,_,_,_,_,__ - Reporting needs to be more brief, if possible
_,fr,_,M,_,_,__ - Some airports don't measure aft certain hours
_,fr,_,_,_,P,__ - System works well right now except for northern airports which have no RFI
_,fr,_,_,_,_,__ - Text of CRFI report varies. Should be standardized
T,fr,_,_,fo,_,__ - The biggest problem regarding CRFI is getting accurate up to date values. They are usually non-existent or hours old.
_,fr,A,M,_,_,__ - There is a wide variation between airports on the above points.
T,fr,A,_,_,P,__ - Timeliness is a problem especially at busier locations and therefore pireps are excellent source of info - pilots rarely give!
T,fr,_,_,_,P,__ - Tower is more aware of "runway sweeping" than TML. In snowing condition Runway should update TML asap of SNIC/rwy condition//PIREPS
T,fr,_,_,fo,P,__ - Transmission of rwy condition should be transmitted to pilot by ATC prior to descent so it can be included in landing briefing.
T,fr,_,_,_,P,__ - Type specific
_,fr,A,_,_,P,__,None - Units as named + values derived should be the same worldwide. Having to learn/understand all different methods sometimes leads to confusion if info is received just prior to landing
T,fr,_,M,fo,P,__ - Up to date information is critical - occasionally we have held in the air waiting for an RSC report we had to request meanwhile using up valuable fuel reserves.
T,fr,A,M,_,P,__ - Use of pilot reports in particular
_,fr,A,M,fo,P,__ - Values of CRFI does not apply evenly to different categories of aircraft
_,_,A,M,_,_,__ - Values separate at touch down zone, half way down & most importantly that last 2 thousand feet or so when you just may need the braking the most.
T,fr,A,M,fo,P,__ - Very hard on the east coast to get reports and sometimes refusing to land before they do give a report
_,_,_,_,_,P,No - We have a lot and enough information regarding this issue.
T,fr,A,M,fo,P,__ - We need accuracy of values by jet and by turbo prop; remember turbo prop do a lot of work at all the small airports in Canada
_,fr,A,_,_,_,__ - When runway is slippery arrange to get reading of CRFI late enough to be accurate for landing of schedule flights
T,fr,A,M,fo,P,__ - Yes Yes Yes!

D3. Does the quality of runway friction information vary between airports? If yes, in what way:



[Valid responses: 388]

Varies by, and which is better	Turbop rop	Jet <41 tonne	Jet: Narrow-body	Jet: Wide-body
Does not vary	26%	27%	38%	45%
Varies by size	54%	65%	47%	47%
Larger/major better*	43%	54%	31%	28%
Mid-sized better*	2%	0	3%	1%
Varies by region	8%	15%	24%	15%
Varies by owner type	29%	19%	14%	11%
TC better*	20%	16%	4%	5%
LA/municipality better*	1%	2%	1%	0
Varies by other characteristic	15%	8%	10%	7%

* No adjustment for pilots indicating that data varies by characteristic, but who did not specify which is better

Comments: Regions – which are better:
Airports which normally have slippery rwy seasons
ARCAS where occurrences are more frequent (experience)
Atlantic better
Better in the West
Canada
Central Canada
Central is better
East
East coast/North - more frequently have low JBI
East coastal areas
en centres urbains
Maritime used to have freezing PC PN
Maritimes and Ontario
More experienced
Northern
Northern BC is very poor
Northern YXY excellent
Ones that have more contaminated runways
Ontario
Ontario
Poor in Northern Regions
Prairie best

Région urbaine
Regions in colder climates
Southern
The areas that use it more often
Western Region
YFC, YSJ, YQM **poor** reporting
YQB is **worst**
YYT

Comments - Varies by Other Characteristic:
Achalandage de l'aéroport
Airports with less funding tend to have lower quality reporting or none at all
Airports without a control tower tend to leave old CRFI reports in effect
CRFI given for gravel strips differ. Not as good as T.C. reading/pavement.
Depends on each individual reporter
Each airport is different regardless of size, location etc.
For some reason east coast airports such as Halifax & Moncton are the worst I have experienced in more than 25 years of flying.
Hours that maintenance available for the airport.
How proactive load airport staff are at taking and updating the CRFI's.
Individual airports vary
It is just a matter of "dollars". Everybody wants to save 1 dollar - they keep their old JBI system, and sometimes it is not that reliable to us!
It just varies too much even same location.
meteo locale
Night time operations (2200-0600) tend to have incomplete reports due to lack of staff (reduced) to do reports & clean runways.
Pas de constante varie d'un aéroport à l'autre. Il y a des petits aéroports où c'est excellent
Selon les heures d'exploitation
Some airports are more keen to update reports.
Time of arrival/departure affect info. ie. a 6:00 am departure at a small facility.
Too many different names/values! Only need one type that would require a quick glance at a chart to determine application to present situation
Toronto, Winnipeg (big centers)
Training of individual providing information, time of night will also make it vary
Unable to specify - variances noted have been of no consequence.
Varies according to skill & experience of individuals doing observation or measurement
Varies by airport to airport (major international)
Varies by areas with more freq bad winter conditions
YUL better
YYZ awesome, YQM YQB YFC mediocre
YYZ better

Comments on variation:
(Preceded by response to whether data varied by each of the characteristics: N=No variation, S=Size, R=Region, Ow=Owner type, Oth=Other)
_,_,R,__,__ - Airports that are subject to extensive snowfall freezing rain etc.
_,_,_,__,__ - As in the winter
_,S,_,__,__ - At airports with a higher traffic volume the frequency of CRFO measurement is greater. All airports should be re-inspecting a runway's CRFI anytime there is a change in conditions - ie. snowfall, temperature change or at the very least hourly.
_,S,_,__,__ - Aux aéroports moins occupés
_,S,R,Ow,Oth - Aux aéroports principaux
_,S,_,__,__ - Big airport = more frequent readings.
_,S,_,__,__ - Bigger airports are more accurate.
_,_,_,__,__ - Can't comment
_,S,_,__,__ - Control towers close at smaller airports at night, and info is not available even though aircraft are still operating.
N,_,_,__,__ - D31 - My impression is that they all follow the same procedure.
N,_,_,__,__ - D31) That I have noticed
_,S,R,Ow,__ - Depends how bad the weather is & how busy, bad conditions & busy = poor everything
_,_,_,__,__ - Do not fly to enough airports that provide this info to be able to qualify them.
_,_,_,__,__ - Don't know. Haven't noticed any difference
_,S,R,__,__ - Getting CRFI is easy in Canada's large airports YUL, YYZ, YHZ, YYT, YVR
N,_,_,__,__ - Haven't noticed much variance - European airports different than Canadian
_,S,R,__,__ - I have found it varies from region to region and airport to airport depending on severing of weather and differences in equipment used to conduct CRFI
N,_,_,__,__ - I have not noticed a variance but only operate into main airports
_,_,_,__,__ - I have only operated into Toronto and overseas in the last year
N,_,_,__,__ - I imagine that for some small airport, information is sometimes weak like they were 18 years ago. Now I'm always going to big airport where quality seems to be the same
_,S,R,Ow,__ - I noticed that some guys aren't considering the side friction
N,_,_,__,__ - I operate into large airports only. Usually very accurately useful
_,_,_,__,__ - I thought they were standard!
_,_,_,__,__ - Il faut souvent questionner les contrôleurs pour avoir l'information
_,_,_,__,__ - Individuals do not always have the same degree of conscientiousness when it comes to timely and accurate RSC reporting and measuring

_,_,_,__,__ - Insufficient experience to assess.
_,S,_,__,__ - Int'l. airports best
_,_,_,__,Oth - It does vary between airports but I don't know for what reason (there seems to be no consistency)
_,_,_,__,__ - I've never had confidence in YVR because of their lack of experience with bad weather and a bad experience in the past
_,S,_,__,__ - Larger airports more aware
_,S,_,__,__ - Larger airports usually more timely
_,S,_,__,__ - Larger have 24 hr runway maintenance staff
_,_,R,__,__ - Les américains donne une glissance de piste souvent plus pire qu'elle l'est vraiment.
_,_,_,__,__ - Major airports obviously update info more often and have current braking action reports
_,S,_,__,__ - Medium size
_,S,_,__,__ - Mid sized airports better
_,S,_,__,__ - More money to spend on more sophisticated equipment.
_,_,_,__,__ - Most of my experience is YYZ to the U.S., I have mostly have one station to comment on
N,S,_,__,__ - NAVCAN
_,_,_,__,__ - Non-busy airports (night-ops) often seem to be in a position to pass on rwy info as it is available - often only one tower controller (also talking with ground ops)
N,_,_,__,__ - Not aware of any differences
_,_,_,__,__ - Not enough personal data.
_,_,_,__,__ - Not familiar enough to know
N,_,_,__,__ - Not noticeably
_,_,_,__,__ - Not noticeably
_,S,_,Ow,__ - Note: If conditions exist reporting to be done every 30 min - both my diversions could have been avoided if CRFI was updated & both times with 1 hour period. The biggest problem right now is receiving regular CRFI reports & accurate.
_,_,_,__,__ - Only fly to major airports
_,S,R,__,__ - Poor at East Coast airports after hours.
_,_,R,__,__ - Quebec City & Atlantic Canada very poor.
_,_,_,__,__ - Really only one airport CYYZ that I use.
_,S,_,__,Oth - Seems proportional with airport revenues + activity
_,S,_,__,__ - Size - frequency of flights - obvious
_,S,_,Ow,__ - Small (low budget) airports often take CRFI measurements just prior to arrival making it difficult to plan & prepare in advance. Require constant monitoring while airport open
_,_,_,Ow,__ - Smaller airports are slower to clean and apply chemical to rwy.
_,S,_,__,__ - Smaller airports will respond to a request for a new CRFI better than larger ones.
_,S,_,__,__ - Some airports leave old reports in computer for 2 days after report was made. All reports should have a shelf life.
_,S,_,Ow,__ - Some smaller airports (not all), the first fall snow always catches them off guard-poorly trained or ill equipped. Some local authorities are terrible.
_,S,_,__,__ - Sometimes it is available sometimes not
_,S,_,__,__ - Souvent Toronto l'entretien des pistes et taxiway laisse à désirer et la précision des rapports aussi.
_,_,_,__,__ - TC airports more consistent re: clearing of snow, reports, etc,
_,S,R,__,__ - The bigger the airport, the better the CRFI reports it seems.
_,_,_,__,__ - There are variances but I cannot identify them as to region/authority/size
N,_,_,__,__ - Timeliness, frequency, more details would improve quality at all airports. Communicate better.
_,S,_,__,__ - Usually larger
_,S,_,__,__ - Aux aéroports achalandés
_,_,R,__,__ - Values in the Maritime are suspect
_,S,_,__,__ - Variation with size - 50/50
_,_,_,__,Oth - Variations are unpredictable
_,S,_,__,__ - Varies by time of day ie. poor service @ night
_,_,R,__,__ - West coasts deals with very wet humid, slushy conditions whereas the prairies deal mostly with dry snow type conditions - CRFI values maybe the same in both locales, but braking very different!
_,S,_,__,__ - Whether ATC located at airport or offside (More a problem relating to weather reporting in general).
_,S,R,__,__ - YPR - 2000 local time good luck
_,S,_,__,__ - YYZ-YUL-YVR better, some remote airports the CRFI seems to have been inaccurate (CYHY, CYSM, CYTH, CYQD)

E. TRAINING

E1. When did you last receive training specifically on the use of runway friction values?

		Configuration of aircraft you currently fly:				
		Turboprop	Jet under 90,000 lb. (41 t)	Narrow-body jet	Widebody jet	Total
When did you last receive training specifically on the use of runway friction values?	In last 12 months	49 62.0%	43 84.3%	54 37.8%	51 45.9%	197 51.3%
	Over 12 months ago	19 24.1%	7 13.7%	50 35.0%	39 35.1%	115 29.9%
	Never	11 13.9%	1 2.0%	39 27.3%	21 18.9%	72 18.8%
Total		79 100.0%	51 100.0%	143 100.0%	111 100.0%	384 100.0%

E2. If you received training, in your opinion, how well was the use of runway friction values, specifically, covered in your last training course?

		Configuration of aircraft you currently fly:				
		Turboprop	Jet under 90,000 lb. (41 t)	Narrow-body jet	Widebody jet	Total
How well was the use of runway friction values, specifically, covered in your last training course	Very well	4	9	7	15	35
		5.6%	18.4%	6.4%	15.3%	10.7%
	Well	15	20	26	22	83
		21.1%	40.8%	23.6%	22.4%	25.3%
	Adequately	30	18	48	33	129
		42.3%	36.7%	43.6%	33.7%	39.3%
	Poorly	21	1	22	23	67
		29.6%	2.0%	20.0%	23.5%	20.4%
	No opinion	1	1	7	5	14
		1.4%	2.0%	6.4%	5.1%	4.3%
Total		71	49	110	98	328
		100.0%	100.0%	100.0%	100.0%	100.0%

[72 have not received training]

Comments on how could it be improved:

Very well - En étant introduite dans votre refresher annuelle sur type d'avion.

Very well - Make annual training mandatory on use of CRFI tables. Make CRFI tables mandatory in flight operations manual. As to the best of my knowledge the CRFI tables are not in our aircraft library, so unless you carry your AIP (which is not mandatory) you might n

Very well - Pas vraiment, la théorie ne remplace pas l'expérience.

Very well - Qualité présente.

Well - ??? Course annually + video

Well - Avec une livre de réference rapide contenant des examples.

Well - By issuing updates/questionnaires prior to winter months

Well - Company & aircraft specific charts would be useful.

Well - Créer un programme en simulateur sur différente qualités de piste.

Well - Instructor personality item - hard to improve.

Well - It is covered in ground school on a yearly basis, as well is sometimes presenting during bi-annual simulator training.

Well - Less interpolation and eliminating the need to jump from one chart to another to another

Well - Make it type specific!

Well - Only by info being handed out.

Well - Réduire le nombre de calcul, avoir des chartes pour le type d'avion utilisé

Well - Simplify if possible

Well - Souvent l'utilisation et procédure des constructeurs n'est pas standard.

Well - Very confusing charts

Adequately - A lot of the training is spent complaining about how inaccurate the values are

Adequately - Accentuer la formation sur des examples opperationnel concret.

Adequately - Application to accelerate-stop distance

Adequately - As in all areas of training everything has been cut to the bone. More time & more training required

Adequately - Be more type specific more time in this area.

Adequately - But outdated

Adequately - By incorporating questions to verify our knowledge. It could be done during our Annual Recurrent Training

Adequately - Could highlight variations in friction across rwy and down length which TYP occur.

Adequately - Give the instructor more training

Adequately - Guidelines applying CRFI to accel/stop would be extremely useful.

Adequately - Have more info available.

Adequately - Haven't received any lately

Adequately - I felt that it was not well understood, explanations were not that firm. I took a while to comprehend the charts, I felt that not everybody were understanding the same thing, we had a different comprehension

Adequately - I would only reiterate the need for a measurement of how reduced CRFI's affect stopping distance in a rejected take-off.

Adequately - Include more contamination scenarios during loft/training/simulation

Adequately - More detail aircraft specific

Adequately - More emphasis RQD.

Adequately - More examples, explanations charts

Adequately - More ground school performance calculation scenarios and review of different CRFI calculations

Adequately - More organized.

Adequately - More practical lectures would improve use of charts and understanding.

Adequately - More time should be given on this item in our training

Adequately - More training exercises with simulated values to use the charts

Adequately - Needs updating

Adequately - No Boeing (Aircraft Specific info) info.

Adequately - Nouvelle information au lieu du même vidéo de TC depuis 5 ans.

Adequately - Once again keep it simple.

Adequately - Operator should customize tables for each type, thereby enable the crew to make quick decision, ie. when CRFO updated during approach - not time to dig thru manuals and tables/GA to check the table should not be preferred option.

Adequately - Pireps from all pilots on how a/c performed vs guidance material in order to monitor validity.

Adequately - Plus claire plus facile.

Adequately - Questionnaires with different scenarios specific to your aircraft type.

Adequately - Should almost be included in every Annual Recurrent training
Adequately - Simulator training.
Adequately - Spend more time looking at all performance aspects of the aircraft your flying. After my initial aircraft course, virtually all performance review is by self-study
Adequately - T/O & landing JBI's don't mean anything - they are just reference to another type of A/C years ago.
Adequately - Take-off restrictions applied!
Adequately - Training by someone who has specific knowledge in the field
Adequately - Video showing how it is taken and effects of different CRFI values
Adequately - What exactly is expected of us by the Flt. Ops Dept - minimum conditions for operation & use of guidance material
Poorly - Always too short, too fast course was given just to be legal with MOT we don't go deep enough!
Poorly - Because CRFI # came from non-turboprop aircraft, everyone including instructors are skeptical about using the data. I want the data/training and use to be cut & dry. Then maybe I will be able to commit everything to memory.
Poorly - Booklet with work through examples and exercises.
Poorly - By spending more time discussing about "CRFI" and slippery condition. In our era most airline try to minimize time for training… "Time is money!"
Poorly - CRFI values covered quickly on first airplane course then not at all on second. I guess I am assumed to have required knowledge! Company did issue a Bulletin on first airplane type
Poorly - Charts are very unfriendly and causes great confusion.
Poorly - Dedicated performance/runway analysis ground school with adequate reference to CRFI information.
Poorly - Employer never challenges captains decision not to try out a challenged induced rwy environment, No pressures that way - this is good.
Poorly - En donnant des exemples concret de penalités de poid au types d'avion utilisés.
Poorly - Have an instructor who really knows how to use it.
Poorly - Have never received formal training, only been given info to read.
Poorly - Incorporate in pre-ride work package some eg. to get you onto the books. Review during recurrent ART, esp. min V speeds!
Poorly - Make ground training contain less theory & more practical info. ie. how charts/graphs can be applied effectively in daily operations.
Poorly - More aircraft specific info required and reject T/O stop info not available during training
Poorly - More specific to aircraft type
Poorly - More time/review in more detail
Poorly - Most instructors don't like the subject of performance, so it is often skipped or neglected
Poorly - Need some training on accelerate & stop distance
Poorly - Need to spend time on effect of low CRFI values in take-off.
Poorly - Not sure , we are losing money now. We can't get good training when making money. Transport Canada a willing accomplice in this.
Poorly - Provide more examples & more info on effects to take-off performance.
Poorly - Put all the info in AIP
Poorly - Revue trop brièvement compte tenu de la quantité et la complexité des information. Compte tenu aussi de l'incompatibilité des informations fourni par TC et par Boeing.
Poorly - Should be reviewed during ART.
Poorly - Specific examples & constraint to be reviewed & studied.
Poorly - Teach in classroom.
Poorly - Teach us how to relate it to large jet transport operations. Use actual examples.
Poorly - The challenge was that it was a small part of a major change in procedures. Hopefully things will stabilize & the training get more prominence.
Poorly - Too much left to self study. More instructor input would be useful
Poorly - Utilisation de chartes précises pour le genre d'appareil pilote (JBI 03, JBI 0.35, JBI 0.4 etc.)
Poorly - We all seem to be on a learning curve. Your research is very important. A/c type relevancy is something that needs to be focused on. Again - a type specific chart - (weight, speed, installed equip/CRFI)
Poorly - Winter simulator session should have extensive briefing with examples along with aircraft handling techniques. Right now, it is not covered by our training dept. to any degree.
No opinion - CRFI training should be mandatory and included in an annual recurrent ground school

F. FREQUENCY OF SAFETY CONCERNS

F1. In the time period given, how often did you experience situations when landing on a runway that was icy or covered with compacted snow where you felt that the aircraft:

a) braking was significantly reduced (past 12 months)?

		Configuration of aircraft you currently fly:				
		Turboprop	Jet under 90,000 lb. (41 t)	Narrow-body jet	Widebody jet	Total
F1A	0	7	2	17	24	50
		9.2%	3.9%	12.8%	22.2%	13.6%
	1 - 5	39	32	92	74	237
		51.3%	62.7%	69.2%	68.5%	64.4%
	6 - 10	22	9	17	7	55
		28.9%	17.6%	12.8%	6.5%	14.9%
	11 - 15	2	6	5	2	15
		2.6%	11.8%	3.8%	1.9%	4.1%
	16 - 20	4	1	1	1	7
		5.3%	2.0%	.8%	.9%	1.9%
	21 - 25	1				1
		1.3%				.3%
	26 - 30		1			1
			2.0%			.3%
	46 - 50	1				1
		1.3%				.3%
	56 - 60			1		1
				.8%		.3%
Total		76	51	133	108	368
		100.0%	100.0%	100.0%	100.0%	100.0%

b) was slipping sideways due to crosswinds (past 12 months)?

		Configuration of aircraft you currently fly:				
		Turboprop	Jet under 90,000 lb. (41 t)	Narrow-body jet	Widebody jet	Total
F1B	0	28	32	81	85	226
		36.8%	62.7%	60.9%	79.4%	61.6%
	1 - 2	33	15	41	17	106
		43.4%	29.4%	30.8%	15.9%	28.9%
	3 - 4	9	1	7	3	20
		11.8%	2.0%	5.3%	2.8%	5.4%
	5 - 6	3	1	1	2	7
		3.9%	2.0%	.8%	1.9%	1.9%
	7 - 8		1	1		2
			2.0%	.8%		.5%
	9 - 10	1	1	1		3
		1.3%	2.0%	.8%		.8%
	19 - 20	2				2
		2.6%				.5%
	Over 20			1		1
				.8%		.3%
Total		76	51	133	107	367
		100.0%	100.0%	100.0%	100.0%	100.0%

c) was close to not stopping on available runway (past 12 months)?

		Configuration of aircraft you currently fly:				
		Turboprop	Jet under 90,000 lb. (41 t)	Narrow-body jet	Widebody jet	Total
Experience landing on icy/compact snow runways: close to not stopping on available runway (1 yr)	0	71	41	119	103	334
		92.2%	80.4%	88.1%	95.4%	90.0%
	1	4	8	13	4	29
		5.2%	15.7%	9.6%	3.7%	7.8%
	2	1	1	2	1	5
		1.3%	2.0%	1.5%	.9%	1.3%
	3	1		1		2
		1.3%		.7%		.5%
	4		1			1
			2.0%			.3%
Total		77	51	135	108	371
		100.0%	100.0%	100.0%	100.0%	100.0%

d) ran off the side or end of runway (past 5 years)?

		Configuration of aircraft you currently fly:				
		Turboprop	Jet under 90,000 lb. (41 t)	Narrow-body jet	Widebody jet	Total
Experience landing on icy/compact snow runways: ran off side or end of the runway (5 yrs)	0	75	49	132	106	362
		96.2%	98.0%	98.5%	98.1%	97.8%
	1	2	1	2	1	6
		2.6%	2.0%	1.5%	.9%	1.6%
	2	1			1	2
		1.3%			.9%	.5%
Total		78	50	134	108	370
		100.0%	100.0%	100.0%	100.0%	100.0%

Frequency of Occurrence per 1000 flights

Flight change to reduce risks	Turbo prop	Jet <41 tonne	Jet: Narrow-body	Jet: Wide-body	Total
Braking significantly reduced	9.4	11.2	12.5	17.3	11.7
Slipped sideways due to X-winds	2.8	1.7	3.8	2.7	2.9
Close to not stopping on runway	0.18	0.53	0.47	0.37	0.36
Ran off side of runway	0.016	0.008	0.009	0.037	0.015

Comments: *(preceded by indicated number of times for each incident)*

2, 1, 0, 0 - Close to not stopping twice in 20 years

12, 0, 0, 1 - F1d) temporarily lost control of the aircraft because one main wheel tire touched down in a deep windrow in poor visibility in a crosswind. Came within a few feet of the side of the runway.

1, 0, 0, 0 - F1e) Uncontrolled on taxiway (last 5 years) = 3

20, 0, 0, 0 - Have slipped sideways many times on taxiways

2, 2, 2, 0 - Very close in YQT 3 yrs ago - wet snow JBI changing rapidly

G. IMPROVEMENTS

G1. Do you feel that the runway friction information currently provided by the airport could be better used?

Do you feel that runway friction information currently provided by airport could be better used? * Configuration of aircraft you currently fly: Crosstabulation

		Configuration of aircraft you currently fly:				
		Turboprop	Jet under 90,000 lb. (41 t)	Narrow-body jet	Widebody jet	Total
Do you feel that runway friction information currently provided by airport could be better used?	Yes	47	30	889	54	220
		60.3%	61.2%	63.6%	49.5%	58.5%
	No	16	5	14	20	55
		20.5%	10.2%	10.1%	18.3%	14.7%
	No opinion	15	14	37	35	101
		19.2%	28.6%	26.6%	32.1%	26.9%
Total		78	49	140	109	376
		100.0%	100.0%	100.0%	100.0%	100.0%

Comments:

Yes – " Smaller" airports communicate info in a more timely manner so we can calculate effects 0 = contamination earlier

Yes - A mixture of CRFI and PIREPS make for good information

Yes - Again - as it relates to specific aircraft.

Yes - Aircraft operating material needs to make reference to CRFI values.

Yes - Although not exactly sure how.

Yes - Apply it to taxiways somehow

Yes - At smaller airports during times of precip., plowing etc. have the CRFI taken at more regular intervals

Yes - ATIS should be updated as CRFI changes. PIREPS from tower are also good

Yes - Available more often

Yes - Better correlate it with AFM for QUICK easy reference. Anybody can calculate the risk with an hour at a desk but our decisions are often REQUIRED to be made in minutes or seconds

Yes - Better standard to determine how to operate

Yes - By dispatch

Yes - By having better ground school only for that

Yes - CRFI values do not correlate to aircraft AOMS - yet

Yes - Correlating the CRFI values with the various industry reported braking action formats.

Yes - Could be better correlated into the take-off …….

Yes - Could manufacturers be required to apply CRFI to that A/C type.

Yes - CRFI should be reported hourly on the ATIS when required. CRFI readings should be taken hourly during inclement weather. PIREPS should be included on the ATIS

Yes - Crosswind calculation could be done by pilots more routinely

Yes - Crosswind limit could be stated.

Yes - CYYZ - database info packaged & correlated into a useful database for heavy aircraft. Would provide for dispatch efficiency.

Yes - Definite need for better data on a/c flown by the major airlines, data that we can feel comfortable that we count on, and especially for RTO on a slippery runway (broken down for specific situations)

Yes - Direct correlation with airline performance data.

Yes - Dispatchers should be responsible for forwarding updates when received to arriving and departing aircraft

Yes - Elle est parfois disponible mais pas transmise sur l'ATIS. On doit en faire la demande au contrôle sol.

Yes - En demandant un bon rapport de l'appareille, qui s'est posé devant nous.

Yes - Every airport has a pickup truck, but the information relayed to a PA-31 or a B-747 is the same

Yes - Everyone including instructors are skeptical about using the data because CRFI # came from non-turboprop aircraft. The data/training and use to be cut & dry.

Yes - Everyone should use ?????

Yes - Explain what affect temperature has on CRFI

Yes - For crosswind landings on contaminated runway there is now no friction value available. Some equivalent would be helpful RSE vs CRFI?

Yes - For dispatch

Yes - Get a worldwide standard! So we are all speaking the same language (Ask a Brit or a German what JBI is!)

Yes - Get the CRFI out earlier in the morning for small aerodromes

Yes - Have approach/ departure manuals incorporate charts (a/c specific) for each runway. Might be expensive but info would be at your fingertips.

Yes - Have asked for a CRFI when slush is on runway and was told "they don't do CRFI's when slush is on runway" by tower! That's when I need to know how slippery it is!

Yes - I don't know ……. the "standardization" is across Canadian airports (small to large airports), but I knew that every airport had the latest TOR the line CRFI equip. than given to me. I would feel better with the number

Yes - I would like to see more information made available on take-off. Much more emphasis seems to be placed on the landing phase of flight.

Yes - I would like to see one international standard used, and have a/c manufactures apply it to performance data for specific types

Yes - If one knows the dry runway stop distance for landing and the contaminated for landing runway stop distance for a particular weight/speed combination then one knows the actual extra

distance required due to the CRFI. This extra distance can be subtracted
Yes - If the CRFI x-wind limit is exceeded for that runway, they should not allow arrivals & landings on that rwy. Some land, some wait, or divert. Should be a hard limit.
Yes - If the values were more accurate more often, pilots might find them of more use. JBI seemed to be more accurate than CRFI.
Yes - If timely passing on of information.
Yes - If updated
Yes - If we had a concrete way to apply the values to take-off (eg. adjust V1/VR and a take-off weight based on CRFI)
Yes - Implemented with go no go decision at the SCOCC level.
Yes - Improve enroute accessibility to timely (within the hour) CRFI reports. Carry out hourly CRFI reports even when no change.
Yes - Incidences par TYPE d'appareil
Yes - Include as a comment on the hourly weather report
Yes - Index must be accurate, definitive and endorsed by the Company
Yes - Info included in met reports
Yes - It is one thing to receive the info. It is quite another thing to be able to use it correctly, when time is limited
Yes - Its affect on rejected take-off performance
Yes - Je suis satisfait mais il y a toujours une petite place a l'amélioration
Yes - Just make it a percentage value based on dry log distance
Yes - Make information easily understandable ie: "Runway snow covered .5 inch, braking action tested as fair, actual reports fair to good".
Yes - Max shelf life of report - no more than 2 hours when braking reported fair or poor. New JBI at beginning of each ATIS broadcast or PIREP update hourly if JBI not avail.
Yes - More accurate & frequent reports when an ice or snow covered rwy becomes wet.
Yes - More details versus average CRFI
Yes - More frequent measurements are required at remote (FSS) airports
Yes - More frequent updates
Yes - More info for take-off
Yes - More often & more accurate when you need it if there has been changes. It doesn't do us any good if it was done a couple of hours ago.
Yes - More reports with more accuracy
Yes - More specific data correlation between CRFI and take-off data.
Yes - More timely debrief to flight crew. More easily read format for reporting RSC's
Yes - More training & better application for type.
Yes - More update report
Yes - Need more definitive info for specified rwy conditions.
Yes - On ATIS or FSS reports, start to qualify braking action at first eg. good, moderate, poor then expand on details. Too much info given during approach phase.
Yes - Only that the most up to date info be provided. CRFI's 1-2 hrs old aren't much good if conditions change significantly or rapidly.
Yes - Performance data for aircraft is required ie. Weight penalties, V1 reductions etc.
Yes - Plus de mise à jours de CRFI et plus de grafiques mais l'avion n'a plus été construite depuis 20 ans.
Yes - Pre departure info is often spotty at small airports because clearing and new reports are saved for the expected arrival times. A forecast of this would be an asset.
Yes - Providing the information more often when the weather decreases the runway conditions
Yes - Referring to previous comments - if its wet enough to hold a snow wall together, snow should be classified as slush, #2 a runway surface temp would be more useful than an O.A.T. ie. esp. YYC, YXT where temperature extremes are common.
Yes - Regular and timely report to aircraft and flight ops. Staff.
Yes - RFM type specific data for both take-off and landing.
Yes - Same as above. Better Measuring equip & more aircraft specific info.
Yes - Should be extended to include wet runways < 7000'
Yes - Should be universal and more user friendly due usually short notice info.
Yes - Single source book with charts and tables
Yes - Some reports are not valued due to time report taken and the changing conditions either improving or not.
Yes - Some sort of correlation to the take-off case is required
Yes - Sometimes conditions change very rapidly.
Yes - Sometimes friction info is up to 4 hrs old and of no use.
Yes - Standard system with FAA/Euro/AOM.
Yes - Standardize system in N. America and Europe, ie. (ICAO). Let us not forget aviation is a "global" industry.
Yes - Start CRFI reports early in the day. This way operational decisions can be made before most a/c leave their departure airport.
Yes - Strict adherence to a single standardized measurement and degraded performance such as the CRFI
Yes - T/O data
Yes - Take-off data

Yes - TC utilise un index CRFI, Boeing utilise "poor", "medium" "fair". Il faut standardiser.
Yes - The CRFI value given eg. 0.3 should have an aircraft specific interpretation. Ie 0.3 may be too low for a RJ, but acceptable to a Dash 8
Yes - To set specific operational limits
Yes - Transmitting of recent AREPS are most useful
Yes - Un message ATIS séparé du message météo. Plus de surveillance en régions.
Yes - Une information utile serait de donner l'état de taxiway aussi que la rampe.
Yes - Use figures for transport aircraft and grooved and rubber contaminated runways
Yes - We, as pilots need to be trained to better use these values in conjunction with the ref speeds & t/o performance information we are required to use. The airport authorities should make these values (RFI) available more regularly (maybe, as part of the hourly weather observations)
Yes - With appropriate charts
Yes - With more standardized/ consistent training
Yes - Yes, however it is not reported enough. Many reports are 5-6-7 hours old and significant changes have not been reported.
No - At present the information that is provided is adequate, provided the carrier provides appropriate charts for penalties required for contaminated conditions.
No - Better information needs to be supplied - I operate in extreme Northern areas, sometimes RF information is not supplied at all or a half ton truck is used to determine braking action for an aircraft over 22,000 kg
No - CRFI reports are probably as accurate and valid as is presently possible but I find pilot reports of braking action by similar types to be more meaningful and helpful
No - It is an info tool to be considered
No - Until it becomes more exacting it is only one factor: so many other factors come into plan.
No opinion - Question is unclear.

G2. Would you like to see runway friction (CRFI) values used specifically in calculation of allowed landing weights?

Would you like to see CRFI values used specifically in calculation of allowed landing weights? * Configuration of aircraft you currently fly: Crosstabulation

	Configuration of aircraft you currently fly:				
	Turboprop	Jet under 90,000 lb. (41 t)	Narrow-body jet	Widebody jet	Total
Yes, in ops manual	21	22	49	38	130
	26.9%	44.0%	35.0%	35.5%	34.7%
Yes, in guidance material	31	17	49	29	126
	39.7%	34.0%	35.3%	27.1%	33.7%
No	12	1	23	18	54
	15.4%	2.0%	16.5%	16.8%	14.4%
No opinion	8	3	8	9	28
	10.3%	6.0%	5.8%	8.4%	7.5%
Yes, in ops manual & guidance material	6	7	11	13	37
	7.7%	14.0%	7.9%	12.1%	9.9%
Total	78	50	140	107	375
	100.0%	100.0%	100.0%	100.0%	100.0%

Comments:

Yes, in ops manual - Aircraft specific.
Yes, in ops manual - and distances!
Yes, in ops manual - And for allowable t/o weights - t/o is worse - a high speed reject occur near the end of the runway, and probably with 1 less reverser
Yes, in ops manual - Applies quite differently to type as well as weight of aircraft
Yes, in ops manual - As long as the info is accurate
Yes, in ops manual - Currently available.
Yes, in ops manual - Even though I put my (x) in this box, do you really believe that Boeing and Airbus are going to come up with these charts? Never. So, Transport Canada has to do it with a Falcon 20.
Yes, in ops manual - Firm limitations would help. We all know some operations are riskier than others. Just knowing that helps little if we are expected to do them anyway.
Yes, in ops manual - For short runways
Yes, in ops manual - If "you" don't legislate it - the airlines will never adopt it
Yes, in ops manual - In large jet transport operations it is essential.
Yes, in ops manual - In Ops manual, NOT in guidance material
Yes, in ops manual - In the Ops manual would make it a requirement, theory eliminating pressure and ego.
Yes, in ops manual - Inclusion in QRH would be a good idea.
Yes, in ops manual - It surprises me it's not already
Yes, in ops manual - It's better to have black & white decision making, rather than leave it up to a pilots judgment. I've seen CRFI numbers applied in some very different ways.

Yes, in ops manual - Make CRFI tables mandatory in flight operations manual. As to the best of my knowledge the CRFI tables are not in our aircraft library, so unless you carry your AIP (which is not mandatory) you might not have access to the CRFI tables.
Yes, in ops manual - Maybe to restrictive
Yes, in ops manual - One source - preferably in the QRH
Yes, in ops manual - Pourrait-être fait sous forme de rwy analysis.
Yes, in ops manual - Quick reference manual should contain performance data with CRFI incorporated.
Yes, in ops manual - Takes the guess work out of the equation
Yes, in ops manual - This critical information needs to be more user friendly for the pilot to use during approach/holding for landing while conditions rapidly change.
Yes, in ops manual - This would give a better idea of how to apply CRFI to a/c type as values vary widely with weather, a/c weight, performance, handling, etc.
Yes, in ops manual - We make no corrections for contaminated runway ops. other than using full thrust for take-off. This lack of performance corrections is an accident waiting to happen.
Yes, in ops manual - Weight specific & a/c specific
Yes, in ops manual - Yes in ops
Yes, in guidance material - Aircraft type specific reference material.
Yes, in guidance material - Already done
Yes, in guidance material - But not overriding, i.e. info only
Yes, in guidance material - Comme il a été fait dans "altitude correction chart" et pour chaque type d'avion.
Yes, in guidance material - Guidance only not limits
Yes, in guidance material - Have those values and calculated with actual wind at airport
Yes, in guidance material - I do not want to see a chart with CRFI values with an allowable corresponding distance usable. There are too many variables. Guidelines to follow work better.
Yes, in guidance material - I feel that using the charts on AIP air 1-13/14 one is already determining allowable landing weights
Yes, in guidance material - I keep coming back to the need to be able to apply the CRFI to my a/c in quick reference form.
Yes, in guidance material - I would like to see the CRFI values translated for accurate use on the a/c I fly. I know, as a pilot, I like to know exactly what I can expect & with modern technology there is no reason to do like the old bush pilots of 20-30 years ago.
Yes, in guidance material - I would like to see the information that we have available now "re-packaged" into a simpler format. It would provide a consistent "base line" for intelligent risk management
Yes, in guidance material - If it were put in the Air Bus ops manual it would be so confusing, no one would understanding it.
Yes, in guidance material - If the CRFI is low, how much runway do you need to stop the aircraft. "Jets" "Turbo Prop" most runway are 4,000 feet, the material must reflect real life day to day operations
Yes, in guidance material - If you want to make it more of an exact science, otherwise loosen up application of AOM numbers & use broader guidelines.
Yes, in guidance material - It's already in our Route Manual Supplement as a recommended landing distance. I would keep it this way
Yes, in guidance material - Like to see more specific data re Charts with CRFI correlated to actual forecasted landing distance/and T/O distances
Yes, in guidance material - Not enough training in the use of it, and value not reliable enough to have it in AOM/FOM
Yes, in guidance material - Only if the CRFI is applied to the particular aircraft type. Jet type information does not apply to a large turboprop that can disc its propellers
Yes, in guidance material - Only if the tests & CRFI values have been developed for specific a/c
Yes, in guidance material - Only if values are consistent and recent
Yes, in guidance material - Perhaps even in the OPS manual would be a consideration with more info on how accurate or relevant such calculations would be in the "real world"
Yes, in guidance material - Pour consultation rapide
Yes, in guidance material - Realize it's technically impossible to report on all types of tires, brakes etc. Solid criteria should be generic and any improvement/deterioration factors should be covered by OPS manual - type specific.
Yes, in guidance material - There needs to be an international standard.
Yes, in guidance material - This should be similar to calculating t/o performance, thus standardizing & simplifying
Yes, in guidance material - We do this already
Yes, in guidance material - We have that guidance in Jeppesen charts.
Yes, in both - But this info is already covered here for my company
Yes, in both - For both, but at least guidance material
Yes, in both - If we slide off a slippery runway TC , the Airline, and aircraft manufacturer, but the liability on the pilots because CRFI is only "Advisory" - that is a huge cop out! If they

provide the info & expect us to use it, they should take the responsibility too
Yes, in both - Or recommended landing weights
Yes, in both - Ours does.
Yes, in both - The more guidance to the pilot, the better
Yes, in both - This info is currently available to me.
Yes, in both - Yes - I would like to see anything that increases my knowledge or understanding of this situation.
No - Aircraft manual covers most of which is required
No - Chart values (landing weights, flap settings etc.) must be available but not just restricted to landings.
No - CRFI are guidance info not absolute values.
No - CRFI is a guide - often not accurate enough for this purpose.
No - CRFI values available at planning time will be stale, outdated at actual arrival time
No - Experience and company info adequate
No - For guidance only in landing distances - not to restrict operations by limiting T/O weights
No - Guidance only.
No - I'm on the fence because it may be cumbersome and the arrival conditions may not apply. A good alternative is a better option.
No - Imposes a limitation that may not be accurate
No - Not accurate enough for all variables
No - Notre compagnie nous a fourni un méthode du calcul en fraction des condition des pistes.
No - Nous en avons déjà
No - On les a déjà
No - Only if aircraft specific
No - Pilot decision
No - The unfactored dry distance is predicated on landing weight. The distance is then predicated on the CRFI index value - according to the chart - do we need more calculations. I think not.
No - They are not precise enough, conditions changes too rapidly.
No - Unreliable - situations varies too much. It would only put more restrictions on an over-restricted area. Stop trying to kill the industry and economics factor for ……. If you or others are afraid to fly - stop flying, It has to stop somewhere!
No opinion - Avons déjà
No opinion - For us this is already done
No opinion - In our company it is already done

G3. What problems do you foresee with their use in this way?

Comments *(Preceded by responses to whether they would you like to see CRFI values used specifically in calculation of allowed landing weights):*
Yes, in ops manual - Aucun, que des avantages.
Yes, in ops manual - Better to keep it as a recommendation - like recommended crosswind limits
Yes, in ops manual - Can't foresee problems.
Yes, in ops manual - Company does not want to cancel the flight.
Yes, in ops manual - Conflict with economic imperatives
Yes, in ops manual - Cost of operation = less profit
Yes, in ops manual - Could be overly conservative
Yes, in ops manual - Could create problems operationally if runway info is not updated and passed along in a timely manner
Yes, in ops manual - Delayed flight, cancelled flight etc.
Yes, in ops manual - Diagrams are not perfectly clear sometimes and because we look these information during only 1 season and only when runway reported slippery, we need to be cautious to interpret information
Yes, in ops manual - Does not guarantee you can stop in available distance
Yes, in ops manual - Economic
Yes, in ops manual - Falcon 20 vs B747? Everything is relative; aircraft & pilot skill plus or minus reports + runway itself
Yes, in ops manual - Increased diversion & non ops
Yes, in ops manual - It will cost owners some money.
Yes, in ops manual - It would curtail operations slightly but would be a lot safer than educated guess currently in use.
Yes, in ops manual - Limitative versus informative
Yes, in ops manual - Limiting payload, management will fight this, safety must take precedence.
Yes, in ops manual - May be too general providing little latitude under variable conditions or when CRFI is of questionable validity
Yes, in ops manual - May limit operation of a/c during inclement weather
Yes, in ops manual - Moderate operational restrictions (ie. Load cap)
Yes, in ops manual - No problems
Yes, in ops manual - No problems
Yes, in ops manual - No info for T/O and or accelerate stop distances.
Yes, in ops manual - No leeway for pilots to adjust weights, for things not included in the textbooks calculations
Yes, in ops manual - No problems just increased safety

Yes, in ops manual - Non. Cela protège à la fois les pilotes et les passagers.
Yes, in ops manual - None [same comment 6 times]
Yes, in ops manual - None in terms of safety
Yes, in ops manual - None, if data is consistent and its use is the same at all operators
Yes, in ops manual - None, same for everyone
Yes, in ops manual - None. There should be no gray areas, The PIC should be able to determine whether or not the landing or T/off can be made.
Yes, in ops manual - Not practical during rapidly changing conditions.
Yes, in ops manual - Occasionally customers will be inconvenienced.
Yes, in ops manual - Once again: accuracy of obtained data.
Yes, in ops manual - Operation will stop in many occasion
Yes, in ops manual - Pilot now hesitate to use it due to its complexity.
Yes, in ops manual - Regions West Coast - Yukon - Prairie - Eastern - East Coast have so many weather-humidity conditions that to be of much help - local knowledge & experience play a big factor
Yes, in ops manual - Resistance from airlines as this will increase diversions and cancellations.
Yes, in ops manual - Restrictions
Yes, in ops manual - Restrictions on weight, costing our customer more money but safety improves.
Yes, in ops manual - Some trips would be cancelled. That is also the advantage as the trip should be cancelled.
Yes, in ops manual - The ability of the airport authorities to quickly, accurately & consistently update the CRFI values, then transmit them to the pilots
Yes, in ops manual - The company might not like the restrictions. Too bad.
Yes, in ops manual - They must be accurate
Yes, in ops manual - Timeliness & accuracy
Yes, in ops manual - Unnecessarily reducing loads due to inaccurate CRFI values. 2) I'll have to dedicate another 5 min. (per kg) of my life with my head in the books instead of flying the airplane.
Yes, in ops manual - Very few but would provide more definitive max landing wt. values
Yes, in ops manual - Would have to ensure CRFI values are accurate and consistent between all airports.
Yes, in guidance material - A tendency to believe that CRFI is always an accurate indication of aircraft performance.
Yes, in guidance material - Adequate training + use + manufacturer support in publishing
Yes, in guidance material - Again, all of these tools are a guide and not as accurate a PIREPS (like type braking action)
Yes, in guidance material - Alternate airport availability
Yes, in guidance material - At present in the heat of the moment pilots tend not to calculate exact penalties, but take broader precautions.
Yes, in guidance material - Can become very operationally restrictive when conditions don't warrant such a restriction
Yes, in guidance material - CRFI will have to be more consistent and reliable
Yes, in guidance material - Conditions are too variable, to make hard numbers work.
Yes, in guidance material - Confusing charts create confused crew!
Yes, in guidance material - Constant changing of conditions at a/p
Yes, in guidance material - Cost, training, type specific problems
Yes, in guidance material - CRFI measurements do not seem to be exact & change rapidly
Yes, in guidance material - Diversion
Yes, in guidance material - Guidance can become "mandatory" and shut out common sense.
Yes, in guidance material - Have to be a/c type specific
Yes, in guidance material - I believe that like JBI, CRFI is a guide only, and if aggressively applied, would lead to un-required diversions
Yes, in guidance material - If actual CRFI was better, then flights could divert or be CNX'd based on incorrect info.
Yes, in guidance material - If too stringently regulated, could end up diverting aircraft to other airports in occasions where there previously was no problem - drive up air operator's cost unnecessarily.
Yes, in guidance material - Impossible to be that specific!
Yes, in guidance material - Inaccuracy of CRFI could affect operations
Yes, in guidance material - It is only advisory, not regulatory therefore when it comes to the crunch, it can be ignored.
Yes, in guidance material - Lack of accurately determining actual stopping distance under different conditions may lead to overly conservative & unnecessary weight limits. This could unnecessarily impede operations at times even if only produced recommended limits & not hard limits.
Yes, in guidance material - Lack of being used
Yes, in guidance material - Landing distances too variable at low CRFI values (95% is not good enough!) If adherence to these values is not

mandated, those operators may be penalized economically for taking a conservative approach
Yes, in guidance material - Limitations for operations - most time braking is a lot better than reported.
Yes, in guidance material - May cause restrictions to using desired airport.
Yes, in guidance material - Misuse by inexperienced pilots.
Yes, in guidance material - More in the planning of the flight. Those values are hard to forecast
Yes, in guidance material - No opinion
Yes, in guidance material - No problem as long as we keep it as guidance only
Yes, in guidance material - No problems
Yes, in guidance material - None [same comment 5 times]
Yes, in guidance material - None if just as guidance material
Yes, in guidance material - None, due to the fact that they would improve on safety & knowledge.
Yes, in guidance material - Not all operators following it.
Yes, in guidance material - Not applied properly
Yes, in guidance material - Old or inaccurate values are dangerous
Yes, in guidance material - Only good in Canada (because of no cross reference to JBI or other common values).
Yes, in guidance material - Only guidance then experience will lead the way.
Yes, in guidance material - Oui! Il est surprenant de voir combien de pilotes, F/O et Capt ne comprennent pas les calcules à faire pour un décollage avec piste glissante.
Yes, in guidance material - Oui, si elle deviennent incriminente si non utilisé adéquatement ou si le plus récent CRFI n'a pas été utilisé. Les CRFI ne sont pas émient regulièrement.
Yes, in guidance material – Poor……., misinterpretation
Yes, in guidance material - So much paperwork that it would make calculations complicated, it must be easy!
Yes, in guidance material - The accuracy v/s time and regulation lead to non-operational guidelines
Yes, in guidance material - The companies must buy in to restrictive landing weights that will result in cancelled flights
Yes, in guidance material - Too restrictive, using inaccurate info to dictate the plan.
Yes, in guidance material - Too general if not aircraft specific
Yes, in guidance material - Too limiting
Yes, in guidance material - Too much regulation is not good, the pilots need to make judgment calls to operate their a/c safely and efficiently (Clean wing concept, good example)
Yes, in guidance material - Ultimately the pic is responsible for the safe movement of aircraft. No problems.
Yes, in guidance material - Unless accuracy is improved the CRFI effect is too varied by type, ie. DHC8 is not affected as CARJ. This info is available now
Yes, in guidance material - Unless technology improves in measuring friction CRFI values may cause reduced landing weights unnecessarily.
Yes, in guidance material - Using data from a Falcon and applying it to a Dash 8
No - As above.
No - Complicate further operations
No - Cumbersome, restrictive, not required.
No - Dated info - limiting operating procedures.
No - Departures on contaminated runways, icy or wet is more critical than landings in most cases
No - Different manufacturers could/would present the information in their own way, creating different understandings amongst user groups
No - Erosion of pilot in command authority
No - Guidance material - most pilots or some, will use that as restriction or limits to respect.
No - Guidance only/Pilot discretion
No - I don't need the Government in my cockpit provide accurate timely information only!!
No - I feel they are a useful guideline (not to be used as an "exact" science).
No - I would usually restrict leads for take-off but conditions may change by arrival time (ie get better)
No - Imposes a limitation that may not be accurate
No - Inappropriate operating restrictions
No - Inflexible, too rigid
No - Legislated airmanship
No - May give false sense of margin of safety, when more significant factors are pilot skill combined with good judgment.
No - More restrictions. Less pilot authority.
No - Non [same comment 3 times]
No - Not accurate, old data, does not always reflect aircraft experience.
No - Pas assez rapide à calculer
No - Removes all discretionary decision making from Captain
No - Since measurement process is not accurate it may unnecessarily ground flights
No - Some pilots would use them to cancel flight, some managers would use them to blame pilots.
No - Too restrictive too many hours prior to arrival
No - Too limiting, not required for large carriers with long runways.
No - Too many variables to be able to fix a landing weight restriction ie. wind vector, runway lengths AC type, rubber contamination
No - Too many variances in AC type/performance and technique.

No - Too restrictive
No - Too strict, use airmanship!
No - Un des problèmes avec le CRFI est la table qui ne va pas au delà de 4000 ft du côté "unfactored"
No - We need to leave the final decision with the crew, not several numbers that when added up you cannot land? The land or no land becomes based on several # of which any of them could be wrong.
No - We wouldn't be able to land 50% of the time on most runways in the Arctic.
No opinion - Changing limitations based on changing WXX
No opinion - May result in both unnecessary diversions and approaches to landings when not advisable; experience and professional judgment rules.
No opinion - Pour références seulement. Crainte d'application trop arbitraire
No opinion - Too restrictive
Yes, in both - Data accuracy for inquiries/legal action.
Yes, in both - Ease of access
Yes, in both - I won't know until I look at it.
Yes, in both - If not up-to-date could have a major economic effect on company. Hard to plan when conditions in future are unknown or variable
Yes, in both - Il faut des chiffres plus précis et des facteurs de sécurité adéquat pour être en mesure de démontrer à son patron que l'on a pu décoller à l'heure à cause de l'état de la piste.
Yes, in both - Liability!
Yes, in both - More limiting, for manufacturers
Yes, in both - No problem, gives us hard numbers to use based on current CRFI.
Yes, in both - Non conformes avec les autres pays ex. FAA, JAA etc.
Yes, in both - None
Yes, in both - None
Yes, in both - Runway condition changes enroute putting the a/c over the landing weight requiring more diversions
Yes, in both - Some will use info as go-no go before departure - I have asked dispatch, or what basis do you wish for me to go when CRFI calculations below limits: CRFI needs to be updated regularly for general public awareness, but needs to offset the risk of fear of
Yes, in both - The #s will show us not being able to land even though we know we can.
Yes, in both - Time consuming to consult.

G4. Are there other ways you like to see the runway friction (CRFI) values used?

Comments:
1) The way they're measured needs to be consistent. 2) Values have to mean something (at which point is the runway a skating rink)
Accelerate/stop calculation
An alert in AITIS or SA, ie. "braking fair/poor/good RPTD"
Application for T/O wt restrictions
Apply to accel/stop distances (no info for my a/c type)
As a guideline is very good but not specific enough for each aircraft. Aircraft specific - good.
As part of total information required to make a decision
As previously stated
As they pertain to take-off performance, ie. accelerate stop!
As they are now - to provide us the info of the CRFI and we have to deal with it - that's it.
ATC ground hold program for busy airports - force airlines to combine flights, cut congestion, allow more space between landings, etc.
Below a certain value - the airport operator has to keep more than 1 rwy useable
Broadcast on ATIS (updated in timely manner during operations on slippery runways)
Calculating take-off data.
Close airport if below certain #. Make airport accountable to passengers who pay airport improvement fees. If rwy conditions shutdown airports.
Combined with pilot reports of braking actions but disregard all "nil" braking reports - A "nil" report is inaccurate as it would result in an overrun
Consistent reporting very important.
Correlated to take-off weights for a/c type
CRFI not accurate enough to predict 3+ hours into the day
Data concerning how reduced CRFI values impact rejected take-off performance.
Determining max T/O weights.
Determining reduced V1
Direct relation between aircraft type and stopping distance required
Flooded runways (ie after a heavy thunderstorm)
For arrival delay, planning, runway treatment programs, staffing levels
For potential RTO!
For t/o use to decrease actual runway length to an effective length to give an actual safe take-off weight
For take-off
For take-off

For take-off and rejected take-off distances (ie. Balance Field calculations)
For take-off information. Currently, I can calculate if it is safe to land, but cannot apply CRFI info for our departure.
For take-off/reject
Good for assessment of risk but decision etc to proceed should be based on captain's + F/O's agreement on risk: prior aircraft braking reports offer best info. Re aircraft type braking.
Greater LAHSO/SIRO operational restriction.
Guidance for take-off
Handing not allowed below minimum CRFI. Use of reverse thrust allowed in formula.
Have approach/ departure manuals incorporate charts (a/c specific) for each runway. Might be expensive but info would be at your fingertips.
How about addressing balanced field length requirements with a low CRFI? (t/o PERFORMANCE)
I really don't know if there is any other way
In determining max payload for operation into airports with low CRFI values.
In the calculation of rwy take-off requirements and/or V1 reductions; and/or weight penalties.
Incorporated with day-to-day use manuals, ie. Jeppesen Airport analysis
Is there any way that the "history" of the amount of precipitation over last 2 hrs., 6 hrs or some equivalent manner, i.e. 4" in last 2 hrs - 12" total, this helps give me a better picture of what's up.
Je ne suis pas convaincu que le Falcon utilisé pour les tests de CRFI soit représentatif pour les plus gros avions.
Je ne vois pas.
Just make info & calculations simple & accurate
Make their use mandatory in calculating T/O & lag performance and enforce this.
More frequent observations required - when conditions are poor.
More information for take-off
Need more data on how take-off distance is affected for a rejected T/O.
No [same comment 14 times]
No opinion
No take-offs or landing allowed below certain minimum readings. Clean the runway.
No, runway contaminated & slippery is good
None, same for everyone
Not at this time
Not really.
On runway turnoffs (high speed) when they are contaminated by ice or snow
On taxiways
One standard for all countries.
Only stopping distance vs landing wt.
Oui
Oui, sûrement
Pas pour l'instant
Published when crosswind exceeds limit + rwy conditions exist. ie. On ATIS or given by ATC.
Quick reference graphs
Quick reference placard for crosswinds
Reductions to V1 on take-off
Reference only.
Sans opinion
See G1: Would like to see CRFI for contaminated runway as well as ice and compact snow
Should be in Ops Manuals for T/O weights too
Simpler faster to read values we often do not have the luxury of time for decisions
Simplify material
Standing water
T/O
Takeoff - balanced field lengths
Take-off degradation for aborted take-off.
Takeoff stop distance
Takeoff weight reductions - some way to factor abnormal landing scenarios (eg.: partial flap) with a/c certified under "old" standard
The restrictions, ie. V1 cuts and ability to hold centerline and restricted accelerate/stop distances addressed by CRFI.
There should be different values provided for different category of aircraft, eg. transport jets, turbo props, bizz jets, etc.
To be able to calculate stopping distance after a reject at each 10 knt speed. Example 100 kts reject/110 kts reject 120 kts reject, etc.
To be added to hourly weather report (SA) in order to alert flight crews
To determine friction on a wet rwy. Particularly when it has been previously contaminated with snow or ice.
Touchdown zone & last 2000' of rwy.
Use aircraft specific tables that are easy to refer to in short time.
Use case studies on class or duplicate in simulator (training)
Used in allowed T/O weights for balanced field length.
Valid type - specific crosswind data.
We apply t/o penalties for wet/1'4 deg. Slush/1/2" slush correlate CRFI values into the t/o decision, ie. what CRFI corresponds to wet, 1/4" slush, 1/2" slush?
Wet or damp runways for take-off
Wet runways because there are situations, ie. long runways where reduced EPR & less flap could be used or in wet conditions where reduce VI speeds should be used
Yes - crew needs user friendly data specially when all surrounding factors are not - reduces apprehension.
Yes on taxiways

Yes when landing @ YYZ an into wind rwy would go a long way to reducing reliance on all aspects affecting the capabilities of airman & aircraft. Noise abatement is absolutely an invalid excuse & offers genuine compromise to safety.

Yes, make information easily understandable ie: "Runway snow covered .5 inch, braking action tested as fair, actual reports fair to good".

H. PILOT EXPERIENCE

H1. Please indicate the configuration of aircraft you currently fly:

Configuration of aircraft you currently fly:

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Turboprop	80	20.4	20.7	20.7
	Jet under 90,000 lb. (41 t)	52	13.2	13.4	34.1
	Narrow-body jet	143	36.4	37.0	71.1
	Widebody jet	112	28.5	28.9	100.0
	Total	387	98.5	100.0	
Missing	System Missing	6	1.5		
	Total	6	1.5		
Total		393	100.0		

H2. How frequently do you fly?

Number of departures per year

No. of departures per year

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 - 199	116	29.5	33.9	33.9
	200 - 399	95	24.2	27.8	61.7
	400 - 599	65	16.5	19.0	80.7
	600 - 799	40	10.2	11.7	92.4
	800 - 999	17	4.3	5.0	97.4
	1000-1199	8	2.0	2.3	99.7
	1400-1599	1	.3	.3	100.0
	Total	342	87.0	100.0	
Missing	System Missing	51	13.0		
	Total	51	13.0		
Total		393	100.0		

Number of hours flown per year

No. of hours flown per year

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	200 - 399	3	.8	.8	.8
	400 - 599	42	10.7	11.0	11.8
	600 - 799	221	56.2	57.9	69.6
	800 - 999	103	26.2	27.0	96.6
	1000-1199	13	3.3	3.4	100.0
	Total	382	97.2	100.0	
Missing	System Missing	11	2.8		
	Total	11	2.8		
Total		393	100.0		

H3. How many years have you been a commercial pilot?

No. years a commercial pilot

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0 - 9	42	10.7	10.9	10.9
	10 - 19	156	39.7	40.3	51.2
	20 - 29	138	35.1	35.7	86.8
	30 - 39	49	12.5	12.7	99.5
	40 - 49	2	.5	.5	100.0
	Total	387	98.5	100.0	
Missing	System Missing	6	1.5		
	Total	6	1.5		
Total		393	100.0		