EUROPEAN AVIATION SAFETY AGENCY
AGENCE EUROPÉENNE DE LA SÉCURITÉ AÉRIENNE
EUROPÄISCHE AGENTUR FÜR FLUGSICHERHEIT

Research Project EASA.2009/4

Regulation of Ground de-Icing and Anti-Icing Services in the EASA Member States

Interim Report

easa.europa.eu

Disclaimer

This study has been carried out for the European Aviation Safety Agency by an external organization and expresses the opinion of the organization undertaking the study. It is provided for information purposes only and the views expressed in the study have not been adopted, endorsed or in any way approved by the European Aviation Safety Agency. Consequently it should not be relied upon as a statement, as any form of warranty, representation, undertaking, contractual, or other commitment binding in law upon the European Aviation Safety Agency.

EASA.2009.OP 21

Study on the regulation of ground de-icing and anti-icing services in the EASA Member States

INTERIM REPORT

INTRODUCTION

airsight GmbH

Gustav-Meyer-Allee 25
13355 Berlin
Germany
Phone: +49 30 45803177
Fax: +49 30 45803188
www.airsight.de

Table of Contents

1 Introduction

The tender specifications for EASA 2009.OP 21 were issued following: recommendations to address safety issues associated with thickened fluid residues; in response to comments submitted to A-NPA 2007-11; and the development of an Agency Plan of six medium and long-term actions. The terms of reference for this Study constitute one of the medium-term elements of this Plan, as follows:

> *Investigate and recommend the means by which the Aviation Authorities of Member States manage matters with respect to the certification of service providers, availability of fluids at aerodromes, etc.*

In order to support the Agency in developing a voluntary harmonised regulatory approach to providers of de-icing / anti-icing services, and to achieve a greater availability of fluids at aerodromes, the Agency demanded factual inputs and informed advice from a knowledgeable consultant.

The Project consists of three work packages:

Investigation of the problem area:

A systematic study containing an overview over the regulatory approaches taken by the National Aviation Authorities (NAAs) in the EASA Member States towards de-icing and anti-icing service providers. Also to obtain an overview over the airports / aerodromes at which air operators with a fleet containing susceptible aircraft are unable to get the appropriate de-icing and anti-icing treatment.

Recommendations for regulatory action by Member States and the role of EASA therein:

Due to being neither the direct regulator nor rule maker for ground-handlers, EASA wanted to obtain appropriate recommendations as to the most effective ways in which the NAAs of the EASA Member States could regulate deicing / anti-icing services in a harmonised way, so that the safety of aircraft operations is maximised and a level commercial playing field remains ensured. Recommendations were to centre on how the availability of type I fluids and the quality of service provision can be improved at the aerodromes of the EASA Member States.

Pre-regulatory impact assessment (pre-RIA) on the recommendations:

In order to assess the impact of the recommendations the Agency wanted the prospective consultant to undertake a Pre-Regulatory Impact Assessment in which to judge the safety, economic, social, and environmental impacts of each recommendation. In particular the Agency wished to obtain quantitative estimations of the average investment expenditure for equipment to provide adequate aircraft ground de-icing / anti-icing operations (at an aerodrome where this was not previously provided) including the corresponding depreciation costs and maintenance costs, and also the same for very small, small and larger aerodromes to upgrade facilities and equipment to providing fluid type I in addition to type II and IV.

The Interim Report to EASA.2009.OP.21 marks the end of the second work package (above) and includes a complete summary of the Study conducted under the first work package (above). With reference to the submitted airsight GmbH Project Plan (submitted to EASA at the Kick-off Meeting, in Köln, on 13 April 2010) this Report fulfils Deliverable 4 and marks the end of Work Package 5. It represents the culmination of an investigation in to the status quo of de-icing / anti-icing service provision and operations throughout EASA Member States. Furthermore, it includes an analysis of the data collected and the presentation of various options which, if adopted, may lead to an improvement in standards of de-icing / anti-icing and a greater availability of de-icing fluids. As a Deliverable to the Agency from the contractors, the opinion, analyses, assumptions and recommendations made within this Report are made by airsight GmbH and do not constitute any commitment, nor infer support, by EASA for the Report's contents.

This paper briefly explains the content and structure of the Interim Report.

2 Structure of the Interim Report

The Interim Report consists of 6 separate documents:

- Introduction Paper
- Data Summary and Analysis
- Options for Change
- Attachment A to Options for Change: Summary and Analysis of Available Safety Data
- Attachment B to Options for Change: References from Regulations and Other Documents
- Attachment C to Options for Change: Notes on FAA Standardised International Aircraft Ground De-icing Programme

Also accompanying the Interim Report will be any raw data collected via questionnaires, interviews and other means.

3 Aim of the Interim Report

The aim of the Interim Report is to present the Agency with options for the most effective ways in which NAAs could regulate de-icing / anti-icing services in a harmonised way, so that the safety of air operations is maximised, and a level commercial playing field remains ensured. These options centre on how the availability of type I fluids can be improved, and how the quality of service provision can be improved. Options are also presented centred on voluntary mechanisms with potential for achieving the same goals.

3.1 Stakeholders Representatives' Briefing

The options developed are to be presented to stakeholder representatives, including EASA representatives, at a Briefing in Köln, 6 December 2010. The aim of this is to attain feedback from all relevant stakeholder groups on the viability of each option. This feedback can then be included in the subsequent Preliminary Regulatory Impact Assessment, where the safety, economic, social and environmental impact of options will be assessed. Thus allowing substantive recommendations to be made, backed-up with supporting evidence.

The options included within this Report are numerous and detailed and, in effect, many of them could form a Work Programme for future development. It is not the intention to present each and every option at the Briefing, but rather to present the higher-level options that meet the criteria of the project; i.e. those options that address regulatory and voluntary mechanisms for improving standards and the availability of fluids. To create a short-list will involve a prioritisation of options and a de-facto list of recommendations; this short-list will be circulated to attendees around 10-days prior to the Briefing as part of an Information Paper.

3.2 EASA Actions

The Agency, as well as being the project sponsor, is also a stakeholder and will be able to provide valuable and relevant feedback on the options as they are presented in the Interim Report and also at the Briefing. It seems sensible for the Agency's representatives to evaluate the options (both high-level and detailed) and provide early feedback on the creation of a short-list for presentation at the Briefing. The allotted 20-day response time expires after the planned Briefing; therefore a quicker turn-round would be necessary.

To assist the Agency in this matter, the Study Team will commence immediate drafting of the Information Paper, including a proposed short-list of options to be presented, and this will be available for discussion directly following the planned teleconference on 12 November at 10:30 German Local Time.

4 Contents of the Interim Report

The 3 Attachments to the “Options for Change” section of the Report are supporting documents, frequently referred to in the main body of the Report. They are useful in that they provide background details to some of the analysis and opinions within the main Report; however, for expediency, the reader may wish to delay examining these documents. Attachment B (References) is not designed to be read from start to finish, anyway, and is completely a reference document to specific regulations excerpts (and other documents), and includes possible options that were not selected for the main Report.

The two main documents: Data Summary and Analysis, and Options for Change, are best read in that order. The latter document’s discussions and conclusions are based on the data presented in the former.

4.1 Data Summary and Analysis

This document presents the statistics of responses to on-line questionnaires, interviews and other data sources, followed by analysis of each area within the Study. The analyses presented include:

- type I fluid availability, defined by weather zones and Member States,
- factors affecting the supply and use of different fluids,
- varieties of market mechanisms for supplying de-icing / anti-icing services,
- infrastructure ownership and use,
- training standards and classifications, and
- NAA oversight and responsibilities of the three main affected stakeholder groups: operators, aerodromes and service providers.

4.2 Options for Change

This document provides further analysis and opinion. It specifically leads the discussion to numerous options, aimed at a variety of stakeholder groups, to change the status quo. Utilisation is made of existing and available information of relevance, primarily the Agency’s previous work on de-icing / anti-icing matters through A-NPA 2007-11, wherein numerous recommendations that were made remain valid and still need to be considered. Included within the document are discussions on the following subjects:

- an Industry-wide safety initiative aimed at collecting data,
- the nomination of de-icing / anti-icing subject-matter experts,

- the various regulatory pathways to affect de-icing / anti-icing standards and availability of fluid,
- the factors that promote and deter service providers attaining high standards, and
- alternative regulatory models based on regulation of other activities.

4.3 Options for Change – Attachments

4.3.1 Attachment A – Summary and Analysis of Available Safety Data

This is not a full Safety Study, however, in determining which options to propose, the areas of weakness within de-icing / anti-icing operations needed to be identified. Therefore, this brief and restricted meta-study allows the Study Team to draw conclusions as to which areas to focus any proposed regulatory changes. Fortunately, the conclusions drawn support anecdotal data collected during interviews and also openly discussed, for many years, at other forums (AEA, ERA, SAE). Furthermore, this paper highlights the lack of lower-level safety data which is collected, shared and analysed; specifically, self-reported human error by service provider operatives.

4.3.2 Attachment B – References to Regulations and other Documents

This document is an edited and improved version of that presented with the Inception Report in June 2010. It was used as a logical tool by the Study Team to ensure that all existing regulatory mechanisms were examined in detail, with the intention of creating options for future amendment, improvement and addition. It includes relevant excerpts from such documents as EU OPS, ICAO Annexes 6 and 14, Doc 9640, and also includes the Agency's proposals for Authority Requirements, Operator Requirements and Implementing Rules Operations. Each excerpt is accompanied by a brief explanation of relevance, a variety of possible options and a brief impact statement.

Although used as a development tool by the Team, it is included to assist the reader access the relevant regulatory excerpts easily and to view the logic applied by the Team in the analyses.

4.3.3 Attachment C – FAA Standardised International Aircraft Ground De-icing Programme

This document contains brief notes made from an FAA presentation on their proposed programme of regulatory reform for US Air Carriers' approved de-icing / anti-icing programmes. Also included are some useful excerpts from the FAA SIAGDP document, to help the reader understand the intended emphasis of this programme.

EASA.2009.OP 21

Study on the regulation of ground de-icing and anti-icing services in the EASA Member States

INTERIM REPORT

DATA SUMMARY AND ANALYSIS

airsight GmbH

Gustav-Meyer-Allee 25
13355 Berlin
Germany
Phone: +49 30 45803177
Fax: +49 30 45803188
www.airsight.de

Table of Contents

Table of Figures

1 Off-Site Data collection

1.1 Objectives

The initial objective of the off-site data collection was to collect a large amount of data from all stakeholders, in order to get an overview of the current situation with regard to de-icing / anti-icing services, and to provide the required quantitative information for the Impact Assessment.

1.2 Online questionnaires

To fulfil the previous objectives, the following questionnaires have been developed, and made available online between 07th July 2010 and 15th October 2010 to the stakeholders:

- NAAs Questionnaires
    - Questionnaire 1: General Data
    - Questionnaire 2: Oversight of Aerodromes
    - Questionnaire 3: Oversight of Service Providers
    - Questionnaire 4: Oversight of Air Operators
    - Questionnaire 5: Oversight of Continuing Airworthiness
- Aerodromes Questionnaire
- Service Providers Questionnaire
- Air Operators Questionnaires
    - Questionnaire 1: Regulations and Operations
    - Questionnaire 2: Maintenance

Please refer to the Inception Report for more details on the development methodology and content of the questionnaires. The initial invitations to the online questionnaires, supported by an accreditation letter issued by EASA Rulemaking Director, were sent per email to the stakeholders either directly (to existing airsight contacts to aerodromes, service providers' individual stations, aircraft operators, as well as to the directors of the Member States' national authorities) or indirectly (aircraft operators via associations such as ERA, AEA, service providers' individual stations via their headquarters or aerodromes etc.).

Individual reminders containing the initial invitation were sent to the stakeholders during the summer, and further actions (email reminders, phone calls etc.) were conducted throughout the summer to achieve a highest possible number of respondents.

1.3 Questionnaire respondents

As of 15th October 2010, completed questionnaires have been received, as follows:

- 37 questionnaires from the Aerodromes
- 69 questionnaires from the Service Providers
- 30 questionnaires from the Air Operators (Questionnaire 1 - Regulations and Operations)
- 25 questionnaires from the Air Operators (Questionnaire 2 - Maintenance, including Quality Assurance)
- 13 questionnaires from the National Aviation Authorities

Thus, the overall participation of the stakeholders is considered to be most satisfactory.

The different response ratios of the stakeholders may, in themselves, be interpreted as a potential finding of the study.

- The high level of participation of the service providers can be explained by the fact that they are the most involved in the field of de-icing / anti-icing, and will be potentially the most affected stakeholder group by the impact of this present study. The identification of a responsible person for this study and the provision of detailed quantitative figures was straightforward, possibly because service providers are used to being frequently audited by the aircraft operator.
- The medium level of participation of the aerodromes (37 answers for over 150 aerodromes directly contacted) is related to their current level of involvement in de-icing / anti-icing services. Most aerodromes do not provide directly for de-icing / anti-icing, and therefore do not feel responsible for third-party providers. Such aerodromes, within the study, simply forwarded the relevant questionnaires to their service providers (this further also explains the high participation of the service providers).
- The medium, and partially incomplete, involvement of the NAAs in the study is probably due to the difficulties of the authority to identify a central focal point responsible for the field of de-icing / anti-icing. In most cases, no such dedicated persons exist within the NAAs.
- The medium level of participation of the aircraft operators is due to similar reasons as mentioned above for the NAAs. De-icing / anti-icing related matters are dealt with by several distinct departments (air operations, quality assurance, maintenance etc.), and the identification of a focal point was difficult.

2 Analysis of the collected data

2.1 Type I Fluids availability at Member States aerodromes

2.1.1 General Overview

The following analysis focuses on the availability of Type I fluids[1] at European Aerodromes. The information on Type I fluids has been provided by the questionnaire respondents (aerodromes and service providers) consolidated with IATA DAQCP data. In total, data on Type I fluid availability has been determined from the sample of 168 aerodromes involved in this study.

Type I fluids are currently available at 91 aerodromes (54.17 % of the 168 studied aerodromes).

The following map (Figure 1) shows graphically the collected data and defined weather zones; the red dots represent those aerodromes not providing Type I fluids, and blue dots the aerodromes which are providing Type I fluids. The figures contained in the Annex of this document presents several magnifications of selected area of this map.

In order to classify aerodrome stakeholders to make informative comparisons of data, six weather zones were established. The criteria used for these five classifications are based on the average number of “snow days” (Table 1) experienced per annum as measured over the past 5 years.

[1] *SAE AMS 1424* Type I Qualified Fluids

Zone	Snow Days
	fewer than 5
	5 to 9
	10 to 19
	20 to 39
	40 to 70
	more than 70

Table 1: Average Number of Snow Days per annum which define selected Weather Zones

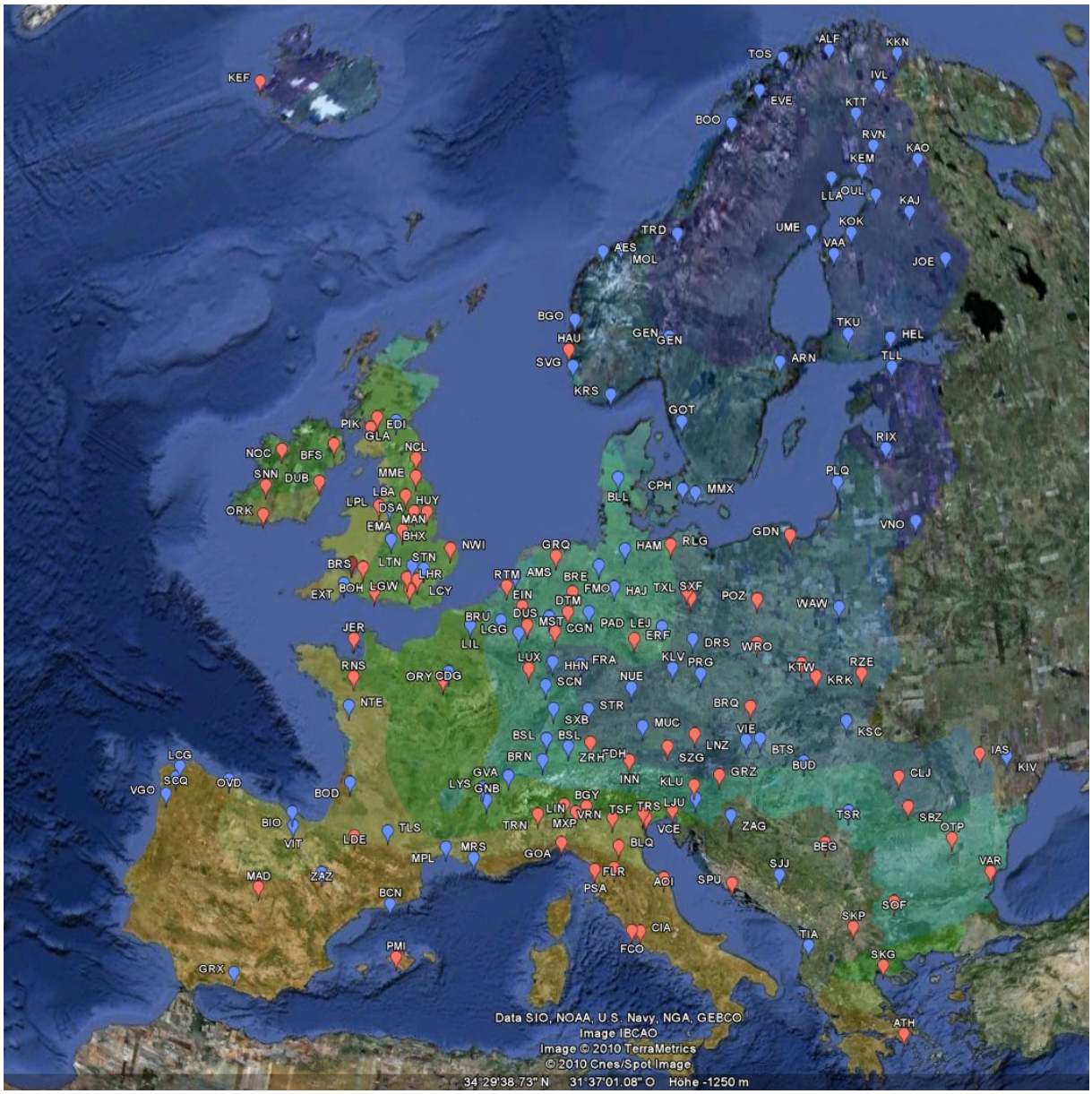

Figure 1: Map of Type I Fluids availability at Member States' aerodromes

2.1.2 Type I Fluids availability per Member State

As shown in the previous map and in the Figure 2 below, fluids availability is very heterogeneous among the Member States. While in addition to thickened fluids[2], Type I fluids are greatly available in the Nordic countries (Finland, Sweden, Norway, Denmark and the Baltic States), other Member States tend to rely mainly on thickened fluids (Belgium, United Kingdom, Romania, The Netherlands, Austria, Poland, Bulgaria, Greece, Ireland, Italy and Iceland).

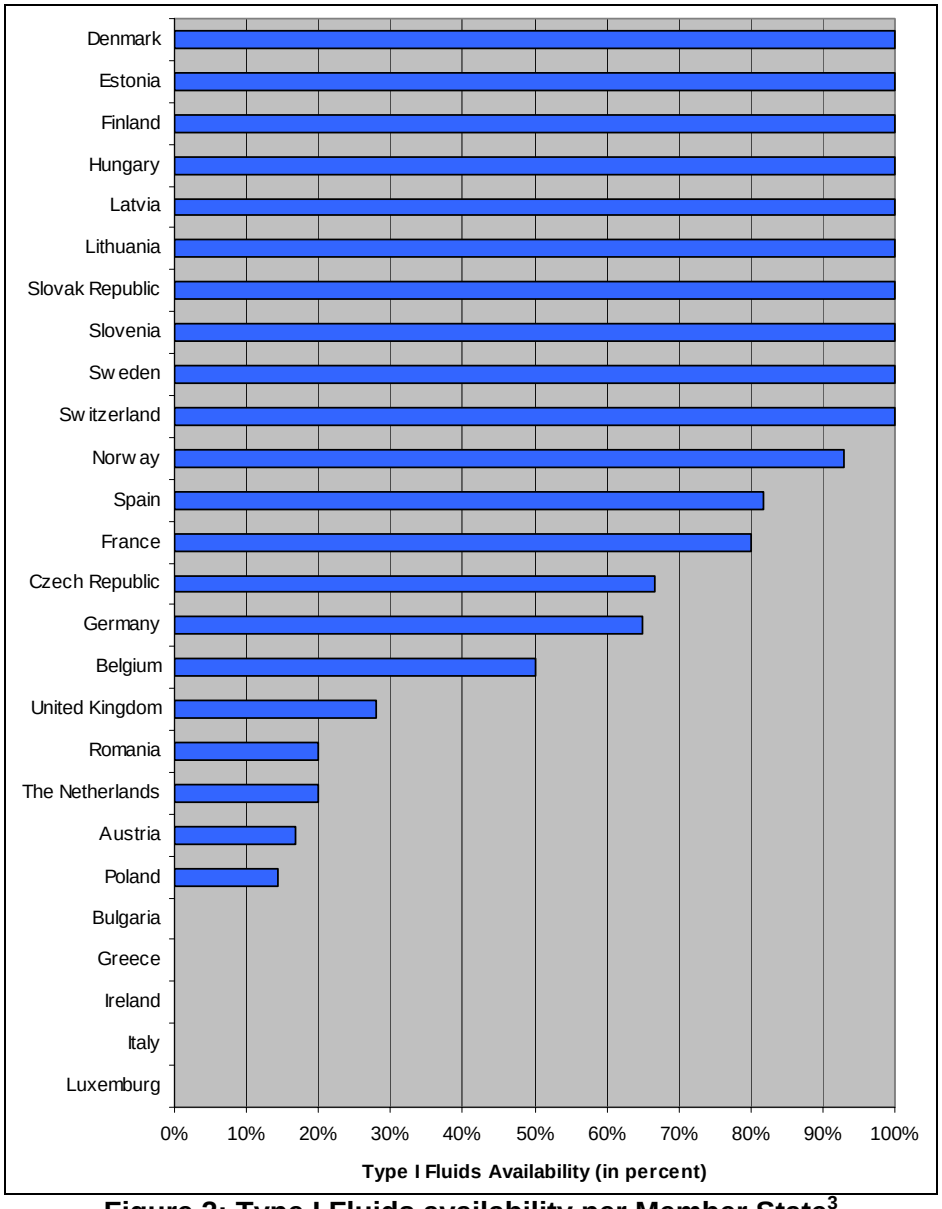

Figure 2: Type I Fluids availability per Member State[3]

[2] *SAE AMS 1428* Type II, III, IV Qualified Fluids

[3] Based on the data collected in 2010 during the study – possibly not representative of a country situation

2.1.3 Type I Fluids availability per Winter Zone

The proportion of aerodromes providing Type I fluids per Winter Zone, displayed in Figure 3, further explains the current utilisation of de-icing and anti-icing fluids. Italy, Spain, and South of France, situated in Zones 1 and 2 (less than 10 snow days per year) have a different approach on the fluids provision at their aerodromes. While aerodromes in Spain and South of France mainly conduct “de-icing only” operations with Type I fluids, Italy mainly conduct de-icing / anti-icing operations mainly with thickened fluids only. The aerodromes within Zone 3 are for most part in the UK – a country with a low Type I fluids availability ratio.

Zone 4 and 5 aerodromes (situated in e.g. Germany, Austria, the Benelux, Poland, Romania, Bulgaria etc.) have a Type I availability ratio close to the overall average. It can be observed that, the ‘New’ Member States, such as Poland, Romania and Bulgaria, have a low Type I availability ratio. This may be explained by the fact that these aerodromes had already invested in de-icing / anti-icing infrastructure, facilities and equipment prior to the safety issues with thickened fluids being raised.

Zone 6 aerodromes, mainly located in Nordic countries, make great utilisation of Type I fluids, mainly for use as a de-icer instead of using thickened fluids for that purpose.

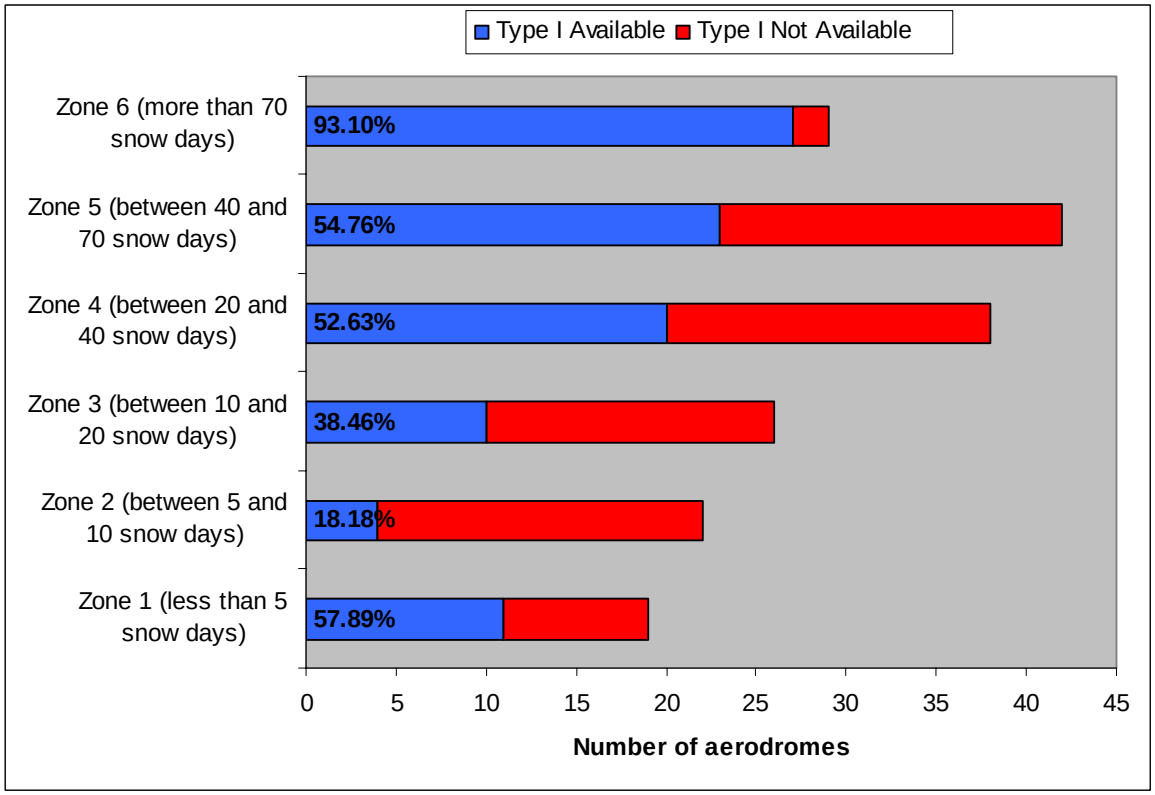

Figure 3: Type I Fluids availability per Winter Zone

2.1.4 Type I Fluids availability per Aerodrome Size and Affected Traffic

A further analysis of the provided information reveals two important facts, namely that Type I fluids availability is, generally, not correlated to:

- the aerodrome size (as displayed in Figure 4)
- the percentage of potentially affected traffic (aircraft with no powered flight controls – which are more affected by thickened fluid residue issues) (as displayed in Figure 5)

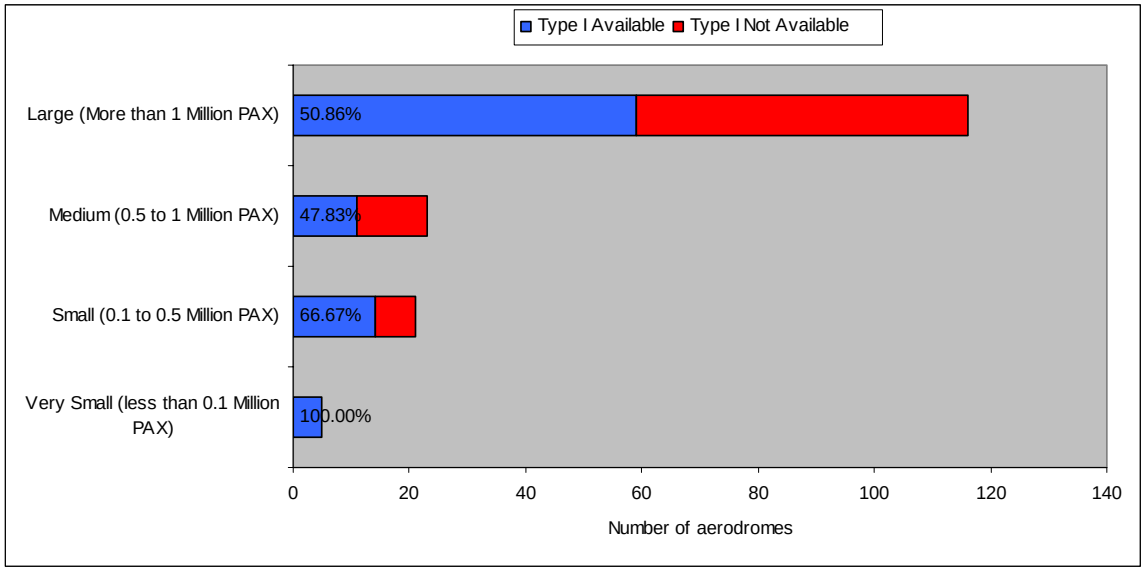

Figure 4: Type I Fluids availability per Aerodrome Size[4]

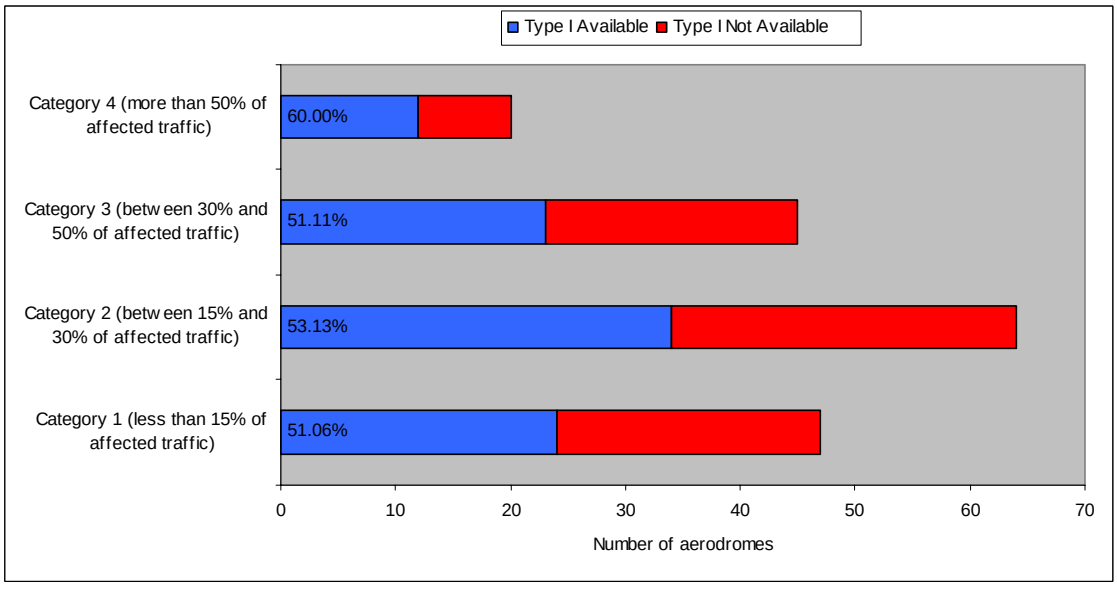

Figure 5: Type I Fluids availability per aerodrome Affected Traffic Category (aircraft with no powered flight controls)

[4] Please consider that the high number of Nordic Countries "Small Aerodromes" (generally providing Type I fluids) which participated to the study increases the proportion of small aerodromes providing TypeI fluids.

2.1.5 Impact on affected traffic of Type I Fluids unavailability

The Figure 6 displays a qualitative “risk factor”, based on the total number of affected aircraft traffic at aerodromes not providing Type I fluids and the weather zone (number of movements of affected traffic at aerodromes not providing type I – multiplied by the weather zone number, e.g. 1 for “Zone 1”). However, a different weighting of the parameters may have led to slightly different results, according to this key indicator; the most affected countries by potential safety issues related to the non-availability of Type I fluids are United Kingdom, Poland, Italy, Austria, Germany and Romania.

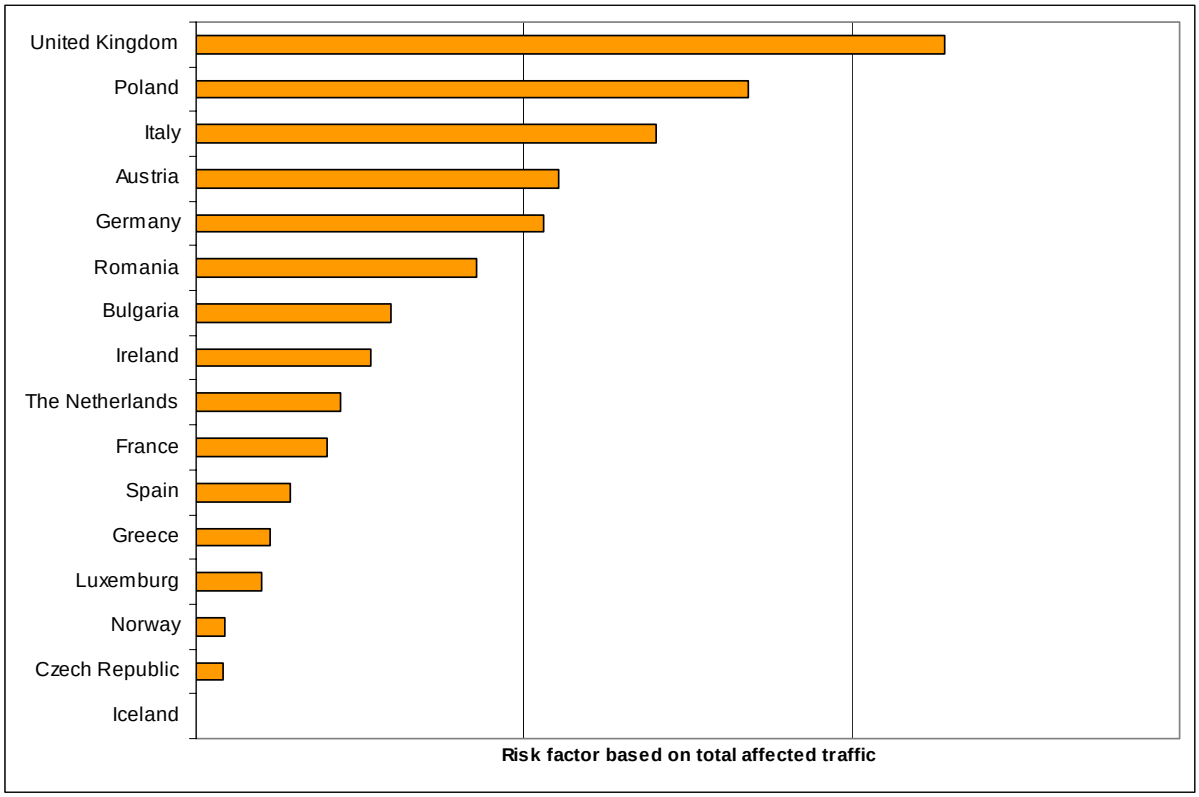

Figure 6: Impact on affected traffic of Type I Fluids unavailability (based on number of affected traffic movements at aerodromes not providing Type I fluids and number of snow days)

The Figure 7 displays a similar qualitative “risk factor” as the previous one, but based only on the number of aerodromes not providing Type I fluids and the number of snow days. In this case, the risk factor does not take the traffic volumes into account.

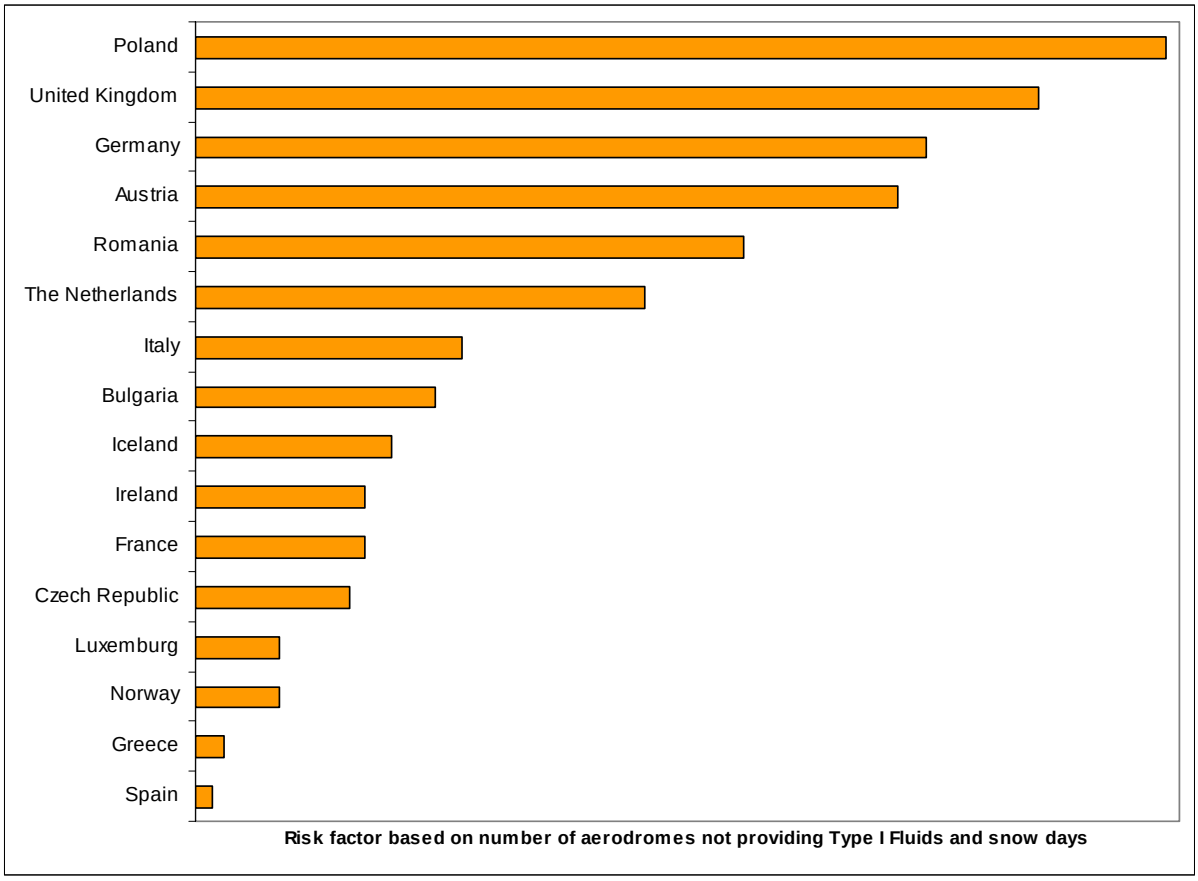

Figure 7: Risk factor based on percentage of aerodromes not providing Type I Fluids and on the number of snow days

2.1.6 Responsibility for the decision of the types of fluids provided

The selection of the types of fluid to be provided, and to a greater extent the decision for upgrading an aerodrome's de-icing / anti-icing infrastructure, facilities and the equipment to be provided, may require significant investment from the stakeholders, namely the aerodrome itself, the service provider(s) and, indirectly, the airlines (higher cost for service).

According to the respondents and interviewees, no national aviation safety regulations directly affect the selection of the types of fluid provided at an aerodrome (please refer to Chapter 2.3.2 for more details).

Therefore, the selection of the types of fluid and related investment is generally based on a consensus of the stakeholders' interests. Therefore, active airline requests, as well as the management and organisation of the de-icing / anti-icing services and the ownership of the storage facilities, are the main influencing factors for the responsibility of the decision.

As a general rule, the higher the number of stakeholders and required investment, the more difficult is the decision process. In cases where the aerodrome itself is providing de-icing / anti-icing services, or the sole service provider is under the partial or full management of the

aerodrome, the decision for additional investment could be straightforward. Whereas, in cases where multiple independent service providers are required to invest in new equipment and possibly new storage facilities, the decision may be more complex.

Almost all airports have set-up an Airport Users' Committee (mandatory for aerodromes within the scope of Council Directive 96/67/EC). However, the inclusion of de-icing / anti-icing service provision related matters within such committees is very limited, especially at small and medium aerodromes. The AUC is more likely to discuss surface snow removal plans, taxi traffic patterns and traffic flow rates during winter operations. According to Figure 8, at 58% of the aerodromes the Airport Users' Committee has no influence; only 17% of the aerodrome respondents mentioned that such committees have a large influence[5]. This is mainly due to the complexity of the subject as well as the lack of representation of the airlines. As a result, airlines informally express their interest indirectly to the monopoly service provider or to the aerodrome if several service providers are present. The discussions on the required de-icing / anti-icing investments and resulting costs to the airlines take place more in dedicated working groups.

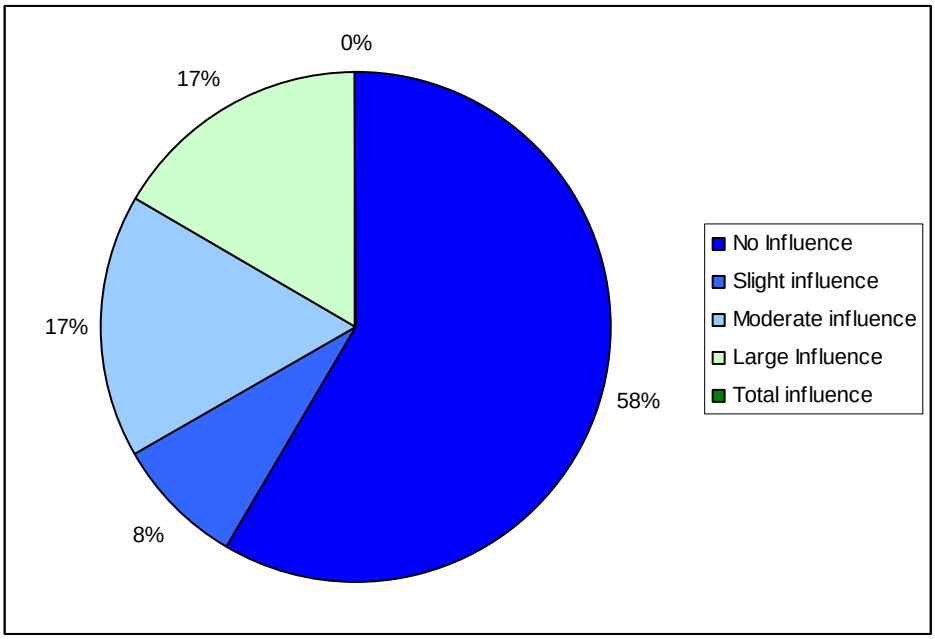

Figure 8: Influence of the Airport Users' Committee over which fluid types are made available to airlines

[5]Service Provider Questionnaire – Question 2.2: With regard to the role of aerodrome management, does your National Authority imposes Regulatory Requirements on Availability of Type I Fluid

2.1.7 Factors influencing Type I Fluids availability

2.1.7.1 Supporting factors

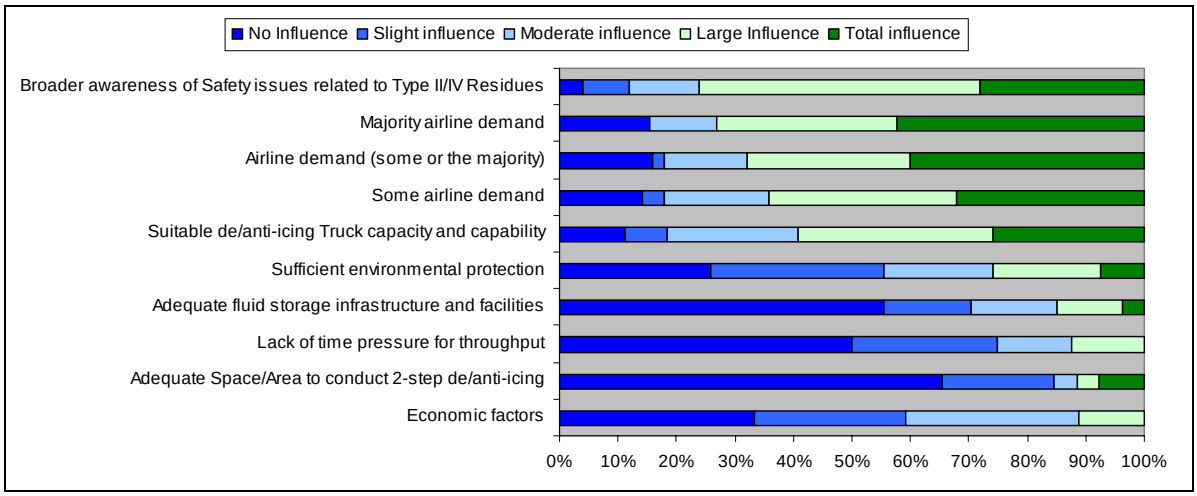

Figure 9: Supporting Factors which influenced the decision to provide Type I fluid and two step de-icing / anti-icing

The principal factor supporting the utilisation of a Type I fluid, not assessed in the questionnaires, is its capability as a de-icer to break the bonding of snow and ice. Consequently, countries with severe winter conditions make an intense use of such fluids within a two step de-icing / anti-icing.

According to those aerodromes and service providers who have introduced the two-step procedure with Type I fluid used in the first step, the second contributory factor was the broader awareness of safety issues related to Type II/IV Residues: over 70% of the respondents stated that it had a large or total influence in providing Type I fluids. Some aerodromes, immediately or soon after the publication of the first safety advices related to thickened fluid residues consequently changed their operations – though, according to the opinion of the stakeholders, there was no scientific evidence that two-step procedures would completely eradicate the residue issues.

The third influential factor, and related to the second factor, is the active – or anticipated – demand from the airlines to provide Type I fluids and a two-step procedure. Airlines, by reducing the number of thickened fluids applications lowers both the risk of incidents related to residues (safety factor) as well as their maintenance cost for cleaning residues (economic factor). By responding directly to existing airline requests, or projecting new airlines' requirements, aerodromes potentially increase current client satisfaction and attract more airlines: an interviewed airline mentioned that the non-availability of Type I fluid would decrease by 25% the probability to operate at an aerodrome.

According to the interviewed aerodromes and service providers, the total cost of fluids for providing one-step or two-step de-icing / anti-icing procedures is similar. This is because, while the cost of neat Type I fluid is higher than thickened fluids, it is more efficient as a de-icing fluid, and is also frequently used in a more diluted form than thickened fluids; therefore the cost is about the same. Consequently, there is no additional increased cost of fluids for the airline, besides the initial investment for upgrading the infrastructure, facilities and equipment.

Numerous arguments have been provided by the stakeholders through interviews regarding the operational benefits of providing a two step de-icing / anti-icing procedure with Type I fluids (applied heated) for de-icing and thickened fluids (applied cold) for anti-icing, namely:

- The ease of storage, mixing and testing Type I fluid and its low risk of degradation when compared to thickened fluids.
- The ease of using (in a second step) "cold" thickened fluids. First, it avoids unnecessary heating of fluid in vehicle tanks, or repeated heating of fluids which may degrade fluids. Secondly, the use of cold thickened fluids ensures a more accurate HoT; the heating of thickened fluids reduces their viscosity, thereby decreasing the fluid's ability to absorb the quantity of precipitation as assumed in HoT tables.

2.1.7.2 Limiting factors

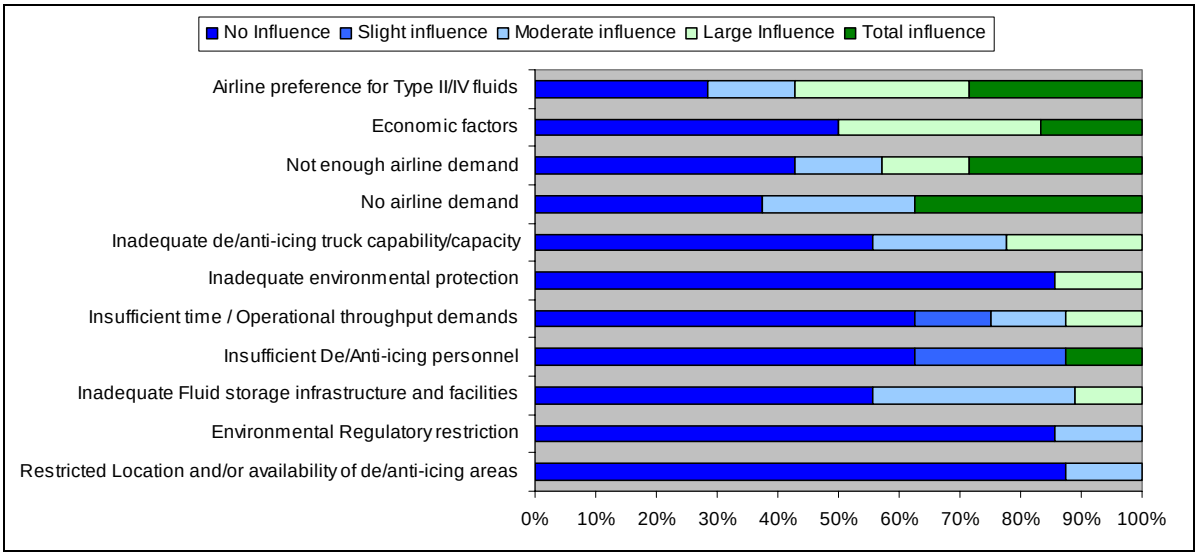

Figure 10: Limiting factors which influence the decision not to provide Type I fluid and two step de-icing / anti-icing

According to the service providers, the main limiting factor to providing Type I fluid and two-step de-icing / anti-icing is the "airline preferences for thickened fluids", directly resulting in too little or no airline demand for changing fluids and methods. For approximately 40% of the

service providers, their given reason for not providing Type I fluids and two-step de-icing / anti-icing is that there is not enough airline demand.

There is probably a series of reasons for such a lack of (communicated) active requests from the airlines to the service providers. The main reasons could be, for instance:

- Many airlines are not affected by safety issues caused by anti-icing fluid residues.
- Many airlines now have adequate maintenance programmes for the inspection and the cleaning of residues.
- The real or perceived higher cost associated to Type I fluids and two step de-icing / anti-icing.
- The longer HoT of thickened fluids may represent a benefit in operations for the pilots.
- Pilots informal comments to their service providers, possibly in contradiction with their company policy, prefer a quick-and-easy one-step de-icing / anti-icing.
- Airlines possibly do not communicate appropriately their requests for Type I fluids and two-step de-icing / anti-icing, or their requests are ignored (50% of the interviewed airlines stated they *would* actively make such requests to the service providers).
- The lack of airline awareness of the current availability of Type I fluids at the stations at which they operate from.

Besides the lack of airline demand for Type I fluids and two step de-icing / anti-icing, other main limiting factors, from the point of view of the service providers, are of an economic nature: the provision of Type I fluids and two step de-icing / anti-icing at aerodromes where it is not yet provided can sometimes require a significant initial investment. This investment represents a major long-term financial commitment from the owners of the facilities and equipment (the aerodrome and/or the service provider(s)), and the rate of return – in most cases not quantifiable – is uncertain. De-icing / anti-icing vehicles are the major equipment expenditure; these vehicles typically have a lifespan of 10 to 15 years, which reflects their depreciation rates. Although they can still retain a high value after seven years, the second-hand market cannot be relied upon to secure a return of investment.

Such investment is hindered by several market conditions:

- Most aerodromes and service providers have a limited financial capacity: de-icing / anti-icing is often performed at a loss at small and medium aerodromes or at aerodromes with modest winter operations (e.g. Southern Europe).
- In addition to the previous point, the predicted level of future earnings for de-icing / anti-icing service provision is very low. This is because traffic figures and the severity

of winter operations are highly volatile: thus, the number of de-icing / anti-icing operations per year can vary in Central Europe by up to 50% (e.g. EFM Ground Handling published in their annual report (4 778 operations during the winter season in 2006-2007, versus 7 309 operations 2007-2008 – an increase of 53%).

- Service providers generally have short-term contracts with the airlines (renegotiated in some cases on an annual basis), as well as with the aerodromes (license terms of seven years for aerodromes within the scope of Council Directive 96/67/EC) – considering that equipment and facilities is used on average between 10 to 15 years. Together, these factors contribute to defensive strategies and the minimising of investment.
- In keeping with providing a better quality of service, the provision of Type I fluids could represent a competitive advantage towards local competitors; however, even if competition exists when several service providers are operating at an aerodrome, the same fluids are usually provided to and by all of them (generally storage facilities are shared).
- It must be noted that the service providers who responded to the questionnaire probably underestimated the limitation imposed by their current equipment (only around 25% of the respondents mentioned that “inadequate de-icing / anti-icing truck capability/capacity to provide Type I fluid” would be a limiting factor).
- Several interviewed representatives of the aerodromes or service providers identified the provision of Type I fluid as a necessity, but could not convince the final decision-makers to adopt the proposed improvement. Some interviewees mentioned that regulatory actions at a National or European level could provide the necessary leverage regarding the provision of fluids.
- From an operational standpoint, operating with a single type of fluid (mainly Type II) offers the advantage of simplicity: aerodromes and service providers can purchase (in most cases pre-mixed) and store a single fluid type, used for both de-icing and anti-icing. Furthermore, according to the interviewees, Type II fluids would particularly well suit the oceanic or moderate continental climates.

2.1.7.3 Non-influencing factors

Several factors have little or no influence on the decision to provide Type I fluids and two-step de-icing / anti-icing. Such non-influencing factors are, amongst others:

- **Aviation regulations on fluid availability:** No national regulations require the utilisation of specific fluid types. Operational Directives on the use of thickened fluids

published by e.g. the Federal Office of Civil Aviation (FOCA) and the French Directorate General of Civil Aviation (DGAC) in 2001 only contain recommendations of a non-binding nature on the types of fluids and procedures.

- **Environmental regulations:** According to the respondents, Environmental regulations have no influence on the provision of Type I fluids. . Nevertheless, prior to the utilisation of any new chemical substance, some aerodromes (e.g. in some States in Germany) have to get approval from the responsible environmental authorities.
- **Operational throughput (capacity issues):** Availability of space (areas) to conduct de-icing / anti-icing operations, together with manpower related issues: A change in the de-icing / anti-icing procedures would not greatly affect throughput, space required (except when additional trucks are required in addition to the existing ones), nor manpower requirements, and therefore does not represent a major limiting factor.

In addition, the informal recommendations made by some IATA DAQCP auditors to the service providers regarding the provision of Type I fluid have usually no impact/response (possibly because non-availability of Type I fluids is not an audit finding).

2.1.8 Selection of Type II/III/IV thickened fluids

Thickened Type II, III and IV fluids may be used in conjunction with Type I fluids in a two-step procedure, when anti-icing is required. The utilisation of these fluids mainly depends of the holdover time to be achieved and the service provider's preferences.

According to the information provided by the stakeholders, Type II and IV fluids are used at an almost equal number of aerodromes (in 44 service providers offering a two step procedure, in addition to Type I fluids, 23 service providers are using Type II fluids, and 21 service providers Type IV fluids). Type III fluids are not used at the aerodromes analysed; and it is believed that only one aerodrome currently supplies Type III at the request of one operator. Operators of regional aircraft may be more inclined to request Type III if more de-icing / anti-icing areas were located closer to departure runways. Figure 15 below shows that 74% of de-icing / anti-icing operations take place at the gate, and only 17% close to departure runways.

2.1.9 Selection of fluid manufacturer

The main criteria for the selection of the brand of fluid are of a commercial, environmental and technical nature.

Commercial aspects include mainly the price of fluids, delivery time and service quality. According to the service providers, the requirements on the delivery-time are the main

limitation in the choice of the fluid manufacturer. Service quality, namely the support provided to answer questions on fluid utilisation (and possibly conduct laboratory tests) in a timely manner is also an important factor.

As all de-icing / anti-icing fluids used in Europe comply with strict SAE technical qualification standards, the physical and chemical characteristics of the fluids used at European aerodromes are probably of secondary importance in the selection of the fluid brand and were not assessed in the questionnaires and interviews.

2.2 De-icing / anti-icing services provision at Member States aerodromes

2.2.1 De-icing / anti-icing market overview

2.2.1.1 Service providers ownership and control

The ownership and control of the service providers may have an influence on de-icing / anti-icing operations. In general, the current global market situation is very eclectic and in constant flux.

Firstly, in order to simplify matters, it is possible to distinguish between “non-independent service providers” (aerodrome operator handling), “independent service providers” (third-party handling), and “self-handling” by the airlines.

- Non-independent service providers are operated directly by the aerodrome. The aerodrome is then providing de-icing / anti-icing services and has full control and responsibility over the services provided. Non-independent stations are for instance operating at Paris-Charles de Gaulle and Ljubljana Airport.
- Independent service providers are owned by commercial entities, separate from the aerodrome operator.
- Self-handling airlines, in this current definition, are also potentially providing services to third party operators or code-sharing partners.

The results of a manual assignment of the audited DAQCP service providers (more reliable in this case than the questionnaire data) to the above categories are illustrated in the following Figure.

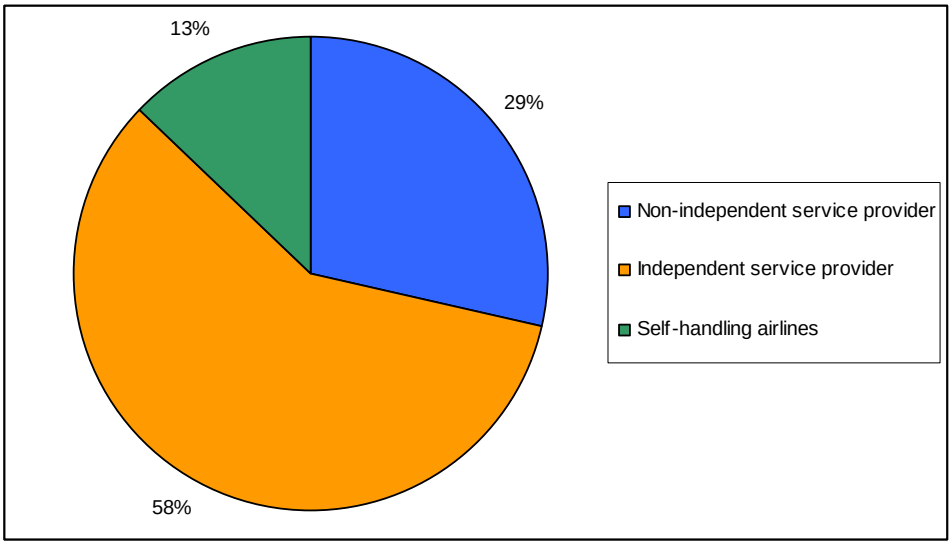

Figure 11: De-icing / anti-icing service provision

The ownership and control of the independent service providers is a complex subject, and beyond the scope of this study. In general, an independent service provider may be owned by a single, as well as multiple, shareholders, such as:

- an aerodrome operator (e.g. Portground GmbH in Dresden and Leipzig, Tallinn Airport GH Ltd)
- an airline (e.g. SAS Ground Services)
- a major ground handling company (Servisair, WISAG Aviation Service Holding, Swiss Port)
- a state-owned company (RTG Ground Handling Oy in Finland)

As the provision of de-icing / anti-icing services is viewed by aerodromes as either essential for their operations, or as simply good for business, aerodrome operators often directly provide de-icing / anti-icing services, or have total or partial control over their independent service providers.

Due to the frequent lack of commercial viability of the de-icing / anti-icing service business, de-icing / anti-icing may have to be performed directly by the aerodrome (acting as a non-independent service provider) or be indirectly subsidised by other ground handling activities.

When services are provided by an independent service provider, owned by the aerodrome, the responsibilities for de-icing / anti-icing overlap in some cases between the aerodrome operator and the independent service provider: for instance, the aerodrome operator may share resources (e.g. workforce) with the service provider. In such scenarios, there is possibly a cross subsidisation of the de-icing / anti-icing activities from other sources of revenue, leading to possible conflict of interests and thereby hindering competition.

However, according to the majority of stakeholders, the involvement of the aerodrome in de-icing / anti-icing may benefit the airlines.

The provision of de-icing / anti-icing services, although listed as a ground handling service in Council Directive 96/67/EC, is defined as an operational requirement (ICAO Annex 6/EU OPS) essential to maintain and ensure airworthiness. Therefore, it should be best considered as a safety critical function rather than a commercial activity.

2.2.1.2 Other services provided by service providers

With a few exceptions (EFM at Munich Airport and N*Ice at Frankfurt Main Airport), all service providers provide other ground handling services besides de-icing / anti-icing. Figure 12 lists the other services provided by the service providers[6].

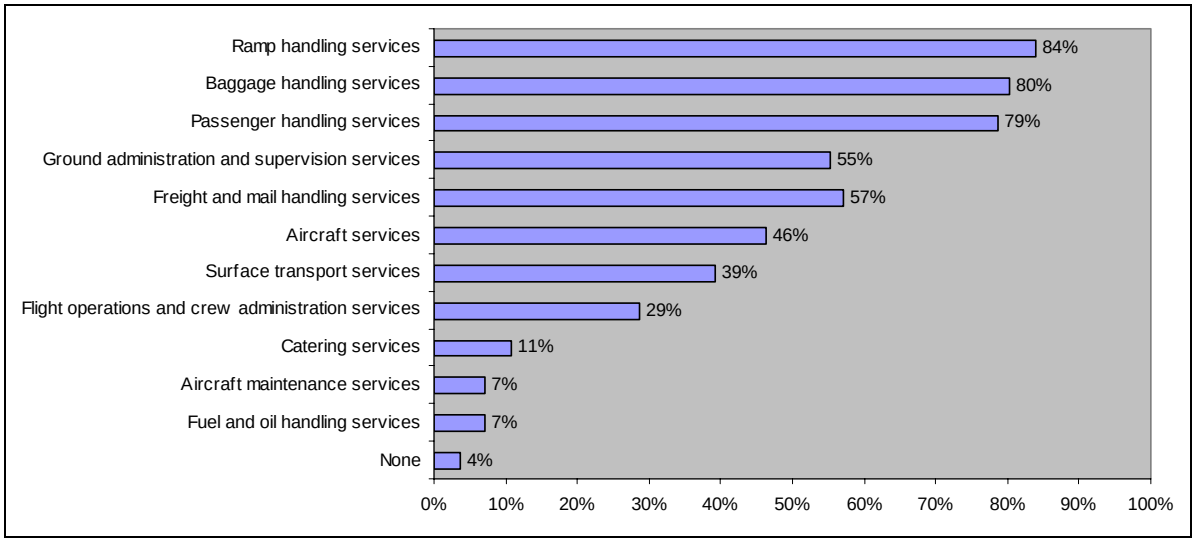

Figure 12: Other aviation services provided at the stations

According to the estimation of the respondents[7] (Figure 13), the contribution to annual turnover by de-icing / anti-icing services is generally below 20%.

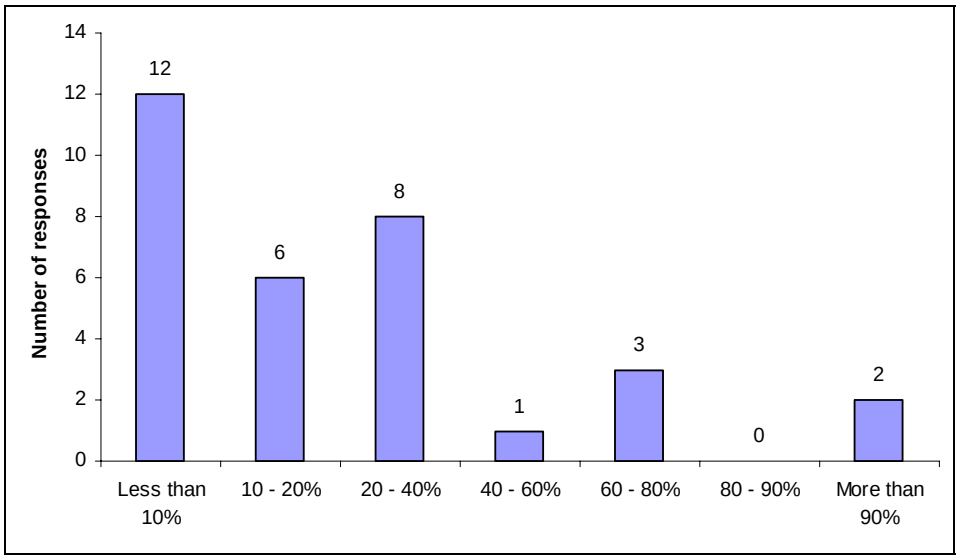

Figure 13: Percentage of Annual Turnover generated by de-icing / anti-icing services

[6]Service Provider Questionnaire – Question 1.10: What other aviation handling services are provided by your company at this location/station?

[7]Service Provider Questionnaire – Question 1.11: What percentage of your Annual Turn-Over is generated by De/Anti-icing services at this station?

2.2.1.3 Competition in the de-icing / anti-icing service market

Any increase in competition between local service providers may be viewed as potentially leading to an increase in quality of service and reduced prices. However, in practice, this theoretical market-mechanism has little influence on price and quality of de-icing / anti-icing services.

As shown in Table 2, the number of service providers available per aerodrome, and therefore the competition – is in most cases extremely limited.

	Number of service providers			
	1	2	3	more than 3
Very Small (less than 0.1 Million PAX)	11 (84.6%)	2 (15.4%)	0 (0%)	0 (0%)
Small (0.1 to 0.5 Million PAX)	39 (92.9%)	3 (7.1%)	0 (0%)	0 (0%)
Medium (0.5 to 1 Million PAX)	24 (100%)	0 (0%)	0 (0%)	0 (0%)
Large (More than 1 Million PAX)	26 (74.3%)	9 (25.7%)	0 (0%)	0 (0%)
Very Large (More than 2 Million PAX)	36 (43.9%)	27 (32.9%)	13 (15.9%)	6 (7.3%)
All aerodromes	**136 (69.4%)**	**41 (20.9%)**	**13 (6.6%)**	**6 (3.1%)**

Table 2: Number of service providers available per aerodrome

At 69.4% of the analysed aerodromes, a single service provider is in a monopoly position. Except for very large aerodromes (more than 2 Million PAX and therefore within the scope of Council Directive 96/67/EC), the majority of aerodromes have a single provider, and none have more than two. Of the remaining 30.6% of aerodromes, there is more than one service provider.

The main factor limiting the number of service providers at aerodromes appears to be the lack of profitability of de-icing / anti-icing. The total amount of de-icing / anti-icing operations at an aerodrome (further dependent on the airport traffic and weather conditions) enables, only in a few cases, multiple service providers to operate at an aerodrome. Based on the above figures, it is possible to suppose that – independent of the winter conditions and further barriers to entry – there is no place for two simultaneous actors at an aerodrome in Central Europe with less than one million passengers per annum. The investment required for a projected small (and unpredictable) number de-icing / anti-icing operations is too great.

A more detailed analysis of the results further reveals major national differences in the competition between service providers. For instance, while more than half of the aerodromes in the United Kingdom have multiple service providers, almost all German aerodromes have a monopoly service provider, under the ownership of the aerodrome.

Though Council Directive 96/67/EC may facilitate market access for new entrants, its interpretation and implementation at national level has led to varying results, and significant “unwritten” barriers to entry still exist. For example, it would make little business sense for a

ground handler to enter into competition with the current monopoly service provider owned by the aerodrome.

2.2.1.4 Selection of the service providers by the aircraft operators

The main factors and their importance for the selection of a service provider by an aircraft operator[8] are shown in Figure 14.

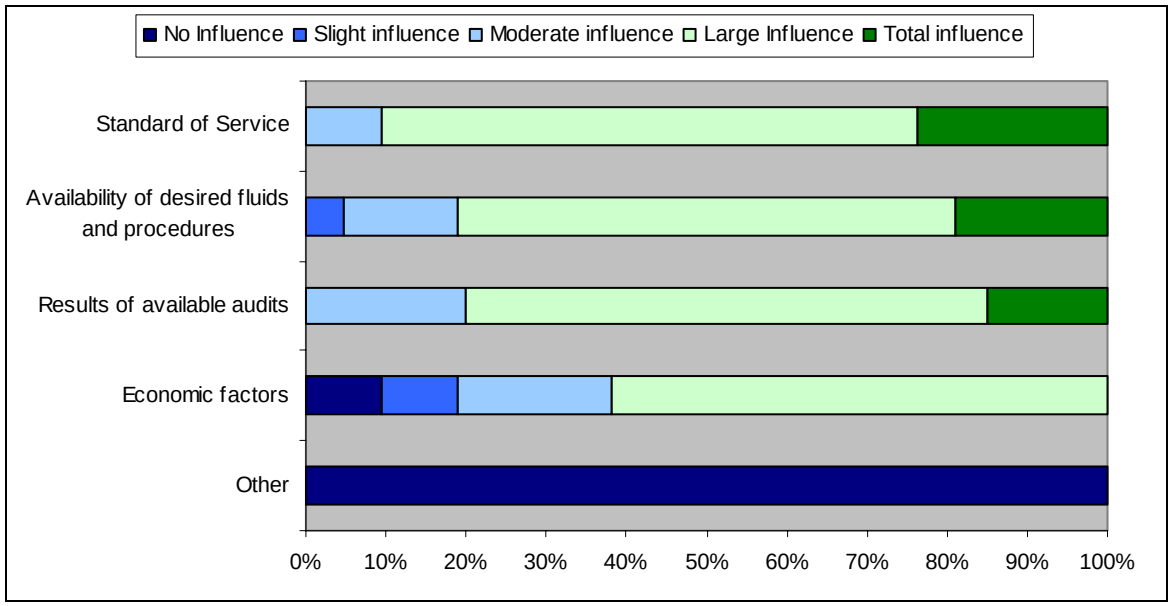

Figure 14: Factors when considering the choice of a de-icing / anti-icing service provider

Unsurprisingly, these factors are:

- The standard of service provided
- The availability of desired fluids and procedures
- The results of available audits
- Economic factors (less than 20% of the respondents mentioned that it would have no or a slight influence)

As most services provided are offered as very standardised, and de-icing / anti-icing is mainly perceived as a commodity by the airlines, it is possible to assume that the main selection criteria are driven by economics.

[8]Service Provider Questionnaire – Question 3.10: Service Provision: Where you have a choice: Indicate the weighting you give to the following factors when considering your choice of a de/anti-icing Service provider.

In cases where multiple service providers operate at an aerodrome (as previously mentioned, on average at 30.6% of the aerodromes), other economic or commercial aspects may, however, limit the choice available to operators. For example:

- An aircraft operator usually chooses a single provider at an aerodrome for all its ground handling services. As de-icing / anti-icing services only represent a minor portion of the contract volumes, the importance given to the previously mentioned factors for the selection of a service provider, in a de-icing / anti-icing context, will be minimal.
- An aircraft operator may have a contract with a single service provider to provide ground handling at different stations. Consequently, this may also reduce the importance given to the standard of de-icing / anti-icing service at each single station.
- Any affiliation between service providers and aircraft operators may further reduce the number of alternative service providers for the airlines, as their obligations may preclude the purchase of services from competitors.

2.2.2 De-icing / anti-icing infrastructure, facilities and equipment

2.2.2.1 Storage tanks

According to the aerodrome respondents, at 85% of the aerodromes, storage tanks are owned and managed by the commercial entity providing de-icing / anti-icing services. At the remaining 15%, the storage tanks are owned by the aerodromes or shared between the service provider(s) and the aerodrome.

By owning the storage facilities, service providers (aerodromes or third parties) have potentially more control over the fluids they provide. When the storage tanks are part of the shared infrastructure – owned by the aerodrome – the service providers can only purchase the fluid types supplied by the aerodrome (e.g. Paris-Orly Airport).

The ownership of the storage tanks is a further limiting factor to competition. For example, when storage is owned by an already established independent service provider, and the aerodrome operator (especially when owning the monopoly service provider) does not permit the construction/use of separate storage facilities, a new entrant would have to purchase fluids– and at the price set – by its competitor.

While at large aerodromes it is usual to have fixed storage facilities, aerodromes with low de-icing / anti-icing activity, such as small and medium ones in France, are making a great use of portable, self-contained cubitainers provided by the fluid manufacturers (e.g. pre-mixed Type II fluids cubitainers).

As well as an aerodrome charging a service provider for their accommodation facilities, they may also charge a rent for the space required by the service providers for their storage facilities and/or cubitainers.

2.2.2.2 De-icing / anti-icing locations

As shown in Figure 15, at 74% of the aerodromes, de-icing / anti-icing operations are performed at the ramp/gate[9].

[9]Service Provider Questionnaire – Question 1.13: Facilities & Infrastructure, description/quantity/capacity: Where are De/Anti-icing operations conducted?

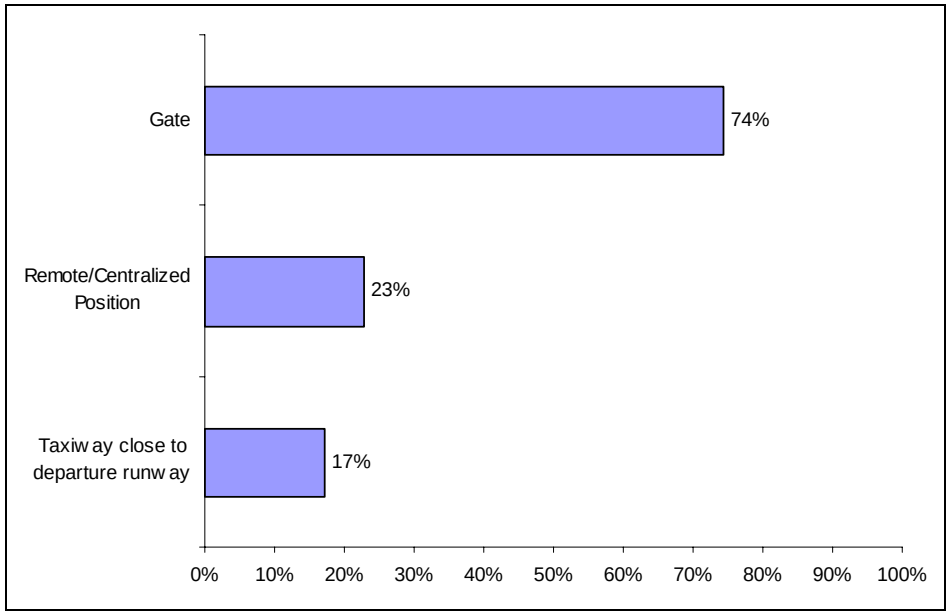

Figure 15: Location of the de-icing / anti-icing operations

Though not specifically addressed by the questionnaires, it would appear that only a minority of aerodromes are equipped with de-icing pads. The main reasons for this are the cost of such infrastructure, and its limited suitability when several service providers are operating at an aerodrome, and the consequent potential for traffic bottlenecks. In this respect the impact of having competing service providers may increase the risk of HoTs being exceeded, due to operations being conducted on the ramp.

2.2.2.3 De-icing / anti-icing fluids recovery and treatment / recycling

According to the responses provided by the aerodromes[10] (Figure 16), 41% of the aerodromes do not recover de-icing / anti-icing fluids. The other 59% of the aerodromes recover fluids, either by glycol recovery vehicles, by the fixed infrastructure at de-icing areas, or by other means.

[10]Service Provider Questionnaire – Question 1.10: Facilities & Infrastructure, description/quantity/capacity: How are de/anti-icing fluids recovered at your aerodrome?

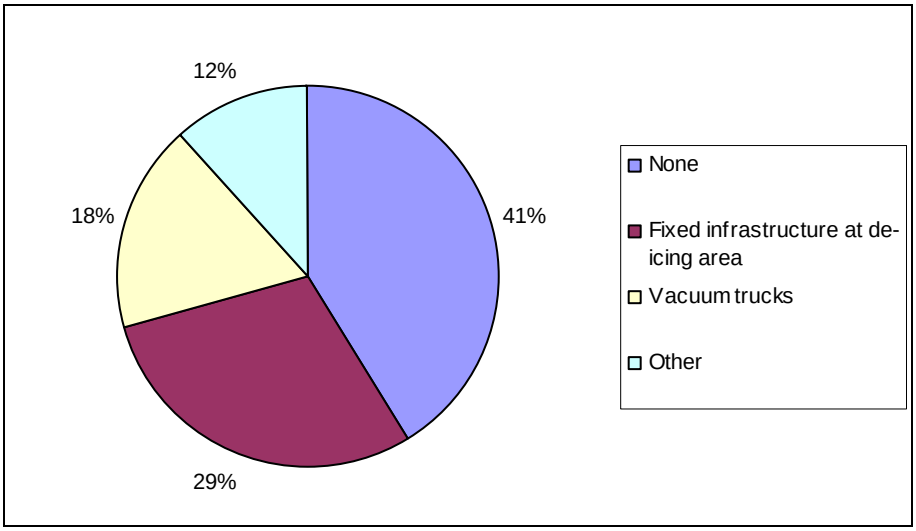

Figure 16: De-icing / anti-icing fluids recovery

The treatment of the collected fluids differs widely, and is not further analysed within this document.

2.2.2.4 De-icing / anti-icing units

Service providers usually buy or lease (or lease buy-back) their de-icing / anti-icing vehicles. It represents generally their most important investment. De-icing / anti-icing trucks are in almost all cases owned (or leased) by the entity providing de-icing / anti-icing services. Trucks are in useful operation between 10-15 years on average.

The number of units at an aerodrome mainly depends on the maximum planned throughput. While an aerodrome such as Frankfurt-Main Airport has around 40 units, smaller aerodromes (e.g. about one million passengers per annum) with a similar climate may only have 3 units (2 in operation, and 1 spare unit).

The sizes, brands, options (e.g. forced air, on-board proportional mix-capability, etc.) and related characteristics (price, maintenance, manoeuvrability, fluid consumption) of the de-icing / anti-icing units depend on the requirements and preferences of the service providers.

Service providers operating with a single type of fluid (e.g. Type II) have, in most cases, trucks not yet equipped to perform a two-step de-icing / anti-icing with both type I for de-icing and thickened fluids for anti-icing. While most manufacturers offer the option to upgrade de-icing units, in some cases (usually for older vehicles) it can be an expensive conversion. Another option, considered by some, is to provide two-step de-icing / anti-icing in the short term (provided fluids are made available), using dedicated trucks for de-icing and others dedicated to anti-icing. However, such procedures are more complicated in practice (coordination effort), and involve more trucks on the apron – which may have an impact on safety.

Therefore, the costs associated with upgrading vehicles/systems to provide two-step procedures can vary considerable between little to great and is dependent on their current equipment.

2.2.3 De-icing / anti-icing fluids

An analysis of the utilisation of non-thickened and thickened fluids is provided in Chapter 2.1.

2.2.4 De-icing / anti-icing standards and quality assurance

2.2.4.1 De-icing / anti-icing standards

Based on the answers of the respondents[11], as shown in Figure 17, 96% of the service providers plan to conduct their operations in accordance with AEA recommendations. Service providers further adapt these recommendations to their own requirements (67%), or to each airline's requirements (43%) as well as the aerodrome management requirements (24%).

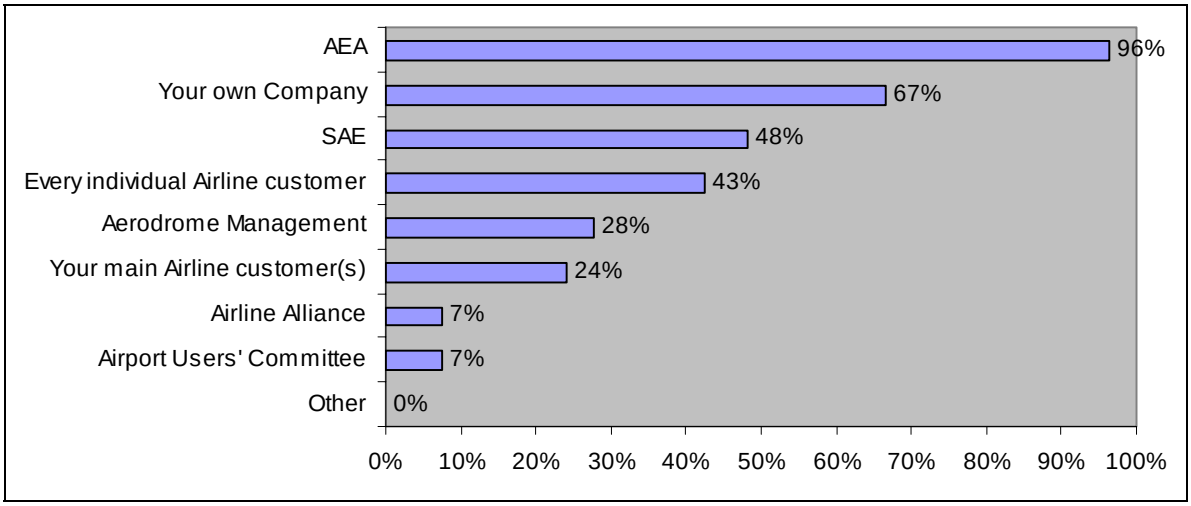

Figure 17: Applicable standards and procedures for service provider operations

The aircraft operators' requirements on de-icing / anti-icing operations are fortunately also based on AEA recommendations[12], as shown in Figure 18, with the aircraft manufacturer's requirements providing a large influence.

[11]Service Provider Questionnaire – Question 4.2: Under whose Standards/Procedures are your De/Anti-icing operations conducted?

[12]Aircraft Operator Questionnaire 2 – Question 2.3: To what Standards are your De/Anti-icing applications undertaken?

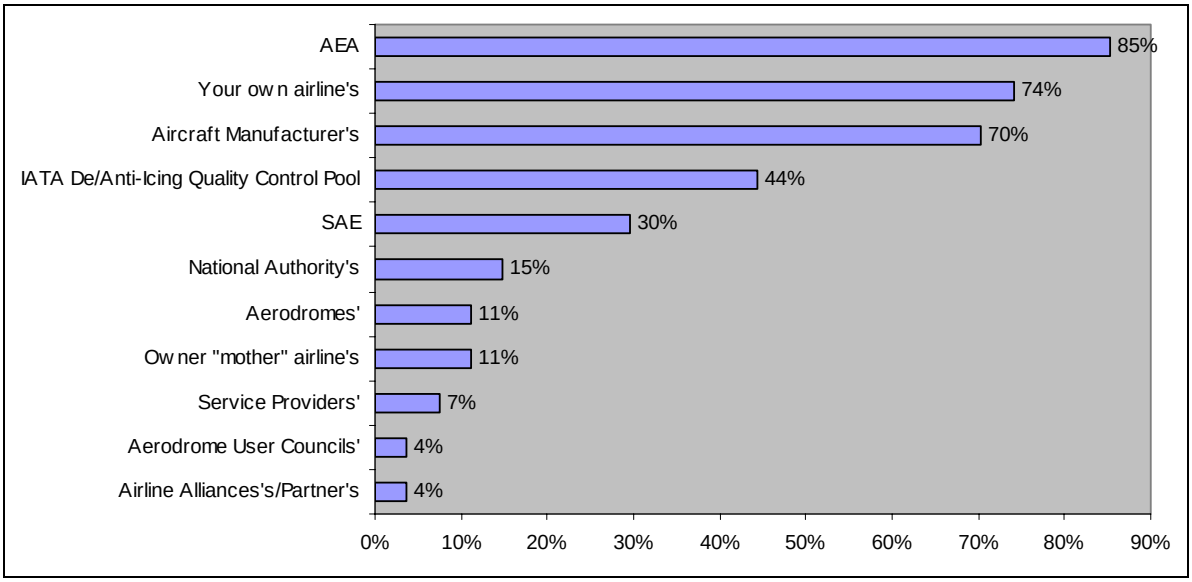

Figure 18: Standards required by airlines for de-icing / anti-icing operations

AEA recommendations are very comprehensive, frequently updated, and freely available over the internet. It must be noted, however, that no reference is made by the service providers to ICAO Manuals and national specifications (choice: "Other"). However, most stakeholders understand that procedures developed from the AEA Recommendations will automatically ensure compliance with ICAO Annex 6, Doc 9640 and EU OPS.

Interviews further revealed that service providers spend a large amount of effort in considering each airline's specific requirements. These requirements are provided to the service providers at the beginning of each season in the form of an airline winter operations manual (according to the aircraft operator respondents, 86% of them have specific requirements[13]). As the manual structure and the requirements may differ for each airline, their implementation in operations is a challenging task.

Numerous service providers interviewed pointed out this last issue, and called for a harmonisation of the airline requirements.

2.2.4.2 De-icing / anti-icing quality assurance

Quality assurance is accomplished via internal and external audits. As shown in Figure 19, 70% of the service providers stated that internal audits were accomplished[14].

[13]Aircraft Operator Questionnaire – Question 1.8: Do you provide documentation to Service Providers detailing your own specific requirements?

[14]Service Provider Questionnaire – Question 6.3: Who conducts audits on your Operations?

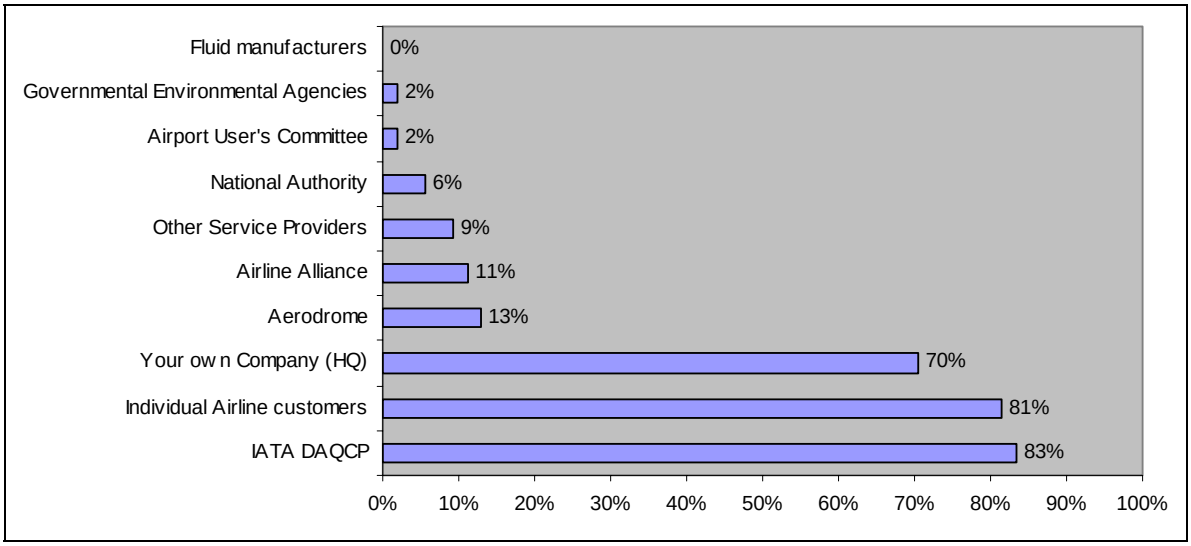

Figure 19: Organisation conducting audits of the de-icing / anti-icing service providers

Based on the same data, external audits are conducted systematically by the airlines, indirectly through IATA DAQCP ("pool-audit", 83%) or directly by individual airlines (81%). The involvement of the aerodrome and the national authorities remains minimal.

IATA DAQCP audits are conducted on an annual basis. These audits, conducted worldwide by a pool of selected auditors, are very comprehensive and standardised. The audit questionnaires are aligned with AEA recommendations, and their results (including potential non-resolved findings) are published to DAQCP members.

Individual airlines also conduct their own audits, either because they are not members of DAQCP, or possibly to follow national regulations (e.g. FAA) or internal quality management requirements.

It is of interest that European airline members of the DAQCP often conduct their own independent audits (e.g. Air Berlin). According to the service providers, these audits are in most cases "pro-forma" (possibly specific to ensure the implementation of an airline specific requirements), and less comprehensive than DAQCP audits.

The number of audits conducted on a service provider per year depends on the number of airlines serviced. Figure 20 shows the number of yearly audits conducted on service providers[15]. While the number of audits remains reasonable for most service providers operating at small and medium aerodromes, some operators at large international aerodromes are audited by more than 20 airlines per season (e.g. Frankfurt Main and Zurich Airport).

[15]Service Provider Questionnaire – Question 6.1: How many audits are conducted by other organisations on your de/anti-icing operation?

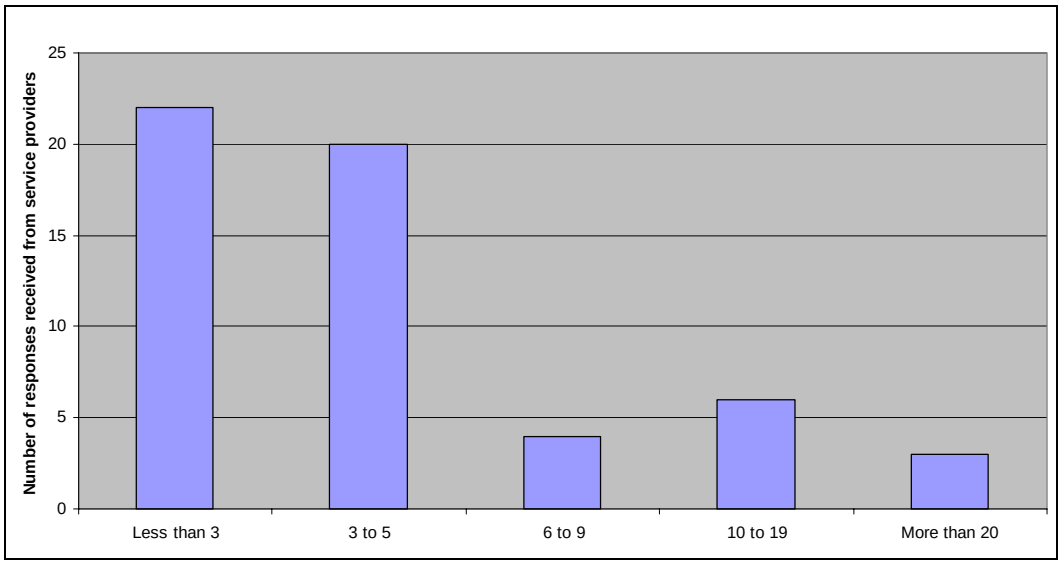

Figure 20: Number of audits conducted per annum on service providers

Meeting the demands of many audits can be expensive and time-consuming, as well as confusing. During interviews, these latter service providers (who are subjected to frequent auditing activity as mentioned above) expressed interest in the harmonisation of airline audits to avoid duplication and simplify matters.

2.2.5 De-icing / anti-icing personnel and training

2.2.5.1 Structure of personnel

As de-icing / anti-icing is a seasonal and irregular activity, almost all personnel involved share other tasks (e.g. ramp and baggage handling)[16]. Except for the Head of Operations or supervisors of large dedicated service providers, no employee is engaged in working full time on de-icing / anti-icing activities.

The proportion of time spent on de-icing / anti-icing activities, and the total number of procedures carried out per employee, also depends on the aerodrome traffic and the winter conditions.

As for ground handling in general, de-icing / anti-icing personnel turnover is very high: between 5% and 30% of the personnel are new and inexperienced recruits, the average being 24% (based on the answer provided by the questionnaire respondents[17] and interviewees). Qualitatively, the higher levels of employee turnover are at service providers operating near larger urban populations.

The above facts pose a major challenge for training and personnel management.

2.2.5.2 Training

2.2.5.2.1 Selection procedures

According to the interviewees, though no formal procedure is defined for the selection of de-icing / anti-icing personnel, great care is given in the initial staff capability.

2.2.5.2.2 Levels of qualification

Figure 21 displays the levels of qualifications (defined by AEA) of the de-icing / anti-icing personnel achieved through training by the service providers.

[16]Service Provider Questionnaire – Question 1.8 How many of your permanent Staff is employed for De/Anti-icing (Dedicated 100% to De/Anti-icing / Sharing other tasks)

[17]Service Provider Questionnaire – Question 1.9 On average for each season, how many Temporary / Seasonal Staff are typically employed for De/Anti-icing, and what are their experience levels? (Experienced recruits / Inexperienced recruits)

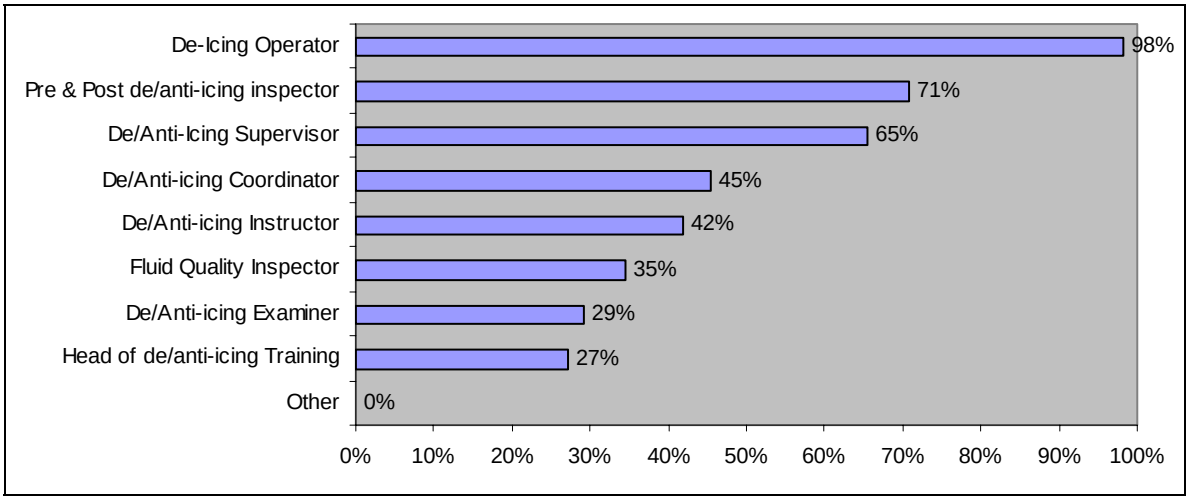

Figure 21: Levels of qualification

According to the respondents, service providers train their personnel as de-icing operators (98% of the service providers), pre & post de-icing / anti-icing inspectors (71%), supervisors (65%), coordinators (45%), instructors (42%) and fluid quality inspectors (35%).[18]

2.2.5.2.3 Trainers' qualifications

The training of the de-icing personnel (mainly de-icing operators), shown in Figure 22, is conducted at the majority of service providers at their premises by an internal instructor (86%), or by an external instructor, usually working as an instructor for another service provider (20%) or an airline (17%).

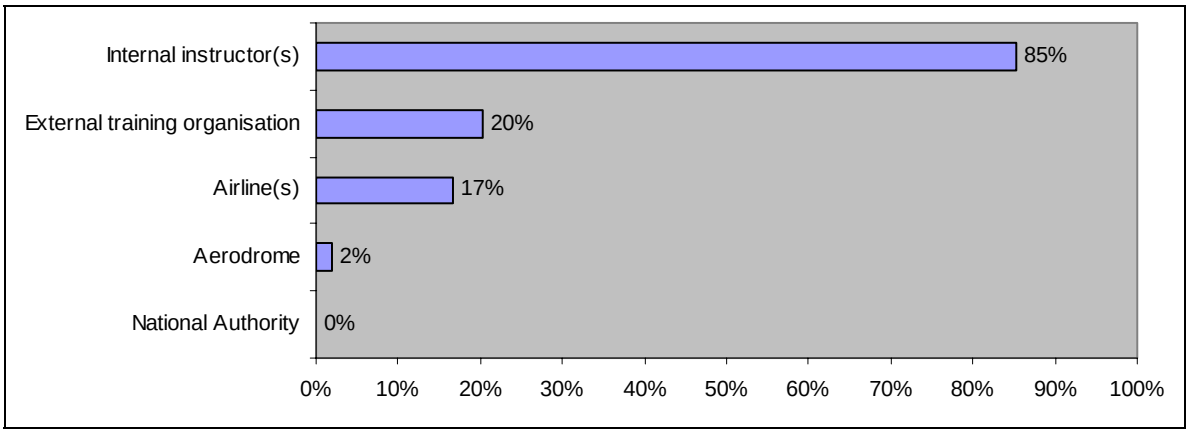

Figure 22: Training instructor or organisation

The involvement of the airlines in training is especially interesting. For instance, Lufthansa proposes training modules for current and future instructors ("train the trainer").

The NAAs, as well as the aerodromes, are not involved in training.

[18]Service Provider Questionnaire - Question 5.3: What positions are personnel trained for?

2.2.5.2.4 Training types

Two main types of training are generally provided: initial (for new or inexperienced recruits) and refresher/recurrent training (for experienced recruits). Both types of training are normally provided annually.

However, as the number of new recruits does not always justify a dedicated initial training course, training sessions for both experienced operators and inexperienced recruits are usually combined.

The duration of the refresher training (possibly similar to the initial training course duration, but not specifically addressed by the questionnaires), displayed in Figure 23, is on average of one and half days, with most opting for one day.

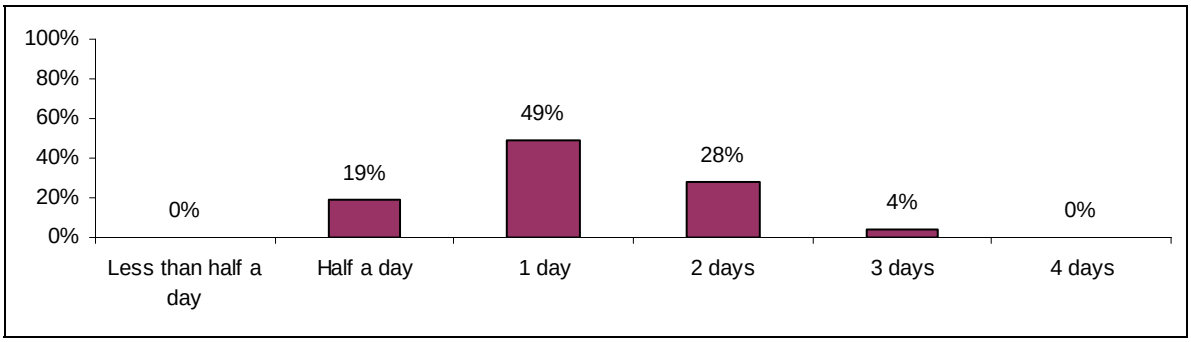

Figure 23: Refresher training duration

Whilst AEA does not provide recommendations on the duration of refresher training, it recommends 14 hours for the theoretical part of initial training and 21 hours for the practical element. These times are reflected in the City & Guilds training course developed by flybe, where “raw” recruits can take 5 days to qualify. However, in practice, initial training times are frequently adjusted to suit the capabilities and experiences of the recruits.

2.2.5.2.5 Training requirements and content

According to the respondents[19] (Figure 24), training courses are mainly based on AEA recommendations (91%), service providers own requirements – usually based on AEA – (80%), and airlines specific standards (59%).

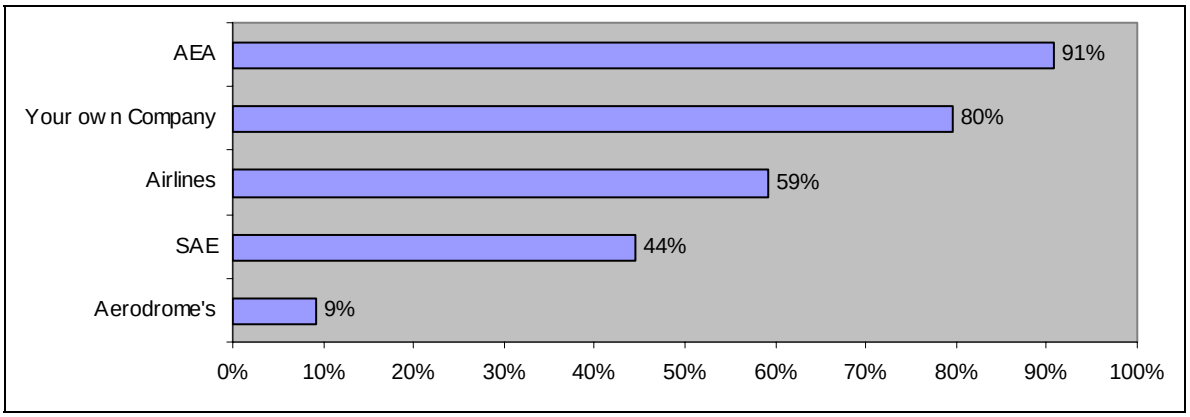

Figure 24: Training requirements & standards applying to de-icing / anti-icing personnel

Therefore, theoretical (classroom) training contains most AEA elements, including the effects of Type II/IV residues on aircraft systems and aerodynamics.[20]

Practical training, a key element, is more complex to conduct than classroom training:

Training is conducted prior the winter season; therefore, practical operation in real conditions is, in most cases, not possible immediately after theoretical training. While personnel may be able to become familiar with manoeuvring de/icing units soon after the classroom course, due to the lack of available aircraft and the cost of fluids, practical training on real aircraft requiring de-icing / anti-icing is difficult; it is usually involves simulation by means of the spraying of water. Therefore, operatives are trained during live operations under the supervision of an instructor or experienced operatives ("On the Job Training" – OJT). Some general uncertainties remain about the content and duration of such training (number and type of aircraft de-iced under supervision), as well as the qualifications of the supervisors and possible evaluation procedure.

[19]Service Provider Questionnaire - Question 5.2: Indicate which Training Requirements & Standards you apply to your de/anti-icing personnel

[20]Service Provider Questionnaire - Question 5.8: Indicate which Training Requirements & Standards you apply to your de/anti-icing personnel

Training simulators and other devices are now available (at a cost) to support training courses. While these may greatly assist with building confidence and addressing operational hazards, they will unlikely rule-out the need for OJT.

2.2.5.2.6 Training evaluation

As recommended by AEA, personnel must successfully complete a final written examination at the end of training. The examination is conducted as shown in Figure 25 by the instructor (internal or external staff). As was already noted for the conduct of training, NAAs and the aerodromes are not involved in this process, either.

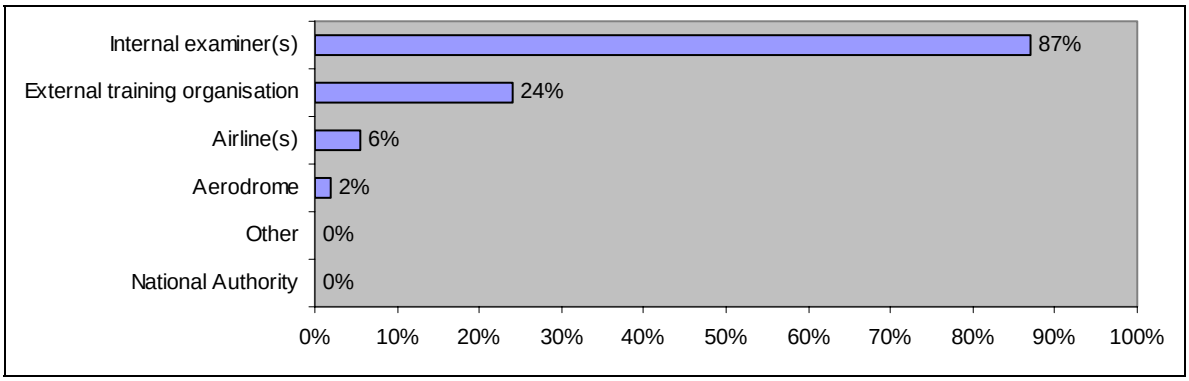

Figure 25: Responsibility for the examinations and awards the qualifications

2.2.5.2.7 Training records

After the successful completion of the written examination (led by the instructors), the recruits receive a certificate – issued internally by the service provider itself or externally by the training organisation – to operate.

The training records are systematically maintained by all service providers[21], as these are required and are checked during audits.

Some service providers issue individual identity certificates/licences to be carried by operatives and produced on request.

2.2.5.3 Safety Management

Service providers may have their own safety management system, or integrate their reporting scheme with the reporting systems of the aerodrome and aircraft operators to share occurrence information.

[21]Service Provider Questionnaire - Question 5.10: Does your Company maintain Training Records?

According to the 85% of the aerodromes[22] and 65% of the aircraft operators[23], service providers' occurrence reports are included in their SMS reporting scheme. These figures have to be taken carefully, as it does not mean that the reporting system is functioning in practice, and no information was provided to the categories of occurrence potentially reported. For further discussion on this matter see OPTIONS FOR CHANGE – ATTACHMENT A: Summary and Analysis of Available Safety Data (Safety Data Section).

[22]Service Provider Questionnaire - Question 2.10: Does the Aerodrome include De/Anti-icing Service Providers within the SMS occurrence reporting scheme?

[23]Aircraft Operator Questionnaire - Question 1.9: Do you include De/Anti-icing Service Providers in your Occurrence Reporting Scheme/SMS?

2.3 Responsibilities of the National Aviation Authorities (NAAs)

2.3.1 Coordination of de-icing / anti-icing activities within the NAAs

De-icing / anti-icing activities generally involve several departments of the Authorities, namely: Safety Regulation, Certification, Aerodrome, Flight Operations, Airworthiness, and Personnel Licensing department.

According to representatives of the NAAs, responsibilities in this field are divided between the one or many of the above mentioned departments; 3 out of 10 NAAs stated that the Aerodrome department held responsibility, while the remainder mentioned divided responsibilities – involving principally the Aerodrome, Safety Regulations, Airworthiness (incl. maintenance) and Flight Operations departments.

NAAs normally have no principal coordinator in the field of de-icing / anti-icing (exceptions: France and Switzerland).

2.3.2 National de-icing / anti-icing regulations directly applicable to aerodromes and service providers

The answers provided by the stakeholders (aerodromes, service providers, aircraft operators and national aviation authorities) through the questionnaires on the regulations of de-icing / anti-icing services have to be taken with great caution. Therefore, no quantitative figures based on the answers are provided in this chapter.

A cross-analysis of the responses provided by stakeholders operating at the same aerodrome or within the same Member State reveals many discrepancies and contradictions. For instance, in the United Kingdom, 5 service providers stated in the questionnaires that the UKCAA would regulate their operations and 5 other providers stated that it would not[24]. The UKCAA itself advised that *contractual arrangements between airlines and their service providers are not regulated.*

Firstly, the questionnaires and interviews were aimed to collect information on binding regulations published by national authorities specific to de-icing / anti-icing which are directly applicable to service providers or aerodromes. However, the respondents have very different definitions or perceptions of the scope, applicability, nature or status of “regulations” – which makes comparison of answers difficult. Although only a minority of the aerodromes and

[24]Service Provider Questionnaire – Question 4.1: What influence does your National Aviation Authority have over your operations?

service providers declared that their de-icing / anti-icing activities are regulated, this minority probably overestimated the extent of the regulations:

- For instance, ICAO manuals or AEA recommendations, which are not binding regulations, are in some cases perceived as binding regulations by the service providers or aerodromes.
- Similarly, some respondents (e.g. NAAs of Hungary, Czech Republic and Italy), referring to the fact that de-icing / anti-icing is a ground handling activity, answered in the questionnaire that de-icing / anti-icing is regulated by the national implementation of the Council Directive 96/97/EC – or by the Code of Civil Aviation. While these answers are semantically correct, these national ground handling regulations do not cover specifically or in great details de-icing / anti-icing services.
- Additionally, many NAAs, aerodromes and service providers consider (correctly) that de-icing / anti-icing services are regulated, but with reference to indirect regulation through air operations regulations (EU-OPS).

Therefore, in general, no specific, direct, binding National Aviation regulations are applicable directly to de-icing / anti-icing service providers.

A regulatory document applicable to service providers and containing some detailed requirements on de-icing / anti-icing operations was provided by Finland[25]. This document, is however non-exhaustive and contains a few requirements in addition to those derived from Directive 96/97/EC. It makes reference to the “ICAO Manual of Aircraft Ground de-icing / anti-icing Operations” (ICAO Doc. 9640- AN/940), and therefore does not contain detailed binding specifications.

2.3.3 Direct oversight of de-icing / anti-icing service providers by National Aviation Authorities

According to the responses provided by the service providers, NAAs perform very little oversight of de-icing / anti-icing service providers: only three of 54 service providers (less than 6%) stated that their NAAs conducted audits on their operations[26].

NAAs may conduct audits of the aerodrome de-icing / anti-icing infrastructure (against ICAO Annex 14 requirements) and approve or license ground handlers, but they do not conduct

[25]GEN M1-3, 12.6.2002: Ground Handling at Airports (Chapter 4.2.2: De-icing and anti-icing); www.ilmailuhallinto.fi/files/lth/imt-gen-m/ger1_03.pdf - last accessed 27.10.2010.

[26]Service Provider Questionnaire – Question 6.3: Who conducts audits on your Operations?

exhaustive audits of de-icing / anti-icing operations. The main reasons for this are: firstly, the lack of the direct regulations to oversee (confirming the assumptions of the previous chapter), secondly, the lack of personnel responsible for de-icing / anti-icing at the Authorities, and thirdly, Quality Assurance of de-icing / anti-icing is considered to be within the responsibility of the aircraft operators.

2.3.4 National de-icing / anti-icing regulations directly applicable to aircraft operator

The regulation of an aircraft operator's de-icing / anti-icing operations is indirect, via the regulation of Air Operator Certificate (AOC) Holders (AOCH) and related requirements (EU OPS): airlines are required to establish procedures for de-icing / anti-icing (EU OPS 1.345) and to establish a Quality System (EU OPS 1.035).

These regulatory requirements imposed upon airlines concerning de-icing / anti-icing are neither precise nor comprehensive, which introduces much scope for variation in the interpretation of these regulations.

NAAs are therefore not required to draft additional direct regulations.

Figure 26 shows the global answers provided by the aircraft operator on the NAAs' requirements on de-icing / anti-icing (fluid types and application, as well as maintenance activities related to thickened fluids)[27]. The information provided by the study participants confirms that there are few national regulatory requirements on de-icing / anti-icing for aircraft operators.

[27]Aircraft Operator Questionnaire 2 – Question 2.3: Does your National Authority impose/advise/provide/require in any of the following areas

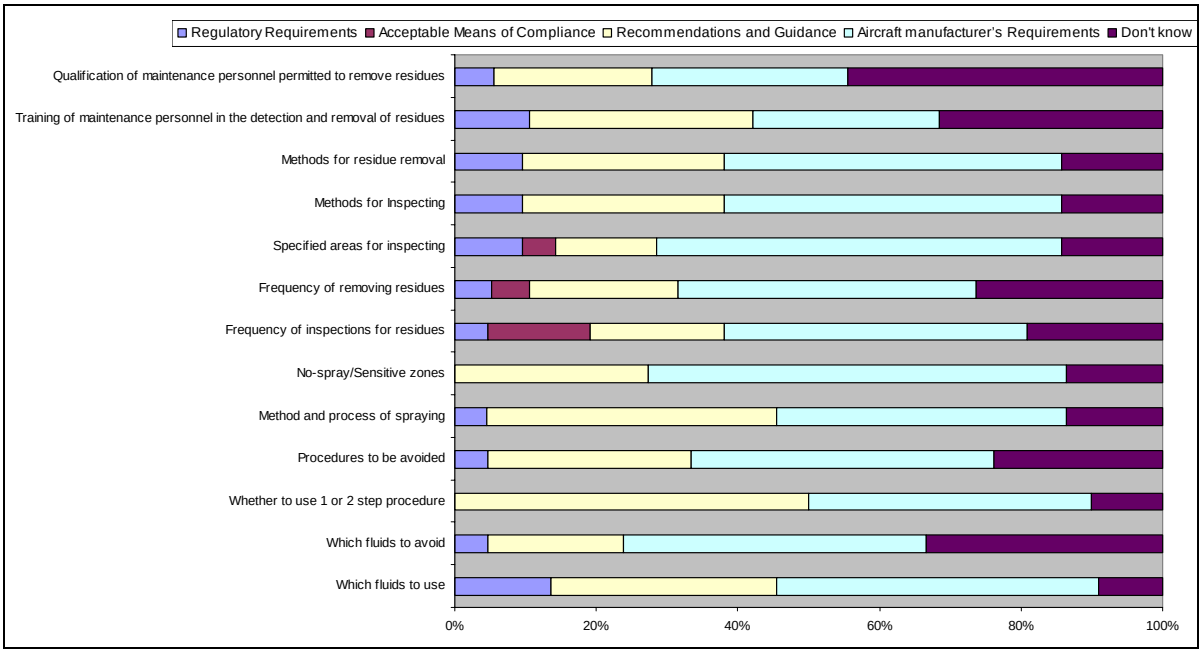

Figure 26: Imposition of National Authorities

2.3.5 National oversight of aircraft operator de-icing / anti-icing operations

The oversight of aircraft operator de-icing / anti-icing operations are generally performed via the review and approval by the NAAs of each airline's Operations Manual (OM), which shall include details of the winter operations plan and any relevant procedures for the flight crew. Figure 27 graphically illustrates the responses provided by aircraft operators on the methods for the approval of the winter operations programme for de-icing / anti-icing.

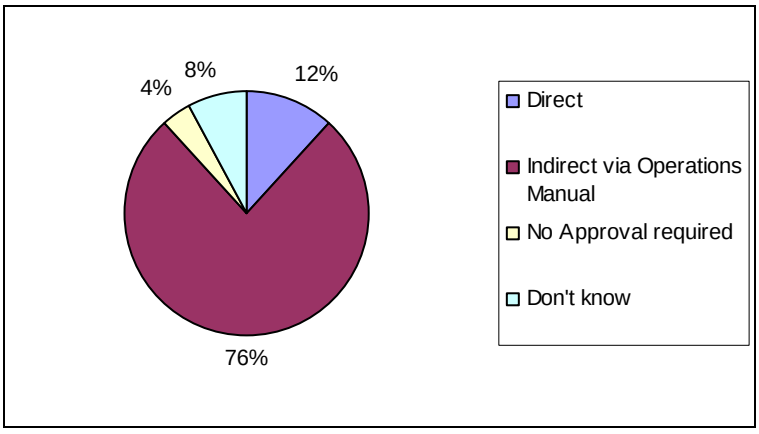

Figure 27: National Authority approval of winter operations plan/programme for de-icing / anti-icing of aircraft on the ground

The winter operations programmes (incl. flight crew training) are audited – as shown in Figure 28 – usually internally by the airline quality department (82%), and only in very few cases directly by the NAAs (9%).

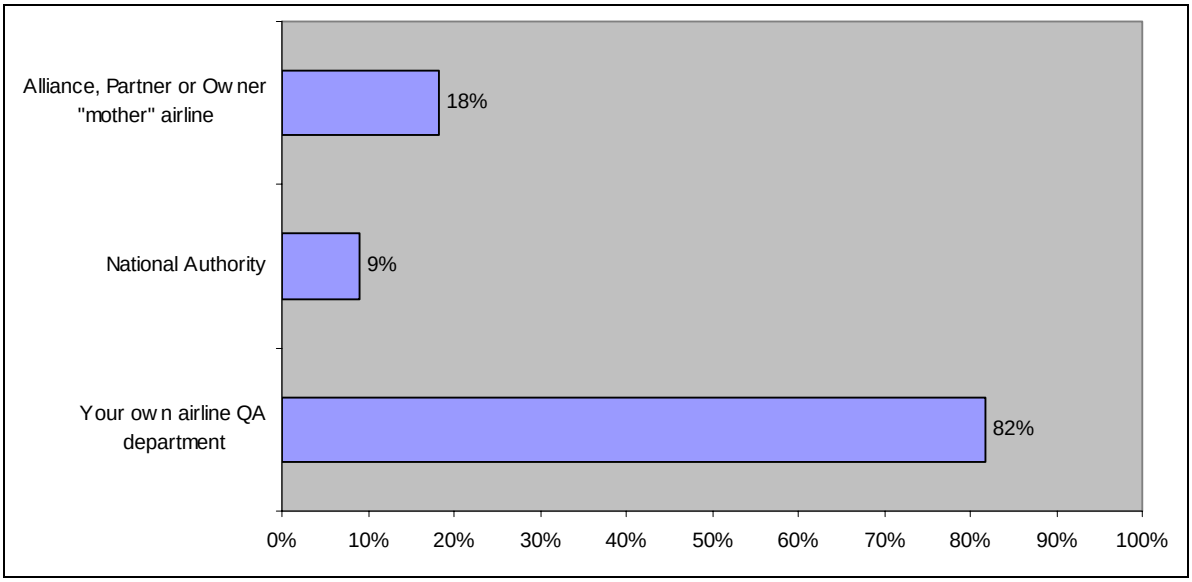

Figure 28: Conduction of aircraft operator de-icing / anti-icing winter operations programme audits

2.4 Incidents related to de-icing / anti-icing services and fluids

The analysis of recent incidents related to de-icing / anti-icing services and fluids is detailed in the attachment “Summary and Analysis of Available Safety Data “ to the “Options for Changes” Document.

Annex 1 – Supportive Material

	Answers from aerodromes			Answers from service providers			
	De-/anti-icing operations are regulated	De-/anti-icing operations are not regulated	Assumption	De-/anti-icing operations are regulated	De-/anti-icing operations are not regulated	Assumption	**Global Assumption**
Austria	0	1	Not regulated	0	2	Not regulated	**Not regulated**
Belgium	1	0	Regulated	0	1	Not regulated	**Not regulated**
Bulgaria	0	0	No answer	0	0	No answer	**No answer**
Cyprus	0	0	No answer	0	0	No answer	**No answer**
Czech Republic	0	0	No answer	0	0	No answer	**No answer**
Denmark	0	1	Not regulated	0	0	No answer	**Not regulated**
Estonia	0	0	No answer	0	0	No answer	**No answer**
Finland	1	0	Regulated	3	8	Not regulated	**Not regulated**
France	1	2	Not regulated	0	3	Not regulated	**Not regulated**
Germany	0	0	No answer	0	6	Not regulated	**Not regulated**
Greece	0	0	No answer	0	0	No answer	**No answer**
Hungary	0	0	No answer	0	1	Not regulated	**Not regulated**
Iceland	0	0	No answer	0	0	No answer	**No answer**
Ireland	0	0	No answer	0	0	No answer	**No answer**
Italy	1	0	Regulated	0	0	No answer	**Regulated**
Latvia	0	1	Not regulated	0	0	No answer	**Not regulated**
Lithuania	0	0	No answer	0	0	No answer	**No answer**
Luxemburg	0	0	No answer	0	0	No answer	**No answer**
Malta	0	0	No answer	0	0	No answer	**No answer**
Norway	0	1	Not regulated	1	1	Not regulated	**Not regulated**
Poland	0	1	Not regulated	0	2	Not regulated	**Not regulated**
Portugal	0	0	No answer	0	0	No answer	**No answer**
Romania	0	0	No answer	0	0	No answer	**No answer**
Slovak Republic	0	0	No answer	0	0	No answer	**No answer**
Slovenia	0	0	No answer	0	0	No answer	**No answer**
Spain	1	0	Regulated	1	1	Not regulated	**Not regulated**
Sweden	1	0	Regulated	3	0	Regulated	**Regulated**
Switzerland	0	1	Not regulated	0	1	Not regulated	**Not regulated**
The Netherlands	0	0	No answer	0	1	Not regulated	**Not regulated**
United Kingdom	1	2	Not regulated	5	5	Not regulated	**Not regulated**

Table 3: Assumptions on the regulatory situation based on aerodrome[28] and service provider[29] answers

[28] Aerodrome Questionnaire – Question 2.2: With regard to the role of aerodrome management: Does your National Authority impose for de/anti-icing operations

[29] Service Provider Questionnaire – Question 4.1: What influence does your National Aviation Authority have over your operations?

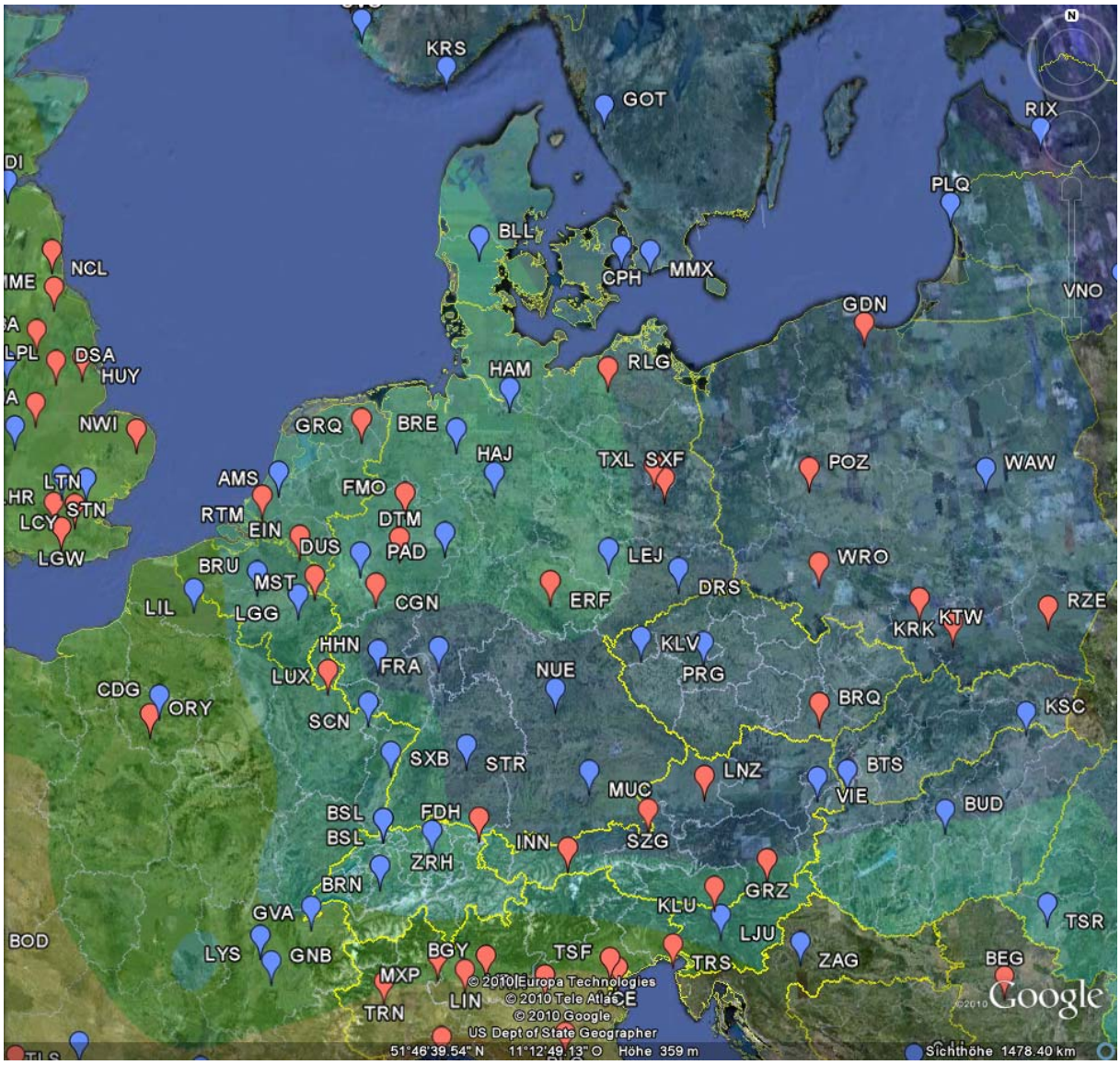

Figure 29: Map of Type I Fluids availability at Member States' aerodromes (zoom to Central Europe)

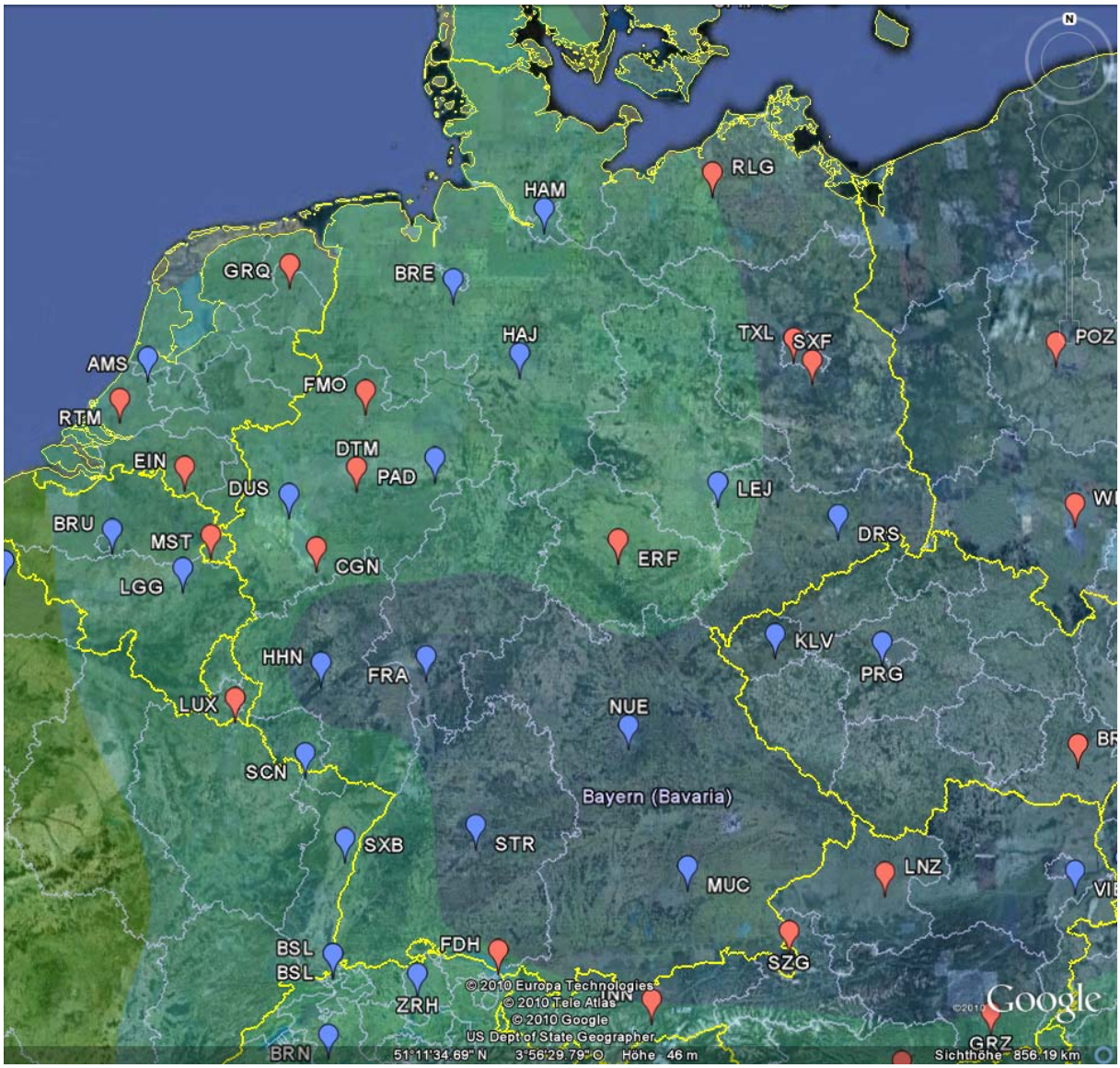

Figure 30: Map of Type I Fluids availability at Member States' aerodromes (zoom to Germany)

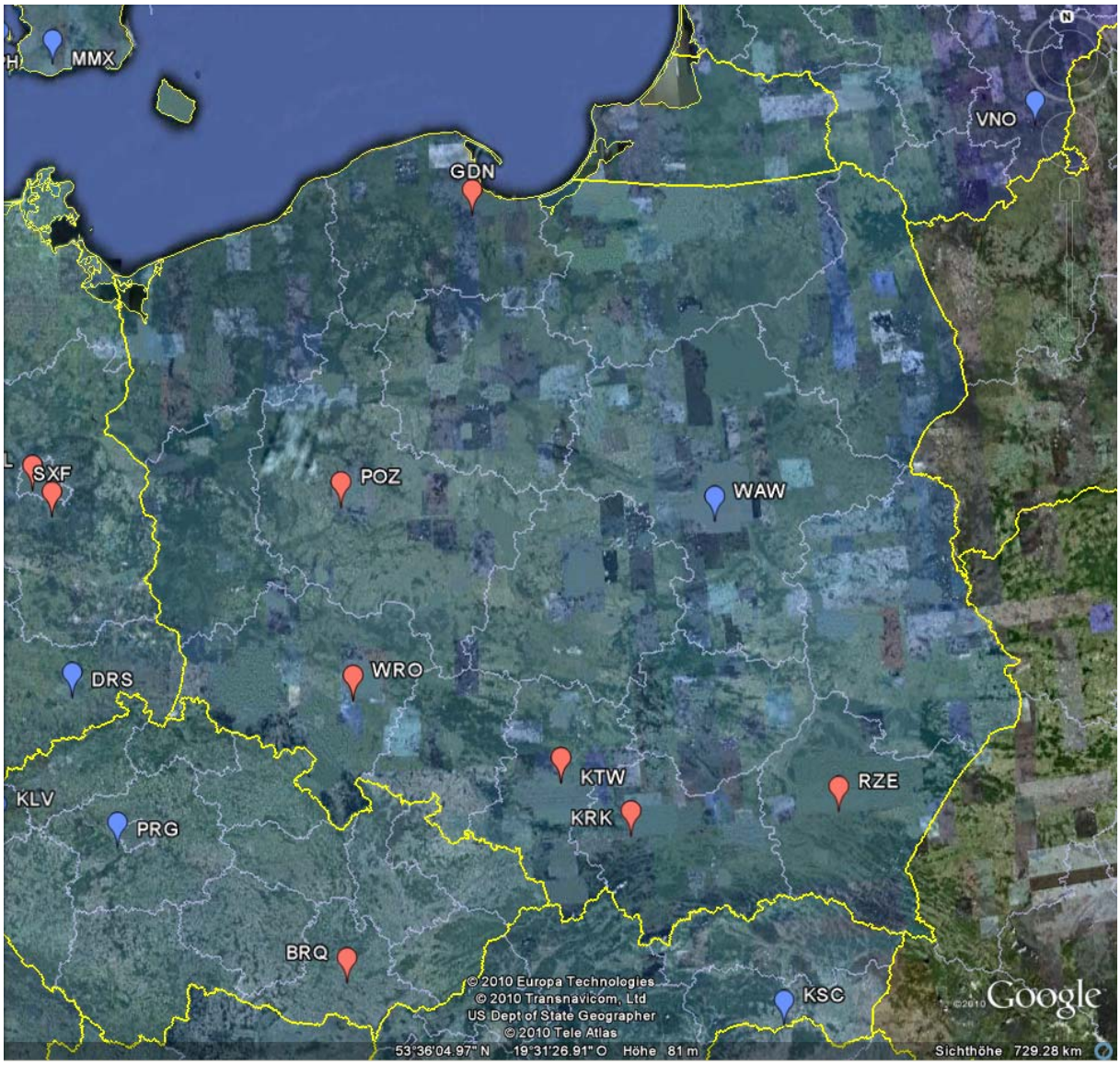

Figure 31: Map of Type I Fluids availability at Member States' aerodromes (zoom to Poland)

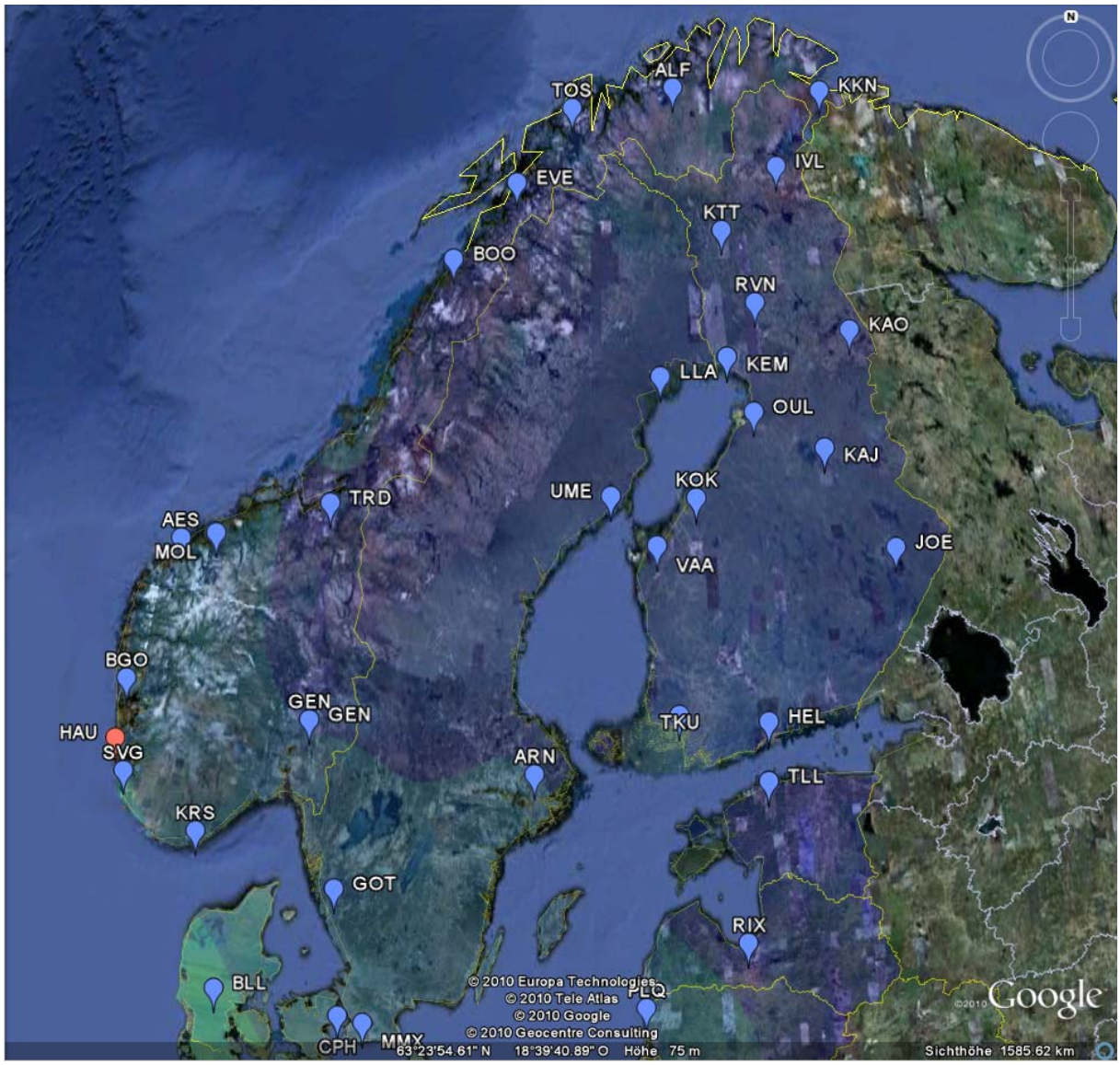

Figure 32: Map of Type I Fluids availability at Member States' aerodromes (zoom to Scandinavia)

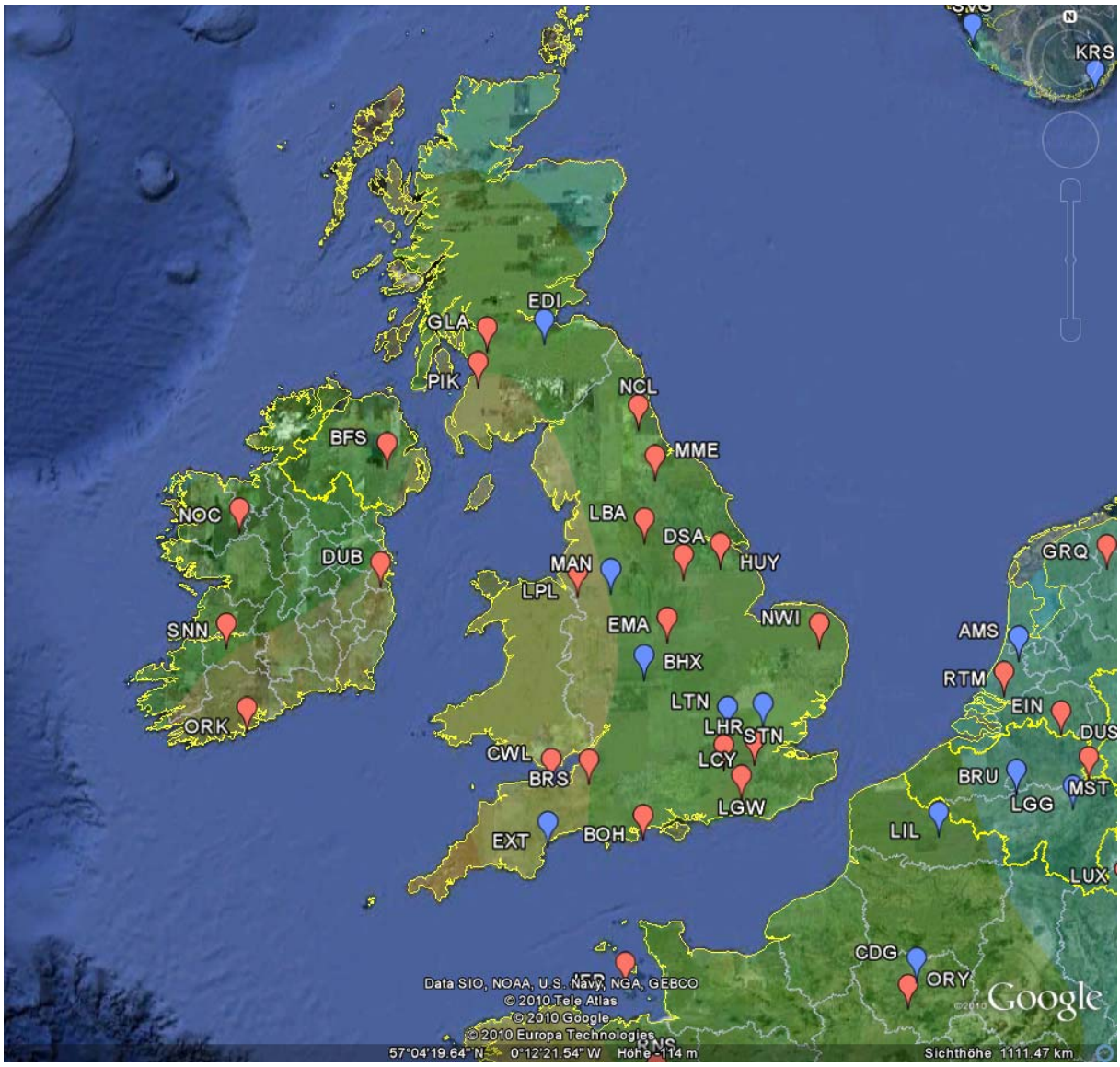

Figure 33: Map of Type I Fluids availability at Member States' aerodromes (zoom to United Kingdom)

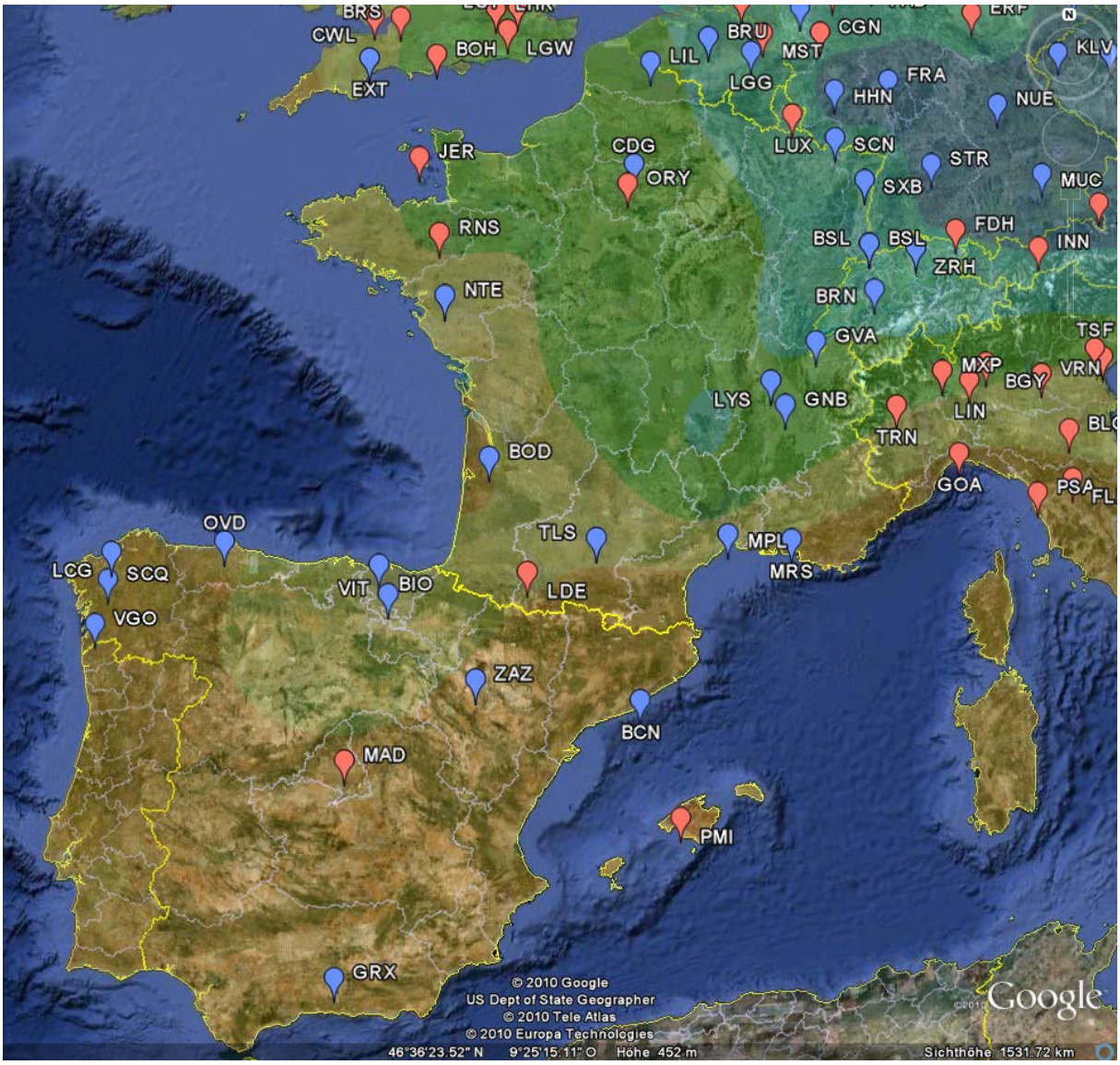

Figure 34: Map of Type I Fluids availability at Member States' aerodromes (zoom to Portugal, Spain and France)

Figure 35: Map of Type I Fluids availability at Member States' aerodromes (zoom to Italy, Switzerland and Austria)

ICAO Code	Country	Aerodrome
BIKF	Iceland	Keflavik International Airport
EBBR	Belgium	Brussels International Airport Company (BIAC)
EDDL	Germany	Flughafen Düsseldorf GmbH
EDDG	Germany	Flughafen Münster / Osnabrück International Airport
EDDM	Germany	Flughafen München GmbH
EDDN	Germany	FNG Flughafen Nürnberg GmbH
EDDP	Germany	Flughafen Leipzig/Halle GmbH
EDDR	Germany	Flughafen Saarbrücken GmbH
EDLW	Germany	Flughafen Dortmund GmbH
EFHK	Finland	Finavia Helsinki-Vantaa International Airport
EGBB	Great Britain	Birmingham International Airport Ltd
EGCC	Great Britain	Manchester Airport
EGLL	Great Britain	BAA plc. Heathrow Airport
EGPH	Great Britain	Edinburgh Airport Ltd
EGPK	Great Britain	Glasgow Prestwick Airport
EGTE	Great Britain	Exeter International Airport Ltd
EIDW	Ireland	Dublin Airport Authority plc
EKBI	Denmark	Billund Lufthavn A/S
ENGM	Norway	Oslo Lufthavn AS
ENGN	Norway	SAS
EPKK	Poland	The John Paul II International Airport Kraków - Balice Ltd.
EPWA	Poland	Warsaw-Okecie International Airport Polish Airports State Enterprise
ESSA	Sweden	Stockholm Arlanda Airport
EVRA	Latvia	Riga International Airport
LEBL	Spain	Aeropuerto Internacional de Barcelona
LEMD	Spain	Madrid Barajas Airport
LFBP	France	Aéroport de Pau - Pyrénées
LFBT	France	Aéroport International Tarbes-Lourdes-Pyrénées
LFJL	France	Aéroport de Metz-Nancy-Lorraine
LFLC	France	Aéroport de Clermont-Ferrand-Auvergne International
LFLY	France	Aéroport Lyon-Bron
LFMT	France	Montpellier Méditerranée Airport
LFPG	France	Aéroports de Paris
LFRB	France	Chambre de Commerce et d'Industrie de Brest
LIPX	Italy	Aeroporto Verona-Villafranca SpA di Gestione Valerio Catullo
LIRF	Italy	Rome "Leonardo da Vinci" Fiumicino Airport
LOWG	Austria	Flughafen Graz Betriebs GmbH
LOWW	Austria	Flughafen Wien AG
LOWS	Austria	Salzburger Flughafen GmbH
LSGG	Switzerland	Geneva International Airport
LWSK	Macedonia	PEAS Public Enterprise for Airport Services "Macedonia" - Skopje

Table 4: List of Study Participants - Aerodromes

ICAO Code	Country	Company
EBBR	Belgium	Aviapartner
EBLG	Belgium	Flightcare Belgium S.A./N.V.
EDDF	Germany	N*ICE Aircraft Services & Support GmbH
EDDG	Germany	FMO Airport Services GmbH
EDDH	Germany	STARS Special Transport and Ramp Services GmbH & Co. KG
EDDM	Germany	Aircraft De-icing Engineering
EDDM	Germany	EFM - Gesellschaft für Enteisen und Flugzeugschleppen am Flughafen München mbH
EDDP	Germany	PortGround GmbH
EDDC	Germany	PortGround GmbH
EDDV	Germany	Flughafen Hannover-Langenhagen GmbH
EFHK	Finland	Northport Oy - Helsinki Vantaa
EFIV	Finland	RTG Ground Handling Oy
EFJO	Finland	RTG Ground Handling Oy
EFKK	Finland	RTG Ground Handling Oy
EFKI	Finland	RTG Ground Handling Oy
EFKT	Finland	RTG Ground Handling Oy
EFKS	Finland	RTG Ground Handling Oy
EFOU	Finland	RTG Ground Handling Oy
EFRO	Finland	RTG Ground Handling Oy
EFVA	Finland	RTG Ground Handling Oy
EGBB	Finland	Servisair
EGBB	Finland	Airline Services Ltd
EGCC	Great Britain	Servisair
EGCC	Great Britain	Airline Services Ltd
EGCN	Great Britain	Servisair
EGFF	Great Britain	Servisair
EGGD	Great Britain	Airline Services Ltd
EGGD	Great Britain	Servisair
EGGP	Great Britain	Servisair
EGGW	Great Britain	Airline Services Ltd
EGJJ	Great Britain	Know Ice
EGKK	Great Britain	Airline Services
EGLL	Great Britain	ASIG
EGNT	Great Britain	Servisair
EGNT	Great Britain	Airline Services Limited
EGNV	Great Britain	Servisair
EGNX	England	Servisair
EGPD	Scotland	Servisair
EGPF	Scotland	Airline Services Ltd
EGPF	Scotland	Servisair
EGPH	Scotland	Airline Services Ltd
EGPK	Scotland	Prestwick Handling
EGTE	Great Britain	flybe
EHEH	Netherlands	Viggo
EINN	Ireland	Servisair
EKFE	Finland	RTG Ground Handling Oy
ENGM	Norway	Nordic Aero AB

ENGM	Norway	SAS Ground Service
ENVA	Norway	Røros Flyservice
EPKK	Poland	KRK Airport Services Sp. Zo.o.
EPPO	Poland	POZ Airport Services Sp. Z o.o.
EPWA	Poland	Flebl
EPWA	Poland	Warsaw Airport Services Ltd
ESGG	Sweden	Nordic Aero AB
ESGG	Sweden	SAS Ground Service AB
ESKN	Sweden	Stockholm Skavsta Airport
ESSA	Sweden	Nordic Aero AB
EVRA	Latvia	airBaltic Corporation AS
LEMD	Spain	IBERIA Airport Services
LEPA	Spain	Acciona Airport Services
LFBP	France	CCI PAU AIRPORT
LFJL	France	GIGAL
LFPO	France	WFS
LFRB	France	CCI BREST
LHBP	Hungary	Malév Hungarian Airlines - Ground Handlings
LOWS	Austria	Salzburger Flughafen GmbH
LOWW	Austria	Vienna Airport Handling
LSGG	Switzerland	TAG Aviation SA
LSZH	Switzerland	Swissport Zurich
EDDT	Germany	GlobeGround Berlin GmbH
EDDB	Germany	GlobeGround Berlin GmbH

Table 5: List of Study Participants - Service Providers

Country	National Aviation Authority (NAA)
Austria	BM für Verkehr, Innovation und Technologie als Oberste Zivilluftfahrtbehörde
Czech Republic	Civil Aviation Authority of the Czech Republic
Denmark	CAA Denmark
Estonia	Estonian Civil Aviation Administration
Germany	Bundesministerium für Verkehr, Bau und Stadtentwicklung
Great Britain	Civil Aviation Authority
Greece	Hellenic Civil Aviation Authority - Greece
Hungary	National Transport Authority Ungarn
Iceland	Icelandic Civil Aviation Administration
Italy	Italian Civil Aviation Authority (ENAC)
Latvia	Civil Aviation Agency of Latvia
Lithuania	Civil Aviation Administration Lithuania
Netherlands	CAA The Netherlands
Norway	Luftfartstilsynet - Civil Aviation Authority Norway
Spain	Ministerio de Fomento
Switzerland	Bundesamt für Zivilluftfahrt der Schweiz

Table 6: List of Study Participants - National Aviation Authorities

Country of Contact	Aircraft Operators
Austria	Austrian Airlines
Austria	Tyrolean Airways
Belgium	TNT Airways
Finland	Finnair PLC
France	BRITAIR
France	Air France
France	REGIONAL
Germany	Contact Air
Germany	Eurowings
Germany	Lufthansa CityLine
Great Britain	British Airways PLC
Great Britain	Blue Islands
Ireland	CityJet
Ireland	Aer Arann
Italy	Neos
Luxembourg	Luxair SA
Latvia	airBaltic Corporation AS
Netherlands	KLM – Royal Dutch Airlines
Netherlands	Transavia
Norway	Widerøe Flyveselskap
Poland	EuroLOT
Romania	TAROM
Sweden	Ryanair
Sweden	SAS
Switzerland	Swiss Interantional Air Lines
Ukraine	CJSC AeroSvit Airlines

Table 7: List of Study Participants - Aircarft Operators

EASA.2009.OP 21

Study on the regulation of ground de-icing and anti-icing services in the EASA Member States

INTERIM REPORT

OPTIONS FOR CHANGE

airsight GmbH

Gustav-Meyer-Allee 25
13355 Berlin
Germany
Phone: +49 30 45803177
Fax: +49 30 45803188
www.airsight.de

Attachments

Attachment A: Summary and Analysis of Available Safety Data

Attachment B: References from Regulations and other Documents

Attachment C: FAA Standardised International Aircraft Ground De-icing / Anti-icing Programme (SIAGDP)

Table of Contents

1 Introduction

In this document, the Study Team presents various options for consideration by the Agency, and stakeholders, aimed at meeting the Terms of Reference for the Study EASA.2009.OP.21; namely options for improving the availability of fluids at EASA member state aerodromes and options for the certification of de-icing / anti-icing service providers by national authorities. However, because of the known difficulties in achieving either of these two outcomes, the options for change presented here have been developed to meet the underlying motivations for the Study, and in doing so, may also address the outcomes already mentioned. A full explanation of the underlying motivations is given in this paper.

The options presented in this paper have been chosen, based on factual inputs and informed advice. In the selection of options, consideration was given to:

- existing work conducted by the Agency in this field,
- existing work conducted by the Industry,
- data collected and analysed as required by the Study ToRs, and
- informed opinion of the Study Team based on input from stakeholders and the Team members' experiences.

Options omitted from this paper are those concerning:

- the management of fluid residues, and
- the certification of fluids.

The reason for the primary omission is that the Agency has undertaken work already to address this issue. However, the Study Team has considered whether the effects of operator, maintenance organisation, and aircraft manufacturer actions, since 2005 have been beneficial in reducing, or managing, the effects of fluid residues. This point is important because the impetus behind this Study is to help reduce the level of risk by reducing the occasions of residue build-up. The latter omission is justified due to any potential solution likely to be of a long-term nature.

Presentation of Options

For this Interim Report, the Study Team, at this stage, has a preference for the presentation of "options" rather than recommendations: however, there are some exceptions (see below). The Study Team believes that the end result for EASA will be an improvement. The meaning of this is threefold:

1. Options can be presented to Stakeholders' Representatives without pre-attached value; therefore feedback can be objective and balanced.
2. Objective feedback provides valuable material for a Regulatory Impact Assessment (RIA).
3. Options are the preferred method of presentation within an RIA, and this Study's Final Report will contain a pre-RIA.

This decision does not preclude the Study Team forming and presenting the Agency with its choice of recommended options; however, this might be more effective if delayed until after the results of the Stakeholders Representatives' Briefing (SRB), where stakeholders (including Agency experts) will have the opportunity to present their objective feedback on the options directly to the Study Team.

Exceptions

Some options, such as the need for a safety initiative and nominated subject-matter experts, *have been* recommended by the Study Team. These are high-level concepts; the specific mechanisms for implementation are still presented as options. Other options are "not recommended" by the Study Team. These are generally where the solutions are long-term (certification of fluids, direct regulation of service providers), and not necessarily because the idea is impractical.

2 Data sources considered for this study

Questionnaires

As described in the Data Summary and Analysis section of this Report, the Study Team has attempted, by means of questionnaires, to ascertain the status quo of a broad range of factors concerning de-icing / anti-icing, and involving the main involved stakeholder groups. This data was not the only source from which the Study Team developed its options.

EASA

The Recommendations made by the AAIB and BFU, and the options proposed and dismissed in A-NPA 2007-11 (summarised below) are all in concord with the Terms of Reference for this Study (2009.OP.21); in that they request the contractor to make appropriate recommendations as to the most effective ways in which the NAAs of the EASA Member States could regulate de-icing / anti-icing services in a harmonised way, so that the safety of aircraft operations is maximised and a level commercial playing field remains ensured. These recommendations should centre on how the following areas can be improved at the aerodromes of the EASA Member States:

- availability of type 1 fluids, and
- quality of service provision.

Interviews

During the data collection phase of this project, participants and interviewees were requested to provide their own recommendations, and these have been summarised and included below.

AEA

When considering the documents “AEA Recommendations” and “AEA Training Manual”, the latter offered more general recommendations for improving overall standards, rather than the more specific technical practices recommended in the former.

Safety

Attachment A to this Study (Summary and Analysis of Available Safety Data) makes some conclusions regarding the regularly occurring underlying factors that may contribute to reduced risk, and these have been taken into account when drafting the options for change.

In the absence of adequate quantity and quality of specific human error safety data concerning de-icing / anti-icing, the sections that follow provide, from valid sources, an overview of desired options and recommendations, which give a broad overview of the

issues which exist and which might need addressing. They are valuable in helping the Study Team to formulate their own options for change and also support some of the conclusions reached previously by the Industry and EASA.

Applicability

This Study concerns the de-icing / anti-icing of aircraft on the ground, and is not extended to de-icing / anti-icing of aerodrome surfaces or aircraft in-flight.

The Study was directed at de-icing / anti-icing operations and oversight of fixed-wing Commercial Air Transport, within EASA Member Sates.

Concerning the argument as to which aircraft are “at risk” from the effects of residues, the Agency’s general policy concerning any actions is to not limit them to only aeroplanes with non-powered flight controls but also include hydraulically controlled aeroplanes (CRD A NPA 2007-11). Therefore, in addressing the quality of service provision, options will apply to all operators of commercial air transport and all aircraft types; as well as all aerodromes and service providers, regardless of the aircraft they provide for.

3 Summary of existing recommendations and options

3.1 Summary of relevant recommendations made by UK AAIB and German BFU (presented in A-NPA 2007-11)

1. Type I Fluid Availability

- **a.** Operators of aircraft with non-powered flight controls are strongly encouraged to use Type I de-icing / anti-icing fluids, in preference to 'thickened' fluids, for de-icing.
- **b.** Type I de-icing fluids are made available on airports regularly used by aircraft with non-powered flying controls and not just Types II/IV.
- **c.** De-icing / anti-icing service providers apply Type I and not only Types II/IV on airports regularly used by aircraft with non-powered flying controls.

2. Fluid Residue Management

- **a.** Operators of aircraft with non-powered flying controls that are vulnerable to the effects of freezing of re-hydrated de-icing fluid residues, establish engineering procedures for the inspection and removal of such residues from critical control surfaces.
- **b.** Where the use of 'thickened' de-icing / anti-icing fluids is unavoidable, operators of aircraft with non-powered flight controls, invoke controlled maintenance procedures for the frequent inspection for accumulations of fluid residues and their removal.
- **c.** Manufacturers of non-powered flying controlled aircraft develop reliable procedures for their aircraft types to ensure the identification and removal of re-hydrated de-icing fluid residues.

3. Approved Organisations and Personnel

- **a.** Consideration be given to establishing regulations such that de-icing / anti-icing training and operations are accomplished by certified and approved companies under the supervision of authorities.

4. Fluid Certification

- **a.** Fluid manufacturers be encouraged to develop fluids, with suitable 'holdover' times, that incorporate gelling agents that are not re-hydratable (sic).
- **b.** Certification requirements and criteria be established with respect to all aircraft de-icing / anti-icing fluids, including mandatory limits or evidence of unrestricted suitability of fluids for aircraft with non-powered flying controls.

c. The expected drying and re-hydration properties of thickened de-icing fluids be described and defined by standardisation in such detail as to eliminate significant quality variations among the products of different manufacturers.

Current Status of these Recommendations

Addressed so far:

1a – EASA SIN 2008-29

2a, 2b – EASA SIN 2008-29 and NPA 2009-09

2c – EASA letter to aircraft manufacturers PBL/ein/C(1.1)2009(D)61465 dated 14 April 2009

For long-term consideration:

4a, 4b, & 4c.

For consideration within this Study (see below):

1b, 1c, & 3a.

3.2 Summary of options and impact assessments presented in A-NPA-2007-11

In A-NPA 2007-11 options for action and associated impact assessments were presented. This is important to understand, because in some areas the Agency may maintain the same opinion, whilst in others it may need to change opinion based on the results of this Study. The purpose of A-NPA-2007-11 was to consult stakeholders on the appropriate measures to be taken in order to address potential safety hazards associated with the residues of fluids used for the ground de-icing / anti-icing of aircraft. It was the intention to use the outcome of the consultation to define an EASA action plan to address this issue and more particularly the recommendations from accident investigators shown above.

A summary of the relevant details are shown below:

Operations Option Proposed - Option 1:

Do nothing. The major objectives are already described in current Regulation (EC) 1899/2006 (EU OPS). Detailed provisions contained in JAR-OPS 1 are currently transposed into implementing rules and associated material for the envisaged amendment to Regulation (EC) No 1592/2002, replacing EU OPS once it becomes applicable. Therefore there is no need for additional wording.

Operations Option Dismissed - Option 2:

Additional rulemaking could address:

- the assessment, oversight and management of de-icing / anti-icing service providers
- the content, practices, procedures etc to be embodied in the operators' processes with respect to selection, use and monitoring of types of fluid used, including the availability of de-icing / anti-icing fluids for aircraft with non-powered flight controls
- the content, practices, processes etc. to be embodied in the operators maintenance programme
- the training requirements for crew regarding fluid types, their properties, use and limitations such that the adequacy and appropriateness of the provided service can be assessed.

Service Providers Option Proposed – Option 2

Encourage the development of industry standards and industry monitoring programmes. Although this option does not lead to a regulatory solution, it may be considered that industry standards and monitoring programmes may bring an appropriate increase in safety.

Service Providers Options Dismissed – Options 1 & 3

- Do nothing. It may be considered that licensing/regulating the de-icing / anti-icing service providers will not improve safety.
- Regulatory approval of service providers: it may be considered that regulatory approval of service providers is necessary to achieve an acceptable level of safety.

Aerodromes Option Dismissed – Option 1

Do nothing.

Aerodromes Option Proposed – Option 2

Rulemaking. Some mechanism is required to ensure that the range of de-icing / anti-icing fluids is made available at all appropriate locations.

3.3 Summary of results of CRD for A-NPA 2007-11

Responses to Options for Operations: Stakeholders tended to be dissatisfied with the chosen option to do nothing. The Agency invited them to comment on the transposition of EU OPS 1.345, 1.346 and associated AMCs into the forthcoming Implementing Rules Operations (NPA 2009-02). NB: the Comment-Response Document to this NPA is currently under review (as of Oct 2010).

Responses to Options for Service Providers: A majority of the commentators preferred option 3 (regulatory approval of the service providers) to the Agency's proposed option 2 (encouragement of industry standards and monitoring programs) as a way forward with respect to service providers that perform de-icing / anti-icing services. Option 2 was considered as the status quo and that only the certification of service providers would make a significant difference.

Responses to Options for Aerodromes: Because of the heterogeneous models for provision of de-icing / anti-icing across different states, weather zones and business models, there was no clear consensus concerning the Agency's preferred option of rulemaking to ensure a range of fluids is available. However, the economic cost resulting from imposing a range of fluid types to be available at aerodromes were highlighted. NB: no aerodrome responded to the A-NPA.

Conclusion

Most commentators to A-NPA 2007-11 would wish that:

a. An appropriate range of fluids is maintained and offered at each aerodrome receiving commercial air transport aircraft;

b. De-icing / Anti-icing service providers be approved, and;

c. Fluids are certified.

However, whilst the Agency concurs with these comments, both fluids and aerodromes (at the time) were outside of the Agency's remit, and therefore these would remain long-term goals.

The Agency did however initiate actions to address the inspection for, and cleaning of, de-icing / anti-icing fluid residues; and, the remaining areas were included in a six-point plan for the medium to long-term. One of these areas formed the basis for this Study, whilst one other area will also be partially addressed by convenience during this Study; these are:

- Investigate and recommend the means by which Aviation Authorities of Member States manage matters in regard to the certification of service providers, availability of fluids at aerodromes, etc (midterm), and

- Make, as far as possible, provisions in the implementing rules on the safety of aerodromes with a view to make the operations of de-icing / anti-icing service providers safer and ensure the availability of fluids (midterm).

These two tasks, above, support the remaining unaddressed recommendations made by the AAIB and BFU as mentioned above (1b, 1c & 3a), which will be considered by this Study:

- To make Type I fluids available at airports regularly used by aircraft with non-powered flying controls.
- To ensure Type I fluids are applied at airports regularly used by aircraft with non-powered flying controls.
- Consideration should be given to establishing regulations such that de-icing / anti-icing training and operations are accomplished by certified and approved companies under the supervision of authorities.

3.4 Summary of recommendations made from Study participants

The recommendations shown here in this section are taken from written comments made by respondents to on-line questionnaires, where an opportunity was given to add additional points of view. The headings refer to the relevant stakeholder group for whom each questionnaire was designed. The fact that comments on some areas of activity or other recommendations for change are omitted, does not imply that the respondents do not have further comments of points of view concerning other recommendations. The inclusion of these comments here does not imply agreement: they are included to maintain a record, but also to show that the Options presented later in this Report do address many of these recommendation.

Operators

- Airlines can nominate “experts” for better communication with service providers; these experts will still need convincing that Type I fluids are useful, e.g. especially when regular weather patterns require a high number of de-icing procedures only.
- Operators can assist service providers and aerodromes with necessary “upgrade” investment by signing long-term contracts. NB: this is also one benefit of monopoly providers – in both cases service providers know they have long-term income and can budget accordingly.

Service Providers

- Regulation is recommended for de-icing / anti-icing:
    - procedures and operations,
    - training programmes,
    - personnel and trainer licensing,
    - standard of equipment, and
    - availability of fluids.
- Service providers should participate in proactive SMS/reporting schemes, which should be linked to the NAA for analysis.
- NAAs/EASA can clarify which fluid and treatment combinations are the “best” rather than just state the alternatives as per AEA/SAE.
- Make the two-step procedure mandatory.

Aerodromes

- Transfer to aerodromes the requirement to provide de-icing / anti-icing services, and allow the opportunity to sub-contract. There was also a small minority of strict opposition to aerodromes taking any responsibility for de-icing / anti-icing.
- Consider the role of the aerodrome under Annex 14 SARPs to provide and maintain facilities and facilitate operational flow/throughput etc.
- Require aerodromes to contact all operators and request what types of fluid and service they require; use the aerodrome to insist that service providers meet the operators' needs; and include types of fluid and service available in the AIP.
- Require the aerodrome to audit third-party contractors against its own SMS requirements.
- NAAs/EASA to require aerodromes to collect safety and service information annually and submit it for analysis.
- Consider the same regulatory arrangement for de-icing / anti-icing as exists for other operational areas e.g. "assistance to passengers with reduced mobility" and the aerodrome's responsibilities therein.
- Landing/take-off fees can be adjusted to cover the costs of annual de-icing / anti-icing.
- A regulatory solution for de-icing / anti-icing can be extended to other unregulated and safety critical services, such as aircraft loading.

3.5 Summary of recommendations made by interviewees

Some interviews were conducted with representative stakeholders from each of the main groups. These interviews were conducted face-to-face; by telephone and also via e-mail. The recommendations shown here represent a summary of those recorded. Their inclusion does not imply support: they are included as a record, and also to show that the Options presented in this Report do address many of these recommendations.

Operators

- Operators to have a nominated de-icing / anti-icing expert: this person to be sole conduit for communication with service providers, aerodromes and NAAs.
- Improve the knowledge of pilots on this matter.
- At the Airport User's Committee level, operators can influence how money used for improving infrastructure is raised and invested.
- Flight crew should not know the precise breakdown of costs/prices of de-icing / anti-icing services and fluid for each location.

Aerodromes

- Aerodromes to convene AUC meetings dedicated to de-icing / anti-icing "operations" separate from those held to discuss traffic flow.
- Aerodromes can mandate the supply of Type I fluid through its contracts with service providers (when granting a license to operate).

Service Providers

- Training for de-icing / anti-icing operatives should be based on the practical: too much technical information is used, and this is often unclear and contradictory.
- Service provider operatives should not know the price/costs their company charges for de-icing / anti-icing services and fluid.

Authorities

- EASA to facilitate a standing working group to assist the Agency and stakeholders clarify harmonised understanding of regulations and recommendations.
- EASA to provide a minimum set of “hard rules”; too many are difficult to apply in all circumstances.
- EASA to prescribe the contents of Operations Manuals to prevent variation and promote higher standards.
- EASA to clarify what is meant by the passing of the anti-icing code.
- EASA to insist that aircraft manufacturers provide their requirements and recommendations for residue management in a standardised format.
- Ensure that agreed standards are globally accepted (helps when foreign operators audit EU service providers and also when EU operators audit service providers overseas).
- EASA to support and facilitate the pooling of audits using industry experts as auditors.
- Allow monopoly service providers owned/managed by the aerodrome; this will encourage adequate levels of investment.
- Define responsibilities based on “location of fluid”: the fluid manufacturer is responsible until delivery and acceptance; then before the fluid is sprayed it is the responsibility of the service provider; whilst the fluid is “on the wing” it is the responsibility of the operator; and, when it drips to the ground it becomes the responsibility of the aerodrome.

3.6 Summary of relevant recommendations from AEA Training Manual

These excerpts are not exhaustive, but are chosen to highlight some of the broader recommendations which support the options presented in this paper. For a full understanding of all the recommendations made by AEA the reader should refer to both the AEA Recommendations and Training Manual documents.

Safety

The main deficiencies of de-icing / anti-icing operations (1.1) were found to contain errors in:

- inspection or the determination for the need of de-icing / anti-icing,
- the de-icing / anti-icing procedure itself and
- negligence/misinterpretation of holdover time.

The factors leading to these errors are:

- poor training,
- miscommunication,
- improper de-icing / anti-icing,
- fluid degradation,
- misinterpretation of tables and manuals etc.

Operators

- Everyone involved in each step of the de-icing / anti-icing process must be trained, qualified and aware of their responsibilities and duties (1.2).
- Operators should have suitable ground handling agreements in place with de-icing / anti-icing providers, at each airfield, which detail the rules and procedures.
- Flight Crew training should cover all relevant aspects of the ground process.
- Post-holder Training is responsible (2.1.3.8) for de-icing / anti-icing training for flight crews, and qualification to be renewed annually with a theoretical part including an examination.
- Proper communication with the service provider is important; there cannot be any doubt of the procedure, fluid used, areas covered etc. when communicating and verifying the process (7.4).

Aerodromes

- Everyone involved in each step of the de-icing / anti-icing process must be trained, qualified and aware of their responsibilities and duties (1.2).
- The infrastructure must enable and support de-icing operations.
- When planning to collect waste glycol, the whole chain must be considered (from ramp to runway) and not only the place of de-icing / anti-icing (10.1).
- The de-icing / anti-icing coordinator (12.2.3) is responsible for controlling the movement of de-icing / anti-icing vehicles on the ramp and remote areas.

Service Providers

- Everyone involved in each step of the de-icing / anti-icing process must be trained, qualified and aware of their responsibilities and duties (1.2).
- De-icing / anti-icing providers should have suitable ground handling agreements in place, with each operator, at each airfield, which detail the rules and procedures.
- Thickened fluids (6.1.5) are, in general, not heated when used as anti-icing fluids because the viscosity will lower if heated. HoTs are determined using certain viscosities. They are also applied undiluted if longer HoTs are needed (7.3.2.2).
- Type-I fluid should be used for de-icing to minimise the possibility of residue problems.
- One-step de-icing / anti-icing is generally performed with a heated un-thickened fluid (7.2.1.1).
- Proper communication with flight crew and other ground crews is important; there cannot be any doubt of the procedure, fluid used, holdover time, areas covered etc. when communicating and verifying the process (7.4).
- The service provider should provide a coordinator(s) (12.2.1/2) for supervising operations, communications and resolving misunderstandings.
- The coordinator is to verify and communicate the required procedures, taking into account variations between operators' requirements (12.2.3).
- Two-step de-icing / anti-icing is performed whenever the contamination demands a de-icing process separately (7.2.1.1).

Authorities

- Everyone involved in each step of the de-icing / anti-icing process must be trained, qualified and aware of their responsibilities and duties (1.2).

3.7 Key themes from summaries

There are some key themes that recur through all the data collected, including the summary of safety data in Attachment A. These key themes highlight areas of weakness which need to be considered when developing options for change and making subsequent recommendations for action. The themes that have been highlighted in this Study are as follows:

- lack of Human Factors safety data from service providers especially
- lack of operator knowledge (pilots and management)
- lack of operatives' knowledge (service providers)
- inconsistent demands for service/procedures/fluid from operators
- inconsistent development and contents of contracts
- inconsistent development of procedures
- uncertainty of post-holder responsibilities
- uncertainty of identifying the responsible post-holder (NAAs, operators)
- uncertainty of responsibilities – operations versus airworthiness
- uncertainty of ultimate responsibility
- uncertainty of level of oversight
- inconsistency in developing procedures, programmes, policies, contracts
- varying interpretations and misconceptions of requirements, standards and procedures (e.g. meaning of anti-icing code, all-clear etc)
- inconsistent auditing standards
- no guaranteed external approval of operators' procedures, policies and programmes
- uncertainty of the role played by the aerodrome (when not a provider)
- inconsistent levels of investment in facilities and equipment

From these recurring themes a short list of general actions can be derived that would address these concerns, for example:

- collect and analyse more safety data in order to reduce risk and comply with performance-based regulation of safety;
- improve key stakeholders' knowledge through better awareness and training programmes;

- clearly define key stakeholders' and individual's responsibilities;
- enhance the consistent application of procedures and harmonised standards through more practical and specific guidance material for operators;
- introduce a level of oversight from the Authority;
- increase the involvement by aerodromes by defining a set of specific responsibilities;
- encourage more investment where necessary.

It is intended that the options developed in this Study and included below in this Report, if adopted as actions, would facilitate the achievement of the above goals, and satisfy all those existing recommendations introduced above in the Information Summaries.

4 Options for change

The sections below detail options for how many of these issues introduced above may be addressed through regulatory and voluntary means in such a way as to also support the primary aims of this Study:

- improving the availability of fluids at aerodromes within EASA member states, and
- improving the standards of de-icing / anti-icing service provision.

Where references are made below to existing or proposed Regulations, Directives, Rules, AMC, Guidance material and Recommendations, Attachment B contains the relevant extracts together with comments on the possible options. In particular, where references are made to “proposed” EASA rules, such as Authority Requirements, Operator’s Requirements and Implementing Rules for Operations, the versions used in this Report (and shown in Attachment B) are taken from EASA NPAs 2008-22 and 2009-02. Whilst some of the associated Comment-Response Documents have been recently published, the versions used here remain the originals from the NPAs. This provides a consistent approach and allows the Agency to consider the results of this Study alongside those of other respondents.

All options are given a coded, self-explanatory reference and number; a list of all options is included at Appendix 1 to this paper.

4.1 The First and Most Important Recommendation

The only known method for positively ascertaining that
an aeroplane is clean prior to take-off is by close inspection.

ICAO Doc9640

One may add to this quote, *a close inspection performed by a trained, qualified and well-motivated person*. Ultimately, whatever has occurred before a post de-icing / anti-icing treatment check, this check is the last safety defence before shifting all responsibility onto the shoulders of the aircraft captain. For a captain to fulfil his/her responsibilities in ascertaining that the aircraft is in an airworthy state at take-off, this check needs to be 100% accurate 100% of the time! The post treatment inspector must be able to accurately decide whether unwanted contamination is present on the aircraft or not, and then communicate this accurately to the captain. The close inspection necessary to achieve this must always include visual, and where necessary tactile.

REC1. *It is recommended that all those involved in de-icing / anti-icing operations on the ground, and all those who have an interest in ensuring the standards of these operations are the highest possible, do whatever they can to make the task of the post treatment inspector as easy as possible.*

This Recommendation requires focus on the purpose of de-icing / anti-icing, first and foremost, as a safety critical function aimed at ensuring an aircraft maintains its airworthiness, rather than as a commercial activity. If stakeholders maintain their focus on this Recommendation whilst reading this document and give it consideration whenever they feel a resistance to support change, then their feedback will be more effective in helping to raise standards of de-icing / anti-icing operations.

4.2 Options to improve the collection and analysis of safety data

With reference to the known safety data, as shown in Attachment A, and the Heinrich occurrence triangle in Figure 1, it is clear that little is known concerning the "unsafe acts" connected with de-icing / anti-icing. This conclusion can be reached because despite there being a regular rate of related accidents, there does not appear to be any data originating from employees of de-icing / anti-icing service providers concerning their personal errors, slips and oversights, or the hazards and threats they face on a daily basis. Yet based on the number of accidents, we can only assume that many unsafe acts occur on a regular basis. The fact is, we just do not know.

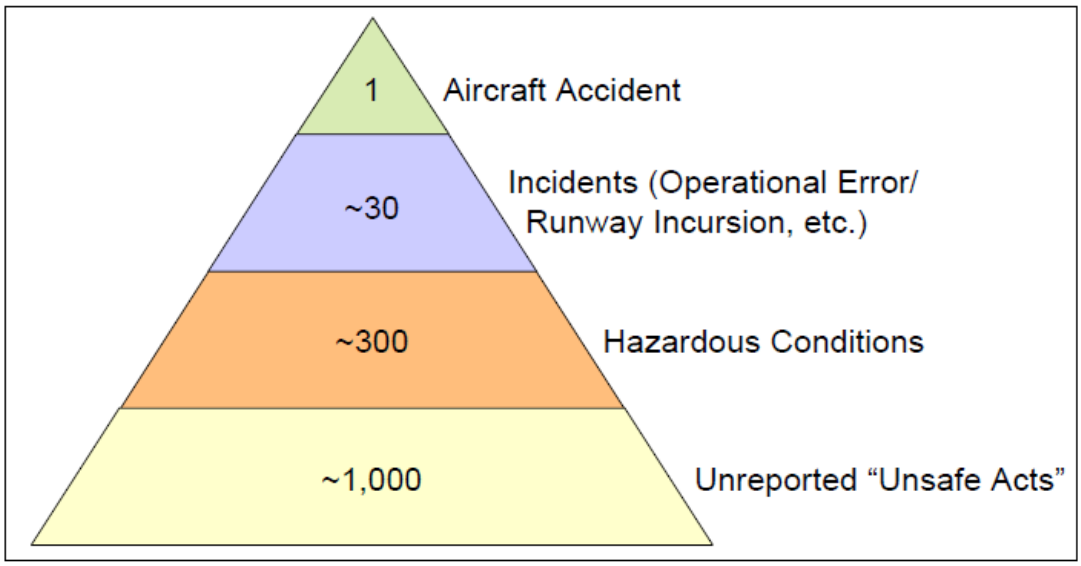

Figure 1: Heinrich Occurrence Triangle (source FAA)

Therefore, the collection of this safety data from de-icing / anti-icing operatives is essential in assisting organisations and regulatory bodies highlight those areas of greatest risk and to direct their risk mitigation measures and resources appropriately. As de-icing / anti-icing service providers are unregulated, the necessary change in reporting culture will require either a voluntary programme of education, promotion, and participation; or, regulated bodies such as operators and/or aerodromes, to demand such a change within their contracts with service providers. Each of these activities will, in all likelihood, require support in the form of expertise, facilitation, education and promotion material. Such support can be made available from within the industry and/or from regulatory bodies. Such a task may be even more challenging, and take longer, than was the case during the changes in the safety culture within maintenance organisations some time ago. However, under the Human Factors banner, many maintenance organisations nowadays enjoy a high reporting rate amongst employees and this data is shared for the benefit of the whole industry. Difficulty in implementation should not be a deterrent to attempts at changing the status quo concerning

self-reporting of de-icing / anti-icing operatives and the analysis and sharing of that data by their employers.

Regulatory requirements already exist for Safety Data to be collected and analysed, however, there is no clear impetus to require operators to collect the type of "low-level" data that is so valuable in reducing risk; furthermore, there is no clarity concerning the collection of such data from third-party contractors. References to existing relevant regulations and their limitations are listed below:

- Directive 2003/42/EC Occurrence Reporting – Both Article 4 1(g) and Annex 1 D (iv) clearly mention and infer, de-icing / anti-icing personnel within the scope of the Directive (Article 3); the scope of the Directive also clearly includes "unsafe acts" (Article 2). However, interpretation of this Directive is within the remit of Member States, and since its publication there has been no amendment to JAR OPS 1.037 or EU OPS 1.037 providing guidance for authorities in this matter.
- EU OPS 1.037 Accident Prevention and Flight Safety Programme – the emphasis is on Incident and Accident data, and not on "unsafe acts", and no reference is made to contracted organisations.
- EU OPS 1.035 Quality System – omits reference to contracted organisations; this was once contained in JAA AMC OPS 1.035.
- ICAO Annexes 6 & 14 SMS Requirements – this SARP is extant and it clearly requires that National Authorities shall require both aerodromes and operators to identify safety hazards, take remedial action and aim to make improvements to safety performance. This adequately covers all areas of operation on an aerodrome and also those connected with continuing airworthiness and flight operations. However, without guidance from the Authority specifically mentioning de-icing / anti-icing operations, it is unlikely that additional effort will be invested. In the event, EU OPS was not amended to accommodate the ICAO SARP, and OPS 1.037 continues as the focus for operators' safety programmes.
- Annex Va to the Basic Regulation – Essential Requirements for Aerodromes – is clear that aerodrome management should: have access to relevant data (B1(a)); take some responsibility in ensuring risks are mitigated against (B1(e)); and, that relationships are established with relevant organisations, including service providers, such that the ERs can be fulfilled (B1(f)). Furthermore, safety data from these organisations collected through the aerodrome's occurrence reporting scheme shall be analysed (B2(b)). It is noted that paragraph B1(f) was identified in A-NPA-2007-11 as a potential mechanism for the regulation of service providers indirectly through the aerodrome.

Proposed Implementing Rules as contained within EASA NPAs 2008-22 and 2009-02 improve the situation slightly, however, there is great scope for improving these further:

- AR.GEN.030(a) Mutual Exchange of Information – requires Authorities to share all necessary information taken as a result of oversight of persons and organizations exercising activities on the territory of a Member State. However, service providers are not included as they are not directly within the oversight of the Authorities unless such data is obtained as a result of the oversight of operators.
- AR.GEN.040(a) Reporting – requires NAAs to notify the Agency of any safety significant occurrences in addition to those required in Directive 2003/42/EC. No explanation is given as to what is meant by "significant", leaving the way clear for different interpretation.
- AMC 2 AR.GEN.300.2 Continuing oversight OPS – how an operator oversees all ground-handling services is omitted from the list of areas the Authority should at least inspect and monitor.
- AMC 2 to OR.GEN.200(a)(2) Management System – fulfils the requirements of ICAO SMS SARPs, with some additional parameters. However, it still does not categorically focus the operator onto the collection of reports of "unsafe acts" from contractor organisations. However, without this data, an operator will not be able to fulfil other elements of the Rule; i.e. to identify all the hazards associated with de-icing / anti-icing, assess the associated risk and make interventions to improve safety performance in this area. The outcome of this Rule depends on the interpretation.
- AMC 2 to OR.GEN.200(a)(4) Management System, Training and Communication on Safety – this requires the organisation to establish communication so that safety matters can be explained. This is limited to within the operators own organisation.
- AMC to OR.GEN.200(a)(5) Management System, Occurrence Reporting – in contradiction to the title, this mirrors EU OPS 1.037 and only highlights the need to report Incidents and Accidents, therefore excluding "unsafe acts" and other valuable safety data.
- AMC to OR.GEN.205 Contracting and purchasing – this re-introduces JAA AMC OPS 1.035 material on quality assurance of contracting organisations. It also clearly requires operators to specify in their contracts with service providers what safety services and safety related activities should be undertaken; thus providing a mechanism to include the collection, analysis and provision of specific safety data.

The thrust behind all ICAO SARPs for SMS is clear: that it is the responsibility of all organisations across the aviation industry to identify hazards in all areas of operation, assess them for risk and take mitigating actions where necessary. That this should include the hazards encountered by de-icing / anti-icing operatives is unquestioned. The fact that such data is not being collected, analysed and/or shared is evident from our Study.

There are several options available to ensure an improved situation in these respects, and they are detailed below.

SAF1. *Conduct an Industry-wide collaborative safety initiative: including data collection and analysis; awareness activities; and development of recommendations and, where possible, tools.* ***Recommended.***

An Industry-wide Safety Initiative, involving all stakeholder groups including service providers, and having the primary aim of obtaining good quality safety data concerning de-icing / anti-icing operations. To achieve this, service providers would require support and guidance to establish effective reporting cultures. Such a Safety Initiative could be launched and facilitated in many ways, including by:

SAF1.a. EASA alone.

SAF1.b. EASA in partnership with Industry; perhaps through the ESSI.

SAF1.c. EASA in conjunction with Member State NAAs.

SAF1.d. Industry alone; perhaps through FSF, IATA, the airline Associations etc.

SAF2. *Reinterpret existing regulations for operators and aerodromes to motivate greater collection and analysis of relevant safety data.* ***Recommended.***

Existing Rules for operators and aerodromes could be re-interpreted to ensure that the relevant safety data is collected. This would require EASA and NAA collaboration and cooperation. As no amendments to regulations would be required under this option, a great deal of explanatory material would be necessary. The appropriate Regulatory mechanisms include those listed above for SMS and Occurrence Reporting. Such reinterpretation may best be served by the use of AMC and GM produced by NAAs.

SAF3. Amend proposed EASA regulations for authorities and operators to ensure effective collection and analysis of relevant safety data.

Forthcoming ARs, ORs, and Implementing Rules for Operators (eventually aerodromes) may be amended to include specific references to de-icing / anti-icing operations and service providers to achieve the aim of collecting suitable safety data. Furthermore, explanatory material can be produced to help NAAs and organisations to interpret the meaning, and which clearly highlight the need to collect data of "unsafe acts" from service providers. For example:

SAF3.a. AR.GEN.30.(a) Exchange of Information & AR.GEN.40.(a) Reporting – interpretation of these requirements may include guidance for Authorities to include the exchange of safety data including "unsafe acts" arising through operators' contracted out service providers, and that this data is not restricted to incidents and accidents.

SAF3.b. AMC 2 AR.GEN.300.2 Continuing Oversight Ops – this AMC can be amended to include oversight and monitoring (as required) of the mechanism through which operators ensure service providers maintain an appropriate safety culture (professional attitude) through collection of safety data – specifically self-reporting of "unsafe acts". This may be achieved through the inspection of those elements of a basic contract with service providers (excluding commercial clauses) that are relevant to safety.

SAF3.c. AMC 2 to OR.GEN.200(a)(2) Management System – can be expanded to include the need for operators to include service providers within their SMS as a source of safety data, such that hazards encountered by service providers can be identified and the associated risks to operations assessed by the operator. A programme for achieving this may be required.

SAF3.d. AMC 2 to OR.GEN.200(a)(4) Management System, Training and Communication on Safety – this AMC might be amended to include the need for operators to explain safety matters to service providers, and give support where necessary, in particular why certain safety data should be collected and analysed.

SAF3.e. AMC to OR.GEN.200(a)(5) Management System, Occurrence Reporting – this AMC can be expanded to include the objective of collecting and analysing valuable data such as that obtained through the self-reporting of unsafe acts, thereby providing an

operator with an insight into potential accident pre-cursors and areas of high risk. It may be made clear that this data should be sought not only from the operator's own personnel and employees, but also from those personnel working for service providers conducting contracted-out safety critical functions.

SAF3.f. AMC to OR.GEN.205 Contracting and purchasing – clarification can be provided to this AMC such that SMS activities, including reporting of "unsafe acts", are included in the written agreement between operator and service provider, as well as details of the safety services to be provided. The written agreement referred to could be subject to oversight and monitoring as required under AMC 2 AR.GEN.300.2, mentioned above in Option SAF3.b.

SAF4. *To conduct an Industry-wide review of, and lobby for amendment to, Directive 2003/42/EC on Occurrence Reporting; in order to align the Directive with ICAO SMS requirements. Thereby encouraging States to meet the needs of the Directive and encouraging a harmonised interpretation.*

SAF4.a. NAAs to ensure that the intent of the Directive is enforced: the need for *all* personnel to report occurrences (Clause 7); and the need to share this information (Clause 8).

SAF4.b. Lobby to amend, or expand, the definition of "occurrence" to include specifically: *human, procedural and system errors considered by the reporter to increase risk.*

SAF4.c. Lobby to expand the Scope of the Directive (Article 3), to include specifically de-icing / anti-icing activities, by including examples in the Appendix to Annex I.

SAF4.d. NAAs to take up their responsibilities to ensure de-icing / anti-icing operatives comply with mandatory occurrence reporting (Article 4, 1.g) and they *shall* (rather than *may*) encourage voluntary reporting (Article 9).

SAF4.e. NAAs to interpret the Directive from the point of view of de-icing / anti-icing operations and issue relevant awareness and guidance material.

NOTE: *Any safety initiative, and/or re-interpretation of regulations from the perspective of de-icing / anti-icing operations, may easily be extended to all unregulated safety critical activities, and therefore provide a greater opportunity to improving aviation safety.*

4.3 Options to improve communication and coordination – de-icing / anti-icing subject-matter experts

During the Study, it became apparent that one of the key difficulties in obtaining feedback from NAAs and operators was identifying a single post-holder within each of these organisations who could identify their own lines of responsibility and understand all the issues concerning de-icing / anti-icing relevant to their whole organisation. For example, within operators' organisations day-to-day decision-making often lays within flight operations, training programmes often fall under the remit of post-holder training, the knowledge-base may reside within the maintenance department, long-term strategy for contract provision may sit elsewhere, and yet the responsible post-holder is often ground operations. Similarly, within NAAs several departments are responsible for different aspects of de-icing / anti-icing of aircraft on the ground. This situation was pre-empted by the Study Team and questionnaires were developed as follows:

- NAAs:
    - General Data and Safety
    - Oversight of Operators – flight operations
    - Oversight of Operators - continuing airworthiness
    - Oversight of Aerodromes
    - Oversight of Service Providers
- Operators:
    - Flight Operations
    - Maintenance and Quality

Despite this, it was often difficult for the person nominated by the Director and contacted by the Team, to coordinate responses between these different departments and gather all the associated data. Often, the same questionnaire was completed by different people within an organisation and their answers were different; and where similar questions were posed in different questionnaires the answers also frequently contradicted each other.

Coordination, communication and clear channels of responsibility are all areas highlighted by existing documentation and safety data, as weaknesses in the system.

The options available to improve coordination between different organisations, and within organisations are:

SME1. *EASA to appoint its own subject-matter expert for internal and external communication and coordination of de-icing / anti-icing issues.*

Require EASA to appoint a suitably experienced subject-matter expert for de-icing / anti-icing. This person shall be the focal point for all communications on de-icing / anti-icing matters within the organisation, between the Agency and the NAAs, and with all other relevant agencies, bodies and organisations. Furthermore to require EASA to define this person's responsibilities, including the coordination, communication and interpretation of the Agency's regulations and oversight activities for all de-icing / anti-icing matters.

SME2. *EASA to establish, maintain and publish a record of nominated de-icing / anti-icing subject-matter experts.*

Require EASA to establish, maintain and publish a repository of nominated subject-matter experts from all NAAs, all operators and all aerodromes within the Member States, plus any others deemed to be of interest (e.g. FAA, AA, AEA, SAE etc).

SME3. *NAAs to appoint their own subject-matter experts for internal and external communication and coordination of de-icing / anti-icing issues.*

Require NAAs to appoint a suitably experienced subject-matter expert for de-icing / anti-icing. This person shall be the focal point for all communications on de-icing / anti-icing matters within the organisation, between the NAA and all other agencies, bodies and organisations. Furthermore to require NAAs to define this person's responsibilities, including the coordination and communication of the Authority's regulation and oversight of all de-icing / anti-icing matters, including:

a policy
b programme
c safety performance
d flight operations
e continuing airworthiness
f aerodromes
g service providers
h training
i environmental protection.

SME4. *Operators to appoint their own subject-matter experts for internal and external communication and coordination of de-icing / anti-icing issues.*

Require operators to appoint a suitably experienced subject-matter expert for de-icing / anti-icing, and not necessarily a nominated post-holder. This person

shall be the focal point for all communications on de-icing / anti-icing matters within the organisation, between the operator and service providers, and between the operator and the Authority. Furthermore to require operators to define this person's responsibilities, including the coordination and communication of the operator's de-icing / anti-icing:

a policy
b programme
c procedures
d operations
e continuing airworthiness
f training
g contractual agreements (technical contents)
h advising Safety Manager (AMC2 OR.GEN.200(a)(3)2.b.vii, viii, ix).

SME5. *Aerodromes to appoint their own subject-matter experts for internal and external communication and coordination of de-icing / anti-icing issues.*

Require aerodromes to appoint a suitably experienced subject-matter expert for de-icing / anti-icing, and not necessarily a nominated post-holder. This person shall be the focal point for all communications on de-icing / anti-icing matters within the organisation, between the aerodrome and the Authority, operators and service providers. Furthermore to require aerodromes to define this person's responsibilities, including the coordination and communication of de-icing / anti-icing:

a operations
b facilities
c fluid storage and handling
d traffic flow.

4.4 Pathways to regulation

The Technical Specifications for the Study require that recommendations are made for the most effective ways in which NAAs could regulate de-icing / anti-icing service providers, based on investigations into how they accomplish this already. However, it is apparent from the investigations that none of the EASA Member State's NAAs actually regulate the standards of de-icing / anti-icing by service providers in any direct way at all (see Data Summary and Analysis). Several Member States do impose certain organisational requirements onto their service providers (using Directive 96/97/EC), but they do not address standards of fluid handling and application, communication or coordination. Furthermore, many stakeholders have recommended to the Study Team that the direct regulation of de-icing / anti-icing service providers is essential to improve standards of de-icing / anti-icing, however, there is no mechanism for doing so directly; either within Member States or EASA.

This "call", by elements of the Industry, for the regulation of de-icing / anti-icing service providers has been extant for about a decade. Since the winter of 2005/6 EASA has decided to act on several recommendations made by the UK AAIB and German BFU (EASA A-NPA-2007-11) including the request to consider the future need for certification, licensing, approval and training of organisations who provide de-icing / anti-icing services and their personnel.

The lack of a clear and direct pathway for regulation of service providers is probably a fundamental reason why standards of de-icing / anti-icing service provision vary. One "indirect" pathway from regulator to service provider, and the one currently used, is via the regulation of AOC holders; for example the requirement for airlines to establish Quality Systems (EU OPS 1.035), ensures some oversight, by airlines, of de-icing / anti-icing service providers and their operations. There is also the requirement for airlines to establish procedures for de-icing / anti-icing (EU OPS 1.345). However, the regulatory requirements imposed on airlines concerning de-icing / anti-icing are neither precise nor comprehensive, which introduces a lot of scope for variation in interpreting these regulations.

Since EU OPS superseded Member States' national regulations based on JAR OPS 1, there is no harmonised pan-European guidance material or acceptable means of compliance for airlines to follow concerning de-icing / anti-icing operations. Although some JAR OPS 1 Section 2 material was elevated to become Appendices in EU OPS, this was not the case for de-icing / anti-icing. Some NAAs retain JAR OPS 1 Section 2 "support" material as an aid for both airlines and regulators as to how to apply the Rules provided in EU OPS. Prior to EU OPS becoming law, and when JAR OPS 1 was valid, there is no doubt that many airlines used the Section 2 material as the sole means of applying some of their National Requirements. In some areas of airline operations this has effectively resulted in

harmonised (pan-European) application of some rules. For example, this may have been the case for Quality Systems, but unlikely for de-icing / anti-icing procedures. JAA ACJ OPS 1.345 was a late amendment to JAR OPS 1 (Amendment 8, 01/01/2005), and was issued as an Advisory Circular rather than an Acceptable Means of Compliance. So, it is difficult to judge whether this had much impact before JAR OPS 1 was withdrawn within the EU Member States. However, it did contain both information and guidance necessary for an airline to establish adequate de-icing / anti-icing procedures, and the content is still relevant today.

JAR OPS 1 made reference to relevant ICAO, ISO, EUROCAE, SAE and AEA documents as sources from which operational procedures could be established. Many service providers, airlines, aerodromes and national authorities use, in particular, the AEA and SAE documents for this purpose. However, these documents are not regulations, and adoption of the principles recommended in these documentations is voluntary, their interpretation varied, and a harmonised application of standards is not achieved.

Other possible pathways for indirectly regulating service providers may be through regulations for aerodromes; specifically ICAO Annex 14 and Directive 96/97/EC on Ground-Handling. Both of these documents are considered as options in this Study. In the near future, another indirect path may exist through EASA Implementing Rules for aerodromes.

4.5 Options concerning raising standards of de-icing / anti-icing

Our investigations show that, currently, the achievement and maintenance of high standards of de-icing / anti-icing is achieved in several ways:

- Motivated by a professional attitude some service providers unilaterally adopt (and in some cases surpass) industry best practice (commensurate with AEA Recommendations). This approach can also be advocated on the grounds of improved aviation safety and improved business advantage over rivals; especially when airlines are looking for quality, reliability and flexibility in a service and not just a good price.
- Some airlines require these high standards and ensure them by competently and vigilantly overseeing de-icing / anti-icing service providers' operations. This may be enhanced where the airline works in collaboration with service providers, most notably in training standards and syllabus and in the exchange of operational safety information.
- When an aerodrome is involved to some extent in providing de-icing / anti-icing services to airlines, and it considers that a professional, safe and efficient de-icing / anti-icing service is commensurate with a professional, safe, efficient and profitable aerodrome; then proper investment is made towards facilities, equipment and training, and good cooperation and coordination is achieved with the airline customers and high standards maintained.
- At locations where the climate and weather dictate that de-icing / anti-icing operations are in frequent and regular demand, the risks appear greater and therefore the subject is very much at the forefront of all stakeholders' minds.

Many organisations achieve the above, but many others do not, and the reasons for this are also multiple, including for example the following:

- For many service providers de-icing / anti-icing is only a small part of their business (as shown by the Study) and profit margins may be larger in other ground-handling activities – often running at a loss.
- Where service providers rely more, or totally, on their de-icing / anti-icing service provision for profits, and where sale prices cannot be raised due to competition, this will always produce a pressure to reduce overheads.
- Some airlines do not always consider fully the advantages of selecting those service providers with the highest standards; and others are driven partially by cost.

- Many airlines require de-icing / anti-icing services at multiple locations from a multitude of organisations (sometimes they have no choice). Whilst one can argue that it's the same for ticketing, or catering, these are commercial activities and present a much lower Risk to flight operations, therefore, variations in these services can be absorbed and dealt with in slower time.
- Many service providers provide de-icing / anti-icing for a multitude of airline customers, whose requirements may all differ. Again, whilst one can argue that it's the same for ticketing, or catering, these are commercial activities and present a much lower Risk to flight operations, therefore, variations in these services can be absorbed and dealt with in slower time. Whereas relying on de-icing / anti-icing operatives to recall and apply numerous variations can lead to confusion.
- At some locations the need (due to climate and weather) for de-icing / anti-icing services can vary dramatically year-to-year, and may also be very small and in short bursts. The pressure to invest heavily may be small, and this can lead to inadequate provision of services during those bursts when demand is temporarily high. At such locations the experience levels of service provider de-icing / anti-icing operatives may also be low.

Why are some organisations motivated to invest heavily in facilities, equipment and training? In some cases this is probably due to the perspective from which they view de-icing / anti-icing activities and the need for a clean aircraft at take-off. This attitude may be labelled "safety perspective", where de-icing / anti-icing services are viewed as necessary safety activities and the associated costs seen as the "price for safety". If de-icing / anti-icing services are viewed from the perspective of a commercial service (such as baggage handling) then the associated fees may be seen as the "cost of doing business". In an environment where this latter case prevails, then there will always be calls to justify these fees and room for discussions on driving down costs. Between these two perspectives lie many variations and this can lead to confusion of priorities.

There need not be any confusion between what's good for business and what's good for safety. For example, an aerodrome may make a considerable investment in acquiring, installing and making operational an ILS, even though the climate and local weather patterns may only impose low visibility operations on few occasions during any single year. Maintaining a full flight programme in all weather conditions is good for business and the investment is easily justified. An ILS is not mandatory and when the visibility and/or cloud-base are below limits the aerodrome cannot be used for landing. However, once installed, and if it is used, there are clear, strict rules and guidelines for airlines, aerodromes, ATC,

controllers and pilots in its use, limitations, maintenance and capabilities. The ILS is viewed from the "safety" and not the "commercial perspective". De-icing / Anti-icing services are not mandated, nor do they have to be used when available: in both these cases departure during "winter" conditions will not be possible. However, if de-icing / anti-icing services are available and used, then, like an ILS, there does need to be clear, strict rules and guidelines for all those involved on how these services operate. Currently this is not the case.

Status Quo

While some individual stakeholders argue that the existing situation is adequate and that further regulation is not required, a majority of others (from all stakeholder groups) wish to see changes.. This Study *was* launched on a wave of support, lobbying and recommendations made during the past 5 years.

ZERO: *Do nothing; maintain the status quo.* ***Not recommended.***

This is not an option for change, but it is still an option to be considered. However, to select this option would ignore recommendations made by accident investigators, regulators, industry stakeholders and also the available data – all introduced above and elsewhere in this Report. Agency Opinion to A-NPA-2007-11 dismissed this option for service providers and aerodromes, but kept it as an option for operations.

Direct Regulation of Service Providers

Examining mechanisms for the direct regulation of service providers is part of the Study. Some stakeholders consider this a difficult and unnecessary option; preferring to improve standards through amendments to regulation of operators and aerodromes. However, a large representation of service providers is supportive of a system of direct oversight and certification.

REGSP: *To implement direct regulation of de-icing / anti-icing service providers by EASA or NAAs.*

This option would provide a completely new and untested model. The Study found that de-icing / anti-icing service providers are not regulated directly by Member States. On the few occasions where an Authority declared it *did* regulate service providers, it was found that this was actually only indirectly achieved through The Ground-Handling Directive 96/67/EC, Aerodrome and Air Operations regulations. Ultimate responsibility always remains with the operator; and this requirement would probably need to always remain. This is

reinforced by the proposed GM 1 AR.GEN.300 (Continuing Oversight OPS); where there is a clear intention for the Authority to devolve more responsibility onto the operator to monitor the safety of operations. Adopting direct regulation and oversight of service providers may be in opposition to these proposals. Also, the Explanatory Note to EASA NPA 2009-02A, Appendix 1, Paragraph 9, explains how for the time being the regulation of ground de-icing / anti-icing service providers is outside the Agency's remit. Agency Opinion to A-NPA-2007-11 also dismissed this option. Possible options to achieve the direct regulations of de-icing / anti-icing service providers include:

REGSP1. *To undertake regulatory reform, making some (or all) aspects of de-icing / anti-icing the responsibility of service providers.* ***Long-term option.***

To commence a programme of regulatory reform to effect an amendment to the Basic Regulation, and the drafting of Essential Requirements and Implementing Rules for service providers.

REGSP2. *To make de-icing / anti-icing fully a maintenance task.* ***Not recommended.***

If de-icing / anti-icing operations and the associated inspections were considered a maintenance task (in opposition to ICAO Doc 9640 and Annex 6), then service provider organisations would be required to hold a "restricted/limited" Part 145, or operators and maintenance organisations would be the sole providers of de-icing / anti-icing. Numbers of providers would still need to be restricted, due to available space, and therefore operators would still need to negotiate contracts with a third-party. Agency Opinion to A-NPA-2007-11 dismissed this option.

REGSP3. *To make de-icing / anti-icing service provision fully a responsibility of the aerodrome.* ***Not recommended.***

This would require re-interpretation of ICAO Annex 14 and Doc 9640, the turning of recommendations into hard requirements, and the elimination of competition, i.e. only aerodromes could provide de-icing / anti-icing services. Operators would still need to demand their own (and the aircraft manufacturers') requirements, negotiate contracts and conduct quality oversight.

GHDSP. *To regulate certain aspects of de-icing / anti-icing service provision through Directive 96/97/EC on Ground-Handling.*

This option is partially used in a few Member States whereby service providers of de-icing / anti-icing need to demonstrate to the Authority that they have the financial, organisational, and managerial experience necessary to conduct their operations (as per Clause 22 and Article 14 to the Directive), and that their operating/procedures manual is fit for purpose. The Authority then has the option to audit the service provider at regular intervals against these criteria. To ensure a harmonised and fairly implemented application of national regulations based on this Directive, EASA, NAAs and Industry would need to initiate a process of review, agree on the outcomes, and lobby for amendment to the Directive.

GHDSP1. *Permit States to limit the number of de-icing / anti-icing service providers at aerodromes.*

The number of de-icing / anti-icing service providers operating at any single aerodrome can directly influence the quality of service: space constraints and difficulties in coordination are both hazards, and investment levels can be affected. Amendment to Article 6 of Directive 96/97/EC would be necessary, and this can linked to the provisions of Clauses 11, 12, 22 and 23. Any decision to limit the number of service providers may be based on a sound risk assessment conducted by the State, in addition to the conditions outlined in Article 9.

GHDSP2. *Require States to approve organisations for the supply of de-icing / anti-icing services against a set of minimum administrative standards and technical specifications.*

Currently this is acceptable within the Directive: approval (Clause 22); necessary technical specifications for use of infrastructure (Clause 23 and Article 11); and administrative standards (Article 14). Such a policy can be in-line with acceptable minimum standards demanded by operators, but will allow direct scrutiny of service providers by the State. An agreed interpretation of the Directive amongst all Member States, facilitated by EASA may be effective.

The Study revealed an example of an airline gaining a National Vocational Qualification for a de-icing / anti-icing training course, allowing those participants who pass to gain an appropriate vocational qualification. Maintaining a qualified status requires annual renewal following recurrent training. The qualifying body, City & Guilds, is Europe-wide, and a Europass Certificate Supplement can also be applied for. Other vocational qualification

systems could design and deliver similar courses. States may wish to investigate this option with a view towards offering a form of approval to the training organisations and their de-icing / anti-icing training courses (NB: UKCAA is already exploring this option through the UK National Occupational Standards). In support of Option GHDSP2 above, States may then require that service provider operatives must be in possession of a vocational qualification from an approved/acceptable training organisation. As the Study Team is only aware of one example of such a course and qualification this would need to be a long-term option; furthermore, many service providers who currently conduct their own training may need to seek appropriate accreditation from their national vocational qualification system, which will no doubt take time.

TRGSP: *As part of the State approval/selection of service providers through Directive 96/97/EC on ground-handling, require de-icing / anti-icing operatives to possess a valid vocational qualification in de-icing / anti-icing.*

Improving the Regulation of Air Operations

The regulation of standards of de-icing / anti-icing services is currently met through operators' requirements for de-icing / anti-icing, and their quality control programmes. This arrangement is clearly not satisfactory to a large number of stakeholders, and may be due to:

- the provision of inadequate rules and/or guidance material;
- poor interpretation of these rules and guidance; and/or,
- the ineffective oversight of operators' de-icing / anti-icing policies, programmes and quality systems.

The regulations applicable to operators concerning de-icing / anti-icing are minimal; imposing the single assurance of an airworthy aircraft at take-off. Guidance material for operators is comprehensive, detailed and plentiful, and also from a variety of sources. This in itself can present the situation where interpretation of such guidance material is variable, and this is transposed into operators' procedures, training, contracts and quality programmes.

REGAO: *To improve the existing regulations for operators; improve the interpretation of those regulations; and improve the oversight of operators in this regard.* ***Recommended.***

There are many options available to amend and improve interpretation of the current regulations for operators (Attachment B), not all of them are sensible, or liable to be effective. The options included here are considered achievable and they address specifically the areas

of weakness highlighted in "The Summary and Analysis of Safety Data", the recommendations made by stakeholders, and the ToRs to this Study, all previously described within this document.

REGAO1. *Require the approval of operators' de-icing / anti-icing programmes against minimum requirements defined within the regulations.*

REGAO2. *Develop an effective AMC in the form of an example of, or framework for, an operator's de-icing / anti-icing programme.*

These three options, and a combination thereof, will need to be undertaken with consideration given to the intended aims of harmonising programmes and raising standards.

ICAO recommends (Doc 9640) that the operator's de-icing / anti-icing programme, or procedures, is "approved" by the NAA; with special focus on responsibilities and training. De-icing / anti-icing is not included as an item requiring Authority approval, merely "acceptance" through a technical evaluation (Attachment F to Annex 6 Part 1). EASA no longer differentiates between "approval" and "acceptance", although the means of evaluation may vary. Such an evaluation must consider whether the specific policies and procedures would result in the desired outcome. For a satisfactory evaluation to be made, the facilities, procedures and equipment available at each location would need to be considered.

EU OPS 1.345 and JAA ACJ OPS 1.345 do not require any approval by the NAA, but they do provide adequate direction for an operator as to the requirements, however, not towards the detail. With several informative and comprehensive reference documents highlighted as sources for operators to develop their de-icing / anti-icing policies, procedures and programmes, the outcomes will naturally vary and harmonisation of procedures is unlikely. De-icing / anti-icing procedures are not an element of the OM that requires specific approval (JAA IEM OPS 1.1040(b)), instead the operator only needs to ensure that the structure of the OM is acceptable to the NAA (OPS 1.1045). The required contents of the OM contain little guidance and focus mainly on fluid types. There is no presentation of an "acceptable" set of procedures, nor a standard template for both procedures and training syllabus. Furthermore, there is no direct requirement for an operator to establish coordination and communication procedures between flight operations, flight crew, aerodromes and service providers, adequate for all their destinations.

The proposed OPS.GEN.100 and associated AMC and GM does not improve the current regulatory situation, (Attachment B). However, AMC under the Basic Regulation and as described in NPA 2009-02A (paragraph 56 and Appendix II, paragraph 6) are part of a commercial operator's approval, and therefore have the same status as a regulation. Such

an AMC can be divided into the “essential” elements, and the “supporting information” elements.

Overall, in addressing these three options, attention should be given to the following:

REGAO2.a. *providing operators with a clear framework for an acceptable de-icing / anti-icing policy, procedures, training programme,*

REGAO2.b. *providing operators with clear guidelines for establishing and maintaining effective communication and coordination procedures,*

REGAO2.c. *providing operators with template communication messages and meanings connected with all inspections, checks and operations; in particular review of the anti-icing code, and clarification of the “all clear” signal/message (refer to COMM),*

REGAO2.d. *providing operators with a structured framework for the relevant section of the OM (A8),*

REGAO2.e. *clarifying responsibilities for key decision-makers,*

REGAO2.f. *requiring and defining the minimum elements required for an effective contract between operator and service provider, and*

REGAO2.g. *requiring operators to seek approval for any deviations (in certain areas) from the published AMC.*

REGAO3. *Require operators to appoint a subject-matter expert as per Option SME4.*

This contributes towards the need for improved internal and external communication and may help promote improved knowledge amongst the relevant employees and ensure an effective homogenous de-icing / anti-icing policy and programme. Combined with other SME options, this may also contribute towards a harmonisation of standards required of service providers. EU OPS 1.175 details the requirement for operators to appoint nominated post-holders in the areas of flight and ground operations, maintenance and crew training. No preference is given as to which Post-Holder should be responsible for de-icing / anti-icing. This will be detailed in their responsibilities published in the Operations Manual (OM). However, one of these Post-Holders is to be responsible for ensuring contracted organisations maintain proper standards. This particular nominated Post-Holder could be made responsible for appointing a suitably qualified and experienced subject-matter expert to coordinate the operators de-icing / anti-icing programme.

This would align with the requirement for operators to have a *sound and effective management structure.* JAA AMC OPS1.035 specifies clearly that sub-contracted de-icing / anti-icing services are to be subject to quality inspections and audits, under the responsibility of the Quality Manager; this may exclude the QM from assuming the role of the expert.

REGAO4. *Operators to define specific training requirements and knowledge base for operations and dispatch staff concerning de-icing / anti-icing.*

During this Study, it has become apparent how critical the operators' flight operations departments can be in either contributing or hindering de-icing / anti-icing operations, through their role as a communication hub between the service provider, aerodrome and flight crews. Specifying in-house training requirements for flight operations/dispatch staff in de-icing / anti-icing matters may improve safety at very little cost. EU OPS 1.205 and JAA ACJ OPS1.205 refer.

REGAO5. *States to require that operators develop a targeted programme within their SMS, specifically aimed at de-icing / anti-icing.*

This Option is in conformity with Options SAF2 and SAF3. In order to improve performance in the area of de-icing / anti-icing, operators will need to collect safety data from service providers to identify those hazards to their own operations that can only be "seen" from the service provider's/operative's perspective. This can be applied through EU OPS 1.037 and 1.420, *and* OR.GEN.200(a) and associated AMC.

REGAO6. *Operators to be required to provide flight crew with a checklist system that specifically addresses aspects of de-icing / anti-icing.*

One area of risk and inconsistency is both poor decision-making and the technical and procedural knowledge of flight crew. De-icing / anti-icing is a demanding operation, often occurring within the environment of a pressured operational and traffic situation. Furthermore, when other operational, system, environmental, etc., threats emerge during this period, decision-making and access to technical knowledge can be hampered. Providing a set of pilots' notes in a checklist, or in diagrammatic style (in line with HF principles) will greatly enhance decision-making.

REGAO7. *Require the inclusion of an operator's de-icing / anti-icing programme and procedures within the operator's conversion course ground training.*

Under the existing regulations there is a risk that pilots may operate during winter conditions without having undertaken any instruction in the operator's de-icing / anti-icing procedures. Lack of pilot knowledge is a frequent occurrence in reported incidents. Currently de-icing / anti-icing instruction is only included in the operator's recurrent training programme (EU OPS 1.965) and is not included in the operator's conversion course (Appendix 1 to EU OPS 1.945).

REGAO8. *Require the inclusion of applicable elements of the operator's de-icing / anti-icing programme, and any new knowledge, within the operator's differences and familiarisation training requirements.*

It may be possible, under existing regulations, for pilots to be unaware of the need for a variation in de-icing / anti-icing procedures when operating a new variant (of the same type) or type (of the same class) of aircraft. Lack of pilot knowledge is a frequent occurrence in reported incidents. Currently de-icing / anti-icing differences and new knowledge are not included in the operator's differences and familiarisation training requirements (EU OPS 1.950).

REGAO9. *Review and expand the required contents of the operator's de-icing / anti-icing policy and programme that shall form part of the Operations Manual.*

Appendix 1 to EU OPS 1.1045 (A 8) and AMC5 OR.OPS.015.MLR contain a list of 5 specific subjects concerning fluid types which must be described within the OM. Limiting the relevant contents of the OM to these few elements detracts from other critical aspects of the programme. OPS.GEN.600 omits the OM from the list of documents to be carried on all aircraft. The omission of certain information may hinder pilots' decision-making during winter operations. Providing more guidance on the contents of this section of the OM will increase the harmonisation amongst operators of how this information is presented. It is an option to revise this Appendix and include other elements, such as:

- the operator's communication and coordination procedures (for de-icing / anti-icing);
- the anti-icing code;
- inspection and checking procedures;
- re-assessment of HOT in changing conditions;

- affect of frozen contamination on flying control surfaces;
- affect of re-hydrated fluid residues on flying control surfaces; and
- details of the operator's standard contract for de-icing / anti-icing service provision at all destinations.

4.6 Alternative models for regulating de-icing / anti-icing through operations regulations

Like de-icing / anti-icing, other activities exist which

- need to be fulfilled by operators
- rely on third-party contracted organisations and persons
- can be classified as safety critical

These activities include:

- loading (OPS 1.625)
- the carriage of dangerous goods (OPS 1.1145), and
- maintaining the integrity of navigation data (OPS 1.873).

In each case, a different framework of regulations and guidance material has been developed to meet the needs of each activity. However, certain aspects of how these activities are regulated (or not) may provide an insight into potential amendments to de-icing / anti-icing regulation.

Loading

This particular alternative model does not lead to a radical alternative proposal for regulation, but it does highlight the importance given to communication; and the options proposed stand on their own as valid, and would fit within Options REGAO and REGAO3 above.

Unlicensed personnel, employed by non-certified organisations, working under contract to the airline and sometimes sub-contracted through another body (aerodrome, ground-handling agent) are weighing cargo, loading aircraft and completing load documentation. The captain is responsible for ensuring that the aircraft is loaded correctly and within performance limitations. He/she does this by determining whether the mass and balance documentation is acceptable.

> *The mass and balance documentation must enable the commander to determine that the load and its distribution is such that the mass and balance limits of the aeroplane are not exceeded.*

Incorrect weighing, loading, and/or calculations and form-filling may result in an incident or accident. The parallels with de-icing / anti-icing are significant.

For a captain to determine whether de-icing has been successful he/she is relying on the passing of a message, not usually paperwork, but often verbal or visual. The verbal message can be delivered in person, or via VHF; sometimes this message is passed via a

third-party. The visual message can be delivered by a “thumbs-up”, or via a message board; and, potentially via data-link; also sometimes via a third-party.

Also for a captain to determine a HOT following anti-icing, the same system can apply. Usually the two elements are combined into the “anti-icing code”. Unlike loading, de-icing / anti-icing protection degrades gradually and variably, and the information contained in the anti-icing code is essential for the captain to determine whether the aircraft remains in an airworthy condition. In this sense the anti-icing code, or any information, passed to the captain should have the same status as the mass and balance documentation. However, whereas mass and balance documentation is “designed”, fit for purpose, contains all the required information, and is able to be interpreted uniformly by personnel from different organisations and states, the anti-icing Code is not.

Like the other elements of an operator’s de-icing / anti-icing programme, the Code is recommended best-practice, and is described in ICAO Doc 9640, JAA ACJ OPS, AEA and SAE Recommendations. However, like those other elements of an operator’s de-icing / anti-icing programme the Code is open to interpretation, and this Study has discovered that the understanding attributed to the Code varies considerably. For example, in the fourth and final element of the Code, as recommended in ICAO Doc 9640 5.4(d), confirmation is given that the aeroplane complies with the clean wing concept. Whereas, in the sixth and final element of the Code, as recommended by AEA 3.14.3(f), confirmation is given only that the post treatment check has been completed. Some service providers issue the Code only to confirm that the service requested have been provided and not necessarily that a post treatment check has been conducted and no contamination found. Some operators believe that the issue of the Code implies that the aircraft is now clean of contamination. Another aspect for confusion is the connection (or not) of the issuing of the Code and the communication to the flight crew that all de-icing / anti-icing personnel and vehicles are “clear” of the aircraft; and furthermore, confusing this with a communication that the aircraft is clear to taxi.

For a safe de-icing / anti-icing operation and subsequent flight, the flight crew need to know certain information, it can be argued that this information is equally as important as an ATC clearance; therefore, it needs to be unambiguous, standardised, and delivered by someone who has the required understanding and capability. Furthermore, best-practice protocol should be utilised, such as message “read-back”. The elements of communication between the flight crew and ground crew (and other bodies) include:

- results of contamination check (even if conducted by one or both pilots, the results need to be communicated to the rest of the crew, to airline operations, and the “iceman”)

- the location of the de-icing / anti-icing operation (ramp, remote) and any special instructions (engines running/not running, services/fluid available etc)
- request to configure the aircraft for de-icing
- permission to configure the aircraft for de-icing
- request to configure the aircraft for anti-icing (if required prior to the second step)
- permission to configure the aircraft for anti-icing (if required prior to the second step)
- request to commence de-icing / anti-icing (what activity, and with what fluid)
- permission to commence de-icing / anti-icing and any special instructions
- request to reconfigure the aircraft post de-icing / anti-icing
- permission to reconfigure the aircraft post de-icing / anti-icing
- request to run-up engine(s) (if required to prevent engine stall)
- permission to run-up engine(s)
- de-icing complete
- anti-icing complete
- anti-icing Code – including, fluid type, fluid/water ratio, time of commencement of anti-icing application – may also include date
- confirmation and results of post treatment check (aircraft clean/not clean) and any details
- clearance for de-icing / anti-icing crew to depart
- confirmation that the de-icing / anti-icing crew and equipment are clear of the aircraft (including jet blast areas)
- request to taxi
- permission to taxi

Unambiguous and standardised messages demand that each message element does not have two meanings. That is, the anti-icing Code should not mean both “definition of the application” *and* “the aircraft is clean”, because this will not always be the case. Nor should it also mean that the ground equipment and personnel are “clear”. Furthermore a “thumbs-up” is inadequate for any type of safety critical communication by itself. It should only be used in conjunction, and to support, a verbal message. However, the meaning of a thumbs-up is not necessarily globally standardised, and should be discouraged.

Most of these messages are essential for safe coordination, and as such would benefit from international standardisation and use, as well as continuously open channels of instant communication during de-icing / anti-icing. The adherence to special instructions, the Code and the results of the post treatment check effectively (like the mass and balance documents) allow the captain to establish whether the aircraft is airworthy, and whether it remains in that condition. Therefore, the communication from the service provider should be from a suitably qualified person, who ought to be willing to "sign-off" his/her work, by communicating their name (perhaps as part of the "aircraft clean" or Code messages). Furthermore, this person should be present at the operation, in charge of the operation and able to conduct the post treatment check. The Code and "aircraft clean" elements should also be recorded. If, for contractual reasons the post treatment check is conducted by another organisation, then this element of the communication should also be delivered by the qualified person, who is present and also provides his/her identity.

COMM. *Standardise communication elements and their meaning.*

COMM1. *Clarify that the anti-icing Code only provides those information elements within it and does not infer anything else.*

COMM2. *Require a separate "aircraft clean/aircraft not clean" message following the post treatment check.*

COMM3. *Require a separate "equipment and personnel clear of aircraft" message.*

COMM4. *Require continuous verbal contact between de-icing / anti-icing crew chief and flight deck.*

COMM5. *Require critical messages (aircraft clean) to be delivered by qualified person who is present at the operation.*

COMM6. *Require this qualified person to provide his/her name/number with either the Code, or the post treatment check results.*

COMM7. *Require operators to include these elements in their contracts with service providers.*

Dangerous Goods

This is another area where unlicensed personnel working for non-certified organisations are responsible for activities, which if not carried out to the required standards will introduce hazards and therefore introduce risk into aircraft operations. Unlike de-icing / anti-icing, the regulators have found a way of ensuring that all operators and their handling agents comply with the same set of standards.

EU OPS 1.1145 and OPS.GEN.030 refer. These rules require operators and their handling agents to comply with ICAO Doc 9284-AN/905 (Technical Instructions for the Transport of Dangerous Goods). This document is accepted globally, and updated regularly with contributions from many NAAs and Industry organisations. Operators are approved to transport dangerous goods by their Authority; this may, or may not be applied to operators to approve their operations when de-icing / anti-icing is required.

An EASA ruling in the future OR.OPS could be considered whereby the Agency requires *an operator to comply with the applicable provisions contained in the latest edition of Technical Instructions for the safe de-icing / anti-icing of aircraft on the ground*. Specific references can then be made to ensure that the de-icing / anti-icing service provider follows certain checklists and procedures in accordance with these Instructions, and that any personnel involved (whether employees of the operator or not) should also apply the standards within the Instructions. The ultimate result would be that operators draft their de-icing / anti-icing programmes and associated contracts from a single source document.

There are various options available for the source of these Technical Instructions:

- ICAO Doc 9640. Useful as a basis for a regulation, and indeed this is the case existing today. Although reference to an ICAO document is a direct parallel with the regulation of dangerous goods, it is not very useful as a source of technical instructions, checklists and templates.
- EASA AMC to OPS.GEN.100 can be developed into a suitable set of Technical Instructions, with which operators would be obliged to comply unless they sought approval for an alternative means of compliance. Such an AMC could be used to direct operators towards standardised means of coordination, communication, training, training etc, and the template used for the AMC could be designed to assist operators construct their programmes, OM entries and contracts. Options REGAO2 and REGAO3 refer.
- SAE ARP 4737 Aircraft de-icing / anti-icing methods is a technical manual; useful for training, designing procedures and also developing an operator's de-icing / anti-icing policy and programme. However, as an AMC, or set of Technical Instructions it is too broad and not specific enough. However, referring to SAE Recommended Procedures may be considered similar to other references made within regulations to EUROCAE and RTCA documents. One benefit of using SAE is that both Industry and Authorities participate in their update – which is also regular. Another benefit of using SAE is that a family of documents is available covering application, fluids and their handling, equipment and training; these are referred to from within ARP 4737.

- AEA Recommendations; this is the predominant reference document for operators. It is designed, published and updated regularly by operators, with input from aircraft manufacturers. Because operators rely on this document, service providers also use this as a reference, together with ICAO , ISO and SAE documents. However, as an AMC, or set of Technical Instructions the AEA Recommendations is too broad and not specific enough.
- ISO 11075/6/7/8 are used by service providers who may wish to benefit from ISO 9001 accreditation, however, operators prefer to use the documents mentioned above to these ISO documents. It is worth investigating whether a service provider accredited for Quality Management under ISO, specifically against the relevant de-icing / anti-icing standards, has a safer operation than those who are not. If a benefit can be identified and the Industry agrees that the ISO accreditation results in a worthwhile standard and quality of service, then operators may be "required" to obtain their services only from ISO accredited organisations. This concept would be structured in a similar way to Option REGLOA shown below, but more investigation is required.

Identifying, or creating an acceptable source reference set of technical instructions for the safe de-icing / anti-icing of aircraft on the ground may allow EASA to regulate de-icing / anti-icing in a manner similar to the carriage of dangerous goods. Operators de-icing / anti-icing programmes may be approved against these instructions, or not.

TECIN1. *EASA develops a set of Technical Instructions against which operators de-icing / anti-icing programmes shall be approved.*

This Option should be considered alongside Option REGAO1. Operations other than the carriage of dangerous goods which also require special operations approval (OPS.SPA) include: operations in RVSM airspace; operations in airspace with specified navigation performance; and, low visibility operations. Not so easy to draw parallels with de-icing / anti-icing here; the regulation of these operations does involve a lot of technical instruction within the regulations themselves, and therefore a precedent has been set for detailed direction for operators within the regulatory framework.

The format of applying for a special operational approval is quite straight-forward. Applicants provide the competent authority with the documentation required by the applicable subpart as well as a description of the intended operation. Applicants then need to demonstrate that:

- they comply with the requirements of the applicable section;

- the aircraft and required equipment comply with the applicable airworthiness requirements/approvals;
- a training programme has been established for flight crew and, as applicable, personnel involved in these operations; and
- operating procedures in accordance with the applicable subpart have been specified in the operations manual.

It can clearly be seen how these criteria for application of special operations approval could be adjusted to suit de-icing / anti-icing operations. Both service providers' equipment and personnel can be included with reference to external standards of maintenance and training respectively.

TECIN2. *EASA identifies an external source document and adopts it as a set of Technical Instructions which operators are required to follow, and which operators are required to impose on service providers.*

TECIN3. *EASA, in collaboration with Industry and other agencies (EU NAAs, FAA, TC) develops an AMC to OPS.GEN.100 which can be used as a template for operators' de-icing / anti-icing policies, programmes and OM entries (refer to REGAO2).*

Navigation Data

Uploading electronic navigation data into an aircraft's navigation database and system is not a process that allows for the cross-checking of that data at the moment of upload. The operator is entirely dependent on the supplier of data, or equipment (if pre-loaded), to ensure that the data is accurate. Inaccurate navigation data can introduce hazardous conditions and increase the risk of flight operations. Some data can be checked by the flight crew when the data is actually being used, or immediately prior to it being used, however, this is unreliable, and does not ensure the accuracy of the rest of the database. Any errors will remain latent until exposed through use. The similarities with de-icing / anti-icing are plain to see: the flight crew are reliant upon the service provider's "accuracy", and while some post treatment checking by the flight crew is possible, the crew have to rely on someone else to conduct the check and provide assurances. Undetected errors may have an immediate effect, or may remain latent until exposed.

Whereas operators are responsible entirely for ensuring that de-icing / anti-icing is conducted to an acceptable standard, they are not always responsible for ensuring the accuracy of navigation databases. Instead, a system of "approval" of the supplier is used. Operators can obtain their navigation databases from suppliers who hold a Letter of Acceptance (LoA) and

this itself satisfies their responsibility for assuring that the data is accurate. EASA issues the LoA to appropriate suppliers who meet the criteria; this is accomplished in accordance with EASA Opinion 01/2005. Operators can still obtain databases from suppliers who do not hold a LoA, but they then have to demonstrate to the Authority that their procedures are adequate to assure the same standards. In both cases, the operator's Quality System still needs to be employed. One of the aims of the LoA is to ease the obligation on operators to perform what would be nearly impossible and unimplementable controls and processes.

The option of EASA issuing LoAs to service providers of de-icing / anti-icing would introduce different challenges. First there are only a few air navigation database suppliers, therefore the Agency's commitment of resources is limited. Secondly, if EASA did audit every de-icing / anti-icing service provider, this is only a process that operator's are obliged to do anyway; therefore, the duplication would be wasted effort, and to against whose standard would the Agency be conducting audits – each individual operator's? The benefit of using an LoA process is that standard "conditions and guidance" can be established against which audits and inspections can take place.

In EASA Opinion 01/2005, the Agency has the view that *the best solution would certainly be that the industry organizes itself to verify the quality of the navigation data provided by the suppliers and used by the aircraft operators. Such an option, similar to that developed by IATA for the operational safety audit of its member airlines (IOSA)*. This view points towards a possible hybrid system of regulation and oversight. The IATA DAQCP provides a model where member airlines agree a common standard audit checklist (based on AEA Recommendations), and accept the audit results of shared audits within the pool of members. The auditors are provided by the pool members and are trained in accordance with the DAQCP's own accepted standards. In effect, any service provider passing a DAQCP audit is issued with an Industry seal of approval, much like IOSA, whilst not removing the ultimate responsibility from the operator. It could be conceivable that any organisation (like IATA) wishing to establish a de-icing / anti-icing quality control pool can be "approved" or "accepted" by EASA and issued with their own LoA (perhaps LoA1); this would then permit the pool's own qualified auditors to issue, on behalf of the Agency, LoAs (perhaps LoA2) to service providers who meet the necessary standards. Currently, the DAQCP is established from the perspective of their own airline membership, and this limits the number of destinations and service providers included in the scheme. An improvement to the scheme would be to allow service provider membership where they either paid for the privilege of being audited and thereby "accepted", or they paid a fee and contributed to the pool of auditors.

The regulatory control would be established if EASA accepted that a shared audit from one of it's "accepted" schemes would ease the obligation of participating operators to conduct their own audits. Whereas if an operator wished to use the services of a provider who sat "outside" of any scheme and did not possess an LoA, they would have to demonstrate to their competent Authority that they could meet the same standards through their own contract provisions and quality programme.

REGLOA. *EASA to investigate the possibility, and the potential for an LoA system of quality assurance of de-icing / anti-icing service providers.*

In support of the Option REGLOA, or instead of, it may be possible for the Industry to establish a voluntary system of accrediting service providers. Such a system could still be based on ensuring the standards of for example AEA Recommendations, through an audit scheme like the IATA DAQCP. For such a scheme to be successful, all airlines and all service providers would need to agree to participate. However, if a voluntary scheme was established, whereby service providers could opt to be "accredited" by Industry, then this could be used as the basis of lobbying for EASA "approval" of such schemes.

VOL: *Industry commence a system whereby service providers can opt to be accredited through a recognised audit scheme based on acceptable standards.*

4.7 FAA SIAGDP

Attachment C provides some description of the proposed FAA Standardised International Aircraft Ground De/Anti-icing Programme (SIAGDP). This programme is relevant to this Study because as stated in FAA Notice N 8900.26 Dec *2007 Policies, procedures, and requirements are currently under development to authorize an aircraft ground deicing service provider to be issued a letter of authorization (LOA) to provide aircraft ground deicing services under an industry standardized aircraft ground deicing program.*

This FAA SIAGDP also involves a detailed overhaul of FAA AC 120-60B the document against which carriers have their de-icing / anti-icing programmes approved by the FAA. A mechanism that does not exist in EASA Member States. Naturally, to avoid duplication and confliction, any proposed changes to the method of regulation and oversight of operators' de-icing / anti-icing requirements ought to be shared with the FAA (and TC) in order to promote a harmonised system of regulation between the two continents.

LIASFAA. *EASA should take this opportunity to liaise closely with the FAA, and TC, with the aim of harmonising future de-icing / anti-icing regulations and thereby avoiding differing requirements, giving rise to ambiguity and confusion.*

4.8 National authority requirements for oversight of operations

Without a system of direct oversight of service providers it is possible that some NAAs rely on their relationships with operators to understand this dynamic and safety critical activity which takes place within their territory. In such cases, there is no relationship between the NAA and providers of de-icing / anti-icing services. The difficulty, encountered during this Study, in determining a responsible person within EASA Member State NAAs for de-icing / anti-icing service provision is evidence that this lack of working relationship, and possibly knowledge can exist. Option SME3, above, addresses this particular issue.

The oversight of an operator's de-icing / anti-icing programme relies on the NAA accepting the operator's OM, and quality assurance programme. With the emphasis on compliance with operations regulations, the important element of how operators arrange contracts with service providers may be overlooked. How these contracts are arranged and constructed should be of interest to NAAs in determining the standards against which operators audit third-party contractors.

EASAAR1. *EASA to require all NAAs to establish and maintain a monitoring programme of de-icing / anti-icing service providers exercising activities on their territory.*

This requirement will exist in the new Authority Requirements, but may not be implemented fully by all States. AR.GEN.305 Monitoring of activities – requires NAAs to conduct oversight of non-certified bodies and personnel when they are conducting activities on their territory – such programmes and audit schedules shall be proportionate. A unified purpose for such programmes would encourage their development and use, and also provide useful feedback which could be compared between States.

EASAAR2. *EASA to develop guidance for NAAs in how to implement a monitoring programme of de-icing / anti-icing service providers in compliance with AR.GEN.305.*

EASAAR3. *EASA to amend AMC2 AR.GEN.300 Continuing Oversight Ops – to include an operator's arrangements for ground-handling.*

Ill-conceived contracts and arrangements made with de-icing / anti-icing providers can be a source of confusion, or worse. AMC 2 AR.GEN.300 Continuing oversight OPS – specifies a list of items which an operator should *at least* be subject to inspections and monitoring by the Authority. Although not an exclusive list, the inclusion of an operator's arrangements for ground-

handling (including de-icing / anti-icing) would increase awareness of the issue.

With regard to the issue of re-hydrated residues and the management thereof, the data available concerning operator's residue management programmes and their efficacy is not shared, and is mostly anecdotal. Considering this issue has been raised as a serious safety matter, and aircraft manufacturers and operators obliged to focus on eliminating the associated risks, little is actually known as to what should comprise best-practice. It is not known, for certain, whether increased use of type I use *is* beneficial in reducing the risk, or whether a washing cycle after 3 applications of thickened fluid is better than a cycle after 5 applications. Also, there is no consensus on whether preventive anti-icing increases the risk of residues considerably.

What does seem apparent, however, is that since awareness of the issue was raised, and inspection and cleaning programmes introduced, fewer incidents of frozen/obstructed controls are occurring.

What is not known is how much residue is still being found and consequently removed. It would be beneficial to the Industry if a set of data could be collected to allow all interested stakeholders to quantify the existing risks and also compare best-practices. For this, a dataset would need to be established and a method of sharing and analysing agreed, perhaps through a central facilitator. The data that would be helpful includes the following:

- aircraft type
- aircraft identity
- history of applications of de-icing / anti-icing fluid, including:
    - type of fluid
    - procedure
    - location of application
- history of inspections
- brief description of inspection methods, including any variations
- findings – quantitative or qualitative measure of residue formation
- history of cleaning - quantitative or qualitative assessment of effectiveness
- brief description of cleaning methods, including any variations.

A programme of such data collection and analysis would complement any associated data received under Option SAF1, above.

RESDATA1. *EASA and NAAs to agree a dataset and method of collection, distribution and analysis for ascertaining the existing levels of risk from residue formation.*

RESDATA2. *NAAs to require operators, and where applicable maintenance organisations, to record and submit data, relevant to individual aircraft, concerning applications of de-icing / anti-icing fluid, and the effect of inspections for, and removal of, residues.*

RESDATA3. *NAAs to request brief descriptions of operators' residue management programmes, including inspection and cleaning methods, and how assessment of their effectiveness is made.*

The second option here would naturally follow the first option, and therefore would not be retrospective. The third option could be undertaken immediately.

Protection of the environment surrounding aerodromes from noise is usually tightly regulated by NAAs. One consequence of this is that the allocation of active runways by ATC is often made after consideration is given to reducing noise. During winter operations it is crucial that aircraft that have been anti-iced are provided with the most expeditious route to the departure runway. This can be achieved by utilising de-icing / anti-icing areas close to the active runway threshold, or by selecting an appropriate runway closest to the de-icing / anti-icing area – so as to reduce taxi time (Option REGAD6 below). A conflict of interest can arise where access to the preferred runway for compliance with noise limitations involves a longer taxi than access to the closest suitable runway (Runway 18R/36L at Amsterdam Schipol is one clear example).

NOISE. *NAAs should issue instructions to aerodromes and ANSPs to emphasise that during winter operations priority should be given to shorter taxi times (post de-icing / anti-icing) rather than noise limitation.*

4.9 Regulating de-icing / anti-icing through regulation of aerodromes

Some aerodromes are in a privileged position, in that they can choose whether to provide de-icing / anti-icing services themselves when it is profitable. Some benefit from being the sole provider of these services, whereas others, who are also acting as sole providers, do so at a financial loss. The Data Summary and Analysis section of this Report provides more details concerning the varying degrees of involvement aerodromes have in de-icing / anti-icing provision. Regardless of whether an aerodrome provides these services themselves, or not, they do have responsibilities for facilitating the infrastructure and also for the safety of activities conducted at the aerodrome. How much responsibility, and in what areas, can be debated. Whether de-icing / anti-icing vehicles, fluid storage and equipment are considered "infrastructure"; and, whether activities conducted by parties under contract to operators have anything to do with the aerodrome management can be, and are being, debated. The lack of clarity may be considered by some to be useful in providing some degree of practical flexibility, whereas others may consider it to be a source of confusion.

REGSP3, above, is an Option to make de-icing / anti-icing service provision fully a responsibility of the aerodrome. An alternative pathway to raising standards of de-icing / anti-icing service provision could be to utilise existing, and proposed, aerodrome regulation to encourage closer scrutiny and a greater involvement in de-icing / anti-icing operations by the aerodrome. This need not be in conflict with operators' programmes and contracts, nor interfere with any market access that may exist.

Furthermore, the aerodrome is in a unique position in hosting airport users' committees and boards, where all relevant stakeholder groups are represented. These bodies can generate opportunities to establish local consensus on infrastructure, traffic management, procedures and to address local hazards.

An aerodrome's certification by the appropriate Authority includes the acceptance/approval of the airport manual, which shall contain details of the de-icing / anti-icing facilities and services (ICAO Annex 14, 1.4.4). Interpretation of, and compliance with, Annex 14 is non-standard within EASA Member States (airsight Study on Annex 14 Implementation). Depending on an Authority's interpretation of Annex 14 in respect of de-icing / anti-icing facilities, services and location, determines how the responsibilities of aerodromes are currently defined and therefore their compliance with these responsibilities. EASA is currently undertaking the task of creating Implementing Rules for aerodromes, and following this process the question of varied interpretation and application should be resolved.

Aerodromes must also comply currently with ICAO SMS Standards, which NAAs are obliged to enforce. Options SAF1, SAF2, and SAF3 above, address the need for specific focus onto

de-icing / anti-icing. Similarly, the requirement for aerodromes to define lines of safety responsibility will help support Option SME5, above.

Often, the choice of an operator to undergo two-step de-icing / anti-icing is considered as an "additional" requirement, especially at aerodromes where one-step is the norm. In such cases, the aerodrome may be planning its winter operations around traffic flow times associated with one-step de-icing / anti-icing. However, ICAO Doc 9640 is clear in its statement that, concerning facilities, *aerodromes should plan for the two-step de-icing / anti-icing procedure for all de-icing / anti-icing operations even though some operators may choose the one-step procedure on some occasions.*

Doc 9640 also defines an aerodromes facilities as having the following components:

a) de-icing / anti-icing pads for the manoeuvring of aeroplanes;

b) de-icing / anti-icing system comprising one or both of the following:

1) mobile vehicles, and

2) fixed equipment;

c) bypass taxiing capability;

d) environmental run-off mitigation measures;

e) permanent or portable night-time lighting system; and

f) support facilities that may include:

1) storage tanks and transfer systems for de-icing / anti-icing fluids; and

2) de-icing crew shelter.

The inclusion of vehicles supports Option GHDAD2, below. De-icing / anti-icing fluids are not specifically mentioned, however, if an aerodrome has some responsibility over the de-icing / anti-icing vehicles (directly or indirectly), and it needs to plan for two-step operations, then having Type I fluid available must be an inferred requirement.

Two key elements of an aerodrome's de-icing / anti-icing facilities are the location and size of the de-icing / anti-icing areas (pads, aprons, ramps). Specifically, they should present the shortest distance possible to departure runway thresholds to preserve HoTs (Doc 9640 9.5), and they should be able to cope with all expected weather conditions, all relevant aircraft types, all de-icing / anti-icing application methods, and the capability of the de-icing / anti-icing vehicles and equipment (Annex 14, 3.15.6). NAAs could require aerodromes to explain how they ensure that the de-icing / anti-icing facilities available at their aerodrome meet the requirements of their winter traffic plan. In some cases, this may require aerodromes to explain how the desired winter traffic plan is not met, due to inadequate de-icing / anti-icing facilities and/or services.

By agreeing to enforce these Recommendations as Requirements, NAAs will ensure that aerodromes invest effort, and possibly finances, into establishing a fully capable, safe and effective de-icing / anti-icing system, and thereby enhance the safety of the activities and operations occurring at each aerodrome.

REGAD1. *EASA to incorporate within future rules for European aerodromes, responsibilities towards de-icing / anti-icing facilities, operations, services etc.*

REGAD2. *EASA to require that European aerodromes plan and provide for two-step de-icing / anti-icing.*

REGAD3. *EASA to require that European aerodromes are responsible for ensuring that the de-icing / anti-icing facilities (including vehicles) are appropriate to meet the needs of all relevant operators using their aerodrome.*

REGAD4. *EASA to require that European aerodromes are responsible for ensuring that the de-icing / anti-icing services available are appropriate to meet the needs of all relevant operators using their aerodrome.*

REGAD5. *EASA to consider the possibility of including de-icing / anti-icing fluid as part of an aerodrome's facilities.*

REGAD6. *NAAs to require aerodromes to include in their winter operations plans (within the aerodrome manual) a supporting case in favour of each de-icing / anti-icing area, with specific reference to how these chosen areas support the HOT in different weather conditions.*

Some European aerodromes will fall outside of the scope of future EASA rules: this may be due to size, capacity and / or facilities. In such cases the relevant NAA will remain as the regulator. Where such aerodromes are used by commercial air transport operators, EASA considers that it would be favourable to maintain the same standards as met at the larger aerodromes.

REGAD7. *NAAs to impose the same standards (for de-icing / anti-icing) on those aerodromes that fall outside the scope of future EASA rules, and which are used by commercial air transport.*

Directive 96/97/EC on ground-handling is designed to protect open competition in the provision of various ground-handling services. De-icing / anti-icing is included in the list of ground-handling services, with other services such as baggage, ramp, oil and fuel, and mail handling. The aerodrome is permitted to limit the number of suppliers in each of these other services, but not de-icing / anti-icing. Establishing a de-icing / anti-icing service requires a significant amount of investment, and providing the service requires sufficient space within

which to operate safely. Both of these would be reason enough to allow any particular aerodrome to limit the number of de-icing / anti-icing service providers. Clause 11 of the Directive suggests that this is a possibility, but Article 6 excludes de-icing / anti-icing. Option GHDSP1, above, addresses the possibility of aerodromes limiting the number of providers.

The ultimate extension of this concept is to remove de-icing / anti-icing altogether from the constraints of the Directive. This Study has no evidence that aerodromes with only one provider of de-icing / anti-icing causes detriment to either safety or cost to the customer. In fact, having one supplier may encourage: more long-term investment; a growing level of experience; providers solely dedicated to de-icing / anti-icing; an effective relationship between provider and aerodrome / aerodrome users; and, therefore higher levels of service.

In support of Options REGAD3 and REGAD5 above, the Directive allows certain high value elements of de-icing / anti-icing equipment and infrastructure to be brought within the aerodrome centralised infrastructure (Clause 13 and Article 8). Within the terms of the Directive this would then allow States to define technical specifications to which service providers would have to comply, or risk losing their license to operate (Clause 23 and Article 11). Such technical specifications could vary between simple minimum requirements concerning equipment standards, through availability of fluids, and up to full-blown regulation of procedures and training. The quality, capability and maintenance of de-icing / anti-icing vehicles can have a direct affect on the standard of service delivered. Declaring these vehicles as part of the aerodrome centralised infrastructure will bring their capability and maintenance under the oversight of the NAA. This will not restrict service providers from sharing their use, however, any aerodrome effectively “renting” such high value assets will ensure strict control over how they are used, and who uses them.

GHDAD1. *Remove de-icing / anti-icing from the list of ground-handling activities within the Directive 96/97/EC.*

GHDAD2. *Allow, or mandate, that aerodromes specify de-icing / anti-icing vehicles as part of the aerodrome’s centralised infrastructure.*

GHDAD3. *Member States to agree on a set of minimum technical specifications for the proper functioning of de-icing / anti-icing equipment and infrastructure.*

The Directive requires that aerodromes establish and facilitate Airport Users’ Committees (AUC). There is no mandate as to the regularity of meeting, method of meeting and communication, or the subjects to be discussed. At some aerodromes, the AUC is used, prior to each winter season, to discuss aerodrome operations concerning the coordination of traffic during de-icing / anti-icing operations. It is rare that subject-matter experts in aircraft de-icing / anti-icing procedures (from the operators, providers and aerodrome) meet under

the auspices of the AUC to discuss matters specifically related to fluids, procedures, vehicles, communication, safety etc.

GHDAD4. *Aerodromes to agree, with other stakeholder subject-matter experts, a format and remit for special meetings of the AUC which specifically address de-icing / anti-icing operations and service provision.*

4.10 Availability of de-icing / anti-icing fluid types

The Study did not reveal any mechanism currently in use by any NAA which can act as an example of how to influence the availability of fluids at aerodromes within the Member States. However, existing regulations may provide some possibility for Authority influence over the types of fluid supplied at aerodromes within their territory. In considering whether a need exists for compulsory provision of Type I fluid in all, or just some, aerodromes, regard must be given towards the existing risks associated with residues from thickened fluids. That is, since the raising of awareness of the issues associated with residues, and the subsequent introduction of residue maintenance programmes, has the risk been reduced significantly? Furthermore, if Type I fluids were made compulsory, consideration should be given to whether operators would choose to use Type I fluids more than they currently do. Failing any regulation to demand operators always use Type I fluid for de-icing, there is no guarantee that there would be any increased uptake.

There are several options that can be considered, which may increase the availability, and/or the use of, Type I fluids.

If the conditions required for an individual aircraft to maintain its Certificate of Airworthiness included limitations on the use of certain de-icing / anti-icing fluids, then operators would be obliged to adhere to these limitations (EU OPS 1.005 (c)). By means of the instructions for continuing airworthiness, manufacturers could influence operators' use of Type I fluid by:

- insisting that Type I, Type I/water mix, and hot water are the only viable de-icing fluids acceptable, or
- defining a limit to the number of one-step de-icing / anti-icing procedures that can be undertaken before critical areas are cleaned.

For any amendment to the TC, or issue of an STC, evidence would be required as to the necessity. Such evidence could be forthcoming from either the manufacturer following appropriate testing (for all fluids and combinations of fluids), or from operational data indicating loss of airworthiness, due to thickened fluid residues, in certain circumstances. EASA has already taken action by requesting specific information from Type Certificate Holders [14 April 2009 PBL/ein/C(1.1) 2009(D)61465] concerning any recommended procedures and limitations for each aircraft type. Aircraft manufacturers have already issued Operational Notices concerning maintenance procedures for preventing and managing fluid residues. Any regulation in this respect would need to consider the evidential affects of thickened fluid application to each different aircraft type and the associated variation in impact. An alternative approach could be that unless an aircraft manufacturer could provide

evidence that their required residue management programme was effective, then they should require operators to always use Type I in a two-step procedure.

FLUID1. *Aircraft manufacturers instructions for continuing airworthiness to effectively "ban" the use of thickened fluid.*

FLUID2. *Aircraft manufacturers to provide evidence that their proposed residue management procedures are effective; otherwise, to require operators to always use a two-step procedure with Type I in the first step.*

If NAAs, or EASA, consider that de-icing with a thickened fluid produces an unwarranted increase in risk, or that current mitigation measures are unreliable, then operators could be mandated to always use a two-step process, and not allow thickened fluids to be used in the de-icing phase. In effect, the regulator could re-define de-icing fluids as being only Type I, Type I/water mix, or hot water. Again, any evidence that one-step de-icing / anti-icing does not increase risks due to residues, provided a suitable inspection and cleaning programme is followed, could be used to counter this concept.

FLUID3. *EASA redefines de-icing fluid as being only Type I, Type I/water mix, and hot water.*

It may be possible to influence the availability of Type I fluid through NAA regulation of aerodromes; several possibilities exist.

If a State determines that de-icing / anti-icing fluid is part of the aerodrome centralised infrastructure/facilities (Options GHDAD2 and REGAD5 above), then it may be possible to require that all fluid types are available to fulfil the infrastructure/facilities requirements; this responsibility to provide all fluid types may be passed to service providers as necessary and supported by Directive 96/97/EC on ground-handling. ICAO Doc 9640 recommends that all de-icing / anti-icing services and fluids be planned for by the aerodrome, regardless of whether they are used or not. This recommendation could be enforced as a requirement, however, a safety case would need to support the enforcement.

FLUID4. *NAAs mandate that all appropriate aerodromes should always offer Type I fluids and a two-step de-icing / anti-icing procedure.*

An alternative to the above strategy would be to mandate the availability of Type I fluid and the two-step procedure whenever any "user operator" makes a formal request, based on their own safety case, or desired procedures. Of course, this option would also necessarily have to include Type III.

FLUID5. *EASA mandates that an aerodrome shall provide Type I fluid and a two-step de-icing / anti-icing procedure whenever a user operator makes the appropriate request.*

As part of a State Safety Programme (ICAO SMS Standards), the relevant Authority may consider that to reduce the risks associated with fluid residues a certain percentage of traffic should be exposed to Type I fluid in a two-step procedure. Determining the concentration of aerodrome traffic involving "affected" aircraft, may assist in such a task, and lead to the mandate of Type I fluid and two-step procedure at certain aerodromes.

FLUID6. *NAAs should include within their State Safety Programmes a plan to reduce the risks associated with thickened fluid residues, by assuring appropriate availability of Type I fluid throughout a percentage of those aerodromes within their jurisdiction. The selection of participating aerodromes shall be justified by an analysis of traffic profiles of affected aircraft.*

If either a voluntary system or Letter of Acceptance mechanism were established to raise standards of de-icing / anti-icing (see Options REGLOA and VOL), then the audit checklist used to issue the LoA or Industry Accreditation could include a requirement for service providers to provide Type I fluids and two-step procedure to meet operators' requirements. For this to be acceptable, all participants in the pooled auditing programme would have to be in agreement with this addition to the audit checklist, and be certain that this would benefit operators.

FLUID7. *LoA or Industry Accreditation requirements include the provision of Type I fluids and two-step procedure.*

Unlike some of the options included in this Report which are aimed at improving de-icing / anti-icing standards, these options aimed at improving the availability of fluids at aerodromes are likely to require a greater consensus before introducing and possibly some appropriate transition measures. Therefore the opening of debate around these options, or those options deemed most practical and possible by EASA, could be beneficial in attaining a high consensus for any changes. Of course any debate would need to give due consideration to whether any regulatory influence over availability of fluids is necessary.

WRKSHP. *EASA facilitate a fluids availability workshop to discuss these options (FLUID 1 to 7) and any others, with the aim of determining a consensus opinion on a way forward.*

4.11 Additional options

Knowledge of this Study is widespread and much interest in the final result has been expressed from all stakeholder groups. The collected and analysed data is of interest to the Industry by itself, and the options presented, together with the Pre-RIA will facilitate the continuation of debate. Such debate may prove fruitful by itself, but will also prepare the ground for any NPA, or programme, that the Agency wishes publish in the future; thereby raising the quality of comments in response to any NPA.

PUBREP. *EASA publishes the Final Report to this Study and distributes it freely to interested parties.*

5 Information paper and briefing 6 December 2010 Presentation of options to stakeholder representatives

The purpose of the Stakeholder Representative's Briefing (SRB) is for the Study Team to present and obtain feedback on the options available. By avoiding any recommendations it will be more likely that feedback from stakeholders is objective and informative – providing useful material for the pre-RIA. However, as can be seen in this document a lot of options have been developed. It is not the intention of the Study Team to present each and every option at the Briefing, nor in the associated Information Paper. Therefore some filtering will occur, and in this process, any excluded options may indicate a preference for those remaining. This is not necessarily the case. The Study Team will select the higher level options, and omit the specific.

Clarification on these options to be included in the SRB will be made before the planned teleconference on 12 Nov 2010. EASA may then have the opportunity to make an input to the SRB Agenda.

APPENDIX 1: List of Options

Ref	Options for Change	Notes
REC1	*It is recommended that all those involved in de-icing / anti-icing operations on the ground, and all those who have an interest in ensuring the standards of these operations are the highest possible, do whatever they can to make the task of the post treatment inspector as easy as possible.*	
SAF1	*Conduct an Industry-wide collaborative safety initiative: including data collection and analysis; awareness activities; and development of recommendations and, where possible, tools.*	
SAF1.a	EASA alone.	
SAF1.b	EASA in partnership with Industry; perhaps through the ESSI.	
SAF1.c	EASA in conjunction with Member State NAAs.	
SAF1.d	Industry alone; perhaps through FSF, IATA, the airline Associations etc.	
SAF2	*Reinterpret existing regulations for operators and aerodromes to motivate greater collection and analysis of relevant safety data.*	
SAF3	*Amend proposed EASA regulations for authorities and operators to ensure effective collection and analysis of relevant safety data.*	
SAF3.a	AR.GEN.30.(a) Exchange of Information & AR.GEN.40.(a) Reporting – interpretation of these requirements may include guidance for Authorities to include the exchange of safety data including “unsafe acts” arising through operators’ contracted out service providers, and that this data is not restricted to incidents and accidents.	

SAF3.b	AMC 2 AR.GEN.300.2 Continuing Oversight Ops – this AMC can be amended to include oversight and monitoring (as required) of the mechanism through which operators ensure service providers maintain an appropriate safety culture (professional attitude) through collection of safety data – specifically self-reporting of "unsafe acts". This may be achieved through the inspection of those elements of a basic contract with service providers (excluding commercial clauses) that are relevant to safety.	
SAF3.c	AMC 2 to OR.GEN.200(a)(2) Management System – can be expanded to include the need for operators to include service providers within their SMS as a source of safety data, such that hazards encountered by service providers can be identified and the associated risks to operations assessed by the operator. A programme for achieving this may be required.	
SAF3.d	AMC 2 to OR.GEN.200(a)(4) Management System, Training and Communication on Safety – this AMC might be amended to include the need for operators to explain safety matters to service providers, and give support where necessary, in particular why certain safety data should be collected and analysed.	
SAF3.e	AMC to OR.GEN.200(a)(5) Management System, Occurrence Reporting – this AMC can be expanded to include the objective of collecting and analysing valuable data such as that obtained through the self-reporting of unsafe acts, thereby providing an operator with an insight into potential accident pre-cursors and areas of high risk. It may be made clear that this data should be sought not only from the operator's own personnel and employees, but also from those personnel working for service providers conducting contracted-out safety critical functions.	

SAF3.f	AMC to OR.GEN.205 Contracting and purchasing – clarification can be provided to this AMC such that SMS activities, including reporting of “unsafe acts”, are included in the written agreement between operator and service provider, as well as details of the safety services to be provided. The written agreement referred to could be subject to oversight and monitoring as required under AMC 2 AR.GEN.300.2, mentioned above in Option SAF3.b.	
SAF4	*To conduct an Industry-wide review of, and lobby for amendment to, Directive 2003/42/EC on Occurrence Reporting; in order to align the Directive with ICAO SMS requirements. Thereby encouraging States to meet the needs of the Directive and encouraging a harmonised interpretation.*	
SAF4.a	NAAs to ensure that the intent of the Directive is enforced: the need for *all* personnel to report occurrences (Clause 7); and the need to share this information (Clause 8).	
SAF4.b	Lobby to amend, or expand, the definition of “occurrence” to include specifically: human, procedural and system considered by the reporter to increase risk.	
SAF4.c	Lobby to expand the Scope of the Directive (Article 3), to include specifically de-icing / anti-icing activities, by including examples in the Appendix to Annex I.	
SAF4.d	NAAs to take up their responsibilities to ensure de-icing / anti-icing operatives comply with mandatory occurrence reporting (Article 4, 1.g) and they *shall* (rather than *may*) encourage voluntary reporting (Article 9).	
SAF4.e	NAAs to interpret the Directive from the point of view of de-icing / anti-icing operations and issue relevant awareness and guidance material.	

SME1	*EASA to appoint its own subject-matter expert for internal and external communication and coordination of de-icing / anti-icing issues.*	
SME2	*EASA to establish, maintain and publish a record of nominated de-icing / anti-icing subject-matter experts.*	
SME3	*NAAs to appoint their own subject-matter experts for internal and external communication and coordination of de-icing / anti-icing issues.*	
SME4	*Operators to appoint their own subject-matter experts for internal and external communication and coordination of de-icing / anti-icing issues.*	
SME5	*Aerodromes to appoint their own subject-matter experts for internal and external communication and coordination of de-icing / anti-icing issues.*	
ZERO	*Do nothing; maintain the status quo.*	
REGSP	*To implement direct regulation of de-icing / anti-icing service providers by EASA or NAAs.*	
REGSP1	*To undertake regulatory reform, making some (or all) aspects of de-icing / anti-icing the responsibility of service providers.*	
REGSP2	*To make de-icing / anti-icing fully a maintenance task.*	
REGSP3	*To make de-icing / anti-icing service provision fully a responsibility of the aerodrome.*	
GHDSP	*To regulate certain aspects of de-icing / anti-icing service provision through Directive 96/97/EC on Ground-Handling.*	
GHDSP1	*Permit States to limit the number of de-icing / anti-icing service providers at aerodromes.*	

GHDSP2	*Require States to approve organisations for the supply of de-icing / anti-icing services against a set of minimum administrative standards and technical specifications.*	
TRGSP	*As part of the State approval/selection of service providers through Directive 96/97/EC on ground-handling, require de-icing / anti-icing operatives to possess a valid vocational qualification in de-icing / anti-icing.*	
REGAO	*To improve the existing regulations for operators; improve the interpretation of those regulations; and improve the oversight of operators in this regard.*	
REGAO1	*Require the approval of operators' de-icing / anti-icing programmes against minimum requirements defined within the regulations.*	
REGAO2	*Develop an effective AMC in the form of an example of, or framework for, an operator's de-icing / anti-icing programme.*	
REGAO2.a	*providing operators with a clear framework for an acceptable de-icing / anti-icing policy, procedures, training programme,*	
REGAO2.b	*providing operators with clear guidelines for establishing and maintaining effective communication and coordination procedures,*	
REGAO2.c	*providing operators with template communication messages and meanings connected with all inspections, checks and operations; in particular review of the anti-icing code, and clarification of the "all clear" signal/message (refer to COMM),*	
REGAO2.d	*providing operators with a structured framework for the relevant section of the OM (A8),*	
REGAO2.e	*clarifying responsibilities for key decision-makers,*	

REGAO2.f	*requiring and defining the minimum elements required for an effective contract between operator and service provider, and*	
REGAO2.g	*requiring operators to seek approval for any deviations (in certain areas) from the published AMC.*	
REGAO3	*Require operators to appoint a subject-matter expert as per Option SME4.*	
REGAO4	*Operators to define specific training requirements and knowledge base for operations and dispatch staff concerning de-icing / anti-icing.*	
REGAO5	*States to require that operators develop a targeted programme within their SMS, specifically aimed at de-icing / anti-icing.*	
REGAO6	*Operators to be required to provide flight crew with a check-list system that specifically addresses aspects of de-icing / anti-icing.*	
REGAO7	*Require the inclusion of an operator's de-icing / anti-icing programme and procedures within the operator's conversion course ground training.*	
REGAO8	*Require the inclusion of applicable elements of the operator's de-icing / anti-icing programme, and any new knowledge, within the operator's differences and familiarisation training requirements.*	
REGAO9	*Review and expand the required contents of the operator's de-icing / anti-icing policy and programme that shall form part of the Operations Manual.*	
COMM	*Standardise communication elements and their meaning.*	
COMM1	*Clarify that the anti-icing Code only provides those information elements within it and does not infer anything else.*	

COMM2	*Require a separate "aircraft clean/aircraft not clean" message following the post treatment check.*	
COMM3	*Require a separate "equipment and personnel clear of aircraft" message.*	
COMM4	*Require continuous verbal contact between de-icing / anti-icing crew chief and flight deck.*	
COMM5	*Require critical messages (aircraft clean) to be delivered by qualified person who is present at the operation.*	
COMM6	*Require this qualified person to provide his/her name/number with either the Code, or the post treatment check results.*	
COMM7	*Require operators to include these elements in their contracts with service providers.*	
TECIN1	*EASA develops a set of Technical Instructions against which operators de-icing / anti-icing programmes shall be approved.*	
TECIN2	*EASA identifies an external source document and adopts it as a set of Technical Instructions which operators are required to follow, and which operators are required to impose on service providers.*	
TECIN3	*EASA develops an AMC to OPS.GEN.100 which can be used as a template for operators' de-icing / anti-icing policies, programmes and OM entries (refer to REGAO2).*	
REGLOA	*EASA to investigate the possibility, and the potential for an LoA system of quality assurance of de-icing / anti-icing service providers.*	
VOL	*Industry commence a system whereby service providers can opt to be accredited through a recognised audit scheme based on acceptable standards.*	

LIASFAA	*EASA should take this opportunity to liaise closely with the FAA, and TC, with the aim of harmonising future de-icing / anti-icing regulations and thereby avoiding differing requirements, giving rise to ambiguity and confusion.*	
EASAAR1	*EASA to require all NAAs to establish and maintain a monitoring programme of de-icing / anti-icing service providers exercising activities on their territory.*	
EASAAR2	*EASA to develop guidance for NAAs in how to implement a monitoring programme of de-icing / anti-icing service providers in compliance with AR.GEN.305.*	
EASAAR3	*EASA to amend AMC2 AR.GEN.300 Continuing Oversight Ops – to include an operator's arrangements for ground-handling.*	
RESDATA1	*EASA and NAAs to agree a dataset and method of collection, distribution and analysis for ascertaining the existing levels of risk from residue formation.*	
RESDATA2	*NAAs to require operators, and where applicable maintenance organisations, to record and submit data, relevant to individual aircraft, concerning applications of de-icing / anti-icing fluid, and the effect of inspections for, and removal of, residues.*	
RESDATA3	*NAAs to request brief descriptions of operators' residue management programmes, including inspection and cleaning methods, and how assessment of their effectiveness is made.*	
NOISE	*NAAs should issue instructions to aerodromes and ANSPs to emphasise that during winter operations priority should be given to shorter taxi times (post de-icing / anti-icing) rather than noise limitation.*	

REGAD1	*EASA to incorporate within future rules for European aerodromes, responsibilities towards de-icing / anti-icing facilities, operations, services etc.*	
REGAD2	*EASA to require that European aerodromes plan and provide for two-step de-icing / anti-icing.*	
REGAD3	*EASA to require that European aerodromes are responsible for ensuring that the de-icing / anti-icing facilities (including vehicles) are appropriate to meet the needs of all relevant operators using their aerodrome.*	
REGAD4	*EASA to require that European aerodromes are responsible for ensuring that the de-icing / anti-icing services available are appropriate to meet the needs of all relevant operators using their aerodrome.*	
REGAD5	*EASA to consider the possibility of including de-icing / anti-icing fluid as part of an aerodrome's facilities.*	
REGAD6	*NAAs to require aerodromes to include in their winter operations plans (within the aerodrome manual) a supporting case in favour of each de-icing / anti-icing area, with specific reference to how these chosen areas support the HOT in different weather conditions.*	
REGAD7	*NAAs to impose the same standards (for de-icing / anti-icing) on those aerodromes that fall outside the scope of future EASA rules, and which are used by commercial air transport.*	
GHDAD1	*Remove de-icing / anti-icing from the list of ground-handling activities within the Directive 96/97/EC.*	
GHDAD2	*Allow, or mandate, that aerodromes specify de-icing / anti-icing vehicles as part of the aerodrome's centralised infrastructure.*	

GHDAD3	*Member States to agree on a set of minimum technical specifications for the proper functioning of de-icing / anti-icing equipment and infrastructure.*	
GHDAD4	*Aerodromes to agree, with other stakeholder subject-matter experts, a format and remit for special meetings of the AUC which specifically address de-icing / anti-icing operations and service provision.*	
FLUID1	*Aircraft manufacturers instructions for continuing airworthiness to effectively "ban" the use of thickened fluid.*	
FLUID2	*Aircraft manufacturers to provide evidence that their proposed residue management procedures are effective; otherwise, to require operators to always use a two-step procedure with Type I in the first step.*	
FLUID3	*EASA redefines de-icing fluid as being only Type I, Type I/water mix, and hot water.*	
FLUID4	*NAAs mandate that all appropriate aerodromes should always offer Type I fluids and a two-step de-icing / anti-icing procedure.*	
FLUID5	*EASA mandates that an aerodrome shall provide Type I fluid and a two-step de-icing / anti-icing procedure whenever a user operator makes the appropriate request.*	
FLUID6	*NAAs should include within their State Safety Programmes a plan to reduce the risks associated with thickened fluid residues, by assuring appropriate availability of Type I fluid throughout a percentage of those aerodromes within their jurisdiction. The selection of participating aerodromes shall be justified by an analysis of traffic profiles of affected aircraft.*	
FLUID7	*LoA or Industry Accreditation requirements include the provision of Type I fluids and two-step procedure.*	

WRKSHP	*EASA facilitate a fluids availability workshop to discuss these options (FLUID 1 to 7) and any others, with the aim of determining a consensus opinion on a way forward.*	
PUBREP	*EASA publishes the Final Report to this Study and distributes it freely to interested parties.*	

EASA.2009.OP 21

Study on the regulation of ground de-icing and anti-icing services in the EASA Member States

INTERIM REPORT

OPTIONS FOR CHANGE – ATTACHMENT A

Summary and Analysis of Available Safety Data

airsight GmbH

Gustav-Meyer-Allee 25
13355 Berlin
Germany
Phone: +49 30 45803177
Fax: +49 30 45803188
www.airsight.de

Table of Contents

1 Introduction

To assist the Study Team in the selection of options to improve the standards of de-icing / anti-icing, it was deemed necessary to collate available safety data to determine whether any clear patterns emerge which highlight contributory and causal factors.

This document includes summaries of data collected. Note that the Terms of Reference of the Study did not require, nor resource, a Safety Study. The Study Team do not claim that this document constitutes a comprehensive, or scientifically-based Safety Study; however, from the data collected, two clear messages can be identified:

- There is a lack of coordinated and detailed safety data concerning de-icing / anti-icing in respect of human factors. That is, compared to some other safety critical activities centred on human skills, knowledge and attitude, and relying on procedures and equipment, such as maintenance personnel and flight-crew.
- The contributory factors to these accidents and incidents deduced from each dataset are very similar, centring on:
    - ineffective communication
    - inadequate coordination
    - inadequate procedures
    - wrongly implemented procedures
    - lack of knowledge
    - lack of appropriate training

  Specifically, these factors often applied to inspections as well as operations.

1.1 Caveat

The collected data has been gathered, and therefore, presented in different formats and will have different degrees of validity for which the Study Team does not have the resources to standardise and create comparative descriptors. Also, many of the events occurred outside EASA Member States and some involved aircraft not usually associated with commercial air transport. For the events involving non-commercial operations, and those events occurring more than 20 years ago, the regulatory and safety awareness environments would be different to those existing today. However, it is data which ought not to be ignored and from which National Authorities, operators and service providers may be able to draw some insight to help reduce risk in their own areas of responsibility and operations.

2 Study Team survey questionnaires

2.1 National Authorities

Only 7 of the 12 NAAs questionnaire respondents answered the questions[1,2] on the number of occurrences related to improper de-icing / anti-icing, or anti-icing fluids residues between the Winter seasons 2005/2006 and 2009/2010.

- 4 of 7 NAAs mentioned they experienced occurrences related to improper de-icing / anti-icing within the analysed period (Austria: 3, Switzerland: 3, Spain: 3, Iceland: 1).
- 3 of 7 NAAs mentioned they experienced occurrences related to anti-icing fluids residues within the analysed period (Hungary: 1, Switzerland: 9, Iceland: 1).

2.2 Operators

11 out of the 26 operators who responded to the questionnaires mentioned they experienced incidents related to improper de-icing / anti-icing[3].

The same number (11 operators) stated being subject to events related to anti-icing fluids residues. However, it was not possible to differentiate between in-flight incidents and findings of residues during maintenance and cleaning.

2.3 Manufacturers

Responses from the manufacturers are encouraging with regard to reducing numbers of occurrences caused by frozen re-hydrated residues since 2005.

- Airbus reported no in-flight incidents and only two events of stiff rudders found during ground checks.
- ATR only reported one incident, and that was in 2006.
- BAE Systems statistics clearly show a dramatic reduction in annual occurrences, with 87 in year 2004/05, and only 7 in 2008/09. Whereas before 2005, 25% of reports

[1] NAA Questionnaire – Question 1.4: Indicate the number of reported occurrences related to inappropriate standards of de-/anti-icing:

[2] NAA Questionnaire – Question 1.5: Indicate the number of reported occurrences related to anti-icing fluids residues:

[3] Aircraft Operator Questionnaire – Question 1.6: How many events, occurrences, or incidents due to residues and/or incorrect de/anti-icing has your airline experienced since and including the 2005/06 winter season?

concerned “ice in gaps” and since 2005 there have been none. This may, however, be due to a change in diagnosis.

- Boeing reported that, prior to 2005, they had more occurrences per year of gel residue build-up than they have had in total since 2005. They attribute the new Potassium and Sodium-based Runway De-icing Fluids as contributing to the residues.
- Bombardier stated that the “classic” residue incidents have reduced with time, and only a handful have occurred in the past 5 years.

All the manufacturers attribute the fall in incidents and occurrences to:

- raised awareness,
- recommendations to use Type I and the two-step procedure (NB: there’s no evidence that operators are actually complying with these recommendations), and
- implementation of inspection programmes and regular cleaning.

3 Other data sources

3.1 ADREPS

The Study Team acquired 1014 occurrence reports from the ICAO ADREP database.

There has not been enough time to filter these (many will be associated with in-flight icing conditions), nor to summarise and classify them. No doubt there will be some interesting information contained within; however, it is the opinion of the Study Team that any analysis will only confirm the conclusions reached by the other summaries contained in this paper. This dataset can be forwarded to EASA for further examination if required.

3.2 ECCAIRS

A search of ECCAIRS, made by EASA Safety Analysis Department, was requested for all de-icing / anti-icing related occurrences since 2000.

There were 5 accidents recorded, and 3 occurrences of engine failure not resulting in an accident. The results comprise 27 occurrence reports, 8 of which are related to known occurrences of elevator movement restrictions due to either ice or frozen residues. 7 occurrences were caused by inadequate de-icing / anti-icing, and 4 due to a failure to de-ice. Due to the lack of detail provided in the report summaries, conclusions cannot be made as to the primary reasons why de-icing / anti-icing was inadequate, nor why pilots failed to request de-icing / anti-icing.

3.3 NASA Aviation Safety Reporting System (ASRS) – Summary of the Study 1968 – 1993[4]

This study analysed 52 reports which were submitted to ASRS between January 1986 – January 1993.

81% involved air carrier jet aircraft and 19% involved air carrier turboprops. The main events reported were:

- takeoff with contaminated wing/tail surfaces in 52% of reports,
- engine damage and/or failure due to ice ingestion,
- aircraft control difficulties, and
- rejected takeoffs.

[4] Report Summary published in NASA ASRS Direct Line – Issue No5, March 1993, written by Robert L. Sumwalt, and available from: http://asrs.arc.nasa.gov/publications/directline/dl5_ice.htm ; last accessed 21.10.2010.

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

- Problems associated with detection of and inspection for ice during pre-flight inspections;
- Problems with ice removal, or the confirmation of successful ice removal after de-icing; and
- Difficulties in confirming that aircraft critical surfaces were free from frozen contamination before takeoff.

The procedural problems observed in 25% of reports included:

- failure of de-icing crews to follow prescribed procedures,
- inadequately designed procedures for de-icing and/or post de-icing checks,
- poor communication between de-icing crews and flight crews,
- improperly prepared de-icing fluids,
- lack of reliable equipment, and
- inadequate staffing levels to conduct de-icing.

Inspections: 25% of the problems noted were the result of difficulties in detecting ice on aircraft wings during pre-flight. Half of these cited the elevated height of wing and tail surfaces as a major factor in ice inspection/detection difficulties. 11% cited ice detection problems such as crews being unable to see ice due to poor lighting conditions, the transparent nature of clear ice, or ice that was otherwise hidden from view. Not being able to reach ice during a tactile wing inspection was also cited. Schedule (time) pressures were also reported as contributing to inadequate inspections.

Ice Removal: 50% of reports mentioned problems with ice removal and/or verification of ice removal. 25% cited problems of ice remaining on aircraft critical surfaces after de-icing was completed. In 12 cases where de-icing was ineffective at removing all the contamination the flight crew relied on the de-icing crew's statement or hand signals that de-icing had been completed, and therefore, failed to verify ice removal for themselves.

Before Takeoff: A quarter of the reports in this study referenced problems with the captain making the determination of a “clean wing”. In the absence of an external pre-take-off contamination check by ground crew, pilots found checking the wings from the cockpit and cabin impossible to accomplish, in many cases due to anti-icing fluid obscuring the view

through windows. Also such a check impacts on flight safety by having a flight-crew member absent from the flight-deck at a critical time immediately prior to line-up and take-off.

Knowledge: Inadequate pilot knowledge also played a significant role in many reports, for example:

- Some pilots were using the “clean-wings” of other aircraft as confirmation of their own clean surfaces
- in 12 reports, pilots viewed the snow/ice on their aircraft surfaces as inconsequential, or that it will blow off during taxi or takeoff.

CRM: This study also highlighted that Crew Resource Management (CRM) can have a valuable application for ground icing situations. In ASRS reports where ground icing problems were identified after the aircraft had left the ramp, it was usually the cabin crew who notified the flight crew of the problem.

Recommendations and Possible Solutions: Management must resolve to help flight crews and de-icing crews by providing them with suitable tools for them to perform their functions properly. These tools are in the form of hardware, such as equipment and supplies, and also such things as well thought-out policies and procedures. Also, a healthy, well-advertised, and consistently practiced corporate philosophy of total commitment to safety is absolutely and positively essential.

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

An additional post-de-icing/anti-icing check can be accomplished by someone other than the de-icing crew. This quality control measure is similar to maintenance practices, where one mechanic performs the work, but final inspection of that work is accomplished by another person.

To increase the likelihood that problems are caught before takeoff, consideration could be given to training cabin crewmembers to recognize wing ice formation. Furthermore, all crewmembers could be taught and encouraged to clearly voice their concerns. (NB: this recommendation has since been implemented through EU OPS).

3.4 NASA ASRS – Summary of Reports 1999 – 2009

The Study Team conducted its own search of the NASA ASRS database using the following criteria:

- between February 1999 – October 2009
- Keywords: [Ice, icing, snow, freezing, deicing, de-icing, antiicing, anti-icing, parked, taxi, take-off].

418 reports were accessed. These were manually filtered to select the 103 events directly connected to the de-icing / anti-icing of aircraft on the ground for commercial air transport and/or involving aircraft typically used for commercial air transport within Europe.

The occurrences recorded include:

- engine stalls due to ice ingestion, and/or fan-blade and inlet contamination
- fan-blade damage
- inappropriate flying control responses during take-off run, and after take-off
- frozen deposits in control surface gaps
- decisions not to de-ice despite contamination visibly present
- ice and snow remaining on aircraft surfaces following the post-treatment “all clear” communication
- ice and snow remaining on aircraft surfaces following pre-take-off contamination checks from the flight deck

The NASA ASRS own analysis allocated the primary causes of the 103 reports as follows:

- Company (Operator) Policy – 38
- Human Factors – 33
- Aircraft – 10
- Ambiguous – 10
- Weather – 8
- Airport – 3
- ATC – 1

There is a variety of contributing factors; however, Company Policy and Human Factors arise in 50% of the reports.

From the summary accounts recorded in each report, the Study Team have made the following deductions:

- On 27 occasions an aircraft was dispatched by the de-icing / anti-icing crew with contamination still on the aircraft surfaces,
- On 19 occasions a flight was conducted with contamination still on, or in, the aircraft,

The following specific elements are highlighted as problem areas in these reports, as follows:

- Operator's Procedures – 49
- Service Provider's Procedures – 38
- Training (including lack of knowledge and skills) –35
- Communications – 30
- Coordination – 28
- Inspections – 25
- CRM – 16
- Aircraft Systems – 11
- Anti-icing Code – 9
- Ground Equipment (GE) – 8
- Collisions (aircraft to GE = 4; GE to aircraft = 4) – 8
- Fluids – 2
- Weather (including Observations) – 2
- Violation – 1

Problems with procedures include:

- poor procedures,
- non-compliance, and
- lack of knowledge.

Clearly, these have an impact on the number of reports involving communication, coordination and inspection errors. Thus, it can be inferred that these events may be occurring due to inadequate training.

3.5 Flight Safety Foundation (FSF) Air Safety Network – Summary of Accident Report 1980 – 2009

A search was made of this publicly available database for accidents connected with de-icing / anti-icing of aircraft on the ground between 1980 and 2009.

It must be noted that during this time, although awareness of the dangers to flight with contaminated aircraft surfaces had increased, the spread of accidents included in the results was unchanged:

- 1980 – 89: 13 events
- 1990 – 99: 13 events
- 2000 – 09: 12 events

Also note that many of the accident aircraft were types not necessarily associated with commercial air transport in Europe today; however, the results do show that if procedures are inadequate, or not followed, and aircraft depart with contaminated surfaces, then the risk of an accident is extremely high.

In the search of the FSF database, 38 accident reports were identified. Of these, the probable cause quoted was the failure to de-ice in 28 cases (74%), although failure to de-ice was evident in 36 cases (95%).

Contributing factors are quoted below:

- 10 (26%) failure to inspect, or inadequate inspection,
- 9 (24%) inappropriate procedures and/or supporting regulations,
- 9 (24%) lack of awareness by pilots, and
- 8 (21%) failure to de-ice (only contributing because other factors were involved such as overweight take-off).

3.6 Confidential Human Factors Incident Reporting Programme (UK)

A search of the CHIRP database was requested for de-icing / anti-icing related events.

10 reports were recovered, spanning January 2004 to October 2010.

Of these, 5 were reported by flight-crew and 5 by cabin-crew.

This is a surprisingly low number of reports, bearing in mind that CHIRP is a confidential repository. One explanation for this might be that there is growing confidence in the effectiveness of in-house company confidential reporting systems, which are very effective and trusted these days, and therefore CHIRP is probably used less often. Nothing

conclusive can be deduced from these search results; however, they do highlight the following problems:

- overriding environmental noise protection measures by airports, resulting in long taxi times to distant runways, when closer runways are physically available, thereby increasing the likelihood of HoTs being breached.
- aircraft taxiing for take-off with contaminated wings, before returning for de-icing
- aircraft departing with frost and ice on the wing without de-icing
- pilots over-ruling cabin crew observations of contamination

4 Conclusions

Most of the accidents and serious incidents summarised above are what may be termed the "top of the triangle". Referring to the Heinrich Triangle (see Options for Change) we can ask ourselves – what about the 600 low-level events for every accident? We just do not know what the situation is concerning these regular slips, errors, oversights, problems, hazards etc that must be visible to the de-icing / anti-icing operatives.

With the advent of ICAO SMS SARPs there can be no denying the facts that are available. It is now the responsibility of everyone involved, through SMS regulations, best-practice safety management, and within a positive safety culture, to collect this data, analyse it and share the results.

This short Summary and Analysis of available safety data provides some guidance as to where effort and safety resources should be directed. Notably, this includes improvements to:

- communication,
- coordination,
- inspections/checks
- procedures,
- adherence to procedures,
- knowledge, and
- training.

These issues may be addressed via:

- the creation of new direct and indirect regulations,
- the provision of clear concise and unique regulatory interpretive and guidance material, or
- an Industry-wide awareness programme and associated voluntary accreditation scheme for operations and training.

The available options are discussed and presented in full detail in Options for Change.

EASA.2009.OP 21

Study on the regulation of ground de-icing and anti-icing services in the EASA Member States

INTERIM REPORT

OPTIONS FOR CHANGE – ATTACHMENT B

References from Regulations and Other Documents

airsight GmbH

Gustav-Meyer-Allee 25
13355 Berlin
Germany
Phone: +49 30 45803177
Fax: +49 30 45803188
www.airsight.

Introduction

This Attachment contains extracts from relevant Regulations, Directives, Standards and Guidelines, which have been used as references within the Interim Report - Options for Change.

Each referenced regulation or document is presented in a standard format, with each excerpt followed by notes and comments in the following order:

- EXCERPT QUOTE FROM DOCUMENT
- NOTES AND EXPLANATION OF RELEVANCE
- POTENTIAL OPTIONS FOR CHANGE
- BRIEF NOTES ON POTENTIAL IMPACTS

The “options” introduced and discussed in the sections below are not recommendations for action; and not all of them have been included in the Options for Change section of this Report.

The “impact” discussions are neither complete nor comprehensive; they are included as a beginning for further discussion, and to assist selection of the most practical options for consideration in the main Report. Full impact assessments will be conducted for any options that are recommended to EASA for consideration within the Final Report. Decisions on which options are viable and acceptable will be made after the Stakeholders’ Representatives’ Briefing at EASA on 6 December 2010. Some options have been omitted from this paper already in order to maintain discussions within what is reasonable.

A full list of reference documents relevant to de-icing / anti-icing is included at Appendix 1 to this document. Immediately below, is a list of those documents used as references in the main Report – Options for Change; and shown in the order they are presented. In particular, where references are made to “proposed” EASA rules, such as Authority Requirements, Operator’s Requirements and Implementing Rules for Operations, the versions used in this Report (and shown in this Attachment) are taken from EASA NPAs 2008-22 and 2009-02. Whilst some of the associated Comment-Response Documents have been recently published, the versions used here remain the originals from the NPAs. This provides a consistent approach and allows the Agency to consider the results of this Study alongside those of other respondents.

Documents Referenced in this Paper

Definition of Terms

(Taken from Council Regulation EEC 3922/91 as amended by 859/2008)

‘certification’ (of a product, service, organization or person) means any form of legal recognition that such a product, service, body or person complies with the applicable requirements. Such certification comprises two acts:

(i) the act of checking that technically the product, service, organization or person complies with the applicable requirements; this act is referred to as ‘making the technical findings’;

(ii) the act of formal recognition of such compliance with the applicable requirements by the issue of a certificate, licence, approval or other document in the manner required by national laws and procedures; this act is referred to as ‘making the legal findings’

‘the Authority’ in EU OPS means the competent authority that has granted the air operator's certificate (AOC).

‘operator’ means a natural person residing in a Member State or a legal person established in a Member State using one or more aircraft in accordance with the regulations applicable in that Member State, or a Community air carrier as defined in Community legislation;

“accepted/acceptable” means not objected to by the Authority as suitable for the purpose intended.

“approved (by the Authority)” means documented (by the Authority) as suitable for the purpose intended.

EC	**Annex III to Reg 3922/91**	**Amended by EC Reg 859/2008**
EU OPS		
Applicability: Direct EC law in Member States: ie it has to be adopted as National Law, and applicable to air operators. Effectively JAR OPS 1 Part 1. Some States have retained JAR OPS 1 Section 2 material as maintained in TGL 44.		
Options: As this is the current set of requirements for operators to comply with, any improvement to the rules contained within would seem the sensible approach; and certainly making recommendations to alter EU OPS is still a valid exercise. However, pending the approaching agreement and publication of EASA Implementing Rules for operators (Part Ops), the better option is to ensure that any recommendations to amend EU OPS are taken into account within Part Ops. Laid out below are options available for amending the text of EU OPS.		
Impact: Amending EU OPS would have little impact, but take considerable effort, which might be better directed at ensuring Part Ops contains any recommendations to improve the regulatory situation vis-à-vis the de-icing / anti-icing of aircraft on the ground.		

Article 7 *Member States shall recognise the certification granted pursuant to this Regulation by another Member State or by a body acting on its behalf, to bodies or persons placed under its jurisdiction and under its authority, who are concerned with the maintenance of products and the operation of aircraft.*
This allows for the transfer of any license, certificate or approval of any service provider from one Member State to any other; promoting a level field for commercial competition.
No options or need to amend this Article.
If licensing, certification, and /or approvals of service providers are recommended, the impacts would need to be considered. For example, whether the issuance of an approval was dependent on location specific criteria such as facilities; such as is usual with audits and

site inspections. In such a case restrictions in the transference of qualification would need to apply.

Article 9

Member States shall take the necessary steps to coordinate their research programmes to improve the safety of civil aircraft and their operation and to inform the Commission thereof. After consulting the Member States, the Commission may take any relevant initiative to promote such national research programmes.

A question for NAAs was included in the Study asking for details of any research being conducted. The responses show that none is being conducted.

There are Options available for any Body (EASA, NAA, Industry) to lobby the Commission to:

- request details of any research being conducted by Member States in the area of de-icing / anti-icing, e.g. fluid properties, HOTs, new technology
- require that those Member States who are conducting research coordinate their efforts to avoid duplication and ensure universal acceptance, and
- take an initiative in promoting a research programme into the relevant aspects of de-icing / anti-icing.

The initial impact on EASA and NAAs is slight. NAAs may need to coordinate, under EASA's facilitation, a process to establish an agenda and a plan; although efforts might be better coordinated through the SAE G-12 working groups and meetings where there is already some NAA involvement and this has the added benefit of involving Industry expertise. However, much research conducted by members of SAE G-12 is voluntary and limited, due to lack of resources. Any ambitious research programme would need funding and adequate facilities.

OPS 1.005

General

(c) Each aeroplane shall be operated in compliance with the terms of its Certificate of Airworthiness and within the approved limitations contained in its Aeroplane Flight Manual.

There is a route to influence what fluids and/or what de-icing / anti-icing procedures

can/cannot be used, via the aircraft manufacturer. It is currently normal that manufacturers indicate that airworthiness is compromised by contamination (eg ice, snow, slush etc) on aircraft surfaces, and it should already be made clear in the AFM whether certain amounts of certain contamination (eg frost) on certain surfaces is acceptable and in compliance with the CoA.
No options or need to change this rule.
EASA has already taken action by requesting specific information from Type Certificate Holders [14 April 2009 PBL/ein/C(1.1) 2009(D)61465] concerning any recommended procedures and limitations for each aircraft type. Aircraft manufacturers have already issued Operational Notices concerning maintenance procedures for preventing and managing fluid residues.

OPS 1.035 **Quality system** *(a) An operator shall establish one quality system and designate one quality manager to monitor compliance with, and adequacy of, procedures required to ensure safe operational practices and airworthy aeroplanes. Compliance monitoring must include a feed-back system to the accountable manager (see also OPS 1.175 (h)) to ensure corrective action as necessary.* *(b) The quality system must include a quality assurance programme that contains procedures designed to verify that all operations are being conducted in accordance with all applicable requirements, standards and procedures.*
It is through this Rule that airlines are obliged to ensure that their own procedures are adequate to ensure airworthy aeroplanes. Furthermore, as well as meeting regulatory requirements, the airline must verify that *all operations* are being conducted in accordance with all applicable standards and procedures. There is no definition or explanation of what these standards and procedures may include. EU OPS has no supporting material, and no mention is made to contracted-out services. Whereas JAR OPS 1, Section 2 used to provide interpretive information (some excerpts below) especially AMC OPS 1.035. 5.1 dealing directly with sub-contractors: **JAA AMC OPS 1.035** *2.3 Purpose of the Quality System*

2.3.1 The Quality System should enable the operator to monitor compliance with JAR-OPS 1, the Operations Manual, the Operator's Maintenance Management Exposition, and any other standards specified by that operator, or the Authority, to ensure safe operations and airworthy aircraft.

This gives the Regulatory Authority the power to specify standards of de-icing / anti-icing, and one assumes to then allow, for example, AEA Recommendations as AMC? Similarly, if the airline (operator) should opt to follow the AEA Recommendations and make it a requirement, then a functional Quality System should assure that these standards are achieved and maintained.

2.4.4.c. The Quality Manager should have access to all parts of the operator's and, as necessary, any sub-contractor's organisation.

4.2.2.b. Typical subject areas for quality inspections are Ground De-icing/Anti-icing;

It is not made clear here whether this applies to the airline's own procedures or those of a sub-contractor.

5.1 Sub-Contractors

5.1.1.a. Operators may decide to sub-contract out certain activities to external agencies for the provision of services related to areas such as Ground De-icing/Anti-icing;

5.1.2 The ultimate responsibility for the product or service provided by the sub-contractor always remains with the operator. A written agreement should exist between the operator and the sub-contractor clearly defining the safety related services and quality to be provided. The sub-contractor's safety related activities relevant to the agreement should be included in the operator's Quality Assurance Programme.

5.1.3 The operator should ensure that the sub-contractor has the necessary authorisation / approval when required and commands the resources and competence to undertake the task. If the operator requires the sub-contractor to conduct activity which exceeds the sub-contractor's authorisation/approval, the operator is responsible for ensuring that the sub-contractor's quality assurance takes account of such additional requirements.

Regardless of whether a service provider is authorised (licensed/certificated) and/or approved, the operator is still responsible for ensuring its procedures are followed and standards maintained. This is achieved through writing an effective agreement (contract),

conducting quality inspections and audits, attaining feedback, and then assuring remedial action is undertaken to rectify any deviations.
There are options for EASA to propose amendments to EU OPS such that clear direction concerning sub-contracted services is addressed. However, the Agency has already indicated (NPA 2009 – 02a) that it supports the use of the existing JAR OPS 1 section 2 material, as issued through JAA TGL 44, until such time as it releases its own operations regulations and supplementary material. This issue is addressed through the proposed AMC to OR.GEN.205.
Amending EU OPS would be a wasted effort due to its projected short life expectancy. Any effort would be better focused on ensuring EASA Part Ops met any desired requirements to improve performance. Therefore any recommendations to change EU OPS also need to consider the proposed EASA OPS regulations.

OPS 1.037

Accident prevention and flight safety programme

(a) An operator shall establish and maintain an accident prevention and flight safety programme, which may be integrated with the quality system, including:

1. programmes to achieve and maintain risk awareness by all persons involved in operations; and

2. an occurrence reporting scheme to enable the collation and assessment of relevant incident and accident reports in order to identify adverse trends or to address deficiencies in the interests of flight safety. The scheme shall protect the identity of the reporter and include the possibility that reports may be submitted anonymously; and

3. evaluation of relevant information relating to accidents and incidents and the promulgation of related information, but not the attribution of blame; and

4. a flight data monitoring programme for those aeroplanes in excess of 27 000 kg MCTOM. Flight data monitoring (FDM) is the pro-active use of digital flight data from routine operations to improve aviation safety. The flight data monitoring programme shall be non-punitive and contain adequate safeguards to protect the source(s) of the data; and

5. the appointment of a person accountable for managing the programme.

(b) Proposals for corrective action resulting from the accident prevention and flight safety programme shall be the responsibility of the person accountable for managing the

programme. (c) The effectiveness of changes resulting from proposals for corrective action identified by the accident and flight safety programme shall be monitored by the quality manager.
This Regulation is very much "interpreted" to be aimed at the operator, and personnel employed by the operator, and it is not clear that it extends to sub-contracted service providers and their personnel. Also this regulation has an emphasis on *accident* and *incident* reports, and not on safety data per se (of the type associated with Human Factors that might be appropriate to de-icing / anti-icing operatives). The supplementary information contained within JAA ACJ OPS 1.037(a)(2) does not expand on this emphasis and does not improve interpretation of the Regulation.
Amending this Regulation to address the need for operators to collect safety data from subcontracted service providers and their personnel would make it clear that this is required (and beneficial). The inclusion of ICAO SMS Standards within Part Ops may achieve this task. Providing expanded and more explicit explanatory, and/or supplementary material may help operators interpret and follow the requirements.
A broadening of operators' safety focus, the integration of sub-contracted service providers, and the provision of more explanatory material within operators' SMS's will have a positive impact on safety.

OPS 1.175 (i) **General rules for air operator certification** *The operator must have nominated post holders, acceptable to the Authority, who are responsible for the management and supervision of the following areas:* *1. flight operations;* *2. the maintenance system;* *3. crew training; and* *4. ground operations.* **Appendix 2 to OPS 1.175**

The management and organisation of an AOC holder

(a) General

An operator must have a sound and effective management structure in order to ensure the safe conduct of air operations. Nominated post holders must have managerial competency together with appropriate technical/operational qualifications in aviation.

(b) Nominated post holders:

1. A description of the functions and the responsibilities of the nominated post holders, including their names, must be contained in the Operations Manual and the Authority must be given notice in writing of any intended or actual change in appointments or functions.

2. The operator must make arrangements to ensure continuity of supervision in the absence of nominated post holders.

3. A person nominated as a post holder by the holder of an AOC must not be nominated as a post holder by the holder of any other AOC, unless acceptable to the Authorities concerned.

4. Persons nominated as post holders must be contracted to work sufficient hours to fulfil the management functions associated with the scale and scope of the operation.

(c) Adequacy and supervision of staff:

2. Ground Staff

(i) The number of ground staff is dependent upon the nature and the scale of operations. Operations and ground handling departments, in particular, must be staffed by trained personnel who have a thorough understanding of their responsibilities within the organisation.

(ii) An operator contracting other organisations to provide certain services retains responsibility for the maintenance of proper standards. In such circumstances, a nominated post holder must be given the task of ensuring that any contractor employed meets the required standards.

This Regulation details the need for the operator to appoint a nominated post-holder whose responsibilities implicitly include ensuring that sub-contracted de-icing / anti-icing service providers meet the required standards. Which nominated post-holder is not specified (operators may choose either the flight or ground operations nominated post-holders). JAA ACJ OPS 1.175(i) does not insist on any requirements for knowledge or experience of de-icing / anti-icing amongst its nominated post-holders. Furthermore, this Regulation only requires ground staff to have a thorough understanding of their responsibilities and not

necessarily the technical complexities of sub-contracted services.
Requiring operators to nominate one single person as their de-icing / anti-icing "coordinator/expert/post-holder" may improve communication between all departments, and also with the NAA. The results of our Study show that de-icing / anti-icing experience and knowledge within operators' organisations are fragmented, and therefore one assumes the decision-making process on matters concerning de-icing / anti-icing is not efficient. Providing more detailed supporting information detailing the roles and responsibilities of nominated post-holders may also have the same effect.
The act of nominating a focal-point, any necessary in-house training, and any subsequent establishment of new procedures can all be achieved within the existing management organisation; however, the benefits derived from improved coordination, communication and awareness could be substantial.

OPS 1.175 (m) **General rules for air operator certification** *The operator must arrange appropriate ground handling facilities to ensure the safe handling of its flights.*
This is more like an Essential Requirement, high level regulation, than an Implementing Rule. There is no expansion or explanation, however, accepting de-icing / anti-icing as a ground-handling operation, this Regulation would apply. In practice the de-icing / anti-icing facilities are often owned and managed by the aerodrome management, which is often separate from the de-icing / anti-icing service provision. Therefore, this requirement will need to be met by the operator through the quality system oversight of both aerodromes and service providers.
The Regulation could be amended to state that *the operator must ensure through the quality system etc*, this is merely cosmetic, but it would be appropriate. Otherwise, far more detailed information could be given to explain to operators exactly what is required, both in the Rule and as supporting information.
No great positive or negative impact to be made from these options.

OPS 1.205 **Competence of operations personnel**

An operator shall ensure that all personnel assigned to, or directly involved in, ground and flight operations are properly instructed, have demonstrated their abilities in their particular duties and are aware of their responsibilities and the relationship of such duties to the operation as a whole.

ACJ OPS 1.205

Competence of Operations personnel

If an operator employs Flight Operations Officers in conjunction with a method of Operational Control as defined in JAR-OPS 1.195, training for these personnel should be based on relevant parts of ICAO Doc 7192 D3. This training should be described in Subpart D of the Operations Manual. It is not to be inferred from this that there is a requirement for Licensed Flight Dispatchers or for a flight following system.

This Rule complements Appendix 2 OPS 1.175 (c)(2)(i) shown above, and adds the need for training and ability as well as just knowledge of responsibilities.

There is an option here to specify in detail, within the training requirements for flight operations/dispatch staff, elements of de-icing / anti-icing.

During this Study it has become apparent how critical the operators' flight operations departments can be in either contributing or hindering de-icing / anti-icing operations, through their role as a communication hub between the service provider, aerodrome and flight crews. Specifying in-house training requirements for flight operations/dispatch staff in de-icing / anti-icing matters may improve safety at very little cost.

OPS 1.210

Establishment of procedures

(a) An operator shall establish procedures and instructions, for each aeroplane type, containing ground staff and crew members' duties for all types of operation on the ground and in flight.

(b) An operator shall establish a check-list system to be used by crew members for all phases of operation of the aeroplane under normal, abnormal and emergency conditions as applicable, to ensure that the operating procedures in the Operations Manual are followed.

This is clear and precise and should include de-icing / anti-icing operations and apply to both flight crew and flight operations/dispatch staff.

There is an option to provide supporting information to detail specifically what these duties may be concerning de-icing / anti-icing operations.
Providing supporting material would be useful in reinforcing the need for operators to play their role in ensuring safe de-icing / anti-icing operations. Although, to do so here may duplicate the requirement of OPS 1.345, shown below.

OPS 1.290 (b) 1. **Flight preparation** The commander shall not commence a flight unless he/she is satisfied that the aeroplane is airworthy. OPS 1.345(b) A commander shall not commence take-off unless the external surfaces are clear of any deposit which might adversely affect the performance and/or controllability of the aeroplane except as permitted in the Aeroplane Flight Manual.
These Rules complement each other: one general and the other specific.

OPS 1.345 **Ice and other contaminants — ground procedures** *(a) An operator shall establish procedures to be followed when ground de-icing and anti-icing and related inspections of the aeroplane(s) are necessary.* **ACJ OPS 1.345** **Ice and other contaminants Procedures** Too large to include here. This supporting material is very broad and includes: background educational material; requirements for operators' procedures; maintenance considerations; and, training recommendations. The content is good (based on current best-practices), however, because of its range of subjects and mix of requirements, recommendations and background information it is not perfectly clear, nor necessarily helpful to operators in establishing their procedures. The final section is included here because of its relevance: *10. Subcontracting (see AMC OPS 1.035 sections 4 and 5)*

The operator should ensure that the subcontractor complies with the operator's quality and training/qualification requirements together with the special requirements in respect of:

a. De-icing and/or anti-icing methods and procedures;

b. Fluids to be used, including precautions for storage and preparation for use;

c. Specific aeroplane requirements (e.g. no-spray areas, propeller/engine de-icing, APU operation etc.);

d. Checking and communications procedures.

Ostensibly this Rule together with the associated supporting material and one of the better reference documents (AEA Recommendations) should be enough for an operator to establish suitable and safe procedures appropriate to all personnel involved and covering all aspects of de-icing / anti-icing operations, including contingency procedures. However, there is no link to an "acceptable" set of procedures, nor a standard template for both procedures and training syllabus. Furthermore, there is no direct requirement for an operator to establish coordination and communication procedures between flight operations, flight crew, aerodromes and service providers, adequate for all their destinations.

1. It is an option to review the supporting material and re-present it in more easily digestible chunks; this would also allow for a division of what is definitely required and what is recommended as well as the expected (or demanded) minimum standards acceptable. This is partially proposed in AMC.2.OPS.GEN.100.
2. A template for operators' procedures could be included.
3. Another option would be for each operator's de-icing / anti-icing procedures to be accepted/approved by the Authority: option 2 would also then be required.
4. A strong connection can be made here towards OPS 1.175, 1.205 and 1.210 to emphasise that procedures are required for ground staff and also to highlight the nominated post-holder's responsibilities.
5. A requirement can be added to ensure that operators develop and use adequate coordination and communication procedures that are effective at all their destinations where de-icing / anti-icing is undertaken.
6. A connection can also be made to OPS 1.037 to emphasise the need for operators to improve the collection (and analysis) of occurrence and human factors reports from de-icing / anti-icing service providers; and this element may need to be included in any contracts.

1. The impact would be a clarification and perhaps a move towards more standardisation; the process would allow for further progress in other areas of de-icing / anti-icing if it involved industry expertise.
2. This is easily included in option 1, and it would further increase the move towards standardisation (from the operators' point of view).
3. Likely to incur more work for both operators and NAAs, and also some cost in NAA manpower. This will further motivate operators to standardise their procedures and also NAAs to demand this.
4. As this is reinforcing already existing Rules there should be no effort required, but it may ensure better coordination and communication between flight operations, ground staff, flight crew, aerodromes, and service providers.
5. Creating more procedures and training will require time and effort, however, it should ensure better coordination and communication between flight operations, ground staff, flight crew, aerodromes, and service providers.
6. This would be of great benefit, as currently very little safety data is collected and analysed on the occurrences that de-icing / anti-icing operatives encounter.

OPS1.420
Occurrence Reporting

This Rule covers the need for the operator's employees to file occurrence reports, but does not cover the need to encourage sub-contractors to file reports. No mention is made of human factors reporting.

Reinforcement of OPS 1.037 could be made here by requiring operators to establish the procedures by which third-parties can file occurrence reports, and the need for the operator to promote this.

Little effort required; the clause can be inserted when contracts are renewed, but before then voluntary schemes may develop alongside safety awareness programmes. These programmes can be delivered at the same time as operator specific requirements for de-icing / anti-icing are delivered. The result should be: directly – an increase in safety data available for analysis; and indirectly – greater safety awareness and improved culture amongst service providers.

OPS 1.625

Mass and balance documentation

(See Appendix 1 to OPS 1.625)

(a) An operator shall establish mass and balance documentation prior to each flight specifying the load and its distribution. The mass and balance documentation must enable the commander to determine that the load and its distribution is such that the mass and balance limits of the aeroplane are not exceeded. The person preparing the mass and balance documentation must be named on the document. The person supervising the loading of the aeroplane must confirm by signature that the load and its distribution are in accordance with the mass and balance documentation. This document must be acceptable to the commander, his/her acceptance being indicated by countersignature or equivalent. (See also OPS 1.1055 (a)12).

(b) An operator must specify procedures for last minute changes to the load.

(c) Subject to the approval of the Authority, an operator may use an alternative to the procedures required by paragraphs (a) and (b) above.

This Rule is included because of the similarities with de-icing / anti-icing in respect of the effect on airworthiness if the task of loading is incorrectly carried out, and the fact that loading and the creation of the documentation is often conducted by sub-contracted service providers.

It is conceivable that a similar regulation for de-icing / anti-icing could be proposed. That is, any documentation and/or communication passed from the de-icing / anti-icing service provider to the operator and/or captain, must enable the captain to determine an accurate holdover time and that the aircraft is free of contamination.

If operators want to use alternative procedures, then they would be required to seek Authority approval.

Details of the anti-icing code can be placed in an Appendix.

This would confirm that the anti-icing code has a specific purpose, and that service providers, flight crew and flight operations were all interpreting the code in the same way: thus eliminating confusion as to the meaning of the code. Operators would have to amend contracts in order to ensure that service providers were aware of their post de-icing / anti-icing inspection and communication responsibilities.

OPS 1.873

Electronic navigation data management

(a) An operator shall not use a navigation database which supports an airborne navigation application as a primary means of navigation unless the navigation database supplier holds a Type 2 Letter of Acceptance (LoA) or equivalent.

(b) If the operator's supplier does not hold a Type 2 LoA or equivalent, the operator shall not use the electronic navigation data products unless the Authority has approved the operator's procedures for ensuring that the process applied and the delivered products have met equivalent standards of integrity.

(c) An operator shall not use electronic navigation data products for other navigation applications unless the Authority has approved the operator's procedures for ensuring that the process applied and the delivered products have met standards of integrity acceptable for the intended use of the data.

(d) An operator shall continue to monitor both the process and the products according to the requirements of OPS 1.035.

(e) An operator shall implement procedures that ensure timely distribution and insertion of current and unaltered electronic navigation data to all aircraft that require it.

Agency Opinion 01/2005

On the acceptance of navigation database suppliers

In the Agency's view the best solution would certainly be that the industry organizes itself to verify the quality of the navigation data provided by the suppliers and used by the aircraft operators. Such an option, similar to that developed by IATA for the operational safety audit of its member airlines (IOSA).

In line with the above policy a stand-alone document is produced which will be used for the investigation of navigation database suppliers in Europe and, after satisfactory results, for the issuance of a letter of acceptance (LoA). This document consists of "Conditions" and "Guidance". Finally, to facilitate the work of the investigation team and to allow for a better preparation by the organisation to be assessed, a compliance checklist in line with the above document is provided. The letter of acceptance does not constitute a mandatory requirement since it is not a mandatory certification attesting compliance with a binding act. The letter of acceptance will not attest that the data produced by these organisations can be used by operators, but

that the organisation has put in place an appropriate quality system for the control of the processing of data. This will ease the obligation on the operator to do the same control and facilitate the issuing by the national competent authorities of the approval for the operators to fly in dedicated airspace where reduced separations are implemented.

There is no obligation on operators to buy their data only from organisations holding the letter of acceptance. Operators can either make the verifications themselves or use another competent organisation for this purpose and convince directly their responsible authority that they can be allowed to fly in P-RNAV airspace. The decision whether or not to apply for an EASA letter of acceptance is therefore entirely up to the navigation database supplier concerned. However, by applying, the organisation automatically declares to accept all the obligations that are linked to the letter of acceptance and which are described in the applicable conditions and guidance material. On the other hand the issuance of a letter of acceptance does not give any rights to its holder except the confirmation by the Agency that the organization concerned is in compliance with the applicable and published conditions and guidance.

This Rule is included here because of the similarity with de-icing / anti-icing in respect of the critical nature of the navigation data and the consequences if it is in error, and also the reliance of the operator on a third-party to provide such data.

Also EASA has an opinion and found a solution to a similar problem as that of de-icing / anti-icing; within this solution is the tacit acceptance of pooled auditing of service providers by Industry.

It may be possible for EASA to form an Opinion on the use of pooled auditing of de-icing / anti-icing service providers as an acceptable means of complying with OPS 1.035. Such audits can be based on a checklist which is derived from a document containing “conditions” and “guidance”. Such a document could be derived by the Industry, such as AEA Recommendations, backed up with a checklist such as the DAQCP audit.

Due to the multitude of de-icing / anti-icing service providers compared with database suppliers a solutions would need to be found to “qualify and license” Industry auditors to ensure that the “acceptance” process of service providers was standardised.

The DAQCP currently operates from the airline membership perspective and involves only those destinations and service providers with whom member airlines have business. It may be necessary for a universal scheme to consider membership from the service providers

perspective, where they pay a fee, but member airlines continue to provide the auditors.

It is possible that conditions may be placed on operators who use service providers who have not been “accepted” under such a scheme.

The attraction of reducing the number of required audits of service providers by operators may encourage more operators to join the scheme. The attraction for service providers of having, effectively, only one or two audits per year may encourage them to request auditing under this scheme. The system should be self-funding and indeed provide some economic gain. As membership of the scheme increases then the Industry will move closer to a universal standard.

There is no coercion or mandatory requirement, however, for those service providers who apply for the scheme they would be committed to accept the obligations outlined in any supporting documentation: this can contain procedures, quality assurance, training, documentation, equipment etc.

OPS 1.945
Conversion training and checking

Appendix 1 to OPS 1.945
Operator’s conversion course

(a) An operator’s conversion course shall include:

1. ground training and checking including aeroplane systems, normal, abnormal and emergency procedures;

2. emergency and safety equipment training and checking which must be completed before aeroplane training commences;

3. aeroplane/flight simulator training and checking; and

4. line flying under supervision and line check.

(b) The conversion course shall be conducted in the order set out in subparagraph (a) above.

(c) Elements of crew resource management shall be integrated into the conversion course, and conducted by suitably qualified personnel.

(d) When a flight crew member has not previously completed an operator’s conversion course, the operator shall ensure that in addition to subparagraph (a) above, the flight crew

member undergoes general first aid training and, if applicable, ditching procedures training using the equipment in water.

AMC OPS 1.945

Conversion Course Syllabus

There is no mention in the JAA supporting material, either, of de-icing / anti-icing being part of the ground training syllabus.

Appendix 1 to OPS 1.965(a)1.(i)(B)

Recurrent training and checking — Pilots

Recurrent training shall comprise ground and refresher training; the ground and refresher training programme shall include operational procedures and requirements including ground de-/anti-icing.

These Rules explain the stages and content of an operator's conversion course for pilots, and also the recurrent training syllabus. No mention is made of the operator's de-icing / anti-icing policy, procedures and contracts within the conversion course; however, there is a reference to de-icing / anti-icing in the recurrent training programme. For both elements of training it is required that elements of CRM are integrated into the course.

It is possible to ensure that flight crew learn and understand the operators de-icing / anti-icing policy and procedures before commencing line flying, by making this a requirement of a conversion course. Emphasis can then be placed on the use of CRM to overcome communication and coordination problems that typically arise during winter operations (OPS 1.943).

There should be a positive impact from introducing this option, as pilots are guaranteed to be exposed to the operator's de-icing / anti-icing policy and procedures earlier and perhaps have time to study it in more depth. Any re-emphasis to address CRM issues during winter operations would help towards more positive outcomes during problems with communication and coordination during winter operations.

Appendix 1 to OPS 1.1045 A 8

Operations Manual Contents

An operator shall ensure that the Operations Manual contains the following:

8.2.4 De-icing and anti-icing on the ground. A description of the de-icing and anti-icing policy and procedures for aeroplanes on the ground. These shall include descriptions of the types

and effects of icing and other contaminants on aeroplanes whilst stationary, during ground movements and during take-off. In addition, a description of the fluid types used must be given including: *(a) proprietary or commercial names;* *(b) characteristics;* *(c) effects on aeroplane performance;* *(d) hold-over times; and* *(e) precautions during usage.*
This short paragraph contains very little guidance, and focuses on one element (fluid types) but omits many others. The de-icing /anti-icing policy and procedures are not one of the OM contents that requires specific approval by the Authority (JAA IEM OPS 1.1040(b)); instead the operator only has to ensure that the detailed structure of the Operations Manual is acceptable to the Authority (OPS 1.1045).
It is an option to revise this Appendix and include other elements, such as: the operator's communication and coordination procedures (for de-icing / anti-icing); the anti-icing code; inspection and checking procedures; re-assessment of HOT in changing conditions; affect of re-hydrated fluid residues on flying control surfaces; and contents of the operator's standard contract for de-icing / anti-icing etc.
Revision of the OM contents for de-icing / anti-icing may have the effect of operators reviewing their procedures (especially if the revision is in conjunction with other regulatory changes); this may then have the effect of the revision of training programmes and awareness campaigns. Raised awareness and more valuable information available in the OM will be good for safety.

OPS 1.1145 **Dangerous Goods - General** *An operator must comply with the applicable provisions contained in the latest effective edition of the Technical Instructions for the Safe Transport of Dangerous Goods by Air, including the Supplement and any addenda, approved and published by decision of the Council of the International Civil Aviation Organisation (ICAO Doc 9284–AN/905).*
This paragraph is included as an example of how an EU (EASA) Regulation can be linked to an ICAO Document making the ICAO Document binding. Although ICAO Doc 9640 is

neither comprehensive nor practical, it may be a long-term goal of Industry and NAAs to lobby ICAO to update this Document such that it can become a world-wide standard for both EASA and the FAA (for example) to refer their own regulations towards.
The impact would be a single-source (and accepted) reference document from which operators would develop their procedures; this would lead to greater consistency and more standardised procedures.

ICAO	Annex 6	8 Edition, Amendment 30
OPERATION OF AIRCRAFT – Part 1 – International Commercial Air Transport - Aeroplanes		
Applicability: Minimum Standards applicable to the operation of aeroplanes by operators authorized to conduct international commercial air transport operations. Applied indirectly through States – has been achieved Nationally through Cyprus Agreement to comply with JAR OPS (no guarantee) and now through EC Reg 3922/91 – EU OPS. This is the ICAO source requiring operators to take responsibility for ensuring that "appropriate de-icing / anti-icing treatment" is given and that the aeroplane is "kept in an airworthy condition prior to take-off". EU OPS complies with this through OPS 1.035 and OPS 1.345.		
Options: There is no option to amend Annex 6 in the short term, and without widespread support from NAAs and Industry it is unlikely to happen in the medium and long terms either. However, EASA and NAAs can review Annex 6, in conjunction with ICAO Doc 9640, and reinterpret how best to comply with the Standards and Recommended Procedures, in light of current day knowledge of best-practice. The opportunity is presented for EASA as they develop Implementing Rules and supplementary material for Operations.		

3.2 Safety management (and 8.7.3)

3.2.1 States shall establish a safety programme in order to achieve an acceptable level of safety in the operation of aircraft.

3.2.2 The acceptable level of safety to be achieved shall be established by the State(s) concerned.

Note.— Guidance on safety programmes is contained in the Safety Management Manual (SMM) (Doc 9859), and the definition of acceptable levels of safety is contained in Attachment E to Annex 11.

3.2.4 From 1 January 2009, States shall require, as part of their safety programme, that an

operator implement a safety management system acceptable to the State of the Operator that, as a minimum: *a) identifies safety hazards;* *b) ensures that remedial action necessary to maintain an acceptable level of safety is implemented;* *c) provides for continuous monitoring and regular assessment of the safety level achieved; and* *d) aims to make continuous improvement to the overall level of safety.* *3.2.5 A safety management system shall clearly define lines of safety accountability throughout the operator's organization, including a direct accountability for safety on the part of senior management.*
Most EASA Member States, and operators, have not yet changed their management of safety from the mechanisms of accident prevention that comply with OPS 1.037 and overseen by the quality system according to OPS 1.035. This SARP allows the NAA to be more precise about what is required as part of an operator's safety programme. The key element is the introduction of safety performance measurement, monitoring and improvement.
It is an option, when EASA takes up this SARP within Part Ops, to include specific references to different areas of operation, including de-icing / anti-icing. This may form part of an operator's de-icing / anti-icing policy and procedures (OPS 1.345 and OPS 1.1045) to define with respect to de-icing / anti-icing operations: - examples of typical hazards, - ways and means of taking preventive action to reduce risk (procedures, contracts, fluids, training etc) - ways and means of taking remedial action, - how the safety level is to be monitored and assessed on a regular basis (includes the collection of safety and human factors data from the service providers), - what the key safety goals are, - who is in overall "charge" of the de-icing / anti-icing process (Doc 9640), who provides the information that the aircraft is free from contamination, what are the

pilots responsibilities, and which post-holder is responsible for the policy, procedures and programme?

It is also an option for States, either unilaterally or in unison with EASA, to conduct a Safety Initiative, commencing with a promotion for the collection of more safety data from the service providers.

The impact from adopting these options would be positive from the safety perspective, in the short and medium term respectively. Operators would need to "show" how they intend to improve levels of safety within their de-icing / anti-icing operations. Naturally this will take effort, however, a NAA/EASA led initiative would ease the burden and also improve the chances for harmonisation of effort and the results attained.

4.2.2 Operations manual

4.2.2.1 An operator shall provide, for the use and guidance of operations personnel concerned, an operations manual in accordance with Appendix 2. The operations manual shall be amended or revised as is necessary to ensure that the information contained therein is kept up to date. All such amendments or revisions shall be issued to all personnel that are required to use this manual.

4.2.2.2 The State of the Operator shall establish a requirement for the operator to provide a copy of the operations manual together with all amendments and/or revisions, for review and acceptance and, where required, approval. The operator shall incorporate in the operations manual such mandatory material as the State of the Operator may require.

Appendix 2 Operations Manual

2. Contents

The operations manual referred to in 1.1 and 1.2 shall contain at the least the following:

2.1.9 Ground handling arrangements and procedures.

2.1.15 Instructions for the conduct and control of ground de-icing/anti-icing operations.

Doc 9640

NAA - Responsibilities

The regulatory authority ensures that every operator shall have an approved de-

icing/anti-icing programme or procedures.

The de-icing/anti-icing programme shall:

- *clearly define areas of responsibility for the operator*
- *cover all locations within the operator's route network including de-icing/anti-icing accomplished by subcontract..*

All persons involved in ground de-icing/anti-icing activities shall be trained and qualified in the procedures, communications and limitations of their area of responsibility.

This SARP is complied with in OPS 1.1045 (OM), however, ICAO recommends (Doc 9640) that the operator's de-icing / anti-icing programme, or procedures, is "approved" by the NAA. There is special focus on responsibilities and training. Attachment F to Annex 6 Part 1 (AOC & Validation) does not include de-icing / anti-icing as an item that needs Authority "approval" (para 3.3); it refers only to the contents of the OM as requiring "acceptance" through a technical evaluation.

4.3.2 *The State's technical evaluation should, in addition to ensuring that all required contents are addressed, consider if the specific policies and procedures would result in the desired outcome.*

It can be deduced that an Authority's technical evaluation must consider whether the operator's policy and procedures would work at all of the operator's destinations where de-icing / anti-icing is expected. Therefore this evaluation is dependant on the facilities, procedures and equipment available at each location; making the evaluation dependant on aerodrome management and/or service providers.

It is an option for NAAs/EASA to amend their regulations to conform with Annex 6 as interpreted by Doc 9640, and use an approval process for operator's de-icing / anti-icing programmes, or procedures.

Also, another option would be to limit the approval to particular elements of the programme, in particular the training syllabus and methods, and responsibilities of all those involved. This could be extended to the contents of contracts with service providers.

An alternative would be for NAAs/EASA to specify (through means of an AMC) the contents of an operator's de-icing / anti-icing programme, and the standards to be achieved; then any operator wishing to deviate from this would need an approval.

The problem remains as to whether the operator's policy and procedures/programme is applicable and viable to all of the operator's destinations. One solution would be for a universal audit programme to be used by all operators, acceptable to NAAs/EASA, and

applied to all service providers.

Both the first two options would incur effort on the part of the NAAs; the amount of effort will depend on the mandatory elements and detail required for approval. There is no guarantee for harmonisation using the full approval method unless NAAs/EASA define carefully each element and the standards required.

The third option would result in less effort from NAAs and more likelihood of harmonisation amongst operators.

Flight preparations – Weather Conditions

4.3.5.4

A flight to be planned or expected to operate in suspected or known ground icing conditions shall not take off unless the aeroplane has been inspected for icing and, if necessary, has been given appropriate de-icing/anti-icing treatment. Accumulation of ice or other naturally occurring contaminants shall be removed so that the aeroplane is kept in an airworthy condition prior to take-off.

Note.— Guidance material is given in the Manual of Aircraft Ground De-icing/Anti-icing Operations (Doc 9640).

OPS 1.345

Ice and other contaminants — ground procedures

(a) An operator shall establish procedures to be followed when ground de-icing and anti-icing and related inspections of the aeroplane(s) are necessary.

(b) A commander shall not commence take-off unless the external surfaces are clear of any deposit which might adversely affect the performance and/or controllability of the aeroplane except as permitted in the Aeroplane Flight Manual.

This SARP is covered by OPS 1.345, which inherently (but not clearly) covers also post de-icing / anti-icing inspections and pre-take-off contamination checks, which the SARP does not.

An option would be to expand on this SARP and include in NAA/EASA regulations a clear requirement for both pre and post-de-icing / anti-icing checks/inspections, as well as other checks/inspections whenever doubt exists concerning the state of the external surfaces.

This could be expanded upon by requiring the operator's de-icing / anti-icing procedures to specifically include details of check/inspection procedures together with the coordination and communication processes to cater for all variations of location, equipment and contract that the operator currently is exposed to.

The impact of this would be to ensure that operators have considered the problems that exist for service providers, ground-crew and flight-crew when checks/inspections are required, and how various means of communication make the coordination of this difficult (if not impossible). Thus resulting in remedial and preventive action being taken and flight-crew being supported through firm procedures and clear management decision processes.

Duties of Flight Operations Officer/Flight Dispatcher

4.6.1

A flight operations officer/flight dispatcher in conjunction with a method of control and supervision of flight operations in accordance with 4.2.1.4 (issue of AOC) shall:

a) assist the pilot-in-command in flight preparation and provide the relevant information;

10.3 Flight Operations Officer/Flight Dispatcher

A flight operations officer/flight dispatcher shall not be assigned to duty unless that person has:

a) satisfactorily completed an operator-specific training course that addresses all the specific components of its approved method of control and supervision of flight operations specified in 4.2.1.4;

c) demonstrated to the operator a knowledge of:

1) the contents of the operations manual described in Appendix 2;

2) the radio equipment in the aeroplanes used; and

3) the navigation equipment in the aeroplanes used;

d) demonstrated to the operator a knowledge of the following details concerning operations for which the officer is responsible and areas in which that individual is authorized to exercise flight supervision:

1) the seasonal meteorological conditions and the sources of meteorological information;

2) the effects of meteorological conditions on radio reception in the aeroplanes used;

3) the peculiarities and limitations of each navigation system which is used by the operation; and

4) the aeroplane loading instructions;

e) demonstrated to the operator knowledge and skills related to human performance relevant to dispatch duties; and *f) demonstrated to the operator the ability to perform the duties specified in 4.6.*
These SARPS do not adequately deal with the need for operations personnel to have a good understanding of the operator's de-icing / anti-icing programme, together with the necessary coordination and communication procedures that may be required. They only require that officers/dispatcher have knowledge of de-icing / anti-icing procedures as a content of the OM. Whereas for example, a knowledge of the loading instructions must be "demonstrated" to the operator. This inadequacy is also reflected in OPS 1.205, where no mention is made concerning de-icing / anti-icing.
The only option would be for a review of OPS 1.25 and any related EASA Part Ops regulations for the responsibilities and content of training programmes for operations personnel and dispatch staff.
Ensuring that all operators employ and train operations personnel and dispatch staff adequately in the procedures for de-icing / anti-icing operations – especially coordination and communication, will impact positively on aircraft dispatch during winter operations by ensuring that decision-making is based on sound knowledge.

EASA	NPA 2009 – 02a	Under Review following CRD
Implementing Rules for Air Operations of Community Operators - **Explanatory Note and Appendices**		
Applicability: The first of seven separate NPAs aimed at developing an Opinion on the Implementing Rules for Air Operations of Community Operators and a Decision on the related Acceptable Means of Compliance (AMC) and Guidance Material (GM). The scope of this rulemaking activity is outlined in the Terms of Reference (ToR) OPS.001 and is described in more detail below. This particular NPA provides an explanation of the contents of the other 6 by means of an introduction.		
Options: For all elements of this NPA 2009 – 02, there may be time and motivation to include, in the first publication, amendments related to improving the standard of de-icing / anti-icing, through operators' procedures and programmes, and also through the requirements for Authorities. Otherwise, amendments can be proposed after publication of the Implementing Rules for Operations and Authority Requirements.		
Impact: Any changes to these proposed regulations and associated supporting material will be immediately applicable on publication of the rules (pending any legal or practical periods allowed for adjustment).		

A.IV. Contents of draft Opinions and Decisions

Para 14: The intention is to retain elements and spirit of JAR OPS 1 Section 2 material as extant in JAA TGL 44; thus allowing the better elements of ACJ 1.345 to be maintained.

Para 21: Implementing Rules are to reflect state of the art and best practices in the field of operations; therefore reference is valid to the most respected and used documents such as AEA Recommendations.

Para 44: *Subpart D of Part OPS, OPS.SPA, contains requirements for specific operations that require a specific approval*. Thus giving a vehicle to include de-icing / anti-icing as a special approval operation, such as the transport of dangerous goods.

Para 56: *To maintain the necessary level of flexibility it is imperative that only essential*

safety elements are contained in the rule, leaving nonessential implementation aspects to CS or AMC, so as to provide for a sufficient flexibility as required by the principle of subsidiarity. Such is the fundamental reason for the 'performance based approach' to rulemaking that the Agency has followed. Careful thought must be given to the essential aspects of de-icing / anti-icing regulation; allowing too much flexibility in interpreting the rules will harm the aim of harmonization.

Para 67: The Agency wishes make use of as many AMCs as possible by encouraging industry to promote their best-practices for that cause. This opens the way for inherent acceptance of, for example, the AEA Recommendations to be amended and adopted as AMC material.

Appendix 1 para 9: *On 31 July 2007, the Agency published the Advance Notice of Proposed Amendment (ANPA) 200711 to consult stakeholders on appropriate measures to be taken to address potential safety hazards associated with the residues of fluids used for the ground deicing and antiicing of aircraft. In the Comment Response Document (CRD) 43 , the Agency described the outcome of the consultation and the possible course of action to address these potential safety hazards. One of the proposed actions was to consider the input from stakeholders on "OPS.GEN.100 Ice and other contaminants" and the associated AMC2 and GM1, 2, and 3. The Agency welcomes any comment on how to improve the existing material. It should be noted that, for the time being, the regulation of ground deicing / antiicing service providers is out of the Agency's remit.* Confirmation that the direct regulation of de-icing / anti-icing service providers, by EASA, is not a short term option. However, the Study can include feedback from the CRD to the mentioned references above and furthermore include recommendations for amendment as appropriate to feedback gathered during the Study.

Appendix II para 6: *There is one important change compared to EUOPS/JAROPS 3 insofar as the operations manual, when first presented to the competent authority, needs to be fully approved. Previously, this was only the case for certain parts. This change has been introduced following the new AMC procedure explained in paragraph 56 of the explanatory note, as means of compliance are now part of the approval for commercial operators. These means of compliance are usually described as procedures in the manual.* Therefore, the procedures defined in EASA AMC effectively carry the same status as regulations: limiting de-icing / anti-icing operators' programmes to only one AMC would ensure harmonisation amongst operators and probably the same for service providers who carry out many of these procedures..

EASA	NPA 2009 – 02b	Under Review following CRD
Implementing Rules for Air Operations of Community Operators - Draft Opinion and Decision Part-OPS		
Applicability: The second of the seven separate NPAs aimed at developing an Opinion on the Implementing Rules for Air Operations of Community Operators and a Decision on the related Acceptable Means of Compliance (AMC) and Guidance Material (GM). This section is the recognisable replacement for EU OPS and JAA JAR OPS Section 2/TGL 44, known as Part Ops.		
Options: For all elements of this NPA 2009 – 02, there may be time and motivation to include, in the first publication, amendments related to improving the standard of de-icing / anti-icing, through operators' procedures and programmes, and also through the requirements for Authorities. Otherwise, amendments can be proposed after publication of the Implementing Rules for Operations and Authority Requirements.		
Impact: Any changes to these proposed regulations and associated supporting material will be immediately applicable on publication of the rules (pending any legal or practical periods allowed for adjustment).		

OPS.GEN.030 Transport of dangerous goods

(a) The transport of dangerous goods by air shall be conducted in accordance with the 2007-2008 Edition of the Technical Instructions for the Safe Transport of Dangerous Goods by Air published by decision of the Council of the International Civil Aviation Organization. (ICAO Doc 9284-AN/905.).

AMC OPS.SPA.001.DG(b)(2)(ii) Approval to transport dangerous goods

ACCEPTANCE OF DANGEROUS GOODS

2. An operator or his handling agent should use an acceptance check list which allows for: a. all relevant details to be checked; and b. the recording of the results of the acceptance check by manual, mechanical or computerised means.

GM OPS.SPA.001.DG(b)(1) Approval to transport dangerous goods

PERSONNEL

Personnel include all persons involved in the transport of dangerous goods, whether they are employees of the operator or not.
This is included as a potential mechanism to be copied for de-icing / anti-icing, although ICAO Doc 9640 is inadequate as a source of Implementing Rules. The AMC demonstrates the ability for EASA to determine "what" a third-party unregulated body "should" do.
It may be possible to find a way, legally, for the Agency to refer to a document produced by Industry as an accepted set of standards and procedures, this would ensure operators are harmonised with their de-icing / anti-icing programmes. References to EUROCAE or RTCA documents provide workable examples. Another option would be for the Agency to develop its own reference document; and this may be better placed as AMC to Part Ops.
Finding a solution where Industry best-practices can be adopted universally as the sole standard will greatly enhance harmonisation in this field. Finding a mechanism to directly affect unregulated service providers, and their personnel, via the operator's procedures, policies and contracts will also encourage greater harmonisation.

OPS.GEN.100 Ice and other contaminants (a) At the commencement of a flight the external surfaces of the aircraft shall be clear of any deposit which might adversely affect its performance or controllability. (b) The operator shall apply ground de-icing/anti-icing processes whenever determined necessary, on the basis of inspections and weather conditions. **AMC2 OPS.GEN.100** **GM1 OPS.GEN.100** **GM2 OPS.GEN.100** **GM3 OPS.GEN.100**
Comments made on this Rule and associated material are contained in an Attachment/Appendix XX to this Interim Report.
There are many options to amend and improve this material, including: - offering more detailed guidance to assist operators create their procedures, such that

harmonisation is more likely,

- clarification of responsibilities of all those involved,
- clarification over who conducts checks/inspections,
- expanding on the need for coordinated communication and decision-making, and the variety of ways this can, and is, achieved,
- taking the opportunity to review the contents and meaning of the anti-icing code, such that there is no doubt amongst the ground-crew and flight-crew as to the meaning; the aim being to clarify that the trained and qualified person who conducts the post treatment check specifically states that the aircraft is free of contamination,
- separation and delineation of the “all clear” communication from the anti-icing code,
- encourage the use of safety data in the training programme,
- the addition of requirements/recommendations for operators when contracting de-icing / anti-icing services, as well as training which is included already,
- with respect to the maintenance inspection and cleaning intervals, consideration to current knowledge concerning the use of Type I and whether it does reduce residue formation, and also the use of preventive anti-icing and whether this increases the risk of residue formation.

The impacts would be:

- greater harmonisation of operators’ de-icing / anti-icing procedures and therefore it will be mean fewer variations for service providers which will eliminate risk connected with confusion,
- improved clarity in those areas where confusion and misinterpretation frequently occur (ref to our Study results?),
- reduction of risks associated with de-icing / anti-icing.

OPS.GEN.600 Documents and information to be carried on all aircraft

(a) On any aircraft, the following documents shall be carried on each flight:

The Operations Manual is not included in this list.

Annex IV to Regulation 216/2008 – Essential Requirements for Air Operations

1.b. A flight must be performed in such a way that the operating procedures specified

in the Flight Manual or, where required the Operations Manual, for the preparation and execution of the flight are followed. To facilitate this, a checklist system must be available for use, as applicable, by crew members in all phases of operation of the aircraft under normal, abnormal and emergency conditions and situations. Procedures must be established for any reasonably foreseeable emergency situation.
The Operations Manual, and therefore the operator's de-icing / anti-icing procedures are omitted from this list; even the reference in Essential Requirements is unclear. However, the checklist for use in all phases of operation will cover de-icing / anti-icing.
Thought could be given to requiring operators to provide checklists containing communication procedures, including the anti-icing code, for pilots to use during de-icing / anti-icing operations; other useful information concerning, for example, what to do when doubts about HoT exist, and how to conduct inspections/checks. Reinforcement could be achieved by including specifically the operator's de-icing / anti-icing procedures and policy in the list of documents to be carried.
The impact of using a checklist could prevent miscommunication and confusion and also aid decision-making.

EASA	NPA 2008 – 22c	Under Review following CRD
Implementing Rules for Air Operations of Community Operators - Draft Opinion and Decision Organisation Requirements (General)		
Applicability: One of six NPAs issued on "Authority and Organisation Requirements" containing draft Opinion on the Implementing Rules for Authorities, draft Opinion on the Implementing Rules for Organisations and the related draft Decisions. This NPA specifically contains requirements for establishing management systems and performance-based methods of operation.		
Options: For all elements of this NPA 2008 – 22, there may be time and motivation to include, in the first publication, amendments related to improving the standard of de-icing / anti-icing, through operators' procedures and programmes, and also through the requirements for Authorities. Otherwise, amendments can be proposed after publication of the Implementing Rules for Operations and Authority Requirements.		
Impact: Any changes to these proposed regulations and associated supporting material will be immediately applicable on publication of the rules (pending any legal or practical periods allowed for adjustment).		

AMC 2 to OR.GEN.200(a)(2) Management System
SAFETY MANAGEMENT SYSTEM – SAFETY RISK MANAGEMENT
OTHER ORGANISATIONS

1. Hazard identification processes.

a. Proactive hazard identification processes should be the formal means of collecting, recording, analysing, acting on and generating feedback about hazards and the associated risks that affect the safety of the operational activities of the organisation.

b. Hazards, events or safety concerns should be assessed, analysed, reported, the data collected and stored.

c. Information provided by analysis should be distributed.

d. Confidential reporting systems should be based on established human factors

principles including an effective feedback process.

2. Risk assessment and mitigation processes.

a. A formal risk management process should be developed and maintained that ensures analysis (in terms of probability and severity of occurrence), assessment (in terms of tolerability) and control (in terms of mitigation) of risks to an acceptable level.

b. The levels of management who have the authority to make decisions regarding safety risks tolerability should be specified.

3. Internal safety investigation.

a. The scope of internal safety investigations should include occurrences that are not required to be investigated or reported to the competent authority.

4. Safety performance monitoring and measurement.

a. Safety performance monitoring and measurement should be the process by which the safety performance of the organisation is verified in comparison to the safety policies and objectives.

b. This process should include:

i. safety reporting;

ii. safety studies;

iii. safety reviews including trends reviews;

iv. safety audits; and

v. surveys.

c. The process should be proportional to the size of the organisation and complexity of the activities and be compatible with other management systems and processes used by the organisation.

5. The management of change.

a. The management of change should be a formal process that identifies external and internal change that may affect the activities of the organisation. It utilises the organisation's existing hazard identification, risk assessment and mitigation processes to ensure that there is no adverse effect on safety.

6. Continuous improvement of the safety system.

a. Continuous improvement should determine the immediate causes of below

standard performance and their implications for the management system, and rectify situations involving below standard performance identified through safety assurance activities. The changes should be tracked to ensure that they are effective.

b. Continuous improvement should be achieved through proactive evaluation of:

i. facilities, equipment, documentation and procedures through safety audits and surveys;

ii. Individual performance to verify the fulfilment of their safety responsibilities; and

iii. reactive evaluations in order to verify the effectiveness of the system for control and mitigation of risk.

Introduces ICAO SMS SARPS.

1.a Highlights the need to ensure operators are encouraging and providing the means for service providers to collect and supply safety data concerning human factors, and organisational factors within their own organisation. Linking this to the operator's de-icing / anti-icing policy/programme will highlight the need.

2.b A nominated post-holder may be the person responsible to make the decision to either take mitigating measures or not, however, they will need to consult an expert on the subject of de-icing / anti-icing. The safety manager may not be suitably qualified or experienced, and therefore requiring the operator to nominate a subject-matter-expert will resolve this.

3.a Human slips, errors and deviations made by service provider personnel are not required to be reported, let alone investigated. Mandatory occurrence reporting schemes tend to control the focus of some operators; however, under the auspices of a performance-driven regulation, such as SMS, the requirement to go beyond MORs is clear.

4.a Encouraging operators to include safety objectives within their de-icing / anti-icing policy should drive the need to collect data in order to measure performance. Such performance initially may revolve around increasing reports from service providers from zero in some cases to what they would be expected to be. (Quote Kevan Baines of Baines-Simmons: when speaking about maintenance organisations at an IFA conference 22 Sep at Gatwick, he said *"they should be receiving on average 2 human factors reports per person per year, because that's what airlines get from their pilots"*. This need may be met through AMC to OR.GEN.205 Contracting and Purchasing, shown below.

5.a Highlights the need to assess new providers for safety performance before, or when new

contracts are signed. 6. Extends the activities of the Quality/Compliance System to assessing a service provider's own safety management system.
Operators could be required, through their de-icing / anti-icing programmes to actively encourage service providers to provide them with human factors and occurrence reports (or summary analyses); this will help operators comply with the SMS requirements and also to understand where the greatest risk exists. A subject-matter-expert could be nominated by an operator to provide advice to the safety manager concerning risk reduction measures and risk analysis. Across Europe there is almost a complete lack of the gathering and dissemination of de-icing / anti-icing safety; a centrally-driven and facilitated safety initiative, including survey, would provide a suitable kick-start. Operators can be encouraged to set safety objectives within their de-icing / anti-icing programmes. New contracts with new or existing service providers can be accompanied by a safety assessment.
Ensuring that the SMS requirements are met and followed in the area of de-icing / anti-icing will have a positive effect on identifying currently unknown hazards and reducing risk. Providing motivation and guidance for operators to accomplish this and bring about a culture change within service providers will help to make this more successful. **NB:** The collection of safety data by service providers and the presentation of this data to operators may require a universal system. Either many operators collect *all* the data from a service provider and they each conduct analyses, which is a duplication of effort; or each operator is only presented with safety data specific to them, which will "hide" other precursors from their view. A third system would be for service providers to supply safety data to a central organisation for analysis and the results then distributed universally and used to improve safety. Such a system could operate voluntarily, therefore requiring a coordinating body for all service providers; or it could operate through the requirements of operators as a condition of contract. The benefits to the Industry of a centralised system is that it can be extended to other unregulated areas where safety data is scarce.

AMC 2 to OR.GEN.200(a)(3) Management System

SAFETY MANAGEMENT SYSTEM – ORGANISATION AND ACCOUNTABILITIES
OTHER ORGANISATIONS

The management system of an organisation should encompass safety by implementing the following:

1. SMS organisational structure.

a. Typically this should include a safety manager, a safety review board and a safety action group.

2. The safety manager.

a. The safety manager should be responsible and the focal point for the development, administration and maintenance of an effective safety management system.

b. The functions of the safety manager should be to:

i. manage the implementation plan on behalf of the accountable manager;

ii. facilitate hazard identification, risk analysis and management;

iii. monitor corrective action to ensure their accomplishment;

iv. provide periodic reports on safety performance;

v. maintain safety documentation;

vi. plan and organise staff safety training;

vii. provide independent advice on safety matters;

viii. advise senior managers on safety matters;

ix. assist line managers;

x. oversee hazard identification systems;

xi. be involved in occurrence / accident investigations; and

xii. monitor compliance.

5. Safety accountabilities and responsibilities.

a. The organisation should define the accountabilities of the accountable manager and the safety responsibilities of key personnel.

2.b. The safety manager will need to “seek and consult” with relevant experts in order to accomplish vii, viii and ix. The safety manager may not be an expert in de-icing / anti-icing;

having a subject-matter-expert nominated by the operator will resolve this issue.

5.a. A good safety policy should also define the minimum safety responsibilities of all staff, furthermore all personnel in positions where decisions are made that affect operations (indirectly or directly) will need to have their safety responsibilities defined; at a minimum this should cover a set of requirements for all managers. See AMC 2 to OR.GEN.200(a)(4)1.a&b below.

A subject-matter-expert could be nominated by an operator to provide advice to the safety manager concerning risk reduction measures and risk analysis.

Safety responsibilities of all those involved with de-icing / anti-icing and connected coordination, communication and decision-making can be defined within the operators policy/programme.

Clearly defined responsibilities will enhance coordination and communication, and therefore enhance safety.

AMC 2 to OR.GEN.200(a)(4) Management System
TRAINING AND COMMUNICATION ON SAFETY
OTHER ORGANISATIONS

1. Training.

a. All staff should receive safety training as appropriate for their safety responsibilities.

b. In particular all managers, supervisors and operational personnel should be trained and be competent to perform their SMS duties.

2. Communication.

a. The organisation should establish communication about safety matters that:

i. ensures that all staff are fully aware of the SMS;

ii. conveys safety critical information, and especially that related to assessed risks and analysed hazards;

iii. explains why particular actions are taken; and

iv. explains why safety procedures are introduced or changed.

2.a.ii. As per previous comments made above to AMC 2 OPS.GEN.100 para 6 Training, it is

essential that this information is fed back into the training programme, and at intervals dependant on the critical nature.
Operators can be required to use relevant safety data to amend the de-icing / anti-icing training programme, and where this information is critical to ensure that it is communicated effectively and immediately.
The feedback of safety critical information on de-icing / anti-icing matters will raise vigilance to potential hazards and known areas of risk.

AMC to OR.GEN.200(a)(5) Management System OCCURRENCE REPORTING SCHEME *1. The overall objective of the scheme is to use reported information to improve the level of flight safety and not to attribute blame.* *2. The objectives of the scheme are:* *a. to enable an assessment of the safety implications of each relevant incident and accident to be made, including previous similar occurrences, so that any necessary action can be initiated; and* *b. to ensure that knowledge of relevant incidents and accidents is disseminated, so that other persons and organisations may learn from them.* *3. The scheme is an essential part of the overall monitoring function and it is complementary to the normal daytoday procedures and 'control' systems and is not intended to duplicate or supersede any of them. The scheme is a tool to identify those occasions where routine procedures have failed.* *4. Occurrence reports should remain in the database when judged reportable by the person submitting the report as the significance of such reports may only become obvious subsequently.*
Emphasis on incidents and accidents detracts from the many unreported events which are most valuable in preventing further incidents and accidents. There is benefit in including direct reference to human factors – errors, slips, deviation, omissions etc. The AMC also highlights the benefits of sharing information with other organizations; therefore encouraging service providers to collect and share their safety data is also valid.

Explanation of the occurrence reporting scheme can include an emphasis on the need to collect “lower level” safety data, such as self-reported errors etc. Operators can be required to feedback their safety data to their service providers.
Sharing information will increase trust within service provider personnel and therefore encourage a change of culture leading to more self-disclosure.

AMC 1 to OR.GEN.200(a)(7) Management System
COMPLIANCE MONITORING SYSTEM GENERAL

AMC to OR.GEN.205 Contracting and purchasing
Compliance monitoring responsibility by contracting.

1. Contracted activities.

a. An organisation may decide to contract certain activities to external organisations.

b. A written agreement should exist between the organisation and the contracted organisation clearly defining the safety related services and quality to be provided.

c. The contracted safety related activities relevant to the agreement should be included in the organisation's Compliance Monitoring Programme.

d. The organisation should ensure that the contracted organisation has the necessary authorisation or approval when required, and commands the resources and competence to undertake the task.

e. If the organisation requires the contracted organisation to conduct activity which exceeds the contracted organisation’s authorisation or approval, the organization is responsible for ensuring that the contracted organisation's compliance monitoring takes account of such additional requirements.

GM OR.GEN.205 Contracting and purchasing
CONTRACTING OPERATORS

1. Operators may decide to outsource certain activities to external organisations for the provision of services related to areas such as:

a. Ground Deicing/Antiicing;

b. Ground handling;

d. Flight Support (including performance calculations, flight planning, navigation database

and dispatch); *d. Training; and* *e. Manual preparation.* *2. The ultimate responsibility for the product or service provided by external organizations should always remains with the operator*.
AMC 1 to OR.GEN.200(a)(7) outlines the compliance monitoring system, previously known as Quality System. No specific paragraph is dedicated to sub-contracted services as exists in JAA AMC OPS 1.035 para 5.1. However, this is addressed in AMC and GM to OR.GEN.205. AMC to OR.GEN.205 provides the mechanism by which operators can define, within contracts, the need for service providers to supply safety data. GM OR.GEN.205 The ways in which operators ensure integrity of navigation data (LoA) provided by external organisations may be valuable as a template for how operators ensure the integrity of de-icing / anti-icing services.
Operators can be encouraged to re-draft contracts with service providers to include safety related activities. Considerations can be given to regulation of other contracted safety critical activities, such as navigation data integrity and fuel quality to determine whether a parallel can be drawn with de-icing / anti-icing.
Review and revision of contracts will enable operators to re-focus service providers onto safety.

EASA	NPA 2009 – 02c	Under Review following CRD
Implementing Rules for Air Operations of Community Operators - Draft Opinion and Decision Part-OR Sub-part OPS		
Applicability: The third of the seven separate NPA 2009 – 02 is aimed at developing an Opinion on the Implementing Rules for Air Operations of Community Operators and a Decision on the related Acceptable Means of Compliance (AMC) and Guidance Material (GM). This section is designated as Organisation Requirements concerning Operations with recognisable elements from EU OPS and JAA JAR OPS Section 2/TGL 44, known as Part Ops.		
Options: For all elements of this NPA 2009 – 02, there may be time and motivation to include, in the first publication, amendments related to improving the standard of de-icing / anti-icing, through operators' procedures and programmes, and also through the requirements for Authorities. Otherwise, amendments can be proposed after publication of the Implementing Rules for Operations and Authority Requirements.		
Impact: Any changes to these proposed regulations and associated supporting material will be immediately applicable on publication of the rules (pending any legal or practical periods allowed for adjustment).		

OR.OPS.015.MLR Operations Manual

(a) The operator shall establish an Operations Manual (OM) containing all necessary instructions, information and procedures, including standard operating procedures and training programmes and syllabi, for all personnel involved in air operations to perform their duties and for the aircraft operated.

AMC5 OR.OPS.015.MLR Operations Manual

CONTENTS – COMMERCIAL AIR TRANSPORT

8.2.4 Deicing and anti-icing on the ground. A description of the deicing and anti-icing policy and procedures for aircrafts on the ground. These should include descriptions of the types and effects of icing and other contaminants on aircrafts whilst stationary, during ground movements and during takeoff. In addition, a description of the fluid types used should be given including:

a. Proprietary or commercial names;

b. Characteristics;

c. Effects on aircraft performance;

d. Holdover times; and

e. Precautions during usage.

This Rule and AMC remains the same as Appendix 1 to OPS 1.1045 A.8. They contain very little guidance, and focus on one element (fluid types) but omit many others. The de-icing /anti-icing policy and procedures are not one of the OM contents that requires specific approval by the Authority (JAA IEM OPS 1.1040(b)); instead the operator only has to ensure that the detailed structure of the Operations Manual is acceptable to the Authority (OPS 1.1045).

It is an option to revise this Appendix and include other elements, such as: the operator's communication and coordination procedures (for de-icing / anti-icing); the anti-icing code; inspection and checking procedures; re-assessment of HOT in changing conditions; affect of re-hydrated fluid residues on flying control surfaces; and contents of the operator's standard contract for de-icing / anti-icing etc.

Revision of the OM contents for de-icing / anti-icing may have the effect of operators reviewing their procedures (especially if the revision is in conjunction with other regulatory changes); this may then have the effect of the revision of training programmes and awareness campaigns. Raised awareness and more valuable information available in the OM will be good for safety.

OR.OPS.210.AOC Personnel requirements

(a) The operator shall, in accordance with OR.GEN.210(b) nominate post holders responsible for the management and supervision of the following areas:

(1) flight operations;

(2) crew training;

(3) ground operations; and

(4) compliance monitoring.

(b) Adequacy and competency of staff.

(1) The operator shall employ sufficient staff for the planned ground and flight operations.

(2) All personnel assigned to, or directly involved in, ground and flight operations

shall:

(i) be properly trained;

(ii) demonstrate their capabilities in the performance of their assigned duties; and

(iii) be aware of their responsibilities and the relationship of their duties to the operation as a whole.

(c) Supervision of staff

(1) The number of supervisors to be appointed shall be sufficient in relation to the structure of the operator and the number of staff employed.

(2) The duties and responsibilities of these supervisors shall be defined, and any other necessary arrangements shall be made to ensure that they can discharge their supervisory responsibilities.

(3) The supervision of crew members and personnel involved in the operation shall be exercised by individuals with adequate experience and the skills to ensure the attainment of the standards specified in the operations manual.

There is no specific mention of dedicated safety critical areas of operations in this Rule, only ground and flight operations. In the case of de-icing / anti-icing, it is difficult to find a single contact within an operator's organisation who fully understands this whole aspect of the operation and who takes responsibility for all aspects of the operator's de-icing / anti-icing policy and procedures.

A list can be provided in (b)(2) of specific ground operations tasks, such as loading, dangerous goods, etc and including de-icing / anti-icing, where an operator should nominate a suitably knowledgeable and experienced staff member as a focal point for each of these technical issues. The areas involved may cover flight-crew, ground-crew, de-icing / anti-icing operatives, equipment, storage facilities, compliance auditing and contracting service providers.

De-icing / anti-icing tasks are commonly dispersed amongst several employees; nominating a focal point, or subject-matter-expert would ensure that actions and decisions made by the individuals are at least coordinated, and communications with NAAs and service providers are efficient and congruent.

EASA	**NPA 2008-22b**	**Pending review of CRD**
Authority Requirements		
Applicability: The NPA on "Authority Requirements" contains draft Opinion on the Implementing Rules for Authorities, draft Opinion on the Implementing Rules for Organisations and the related draft Decisions. This is the equivalent of JAA Joint Implementations Procedures (JIPS), relating instead to the relevant EASA Implementing Rules.		
Options: For all elements of this NPA 2008 – 22b, there may be time and motivation to include, in the first publication, amendments related to improving the standard of de-icing / anti-icing, through authority requirements. Otherwise, amendments can be proposed after publication of the Implementing Rules for Operations and Authority Requirements.		
Impact: Any changes to these proposed regulations and associated supporting material will be immediately applicable on publication of the rules (pending any legal or practical periods allowed for adjustment).		

AR.GEN.030 Mutual exchange of information

(a) In order to contribute to the improvement of air safety, the competent authorities shall participate in a mutual exchange of all necessary information, including all finding raised and followup actions taken as a result of oversight of persons and organizations exercising activities on the territory of a Member State.

AR.GEN.035 Mandatory safety information

(a) The competent authorities shall issue mandatory safety information to react to a safety problem which involves person(s) or organisation(s) subject to the Basic Regulation and its implementing rules and requiring immediate action.

(b) Mandatory safety information shall be made publicly available and contain, as a minimum, the following information:

(1) the identification of the safety problem;

(2) the identification of the affected activities;

(3) the actions required and their rationale;

(4) the time limit for compliance with the actions required by the mandatory safety information; and

(5) its date of entry into force.

AR.GEN.040 Reporting

(a) In addition to the reports required by the applicable legislation on occurrence reporting in civil aviation, the competent authority shall provide reports on safety significant occurrences to the Agency.

These three requirements adequately highlight:

- *the need for NAAs to cooperate with each other by exchanging information on de-icing / anti-icing issues if it is deemed safety improvements can be made*
- *the need for NAAs to issue mandatory safety information, including actions to be taken, when a safety matter is identified, and*
- *the need for NAAs to collect data other than through MORs.*

The most effective and efficient way to achieve this is for the Agency to coordinate and facilitate a safety initiative aimed at de-icing / anti-icing.

The impact would be a harmonised programme which ensures more data is collected and analysed and any recommendations for action likely to be taken up.

AR.GEN.305 Monitoring of activities

(a) The competent authority shall establish and maintain an oversight programme to monitor persons and organisations exercising activities on the territory of the Member State or certified by the competent authority that is proportionate to the complexity of the activities and the risks involved. The programme shall be developed taking into account the size of the organisation, local knowledge, possible certification according to industry standards and past surveillance activities.

(b) The oversight programme shall include:

(1) sample inspections, including unannounced inspections;

(2) for each organisation, at least once every 24 months:

(i) regular audits at intervals determined by the results of past surveillance activities;

(ii) meetings convened with the accountable manager to ensure they remain informed of significant issues arising during audits.. *(c) The oversight shall focus on a number of key risk elements and identify any finding.* *(d) The competent authority shall keep and update the continuing oversight programme, including a list of the approved organisations under its supervision, the dates when audit visits are due and when such visits were carried out.*
Requires NAAs to monitor non-certified, as well as certified, organisations through a programme of audits and inspections. I am not convinced this is the meaning intended, however it is useful.
It may be possible to use this requirement to prompt NAAs into an oversight programme of de-icing / anti-icing service providers directly in addition to that conducted through the operators.
24-monthly audits would involve effort and investment, however, a NAA programme which enhanced the operators' auditing would provide the NAA with a greater insight into any variability of service provision standards.

EASA	**NPA 2009 – 02D**	**Pending review of CRD**
***"Implementing Rules for Air Operations of Community Operators"* - Draft Opinion and Decision PartAR – Subparts GEN, OPS and CC.**		
Applicability: This NPA contains the draft Opinion on the Implementing Rules for Air Operations of Community Operators, the Subparts related to Air Operations of the draft Opinion on the Implementing Rules for Organisation Requirements, the Subparts related to Air Operations of the draft Opinion on the Implementing Rules for Authority Requirements and the related draft Decisions (AMC, CS and GM).		
Options: For all elements of this NPA 2009 – 22, there may be time and motivation to include, in the first publication, amendments related to improving the standard of de-icing / anti-icing, through authority requirements. Otherwise, amendments can be proposed after publication of the Implementing Rules for Operations and Authority Requirements.		
Impact: Any changes to these proposed regulations and associated supporting material will be immediately applicable on publication of the rules (pending any legal or practical periods allowed for adjustment).		

AMC 1 AR.GEN.300 Continuing oversight OPS

GENERAL

1. The competent authority should assess the operator and monitor the continued competence to conduct safe operations in compliance with the applicable requirements. The competent authority should ensure that accountability for assessing operators is clearly defined. This accountability may be delegated or shared, in whole or in part. Where more than one agency is involved, an individual department manager should be appointed under whose personal authority operators are assessed.

Not directly applicable to our topic of de-icing / anti-icing, however this AMC highlights a useful principle which should be transferable to other areas and situations. That is, the appointment of a single person to accept authority where multiple agencies are involved.

An NAA attempting to oversee de-icing / anti-icing operations and associated activities is faced with multiple agencies (aerodromes, service providers, operators, maintenance

organisations): it is an option that NAAs can appoint one single person as the de-icing / anti-icing authority, whose responsibility is to coordinate oversight of this safety critical activity.
The impact would be easier and improved communication of issues between authorities, the Agency, and operators. The success of any harmonised cooperative programmes and initiatives will be greatly enhanced.

GM 1 AR.GEN.300 Continuing oversight OPS *1. Responsibility for the conduct of safe operations lies with the operator. Under these provisions a positive move is made towards devolving upon the operator a share of the responsibility for monitoring the safety of operations. The objective cannot be attained unless operators are prepared to accept the implications of this policy including that of committing the necessary resources to its implementation. Crucial to success of the policy is the content of PartOR which requires the establishment of a management system by the operator.* *2. The competent authority shall continue to assess the operator's compliance with the applicable requirements, including the effectiveness of the management system. If the management system is judged to have failed in its effectiveness, then this in itself is a breach of the requirements which may, among others, call into question the validity of a certificate, if applicable.* *3. It is essential that the competent authority has the full capability to adequately assess the continued competence of an operator by ensuring that the whole range of activities is assessed by appropriately qualified personnel.* *4. The safety manager, designated by the operator in accordance with PartOR, shall have direct access to the accountable manager. The accountable manager is accountable to the competent authority as well as to those who appoint him. It follows that the competent authority cannot accept a situation in which the accountable manager is denied sufficient funds, manpower or influence to rectify deficiencies identified by the management system.*
This AMC clearly states the intention of performance-based regulation to devolve responsibility for oversight away from the regulator and onto the operator; therefore, any recommendation for NAA oversight of service providers is moving against the current regulatory impetus, and may be met with resistance on this fact alone. The operators' management systems do have to prove themselves capable though, and in this respect the NAA can legitimately require more scrutiny and the submission of more evidence from

operators.
Supporting such proposals is an option for improvement; as is encouraging the provision of guidance for NAAs specifically on how operators can/should improve their oversight of de-icing / anti-icing service providers.
Time will tell whether the adoption and implementation of performance-based regulation will make an impact on operators' oversight of service providers; however, if applied in a spirit of positive safety culture, and support provided to service providers to change their culture, the impact on safety should be positive.

AMC 2 AR.GEN.300 Continuing oversight OPS *OPERATIONS INSPECTIONS AND MONITORING PROCEDURES* *2. Inspection and monitoring, on a scale and frequency appropriate to the operation, should include at least:* - *infrastructure* - *manuals* - *training* - *crew* - *records* - *maintenance* - *equipment* - *release of flight/despatch* - *dangerous goods* - *operator's management system.*
It would be easy for an NAA to omit inspecting how operators oversee contracted-out services as they are not specifically mentioned. Specifically how operators attempt to meet their own requirements through the contracts they hold; how they communicate and collect safety data with service providers; and what influence they have over the service providers training etc. The caveat *'should include at least'* is a week point in this AMC.
An option would be to append a suitable option such as "ground handling", together with an

explanation, or guidance material.
The impact would be clearer instructions for NAAs to take some notice of how effective operators are at influencing the standards set by service providers.

AMC 3 AR.GEN.305 Monitoring of activities OPS *1. The competent authority should establish a schedule of inspections appropriate to each operator's business. The planning of inspections should take into account the results of the hazard identification and risk assessment conducted and maintained by the operator as part of the operator's management system. Inspectors should work in accordance with the schedule provided to them.*
Assuming that the operator's SMS is effective and suitably resourced, this AMC could be effective. However, unless NAAs are specifically looking to learn whether operators are collecting adequate safety data from service providers with which to effectively identify all hazards, the effects of this AMC will be less than desired. Similarly, to limit (in this respect) inspections to only cover the results of an operator's hazard identification and risk assessment system, deters the NAA scope to inspections in response to valid safety data attained from elsewhere.
It may help to define clearly that inspections programmes ought to take account of any relevant safety data regardless of source (eg FAA, FSF, ERA, other operators etc). A dedicated safety initiative would help to inform NAAs of the hazards that exist in the Industry.
This would have the effect of NAAs helping to cross-fertilise best-practices across operators.

AMC to AR.OPS.300 Certification procedure OPS *PROCEDURES FOR THE APPROVAL OF CARRIAGE OF DANGEROUS GOODS* *The competent authority should verify that:* *1. the applicant is in compliance with the applicable requirements and recognized standards;* *2. the procedures specified in the procedures manual are sufficient for the safe transport of dangerous goods;* *3. operations personnel is properly trained; and* *4. a reporting scheme is in place.*
This is shown as an example, if de-icing / anti-icing was ever considered as requiring special

operations approval.
The NAA could verify compliance with recognised standards (AEA etc), and that the operator's own procedures (as per the OM) and contracts with service providers were sufficient. It would also allow the NAA to verify the operator's winter operations training programme was effective and ensure that the operator was actively collecting safety data from service providers.
This would require NAA effort and investment; it would also raise the issue that where special operations approval was not granted that an operator would not be able to operate effectively in conditions of contamination.

ICAO	Doc 9640	2nd Edition, 2000
MANUAL OF AIRCRAFT DE-ICING / ANTI-ICING OPERATIONS		
Applicability: Useful because de-icing / anti-icing involves many stakeholders, and they are all addressed in this document. Otherwise this guidance would be distributed across several different Annexes – for operators, maintenance, aerodromes, and air traffic control. It also provides some basic guidance for service personnel. Guidance only – from which "standardised procedures and guidance material" can be developed for various segments of Industry, eg: manufacturers, air operators, engineering, maintenance, and service organisations. Relevance is lost – updates are few and far between. Not generally used by Industry as better Industry standards exist such as AEA and SAE.		
Options: In the long-term there may be scope to update this document, however, this would only duplicate more readily accessible and relevant standards which already exist, and which are updated annually. NAAs have the option to adopt/adapt elements of this document into their regulations for operators. NAAs/EASA can consider a similar document (reviewed and amended) so that a single source document is available for all stakeholder groups involved.		
Impact: Without a coordinated approach, there would be little effect as there is no requirement and harmonisation of procedures would not be improved.		

Forward

A review of the history of aeroplane accidents in the air transportation industry revealed that a substantial number are related to winter operations. An examination of these accidents showed a need for formally developed regulations and procedures governing aeroplane de-icing/anti-icing operations, directed towards all segments of aviation, including aeroplane manufacturers, airline operators, and engineering, maintenance and service organizations. This material was intended, in particular, for use by flight crews of all aeroplane types and categories, as well as aeroplane maintenance and service personnel.

This statement can be considered as still valid, and that all segments of aviation still need formally developed regulations and procedures. In Europe this also infers harmonisation

across states. This paragraph also adequately highlights the multitude of stakeholders involved.
1.6 The only known method for positively ascertaining that an aeroplane is clean prior to take-off is by close inspection. *1.7 It is essential for all personnel to recognize that final assurance for a safe take-off rests in a thorough pre-take-off inspection or check.* *2.4 Numerous techniques for complying with the Clean Aircraft Concept have been developed. Proper and adequate deicing, followed by an application of appropriate anti-icing fluid, provides the best protection against contamination. A visual or physical check of critical aeroplane surfaces to confirm that the treatment has been effective and that the aeroplane is in compliance with the Clean Aircraft Concept must be carried out.*
The message can not be clearer: whoever conducts these checks and inspections is the last link in the chain before the person responsible (the aircraft captain) can decide whether the aircraft is airworthy or not. Yet there is no regulated method of ensuring that these checks and inspections are conducted by appropriately trained and qualified personnel to an acceptable standard. NAAs have no direct control over how this is achieved, as they delegate all responsibility to the operator. Even if operators are diligent, they have to (in practice) delegate responsibility to a multitude of different service providers and/or other third parties; each with varying capabilities, experience and possibly procedures.
If NAAs/EASA take these paragraphs as critical and understand the inevitability of human error occurring amongst the cadre of inspectors and checkers, then regulatory action must be considered as a potential risk mitigation measure.
To do nothing does not address the known facts highlighted simply and clearly in these three paragraphs and the history of accidents related to winter operations as indicated in the forward.

5.4 At the completion of aeroplane de-icing/anti-icing, the pilot-in-command will be provided with the following information: *a) fluid type;* *b) fluid/water ratio (Type II, III or IV only);* *c) start time of the final anti-icing application; and*

d) confirmation that the aeroplane is in compliance with the clean aircraft concept.

This basic information will assist the pilot-in-command in estimating an appropriate holdover time from the range provided in the operator's table.

There is no reference as to who passes this information, however, it can be clearly inferred that it is the intention for this information message (anti-icing code) to include confirmation that the "clean wing concept" applies, and that the person who confirms this is the person conducting the post treatment check, as per para 2.4 above. In fact this should apply to any external check – either the aircraft is "clean" or not.

It will be helpful to require (clearly and directly) all operators to ensure that whoever they use to conduct external checks is both trained and qualified to do so and that only such a person can pass the final element of the anti-icing code.

This may reduce some uncertainty by ensuring operators cover this aspect clearly in their contracts, and where a service provider will not (for whatever reason) provide this confirmation, that a suitable third-party is used.

CHECKS AFTER THE APPLICATION OF DE-ICING/ANTI-ICING FLUIDS

6.3 A check to ensure compliance with the Clean Aircraft Concept is made immediately following the application of deicing/anti-icing fluids and is carried out by a qualified person in accordance with the approved operator plan and procedures.

6.4 The pre-take-off check, which is the responsibility of the pilot-in-command, ensures that the critical surfaces of the aeroplane are free of ice, snow, slush or frost just prior to take-off. This check shall be accomplished as close to the time of take-off as possible and is normally made from within the aeroplane by visually checking the wings or other surfaces.

6.5 The pre-take-off check procedures are a critical part of the ground operation and become the only means by which the pilot-in-command can ensure that the aeroplane is in compliance with the Clean Aircraft Concept prior to take-off. If stipulated by the regulatory authority, aeroplane manufacturer, or operational specification or if requested by the pilot-in-command, an external check of aeroplane critical surfaces shall be conducted by qualified ground personnel.

6.6 The pilot-in-command has the responsibility to continually monitor the weather and aeroplane condition to ensure compliance with the Clean Aircraft Concept. If this requirement cannot be satisfied by either an internal or external check of aeroplane critical surfaces, then another de-icing/anti-icing of the aeroplane must be accomplished. Special equipment or

procedures may be required to carry out this check at night or under severe weather conditions.
It is clear that any external check should be conducted by a qualified person. As these checks should be in accordance with the operator's plan and procedures, the operator shall stipulate, or agree to, the training and qualification standard required.
Reinforcement can be made of the need for external checks to be conducted by a trained and qualified person, and a clear connection made with the final element of the anti-icing code.
This may reduce some uncertainty by ensuring operators cover this aspect clearly in their contracts, and where a service provider will not (for whatever reason) provide this confirmation, that a suitable third-party is used.

Authority's Responsibilities *7.1 The regulatory authority ensures that every operator shall have an approved de-icing/anti-icing programme or procedures. The programme shall require that operators comply with the Clean Aircraft Concept.* *7.3 The de-icing/anti-icing programme shall clearly define areas of responsibility for the operator. All persons involved in ground de-icing/anti-icing activities shall be trained and qualified in the procedures, communications and limitations of their area of responsibility. The de-icing/anti-icing programme shall cover all locations within the operator's route network including de-icing/anti-icing accomplished by subcontract.*
In Europe, NAAs do not approve operators' de-icing / anti-icing plans, policies, procedures or programmes. *"Ensuring that every operator shall have an approved programme or procedures"* may be interpreted differently if the NAA offered AMC.
NAAs/EASA can be encouraged to agree (create) an AMC, in support of robust rules, which operators can adopt and gain tacit approval, or request specific approval for variations/deviations.
A coordinated development programme would be needed, however, there is sufficient expertise and knowledge readily available that this should be relatively simple. The largest problem would be acquiring subject-matter-experts appointed by each NAA to participate. The positive impact would be greater harmonisation of operators procedures and/or programmes, which may impact positively on standards of service provision.

Operator's Responsibilties *7.4 Ground de-icing/anti-icing is, technically, a part of the operation of the aeroplane. The person in charge of the deicing/anti-icing procedure is responsible for accomplishing this procedure and verifying the results of the de-icing/anti-icing treatment. Additionally, the de-icing/anti- icing application information reported to the flight deck crew is also a part of the technical airworthiness of the aeroplane.* *7.5 The person responsible for the de-icing/anti-icing process must be clearly designated, trained and qualified. This person shall check the aeroplane for the need to de-ice, shall initiate de-icing/anti-icing, if required, and is responsible for the correct and complete de-icing/anti-icing treatment of the aeroplane. The final responsibility for accepting the aeroplane after de-icing/anti-icing rests, however, with the pilot-in-command.*
7.4 Introduces the concept of a person in charge, and it can be inferred here that ICAO mean it to be someone "outside" of the aircraft. In reality, there may be confusion as to who is in charge, as many people may be involved in the decision-making: operator's flight operations dept; captain, ground operative; crew chief; service provider control dept; third-party "inspector". 7.4 Makes it clear that the anti-icing code has meaning other than just information for calculation of HoT; it confirms that the final element *must* confirm, or not, that the clean wing concept is met. 7.5 Places all decision-making responsibilities on the shoulders of the "outside" person referred to in the earlier paragraph 7.4. Again, in practice this is a coordinated operation with many inputs.
It is possible to require operators make it clearer as to where responsibilities lay, and who makes which decisions. This can be achieved by requiring, within an operators procedures/programme, a coordination and communication plan and procedures; these should assist the pilot in establishing for all destinations who is "in charge" and what responsibilities they uphold.
Any rules, AMC or GM which help operators establish more full-proof procedures will have a positive impact on safety. AMC and GM can help to increase harmonisation.

DE-ICING/ANTI-ICING COMMUNICATIONS *10.1 The communications between ground and flight crews are an integral part of the de-*

icing/anti-icing process and must be included in every de-icing/anti-icing procedure. *10.3 Upon completion of the de-icing/anti-icing procedure and the associated check of the aeroplane, the flight crew shall be provided with information about the final step of the de-icing/anti-icing process which ensures that the aeroplane is in compliance with the Clean Aircraft Concept; this information shall be given in the form of de-icing/anti-icing code.* *10.4 The de-icing/anti-icing codes, which are to be recorded, shall be communicated to the flight crew in the following sequence:* *Element A: specify type of fluid used,* *Element B: specify the percentage of de-icing/anti-icing fluid in the fluid/water mixture,* *Element C: specify in local time, in hours and minutes, the beginning of the final de-icing/anti-icing step,* *The transmission of elements A, B and C to the flight crew confirms that the de-icing/anti-icing was completed and that the aeroplane is clean.* *10.6* ***After*** *de-icing/anti-icing and* ***prior*** *to departure, the flight crew must receive an "all clear" signal from the ground crew that it is safe to taxi.*
This highlights the need for clear and precise communications, and a common understanding of the meaning of these communications. 10.6 There is a potential for confusion, especially when the same person communicates the anti-icing code and the "all clear" signal. "All clear" is perhaps too "close" a phrase to "contamination is now all cleared", and the recommended anti-icing code does not contain a specific "aircraft clean" communication. Having pilots "infer" that the aeroplane is clean from the three elements of the code is prone to error, as these elements can be passed before an inspection is conducted, and can be passed (required) even if the treatment failed.
Clear communication plans and procedures are essential for safe de-icing / anti-icing operations; guidance can be provided to operators. Review and universally agreed amendments to the anti-icing code can be undertaken to include a definite "success/fail" element, and to clearly separate the code from any "all clear" signal.
Clearer and less ambiguous communications will enhance safety. Clarifying the meaning of a final element (aeroplane clean) will reinforce the responsibilities of the service provider.
9.5 Details of the ATC winter operations plan shall be included in all air traffic controllers'

manuals. It shall provide for the shortest possible taxi time to the departure runway for take-off after the completion of the de- icing/anti-icing of an aeroplane. It shall, where appropriate, contain provisions for centralized de-icing/anti-icing and remote pad de-icing/anti-icing and for secondary de- icing/anti-icing at the aerodrome.
This is useful information for operators to include in their de-icing / anti-icing programmes.
Operators can be recommended/required to consult with ATC concerning taxi times, at those aerodromes where HoT is critical.
This will raise awareness of potential problem areas; perhaps save money through requests for inappropriate de-icing / anti-icing, and it may create an impetus amongst concerned stakeholders for investment in facilities at certain aerodromes.

ICAO	Annex 14	5th Edition, July 2009
AERODROMES		
Applicability: This Annex contains Standards and Recommended Practices (specifications) that prescribe certain facilities and technical services normally provided at an aerodrome. It is not intended that these specifications limit or regulate the operation of an aircraft. The specifications, unless otherwise indicated in a particular context, shall apply to all aerodromes open to public use in accordance with the requirements of Article 15 of the Convention. Indirect Regulation. National responsibility to implement (States "shall"). EASA competence not extended yet to Implementing Rules, but Essential Requirements (EC Reg 1108/2009) introduced into Basic Reg 216/2008.		
Options: Reconsideration to how these SARPS are interpreted and implemented by NAAs and eventually EASA could be considered.		
Impact: Depending on any reconsiderations, the impacts may be variable. If nothing is reconsidered or changed, then there will be nil impact.		

1.4.4 As part of the certification process, States shall ensure that an aerodrome manual which will include all pertinent information on the aerodrome site, facilities, services, equipment, operating procedures, organization and management including a safety management system, is submitted by the applicant for approval/acceptance prior to granting the aerodrome certificate. *1.1 De-icing/anti-icing facility: A facility where frost, ice or snow is removed (de-icing) from the aeroplane to provide clean surfaces, and/or where clean surfaces of the aeroplane receive protection (anti-icing) against the formation of frost or ice and accumulation of snow or slush for a limited period of time.*
The de-icing / anti-icing facilities are clearly to be approved (indirectly) by the NAA, therefore implying standards that need to met and consideration towards safety on the part of the Authority. For example, a de-icing / anti-icing facility located at the Ramp, may not be approved in certain weather conditions due to length of taxi to runway (eg at Schipol, de-icing / anti-icing on the ramp for runway 18R/36L departures may not be approved for snow below

14°C, or light freezing rain below 0°C).
Encouraging NAAs to review how they approve de-icing / anti-icing facilities through approval of the aerodrome manual could be part of an overall strategy. See 3.15 below.
The impact may highlight some areas of operational difficulty which present pilots with unnecessary risk.

1.5 Safety management *1.5.1 States shall establish a safety programme in order to achieve an acceptable level of safety in aerodrome operations.* *1.5.2 The acceptable level(s) of safety to be achieved shall be established by the State(s) concerned.* *1.5.3 States shall require, as part of their safety programme, that a certified aerodrome operator implements a safety management system acceptable to the State that, as a minimum:* *a) identifies safety hazards;* *b) ensures that remedial action necessary to maintain an acceptable level of safety is implemented;* *c) provides for continuous monitoring and regular assessment of the safety level achieved; and* *d) aims to make continuous improvement to the overall level of safety.* *1.5.4 A safety management system shall clearly define lines of safety accountability throughout a certified aerodrome operator, including a direct accountability for safety on the part of senior management.*
Aerodrome operations clearly include, for all practical purposes, de-icing / anti-icing operations. therefore, aerodromes should be concerned about the level of safety that is being achieved in this area, and their SMS should be used to asses and monitor this, and also address deficiencies. Even if no direct influence can be made by the aerodrome, the aerodrome should be interested to know that service providers are operating safely. This may be achieved through cooperation and information sharing with the relevant operators.
Aerodromes should be required to establish a means, either directly with service providers, or via operators, by which the safety of de-icing / anti-icing operations can be assessed, and recommendations for improvement made.

Aerodromes can also be required to nominate a post-holder/subject-matter-expert to take responsibility for the application of the SMS in this respect. This person may be the focal-point for all de-icing / anti-icing matters.

Where risks can be reduced through aerodrome actions, this can be highlighted.

The impact could be an improved environment of safety data exchange amongst aerodromes, operators and service providers.

Also aerodromes may take an active approach to facilitating de-icing / anti-icing operations, as a safety critical function for operators' use, similar to ILS protection zones and lighting systems, rather than a commercial ground-handling service.

3.15 De-icing/anti-icing facilities

General

3.15.1 **Recommendation.—** Aeroplane de-icing/anti-icing facilities should be provided at an aerodrome where icing conditions are expected to occur.

Doc 9640 Aerodrome Facilities

Aerodrome de-icing/anti-icing facilities are required at aerodromes where ground snow and icing conditions are expected to occur. This would include aerodromes which serve aeroplanes that can develop frost or ice on critical surfaces as a result of having cold soaked wings.

The aerodrome should plan for the two-step de-icing/anti-icing procedure for all deicing/anti-icing operations even though some operators may choose the one-step procedure on some occasions.

8.6 De-icing/anti-icing facilities have the following components:

a) de-icing/anti-icing pads for the manoeuvering of aeroplanes;

b) de-icing/anti-icing system comprising one or both of the following:

1) mobile vehicles, and

2) fixed equipment;

c) bypass taxiing capability;

d) environmental run-off mitigation measures;

e) permanent or portable night-time lighting system; and

f) support facilities that may include:

1) storage tanks and transfer systems for de-icing/anti-icing fluids; and

2) de-icing crew shelter.

Location

3.15.2 **Recommendation.—** De-icing/anti-icing facilities should be provided either at aircraft stands or at specified remote areas along the taxiway leading to the runway meant for take-off, provided that adequate drainage arrangements for the collection and safe disposal of excess de-icing/anti-icing fluids are available to prevent ground water contamination. The effect of volume of traffic and departure flow rates should also be considered.

Note 1.— One of the primary factors influencing the location of a de-icing/anti-icing facility is to ensure that the holdover time of the anti-icing treatment is still in effect at the end of taxiing and when take-off clearance of the treated aeroplane is given.

Note 2.— Remote facilities compensate for changing weather conditions when icing conditions or blowing snow are expected to occur along the taxi-route taken by the aeroplane to the runway meant for take-off.

Doc 9640

Off-terminal de-icing/anti-icing

8.11 De-icing/anti-icing facilities away from the terminal are recommended when terminal de-icing/anti-icing facilities (including apron facilities) cause excessive gate delays and/or taxi times that frequently cause holdover times to be exceeded.

Remote pad de-icing/anti-icing facilities

8.12 Remote de-icing/anti-icing facilities located near departure runway ends or along taxiways are recommended when taxi times from terminals or off-terminal de-icing/anti-icing locations frequently exceed holdover times. The proper design of these facilities can also improve flow control by permitting repeat de-icing/anti-icing of aeroplane critical surfaces without the aeroplane having to return to more distant treatment sites.

3.15.4 **Recommendation.—** The remote de-icing/anti-icing facility should be so located as to provide for an expeditious traffic flow, perhaps with a bypass configuration, and not require unusual taxiing manoeuvre into and out of the pads.

Note.— The jet blast effects caused by a moving aeroplane on other aeroplanes receiving the anti-icing treatment or taxiing behind will have to be taken into account to prevent degradation of the treatment.

3.15.6 **Recommendation.—** The number of de-icing/anti-icing pads required should be

determined based on the meteorological conditions, the type of aeroplanes to be treated, the method of application of de-icing/anti-icing fluid, the type and capacity of the dispensing equipment used, and the departure flow rates.

Note.— See the Aerodrome Design Manual *(Doc 9157), Part 2*.

Environmental considerations

Note.— The excess de-icing/anti-icing fluid running off an aeroplane poses the risk of contamination of ground water in addition to affecting the pavement surface friction characteristics.

3.15.11 **Recommendation.—** Where de-icing/anti-icing activities are carried out, the surface drainage should be planned to collect the run-off separately, preventing its mixing with the normal surface run-off so that it does not pollute the ground water.

Doc 9640

De-icing/anti-icing facilities must be designed in accordance with local environmental rules and regulations. Environmental factors that have to be considered are:

a) protecting the environment against toxic substances;

b) isolating and collecting used glycol and any other de-icing/anti-icing contaminants to prevent run-off into the aerodrome storm drainage system; and

c) recycling the used glycol.

All of these criteria are “recommended” and not “required”, therefore there is no encouragement for the development of new facilities which may enhance safety and improve coordination. Instead decisions to “upgrade” will likely be taken mainly on commercial grounds.

The list of what are items are included as facilities from Doc 9640 includes the de-icing / anti-icing vehicles, fluid storage etc. This is interesting if the aerodrome *should be providing*. Even if the aerodrome allows third-parties to provide some of the facilities, it remains responsible through Annex 14.

The environmental considerations (backed-up by local government regulations) to recommend drainage will restrict some aerodromes to only conduct de-icing / anti-icing on the Ramp, even though it may not be the most convenient or safe option. Moving operations to a remote area may involve great expense.

The emphasis in Doc 9640 is different than in the Annex: ie *facilities are required* compared to the Annex *should be provided.*

Doc 9640 contains an interesting recommendation that aerodromes should for two-step de-icing / anti-icing for all operations, regardless of whether it is taken-up or not.

If NAAs/EASA decided to create a similar document to 9640, they could adopt some of the criteria from Annex 14 shown here; effectively turning some recommendations into requirements.
Depending on any new requirements the cost and effort impacts would vary. However, any approach which would provide a single source reference which carried the weight of a regulatory body may impact positively on standards.

EC	Reg 1108/2009	Active 21 Oct 2009
EASA - ESSENTIAL REQUIREMENTS FOR AERODROMES		
Applicability: Amends the Basic Regulation and constitutes Annex Va to that document, plus preliminary clauses. Direct Regulation for Member states to adopt and enforce. Design, maintenance and operation of aerodromees, and equipment, as well as personnel and organisations involved therein.		
Options: To interpret this regulation from the perspective of de-icing / anti-icing operations; and make recommendations for adoption in Implementing Rules, yet to be developed.		
Impact: Early interpretation and recommendations should be given due consideration by the Agency Team developing the Implementing Rules.		

Preliminaries: *(7) Taking into account the large variety of aerodromes and their highly individual infrastructures and environments, common aerodrome safety rules should provide for the necessary flexibility for customised compliance, through an adequate balance between implementing rules, certification specifications and acceptable means of compliance. These rules should be proportionate to the size, traffic, category and complexity of the aerodrome and nature and volume of operations thereon, thereby avoiding unnecessary bureaucratic and economic burdens in particular for smaller aerodromes which only involve very limited passenger traffic.*
This highlights the fact that proscriptive one-size-fits-all regulation of de-icing / anti-icing will not necessarily be effective nor desirable.

Preliminaries: *(12) Under the Community institutional system, implementation of Community law is primarily the responsibility of the Member States. Certification tasks required by this Regulation and its implementing rules are therefore to be executed at national level. In certain clearly defined cases, however, the Agency should also be empowered to conduct certification tasks as*

specified in this Regulation. The Agency should, for the same reason, be allowed to take the necessary measures related to the fields covered by this Regulation when this is the best means to ensure uniformity and facilitate the functioning of the internal market.

In principle this indicates that either EASA or NAAs could establish a licensing/certification scheme for service providers, providing a link can be made between de-icing / anti-icing operations with this Regulation.

Preliminaries:

(17) With regard to the regulation of professions which are not covered by this Regulation, the competence of Member States should be retained to establish or maintain at their own discretion, inter alia, certification or licensing requirements of the personnel.

Where a link between de-icing / anti-icing operations and this regulation cannot be made, or EASA does not wish to establish a licensing/certification scheme for service providers, then the option remains with individual Member States.

Amendments to Articles of 216/2008:

'Article 1

Scope

1. This Regulation shall apply to:

(c) the design, maintenance and operation of aerodromes, as well as personnel and organisations involved therein and, without prejudice to Community and national legislation on environment and land-use planning, the safeguarding of surroundings of aerodromes;

(d) the design, production and maintenance of aerodrome equipment, as well as personnel and organisations involved therein;

Article 3

(n) "aerodrome equipment" shall mean any equipment, apparatus, appurtenance, software or accessory, that is used or intended to be used to contribute to the operation of aircraft at an aerodrome; '

Article 8a

Aerodromes

1. Aerodromes and aerodrome equipment as well as the operation of aerodromes shall comply with the essential requirements set out in Annex Va and, if applicable, Annex Vb.

The scope shown here could be interpreted as pertaining to personnel and organisations "involved" in the operation of the aerodrome, and the maintenance of aerodrome equipment.

De-icing / anti-icing equipment and fluid storage facilities do contribute to the operation of aircraft at an aerodrome, and therefore can fall within the scope of this regulation – if so desired.

B — **Operations and management** *(a) the aerodrome operator shall have, directly or under contracts, all the means necessary to ensure safe operation of aircraft at the aerodrome. These means shall include, but are not limited to, facilities, personnel, equipment and material, documentation of tasks, responsibilities and procedures, access to relevant data and record-keeping;*
This connects the aerodrome to service providers, by giving it some responsibility in how they conduct their operations, even if under contract to an operator. This Requirement was highlighted in EASA CRD A-NPA-2007-11 as a mechanism for indirect regulation of service providers.
(e) the aerodrome operator shall ensure that procedures to mitigate risks related to aerodrome operations in winter operation, adverse weather conditions, reduced visibility or at night, if applicable, are established and implemented; *(f) the aerodrome operator shall establish arrangements with other relevant organisations to ensure continuing compliance with these essential requirements for aerodromes. These organisations include, but are not limited to, aircraft operators, air navigation service providers, ground handling service providers and other organisations whose activities or products may have an effect on aircraft safety;*
This can be interpreted as including de-icing / anti-icing operations and service providers; thereby giving the aerodrome responsibilities in this respect. Para (f) was also highlighted in EASA CRD A-NPA-2007-11 as a mechanism for indirect regulation of service providers.
It may be possible to use the requirements B(a, e, f) above to impose some responsibilities onto aerodromes the de-icing / anti-icing services. Such responsibilities may include facilitation of safety data collection and analysis, scrutiny of procedures, training and equipment, inspections and audits etc. Any such proposals would work best if coordinated with the relevant operators.
The impact might include improved communications and coordination amongst aerodrome, ATC, operator, and service provider. Also the aerodrome may be persuaded to invest into facilities and equipment to ensure improved levels of safety.

2. Management systems *(a) The aerodrome operator shall implement and maintain a management system to ensure compliance with these essential requirements for aerodromes and to aim for continuous and proactive improvement of safety. The management system shall include organisational structures, accountability, responsibilities, policies and procedures.* *(b) The management system shall include an accident and incident prevention programme, including an occurrence-reporting and analysis scheme. The analysis shall involve the parties listed in point 1(f) above, as appropriate.* *(c) The aerodrome operator shall develop an aerodrome manual and operate in accordance with that manual. Such manuals shall contain all necessary instructions, information and procedures for the aerodrome, the management system and for operations personnel to perform their duties.*
To be linked with Annex 14 SMS requirements and pending Implementing Rules for SMS, these requirements should ensure that aerodromes collect data on the safety of de-icing / anti-icing operations.
EASA can reinforce these requirements specifically for de-icing / anti-icing operations; perhaps in cooperation with service providers and operators under a coordinated and harmonised initiative.
The impact would be to involve aerodromes more closely, as participants or facilitators, in the standards of operation of service providers operating at their location.

EC	Directive 96/97/EC	Amended 20/11/2003

GROUND HANDLING DIRECTIVE

– on access to the ground handling market at Community airports.

Applicability: Indirect law for EU Member States to adopt into their own laws. Includes de-icing of aircraft as a ground-handling service. The Directive applies to all Community airports open to commercial traffic whose annual traffic is not less than two million passenger movements or 50 000 tonnes of cargo (Article 1).

Annex List of Ground-Handling Services

6. Aircraft services comprise:

6.2. the cooling and heating of the cabin, the removal of snow and ice, the de-icing of the aircraft;

This Directive does not mention “anti-icing” which must be assumed to be an oversight.

Options:

Given the universal recognition that de-icing / anti-icing is an operational procedure necessary to ensure and maintain the airworthiness of aircraft, one key option would be to remove it from this Directive, or exempt it from certain clauses and Articles. As a necessary safety critical function it may be sensible not to consider de-icing / anti-icing alongside “commercial” activities such as baggage handling and postal services.

Otherwise the amending of this Directive would require a consistent and perhaps coordinated effort from EASA, NAAs, Aerodromes and Airline Associations. However, if this could be achieved then the options introduced below could each be considered within an overall review of the entire Directive.

Impact:

Removing de-icing / anti-icing from this Directive would restrict competition amongst providers unless an alternative mechanism was developed, and consideration would also need to be given to removing fuel/oil supply and loading from the Directive.

Assuming amendments were made with the support of all stakeholders, with the aim of improving standards of de-icing / anti-icing, then the impact should be positive.

Clause 11

Whereas for certain categories of ground-handling services access to the market and self-handling may come up against safety, security, capacity and available-space constraints; whereas it is therefore necessary to be able to limit the number of authorized suppliers of such categories of ground-handling services; whereas it should also be possible to limit self-handling; **Clause 12** *Whereas if the number of suppliers of ground-handling services is limited effective competition will require that at least one of the suppliers should ultimately be independent of both the managing body of the airport and the dominant carrier;*
Clause 11 can allow an aerodrome to limit the number of de-icing / anti-icing service providers based on space constraints and also safety considerations. Clause 12 safeguards against an aerodrome implementing this for financial gain.
If it was considered that risk could be reduced through limiting the number of de-icing / anti-icing service providers, then allowing aerodromes to apply this clause is an option.
The impact would be reduced commercial competition, and perhaps choice of service and fluid available. With fewer service providers there would be less overall investment in equipment and training etc which hitherto may be multiplied and duplicated across several providers. However, the remaining provider(s), through larger revenue, would be in a position to invest more money into equipment and training etc.

Clause 13 *Whereas if airports are to function properly they must be able to reserve for themselves the management of certain infrastructures which for technical reasons as well as for reasons of profitability or environmental impact are difficult to divide or duplicate; whereas the centralized management of such infrastructures may not, however, constitute an obstacle to their use by suppliers of ground-handling services or by self-handling airport users;*
Clearly the main de-icing / anti-icing infrastructures (ramp, pad, lights, signage) will be owned and maintained by the aerodrome. Fluid storage and handling facilities can also be large infrastructures, and in many cases the aerodrome owns these, however, these facilities may be considerably cheaper to invest in, and maintain, than a fleet of de-icing / anti-icing vehicles, which are mostly owned by the service providers. It may be argued that for technical reasons and for those of economics an aerodrome may declare the fleet of de-icing

/ anti-icing vehicles as part of the aerodrome infrastructure, and service providers would share this fleet (see Article 8 below).
An option would be to allow the aerodrome to include de-icing / anti-icing vehicles as part of the aerodrome infrastructure and effectively “rent” them to any service providers.
The impact would be, perhaps, a larger investment in vehicles and some form of oversight of the quality and maintenance of these vehicles through the NAA oversight of the aerodrome.

Clauses 22 *Whereas, in order to enable airports to fulfil their infrastructure management functions and to guarantee safety and security on the airport premises as well as to protect the environment and the social regulations in force, Member States must be able to make the supply of ground-handling services subject to approval;* Clause 23 Whereas, for the same reasons, Member States must retain the power to lay down and enforce the necessary rules for the proper functioning of the airport infrastructure; whereas those rules must relate to the intended objective and must not in practice reduce market access or the freedom to self-handle to a level below that provided for in this Directive;
These two clauses indicate that, in the interests of safety, States must implement an approval system allowing approved organisations to supply their services; and to be able to achieve this States have the power to enforce any necessary rules.
States may therefore decide to define technical rules for the proper functioning of de-icing / anti-icing; such technical rules could vary between simple minimum requirements concerning equipment standards, through availability of fluids, and up to full-blown regulation of procedures and training.
The impact would vary depending on the level and quantity of technical rules defined.

Article 4 *The managing body of an airport, the airport user or the supplier of ground-handling services must, under the supervision of the designated auditor, rigorously separate the accounts of their ground-handling activities from the accounts of their other activities.*

This Article is designed to prevent organisations subsidising their ground-handling services from other activities in order to maintain a false edge over rival companies, by making the fact transparent. Clearly this denies an airport the ability to include de-icing / anti-icing services as part of the aerodrome infrastructure, and charges through landing fees for example. Likewise, operators who decide to provide their own de-icing / anti-icing services by self-handling would need to separate those accounts from their main business. Yet if de-icing / anti-icing, as declared in Doc9640 and Annex 6 is an operational activity, then there should be no requirement to do so; even if an operator considers it continuing airworthiness.
This Article could be amended to exclude de-icing / anti-icing from the necessity to separate the accounts from other activities.
The impact may be a less fair commercial playing field, where aerodromes could undercut other service providers by subsidising a loss-making activity, perhaps de-icing / anti-icing, from their other activities. However, it would also support the concept of aerodromes collecting revenues for de-icing / anti-icing through indirect means from all airport users.

Article 5 – Airport Users' Committee *1. Member States shall ensure that, for each of the airports concerned, a committee of representatives of airport users or organizations representing airport users is set up.* *2. All airport users shall have the right to be on this committee, or, if they so wish, to be represented on it by an organization appointed to that effect.*
Without recommended agendas and powers allocated to the AUC, this Article is pointless.
An option would be to specify how decisions made by the AUC could, or should, be addressed by the airport users, and also what types of decisions ought to be made on what topics.
The impact may improve the effectiveness of those AUC's that rarely meet, and those that are ineffective in making change.

Article 6 *2. Member States may limit the number of suppliers (not below 2) authorized to provide the following categories of ground-handling services:* *— baggage handling,*

— *ramp handling,* — *fuel and oil handling,* — freight and mail handling
De-icing / anti-icing is not included, indicating that States cannot limit the number of de-icing / anti-icing suppliers at any location.
To align this Article with clauses 11, 22 & 23, as discussed above, de-icing / anti-icing could be added to this list. It would seem fair to add a caveat that where a State provided a safety case in favour of limiting the number of suppliers in any category of ground-handling service, then it should be free to do so. Such safety cases should be scrutinised by an independent body.
State involvement should not be to its own commercial benefit (directly or indirectly), and such a rule may also reduce commercial fairness. However, where a safety case can be made the impact on safety should be positive.

Article 8 – Centralized infrastructures *1. Notwithstanding the application of Articles 6 and 7 (self-handling), Member States may reserve for the managing body of the airport or for another body the management of the centralized infrastructures used for the supply of ground-handling services whose complexity, cost or environmental impact does not allow of division or duplication, such as baggage sorting, de-icing, water purification and fuel-distribution systems. They may make it compulsory for suppliers of ground-handling services and self-handling airport users to use these infrastructures.* *2. Member States shall ensure that the management of these infrastructures is transparent, objective and non-discriminatory and, in particular, that it does not hinder the access of suppliers of ground-handling services or self-handling airport users within the limits provided for in this Directive.*
Complimenting clause 13. Although there is no defining what centralised infrastructure constitutes de-icing / anti-icing, interpretation can include ramps, pads, lights, signs, communication, fluid storage and handling, and also the vehicles. These may all be argued on the case of cost and/or complexity.
An option would be to allow the aerodrome to include de-icing / anti-icing vehicles as part of

the aerodrome infrastructure and effectively “rent” them to any service providers.
The impact would be, perhaps, a larger investment in vehicles and some form of oversight of the quality and maintenance of these vehicles through the NAA oversight of the aerodrome.

Article 9 - Exemptions *1. Where at an airport, specific constraints of available space or capacity, arising in particular from congestion and area utilization rate, make it impossible to open up the market and/or implement self-handling to the degree provided for in this Directive, the Member State in question may decide:* *(a) to limit the number of suppliers for one or more categories of ground-handling services other than those referred to in Article 6* *(2) in all or part of the airport; in this case the provisions of Article 6 (2) and (3) shall apply;* *(b) to reserve to a single supplier one or more of the categories of ground-handling services referred to in Article 6 (2);* *(d) to ban self-handling or to restrict it to a single airport user for the categories of ground-handling services referred to in Article 7 (2).*
This can provide aerodromes and/or states with the leverage to argue for restricted markets in some areas. However, it is surprising that de-icing / anti-icing is not included on the list of ground-handling activities, because space and capacity are legitimate reasons for limiting the number of providers.
An amendment could be proposed to include de-icing / anti-icing within this exemption; provided an adequate case was made and supported.
Where a “free” market does exist at an aerodrome with restricted space, and the competition is affecting capacity, then the operational impact could be positive.

Article 11 *Selection of suppliers* *1. Member States shall take the necessary measures for the organization of a selection procedure for suppliers authorized to provide ground-handling services at an airport where their number is limited in the cases provided for in Article 6 (2) or Article 9. This procedure must comply with the following principles:*

(a) In cases where Member States require the establishment of standard conditions or technical specifications to be met by the suppliers of ground-handling services, those conditions or specifications shall be established following consultation with the Airport Users' Committee. The selection criteria laid down in the standard conditions or technical specifications must be relevant, objective, transparent and non-discriminatory. *(d) Suppliers of ground-handling services shall be selected for a maximum period of seven years.*
As described in Clauses 22 & 23 above, para 1(a) here indicates that states can require aerodromes (with inferred support of AUC) to establish and adhere to standards and technical specifications for de-icing / anti-icing providers. Therefore allowing an indirect ruling for these providers, and a degree of harmonised standardisation.
An agreement amongst NAAs to agree to one standard (eg AEA), and supported by Industry through the AUCs could be proposed. A proposal could be made to extend the licensing period beyond 7 years for de-icing / anti-icing.
This would not necessarily bring about complete harmonisation, however, it should ensure involvement from the aerodrome in which standards the providers are obliged, by the operators, to uphold; and through the AUC agreements could be made for harmonisation at a local level. The aerodrome could still defer oversight to the operators. This option may also allow for the supply of Type I. Extending the licensing period may encourage more investment and greater competition. De-icing equipment (vehicles) and glycol recovery vehicles (GRV) are expensive items which typically have lifecycle and investment cycle between 10 to 15 years (as discovered during the Study). After 7-years the capital remaining in a vehicle can still be 50% of the initial cost, and the second-hand market is not necessarily buoyant. Extending the period could also see prices falling, as investment can be recovered over a longer period.

Article 14 *Approval* 1. Member States may make the ground-handling activity of a supplier of ground-handling services or a self-handling user at an airport conditional upon obtaining the approval of a

public authority independent of the managing body of the airport. The criteria for such approval must relate to a sound financial situation and sufficient insurance cover, to the security and safety of installations, of aircraft, of equipment and of persons, as well as to environmental protection and compliance with the relevant social legislation.
This Article aims to ensure a business is fit-for-purpose legally, administratively and financially, however, it does not require that any technical specifications or operational standards need be approved by an external public authority.
An option could be to include technical specifications and operational standards for de-icing / anti-icing within this Article.
The impact would be that de-icing / anti-icing service-providers would be obliged to seek and gain approval from their NAA before being granted a license to operate at an aerodrome. Such approval could be an extension of the fit-for-purpose assessment, similar to EU OPS Sub-part B, or forthcoming ORs. This would not preclude the need for operators to conduct full oversight through issue of contracts and quality system procedures. However, it would give NAAs a greater insight into the ground-handling organisations operating at aerodromes within their jurisdiction.

Article 15 *Rules of conduct* *A Member State may, where appropriate on a proposal from the managing body of the airport:* *— prohibit a supplier of ground-handling services or an airport user from supplying ground-handling services or self-handling if that supplier or user fails to comply with the rules imposed upon him to ensure the proper functioning of the airport;*
A safety clause to reduce risk, provided the aerodrome management is adequately taking measures to monitor the standards and safety of ground-handling services, either directly, or indirectly through the operators. Operators too have duty to feedback relevant data to the aerodrome. This clause does not promote high-levels of practice, only allows (consistent) unsatisfactory performers, or those who deliberately violate expected standards of professionalism, to halt operations.
This Article could be amended in alignment with proposals to amend Articles 9, 11 and 14 above, and thus include the right for an NAA to remove an “approval” or license from a de-

icing / anti-icing service provider.
The impact would be as for the proposals to amend Articles 9, 11 and 14 above.

EC/EASA	Reg 2042/2003	Amendment 4, 5 March 2010
EASA - PART M/PART 145 & AMC TO PART M		
Applicability: Direct Requirements enforced by Member States on entities. CA of aircraft registered in Member State, or operated by entity overseen by a Member State.		
Options: Consideration could be given to including de-icing / anti-icing as a maintenance task, instead of an operational task.		
Impact: The financial and political impacts would be great in terms of reorganising the Industry, which in itself will introduce risks. Other impacts would need to be investigated.		

Article 2

Definitions

(d) 'continuing airworthiness' means all of the processes ensuring that, at any time in its operating life, the aircraft complies with the airworthiness requirements in force and is in a condition for safe operation

(h) 'maintenance' means any one or combination of overhaul, repair, inspection, replacement, modification or defect rectification of an aircraft or component, with the exception of pre-flight inspection;

Article 3

2. Organisations and personnel involved in the continuing airworthiness of aircraft and components, including maintenance, shall comply with the provisions of Annex I and where appropriate those specified in Articles 4 and 5 (Organisation approvals and certifying staff respectively).

AMC M.A.201 (h) Responsibilities*

2. The performance of ground de-icing and anti-icing activities does not require a maintenance organisation approval. Nevertheless, inspections required to detect and when necessary eliminate de-icing and/or anti-icing fluid residues is considered

maintenance. Such inspections may only be carried out by suitably authorised personnel.
De-icing / anti-icing could fit within the above definitions: cleaning ice off the airframe and maintaining a clean wing during snow is the process of ensuring a condition for safe operation and therefore can be interpreted as continuing airworthiness; and, applying thick fluid on the wings could be interpreted as a temporary maintenance modification.
De-icing / anti-icing could be declared a maintenance task, in the same manner that cleaning of residues has been declared as a maintenance task.
De-icing / anti-icing operatives would need to hold appropriate licenses/certificates, and their employer organisations approved. The impact would be great: some service providers would go out of business, some airlines would need to employ more staff, NAAs would need to conduct more approval/licensing/certifying tasks etc.

M.A.201 Responsibilities (d) The pilot-in-command or, in the case of commercial air transport, the operator shall be responsible for the satisfactory accomplishment of the pre-flight inspection. This inspection must be carried out by the pilot or another qualified person but need not be carried out by an approved maintenance organisation or by Part-66 certifying staff.
From EU OPS we know that the person who conducts the contamination check must be trained and qualified, as is repeated here, however, in both documents no standard is specified.
A qualifying standard could be defined for personnel who conduct de-icing / anti-icing checks and inspections.
A definition would be helpful.

AMC M.A.201 (h)1 Responsibilities (*) *7. The operator's management controls associated with sub-contracted continuing airworthiness management tasks should be reflected in the associated written contract and be in accordance with the operator's policy and procedures defined in his continuing airworthiness management exposition. When such tasks are sub-contracted the operator's*

continuing airworthiness management system is considered to be extended to the sub-contracted organisation. *9. Contracts should not authorise the sub-contracted organisation to sub-contract to other organisations elements of the continuing airworthiness management tasks.* *13. The operator should only sub contract to organisations which are specified by the competent authority on the AOC or EASA Form 14 as applicable.*
If de-icing / anti-icing were adopted as a maintenance task, then this AMC imposes some controls on sub-contracting.
The operator's de-icing / anti-icing policy and procedures could be placed in the control of the airworthiness management exposition.
Service providers would no longer be able to sub-contract to other organisations. Service providers would need to be "specified" on the AOC, or Form 14, and this would require NAA/EASA action.

AMC M.A.301 -1- Continuing airworthiness tasks *1. With regard to the pre-flight inspection it is intended to mean all of the actions necessary to ensure that the aircraft is fit to make the intended flight. These should typically include but are not necessarily limited to:* *(f) a control that all the aircraft's external surfaces and engines are free from ice, snow, sand, dust etc.. and an assessment to confirm that, as the result of meteorological conditions and de-icing/anti-icing fluids having been previously applied on it, there are no fluid residues that could endanger flight safety. Alternatively to this pre-flight assessment, when the type of aircraft and nature of operations allows for it, the build up of residues may be controlled through scheduled maintenance inspections/cleanings identified in the approved maintenance programme.* *3. In the case of commercial air transport, an operator should publish guidance to maintenance and flight personnel and any other personnel performing pre-flight inspection tasks, as appropriate, defining responsibilities for these actions and, where tasks are contracted to other organisations, how their accomplishment is subject to the quality system of M.A.712. It should be demonstrated to the competent authority that pre-flight inspection personnel have received appropriate training for the relevant pre-flight inspection tasks. The training standard for personnel performing the pre-flight inspection should be described in the operator's continuing airworthiness management exposition.*

M.A.712

(e) In case of commercial air transport the M.A. Subpart G quality system shall be an integrated part of the operator's quality system.

If a contamination check is undertaken as part of the pre-flight inspection, and contamination is detected, then the “control” that the aircraft surfaces are clean is postponed until the post-treatment check. This means that the pre-flight inspection is not completed as per the AMC. At this stage a sub-contracted body is usually involved, who will technically be following the operator’s checking/inspecting procedures as required by OPS 1.345 and defined in the operator’s de-icing / anti-icing programme and procedures.

Their accomplishment by a sub-contractor is subject to the operator’s Quality Systems required under OPS 1.035 as well as M.A.712, which may be integrated.

This point can be clarified further when the “control” for clean surfaces must be delayed due to de-icing requirements; the responsibility is passed from maintenance to operations.

In practice this may have very limited impact. However, a clear dividing line could be drawn between what are the maintenance tasks and responsibilities and which are operations’.

M.A.401 Maintenance data

(a) The person or organisation maintaining an aircraft shall have access to and use only applicable current maintenance data in the performance of maintenance including modifications and repairs.

(b) For the purposes of this Part, applicable maintenance data is:

1. any applicable requirement, procedure, standard or information issued by the competent authority or the Agency,

2. any applicable airworthiness directive,

3. applicable instructions for continuing airworthiness, issued by type certificate holders, supplementary type certificate holders and any other organization that publishes such data in accordance with Part 21.

If de-icing / anti-icing were a maintenance task, then this Rule would apply, giving the NAA/Agency indirect influence over service providers’ procedures.

As this indirect and specific intervention does not exist currently through operations

regulation, it is an option to create an OPS requirement similar to this Rule.
The impact would be that if the NAAs/EASA decided, based on current data (eg from SAE G-12) that a certain procedure, or fluid, was essential, or indeed hazardous, then they could immediately impose this on operators who would need to respond through their contracts with service providers.

EC	Directive 2003/42/EC	4 July 2005
DIRECTIVE ON OCCURRENCE REPORTING IN CIVIL AVIATION		
Applicability: Indirect and general to all elements of the Industry. Technically NAAs should require SPs, Fluid Manufacturers etc to "report" anything that may impact on the safety of flight, passengers or any other person.		
Options: To call for an Industry-wide review of this Directive to include the spirit of ICAO SMS SARPS and best-practice.		
Impact: All positive impacts on the improvement of safety and reduction of risk.		

Clause 7 Various categories of personnel working in civil aviation observe occurrences of interest for the prevention of accidents and should therefore report them. **Clause 8** *The efficiency of detection of potential hazard would be greatly enhanced by the exchange of information on such occurrences.*
This must include de-icing / anti-icing operatives and their employers. However, does not provide clear guidance on what types of organisations are included, nor a means to share this data. Therefore, may not be motivating enough to implement amongst service providers.
Either operators and aerodromes can be required to collect such data from their de-icing / anti-icing service providers, or a voluntary programme to raise awareness and offer support can be initiated, such that this data is provided direct to the NAA, or EASA.
The reporting by personnel working for de-icing / anti-icing organisations will greatly enhance safety by providing valuable human factors and systems data that can be analysed. Requirements to report to operator customers will complicate the system for the providers and introduce an element of "choice" which could be affected by contracts and politics. Analysis by operators will be fragmented. Requirements to report to NAAs/EASA will ensure the largest set of data from which a better analysis can be made and mitigation measures generalised for the whole Industry. Also the

collection and submission scheme for service providers would be much simplified.

Article 2 - Definitions

For the purpose of this Directive:

1. 'occurrence' means an operational interruption, defect, fault or other irregular circumstance that has or may have influenced flight safety and that has not resulted in an accident or serious incident, hereinafter referred to as 'accident or serious incident', as defined in Article 3(a) and (k) of Directive 94/56/EC;

Article 3 - Scope

1. This Directive shall apply to occurrences which endanger or which, if not corrected, would endanger an aircraft, its occupants or any other person. A list of examples of these occurrences appears in Annexes I and II.

This extends the requirements contained in EU OPS 1.037 for operators to report incidents and accidents to those occurrences which are similar to the examples given; however, the definition could be clarified to include specifically human, procedural and system errors that are considered by the reporter to increase risk.

Amending this definition and including it in the scope will greatly enhance understanding and give NAA motivation to encourage and support a broader collection and sharing of a broader range of safety data. This will enhance Article 9.

The impact can only be positive with regards to improving safety.

Article 4 - Mandatory reporting

1. Member States shall require that occurrences covered by Article 3 are reported to the competent authorities referred to in Article 5(1) by every person listed below in the exercise of his/her functions:

(g) a person who performs a function connected with the ground-handling of aircraft, including fuelling, servicing, load-sheet preparation, loading, de-icing and towing at an airport covered by Regulation (EEC) No 2408/92.

2. Member States may encourage voluntary reporting on occurrences mentioned in Article 3(1) by every person who exercises, in other civil aviation operations, functions similar to

those listed in paragraph 1.

Article 9 - Voluntary reporting

1. In addition to the system of mandatory reporting established under Articles 4 and 5, Member States may designate one or more bodies or entities to put in place a system of voluntary reporting to collect and analyse information on observed deficiencies in aviation which are not required to be reported under the system of mandatory reporting, but which are perceived by the reporter as an actual or potential hazard.

These two Articles go some of the way to adding to the scope, and meeting the options proposed above concerning Articles 2 and 3, however, it is not evident that Member States, through their NAAs, are ensuring that this is complied with fully.

Member States can be reminded of these Articles, and also the current status quo concerning lack of safety data (or access to), with the intention of creating action.

The impact may be to encourage cooperation in developing a programme to raise awareness and achieve a satisfactory reporting rate and effective analysis.

ANNEX I - List of aircraft operations, maintenance, repair, and manufacture-related occurrences to be reported

This includes – for example:

A. OPERATIONS

(i) (k) Breakdown in communication between flight crew (CRM) or between flight crew and other parties (cabin crew, ATC, engineering).

(vii) (a) Repetitive instances of a specific type of occurrence which in isolation would not be considered ‘reportable’ but which due to the frequency with which they arise, form a potential hazard.

(vii) (d) Any other occurrence of any type considered to have endangered or which might have endangered the aircraft or its occupants on board the aircraft or on the ground.

B. AIRCRAFT TECHNICAL

(v) (d) Any other event which could endanger the aircraft, or affect the safety of the occupants of the aircraft, or people or property in the vicinity of the aircraft or on the ground.

(vii) Non-compliance or significant errors in compliance with required maintenance

procedures. D. AIR NAVIGATION SERVICES, FACILITIES AND GROUND SERVICES (iv) (a) Failure, malfunction or defect of ground equipment used for the testing or checking of aircraft systems and equipment when the required routine inspection and test procedures did not clearly identify the problem, where this results in a hazardous situation. (b) Non-compliance or significant errors in compliance with required servicing procedures. (c) Loading of contaminated or incorrect type of fuel or other essential fluids (including oxygen and potable water).
This list is not comprehensive, nor does it specifically mention de-icing / anti-icing. In the Appendix to this Annex, there are examples given of types of reportable occurrences, however, none relate to de-icing / anti-icing of aircraft on the ground.
The Directive could be amended to specifically include examples of reportable occurrences for de-icing / anti-icing of aircraft on the ground. Operators and aerodromes could be required by NAAs, under SMS regulations, to interpret this Directive from the perspective of de-icing / anti-icing service providers and to take measures to ensure their compliance.

APPENDIX 1: LIST OF REFERENCES

Document Source	Document Title/Reference
ICAO	Annex 6, Part 1 – Operation of Aircraft
ICAO	Annex 8, – Airworthiness of Aircraft
ICAO	Annex 14, – Aerodromes
ICAO	Document 9137 Part 8 – Airport Services Manual
ICAO	Document 9640 - Manual of Aircraft De-icing / Anti-icing Operations
EC	Reg 3922/91 Annex III – EU OPS
EC	Reg 216/2008 – The Basic Regulation (ERs –OPs, Airworthiness)
EC	Reg 1108/2009 – Essential Requirements Aerodromes
EC/EASA	Reg 2042/2003 (2010) – EASA PART M, 145 & AMC PART M
EASA	NPA 2/2009 – IR OPS
EASA	NPA 22C/2008 – ARs & ORs
EASA	A-NPA & CRD TO A-NPA 2007-11
EASA	NPA & CRD TO NPA 9/2009
EASA	SIN 2008-29
EC	Directive 96/97/EC on Ground Handling market access in Community airports
EC	Directive 2003/42/EC on Occurrence Reporting in Civil Aviation
IATA	Standard Ground Handling Agreement
AEA	Recommendations for De-icing / Anti-icing of aircraft on the ground
AEA	Training Recommendations and background information for de-icing / anti-icing of aircraft on the ground
AEA	De-icing / Anti-icing International vendor audit checklist
SAE	AMS 1424 – De-icing / Anti-icing fluid Type I
SAE	AMS 1428 – De-icing / Anti-icing fluid Types II, III, IV
SAE	ARP 4737 – Aircraft De-icing / Anti-icing methods

SAE	ARP 5646 – Quality programme guidelines for de-icing / anti-icing of aircraft on the ground
FAA	AC 120-60 Ground de-icing / anti-icing programme
FAA	AC 135-16 Ground de-icing / anti-icing training and checking
FAA	N8900-26 Outsourcing of 3rd party provider aircraft ground de-icing

EASA.2009.OP 21

Study on the regulation of ground de-icing and anti-icing services in the EASA Member States

INTERIM REPORT

OPTIONS FOR CHANGE – ATTACHMENT C

Notes on the FAA Standardised International Aircraft De-icing Programme

airsight GmbH

Gustav-Meyer-Allee 25
13355 Berlin
Germany
Phone: +49 30 45803177
Fax: +49 30 45803188
www.airsight.de

INTRODUCTION

This document is a short summary and description of the FAA Standardised International Aircraft De-icing Programme (SIAGDP). It is presented in two sections: the first contains notes made from an FAA presentation on the background of the programme; and the second includes extracts from the SIAGDP document. The reason it is included in this Report is that any progress and changes made by the FAA concerning how de-icing / anti-icing is regulated may have an impact on: European Carriers flying to US aerodromes; and, European service providers contracted to provide de-icing / anti-icing to US carriers operating to/from European aerodromes. Furthermore, a goal of any future regulation, and defining of best-practice, must always remain as reaching global harmonisation. Option FAALIAS presented in Options for Change refers.

Readers will gain a broad understanding of the FAA's intentions from the first section. The extracts in the second section provide more in-depth and precise references to areas of de-icing / anti-icing management and operations that are discussed elsewhere in this report.

NOTES TAKEN FROM A PRESENTATION GIVEN BY OSTRONIC & FISCUSS (FAA) JULY 2008 – WINTER UPDATE

AC 120-60B 20 Dec 2004 is the primary guidance document for the development of an air carrier's aircraft ground de-icing programme (compliance with 14 CFR 121.695). Originally, this was written when most air carriers accomplished aircraft de/anti-icing utilising their own company equipment and personnel at most airports. Much of the de/anti-icing was conducted by company aircraft mechanics with a high degree of knowledge of de/anti-icing fluids, aircraft systems, aerodynamics, aircraft sensitive areas, and the effects of contamination on the critical areas of the aircraft. Also, they would have great familiarity with moving around aircraft and airports in an operational environment.

However today, depending on the air carrier, approximately 70 - 80% of aircraft ground de/anti-icing is accomplished by third party contract service providers

The employee of the typical contracted third-party aircraft ground de/anti-icing service provider:

- has been with the company less than 2 years.
- is often his/her first exposure to aviation and airplanes.
- is usually minimally paid with little or no benefits.
- almost always does part time and seasonal work.

AC 120-60B simply does not address the realities of the present situation in the aircraft ground de-icing environment and the contractual relationships that have evolved between the air carriers and the third party aircraft ground de-icing service providers.

Therefore today (2008/2009) a major re-write of AC 120-60B is underway. The aim is to have one standardised programme for all carriers domestic and foreign, at home and overseas.

If the revision is successful then it will:

- Improve safety by increased standardisation – a programme for use domestically and internationally.
- Provide an authorisation process for third-party aircraft service providers independent of an air carrier's 14 CFR 121.629 approved ground de-icing programme.
- Improve FAA oversight through the third-party service provider authorisation process.
- Make available and encourage the use of quality de/anti-icing fluids to a larger segment of the aviation industry (beyond major commercial carriers).

FAA Notice N.8900.26 states that: An air carrier aircraft may only be de/anti-iced under the air carrier's own approved program or under another air carrier's approved program.

FAA NOTICE - N 8900.26 - *Dated Dec 2007 and valid for one year.*

This was issued as guidance to Safety Inspectors to check up on airline's arrangements with service providers following some clear violations and general ignorance. Inspectors had 90 days to comply. Notice 8900.33 extended the deadline for Foreign Locations, due to logistics.

Extracts

Outsourcing (commonly referred to as "third party") of aircraft ground de-icing services is becoming the norm across the airline industry. When an air carrier outsources these services, the air carrier retains the responsibility for all aspects of its approved aircraft ground de-icing program. This includes the quality management of the service and the training of ground personnel. The FAA may authorize the air carrier to use an outsourced service provider as the agent for the air carrier to physically apply de/anti-icing fluids using the service provider's equipment in accordance with the air carrier's FAA-approved aircraft ground de-icing program (not the service provider's unapproved program). FAA policy also allows an air carrier to use de-icing services provided by another air carrier that has an FAA-approved aircraft ground de-icing program under § 121.629(c). When using the services provided under another air carrier's FAA-approved program, the contracting air carrier needs to provide training for the ground service personnel on the differences between the two programs as they relate to the specific aircraft de-icing procedures, communications, and record keeping. The contracting air carrier retains full responsibility for the safe operation of the aircraft and therefore must have a process to ensure the contracted air carrier's aircraft ground de/anti-icing operation is in compliance with applicable requirements of the regulations and their approved aircraft ground de-icing program.

Policies, procedures, and requirements are currently under development to authorize an aircraft ground de-icing service provider to be issued a letter of authorization (LOA) to provide aircraft ground de-icing services under an industry standardized aircraft ground de-icing program. While this concept would allow an air carrier to be approved to use the service provider's program as per the service providers LOA, no policy or procedure exists for such authorization at this time.

At some foreign locations only one aircraft ground de-icing service provider is authorised to provide aircraft ground de/anti-icing by local governments for environmental concerns. These service providers are providing de/anti-icing services to as many as 25 different air carriers. It is not desirable or practicable to expect these companies, or their employees, to know 25 different ways of accomplishing the same basic task.

- There was a proposal to consider using the concept of a “host” airline at each location, but this was rejected.
- Use of one specific service provider programme for everyone was rejected, due to variation in aircraft, operations, locations etc.
- Incorporating every service provider’s programme into the approved airline’s programme – rejected.
- Revision to airline programmes to incorporate the SIAGDP for overseas destinations - accepted.

SIAGDP is a comprehensive generic aircraft ground de-icing programme based on the guidelines developed by the Association of European Airlines (AEA) for aircraft ground de/anti-icing, and followed by many of the foreign de-icing service providers. The SIAGDP is more detailed and comprehensive than that specified in the current AC 120-60B, and that which is currently in most air carrier’s core FAA approved aircraft ground de-icing programs.

- A service provider’s methods of compliance and specific procedures with the SIAGDP will be identified and evaluated through the initial and yearly audit reports.
    - Audit checklist/form/report modelled after AEA aircraft ground de-icing provider audit form.
    - Audits are to be conducted by knowledgeable individuals under the oversight and coordination of ATA.
    - Single audit sanctioned by an ATA auditor may be shared by all SIAGDP participants.
- The SIAGDP is in addition to, and does not replace, the approved programme under 121.695 (AC 120-60).

NOTES AND EXTRACTS FROM THE SIAGDP DOCUMENT (2010-11 Edition, 1 July 2010)

July 1, 2010
Notes are made and extracts included where they highlight some of the options made in Options for Change, and/or reflect findings made in Data Summary and Analysis within the Interim Report. *Comments are added in italics.*

Executive Summary

The SIAGDP allows U.S. Commercial Air Carriers (not Domestic and on-demand operations Part 135) a:

- shared,
- approved,
- compliant, and
- standardised programme,
- …. to operate in international locations.

The core of this program is the De/Anti-icing Vendor Audit (DEVA).

Pooling of audit results is acceptable, and participants fulfil their internal Quality Assurance program requirements for continuous surveillance of the vendors under contract to perform de/anti-icing services and requirements of the SIAGDP.

The Air Transportation Association (ATA) will host the data repository where each participating airline will submit:

1. List of designated auditors
2. Schedule of planned audits
3. DEVA results, including date of the audit conducted
4. Corrective action responses including acceptance or rejection of location

Participants are:

- Alaska Airlines,
- American Airlines,
- Continental,
- Delta,
- FedEx Express,
- Horizon Air,

- SkyWest ,
- United Air Lines,
- United Parcel Service and
- US Airways.

International De/Anti-icing Chapter - Foreword

This is only a portion of the FAA approved de/anti-icing program and does not cover detailed flight crew or dispatcher procedures.

It covers international de/anti-icing differences associated with local procedures accomplished by third-party de-icing providers.

Third party providers may use all procedures from the main approved de/anti-icing manual or substitute differences contained in the International De/Anti-icing Chapter.

This chapter is divided into four sections:

- Procedures Section
- Training Section
- Quality Control Section
- Reference Section

Procedures

1 De/Anti-icing Fluids

This section on the delivery, storage, pumping, handling and testing of fluids follows accurately the AEA Recommendations*. It may be possible for any regulation to simply refer to the AEA Recommendations and Training Manual and thereby give tacit approval.*

2 De/Anti-icing Operations

2.1 General

The de/anti-icing operation must be suited for each airport, company and local setting. However, airworthiness and operational regulations state that no one can take-off in an aircraft that has any contamination on critical surfaces.

The clean aircraft concept shall be set as the only way of operating.

2.2 Preliminary work for the start of de/anti-icing

A verification of procedures for de/anti-icing should then be made. Procedures may vary according to local demands. The necessary inspections and communications can be made

beforehand at the gate whereas at remote/centralised de-icing, necessary information must be informed to the de-icing crew in another way (e.g. coordinator communication).

2.2.1 Determining the need for de/anti-icing

Certain aspects must be considered, such as, what are the A/C specific requirements and precautions, is the de-icing operation performed at gate or remote, can the aircraft start the engines and taxi to a remote de-icing fully contaminated, who makes the request for the de-icing, verification of proper procedure with all parties involved (ground crew / flight crew / de-icing crew), should air-blower/brushes be used beforehand etc.

2.2.1.1 One-step/two-step de/anti-icing

The selection of a one- or two-step process depends upon weather conditions, available equipment, available fluids and the holdover time to be achieved.

One-step procedure: some contamination, such as frost, can be removed and the surface protected from refreezing, all at the same time using the same fluid and same mixture.

Two-step de/anti-icing (when the first step is performed with de-icing fluid) is a procedure performed whenever the contamination demands a de-icing process separately. *This sentence reflects what is included in AEA Recommendations, and would virtually mandate that aerodromes provide type I fluid, because there will always be days of heavy snowfall and clear ice which "demand" a separate de-icing.*

2.2.2.1 Clean aircraft concept

Contaminated fluid on the surface must not be misunderstood as a clean aircraft; this contamination must be removed. Anti-icing only is not permitted.

2.3.2.2 Anti-icing fluid may be applied to aircraft surfaces at the time of arrival on short turnarounds during freezing precipitation and on overnight parked aircraft. This procedure has a potential risk of building residues and is not recommended if performed continuously.

2.3.1 Aircraft surfaces

If the wing area is large and the contamination is heavy, previously de-iced parts should be considered to be de-iced again before anti-icing.

2.3.1.1 Other areas

The Application of hot water or heated Type I fluid in the first step of the de/anti-icing process may minimise the formation of residues. It must be clear that de-icing or anti-icing should not be performed (sprayed) from the trailing edge forward. This can cause even more residue to collect and there is also the danger of removing grease from hinges and other parts.

2.4 De/anti-icing communication

Proper communication is as important as proper de/anti-icing. There cannot be any doubt of the procedure, fluid used, holdover time, areas covered etc. when communicating and verifying the process.

As important as the communication between the flight crew and the de-icing crew so is the communication between the de-icing crews themselves and the de-icing coordinator. No misconception can be allowed when deciding on treatment and verifying operational procedures.

2.4.1.1 The Anti-Icing Code

The Anti-Icing Code contains the minimum information needed for communication. It is allowed, and preferred, to give other information, such as areas treated, areas checked, engines and propellers, frost thickness on underwings etc, if there is a need for it or if the crew has requested something else.

Note that heavy precipitation rates or high moisture content, high wind velocity or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may also be reduced when aircraft skin temperature is lower than OAT. Therefore, the indicated times should be used only in conjunction with a pretakeoff check. For use of holdover time guidelines consult Fluid Manufacturer Technical Literature for minimum viscosity limits of fluids as applied to aircraft surfaces. A Type II, III or Type IV fluid is considered degraded if the viscosity is below the minimum limit as provided by the fluid manufacturer.

3 Off-Gate De/Anti-icing Operation

3.1 Airport operations

The operation of any de-icing facility should maximise efficiency where possible.

Local settings may demand one sort of operation for one airport that could be unusable for another location. *As long as "local settings" is not a euphemism for different levels of investment and capability/capacity of facilities and equipment and personnel etc.*

3.4 Management of the centralised de/anti-icing operation.

A management and procedure plan should be available at the airport in relevant publications. This program shall explain the necessary procedures of the de-icing operation. The remote de-icing operation must be clearly determined and informed to all stakeholders. A de-icing program must be established irrespective of whether it is a remote only or a mix operation. The procedures, the throughput, the options, the checks, the communication etc. must be

clearly defined and responsible persons must be introduced. A remote de-icing operation (including a mix) must have a coordination operation.

6 De/Anti-icing Coordination

6.1 General

Any winter operation needs a coordinated effort to produce an effective and efficient de-icing procedure. Establish coordination according to the local needs and settings. If the de-icing volume is reasonably large then a coordination system is a must. Coordination can be established for both gate and remote de-icing operations, they can even serve both procedures simultaneously. *With coordination also goes nomination of coordinators – experienced and knowledgeable post-holders, with clearly defined responsibilities. It is also clear that more than one person needs to be coordinating – the operator and aerodrome as well as the service provider need to be "in the loop". Including the aircraft captain – it is a team effort, which needs an overall "leader".*

The area of responsibility lies with the:

- allocation of de-icing work,
- the control of de-icing vehicle resources,
- management of de-icing events,
- communication control,
- safety considerations and
- special occurrences (problem solving) or ad-hoc situations.

Local requirements must be followed and the procedures adapted accordingly.

6.2.1 Coordination recommendations

Who employs the coordinator service provider or Aerodrome? What if there is more than one service provider operating at the same time and location?

The coordinator must have good experience of winter operations and be able to solve situations as they appear. Relating requirements are explained in Training Section. The coordinator must be able to handle several de-icing situations at different times of operation. Some items included in the procedures may be to centralise resources, control vehicle fluid consumption and filling according to the flow of aircraft, verify quality of fluids, give taxi instructions at the centralized de-icing area (or provide contact information), involve stakeholders (e.g. apron suction trucks, other operators), record keeping and to be a source of information (troubleshooting) when needed. The coordinator is constantly monitoring all

communications and operations and can therefore supervise the safety of de-icing operations. The coordinator may need to be aware of environmental aspects and monitor the operations accordingly. Fluid availability and logistics is one important part of coordinating a de-icing operation. The coordinator should be able to provide the flight crew with pertinent information of the de-icing procedure if the de-icing crew is unable to provide such information. Note that at remote areas other de-icing providers may share the same de-icing pad but not the same coordination. This situation should be clarified beforehand and procedures should be set up for mutual understanding and foremost because of safety.

6.2.2 Communication procedures

The coordinator has a role of supervising correct communication between the de-icers to the aircraft and correcting possible misunderstandings.

6.2.3 Safety considerations

It is up to the de-icing coordinator to verify de/anti-icing procedures and take into account variations between company procedures. *At a busy aerodrome with multiple de-icing / anti-icing operations being conducted in parallel, this would be impossible for one person. At each aircraft/de-icing operation interface, a coordinator needs to be present (visually and verbally in communication with the flight crew); this role must rest with the service provider.*

6.2.4 Airport layout and local compliance

The airport infrastructure must support the winter operations.

Training

Adds nothing to, and does not contradict, the AEA Training Manual. 25 pages as opposed to 193.

Quality Control

No variation from AEA into what operators "should" do, how they should conduct audits, when and where, etc.

Also includes the DEVA checklist (DE/anti-icing Vendor Audit). This is not dissimilar to the IATA DAQCP audit checklist.

EUROPEAN AVIATION SAFETY AGENCY
AGENCE EUROPÉENNE DE LA SÉCURITÉ AÉRIENNE
EUROPÄISCHE AGENTUR FÜR FLUGSICHERHEIT

Postal address
Postfach 101253
50452 Cologne
Germany

Visiting address
Ottoplatz 1
50679 Cologne
Germany

Tel +49_221_89990-000
Fax +49_221_89990-999
Mail info@easa.europa.eu
Web easa.europa.eu