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International Strategy for Disaster Reduction



Global Fire Monitoring
Center (GFMC)



UNECE / FAO Team of Specialists
on Forest Fire

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Report 3 – Submitted by the International Fire Aviation Working Group (IFAWG)

Proposal Adoption of Voluntary Guidelines for Fire Aviation

Executive Summary

This report recommends the adoption of voluntary guidelines for the use of aerial means in wildfire management in the UNECE region, in order to improve the safety, effectiveness and efficiency of fire aviation. Adoption of the guidelines would ideally form part of a wider agreement on international cooperation aimed at enhancing fire management capability within the region. The overall purpose of the proposal is to make a substantial contribution to building resilience that will reduce loss of life and damage resulting from wildfires.

This report is complementary to the report to the UNECE/FAO Regional Forum on Cross-boundary Fire Management from the International Working Group on Cooperation in Wildfire Preparedness and Response (IWG-CWPR)¹ which in turn proposes the implementation of an International Wildfire Support Mechanism (IWSM) for the UNECE Region. It is intended that fire aviation will be an integral component of the IWSM, and that the adopting the guidelines for use of aerial means that are referred to in this paper will be complementary to, and consistent with, the priority actions for implementing the IWSM strategic objectives.

The purpose of this report is to:

- a. Provide a briefing to UNECE member states regarding the status of the production of a set of draft voluntary guidelines for the use of aviation resources in fire management. The guidelines are referred to here as the **Fire Aviation Guidelines**². The current draft of the Fire Aviation Guidelines has been developed by the International Fire Aviation Working Group – a working group of the UNISDR Wildland Fire Advisory Group.
- b. Recommend the adoption of the draft Fire Aviation Guidelines by UNECE member states. Adoption of the Fire Aviation Guidelines would implement components of the recommended aims, objectives and priority actions contained in the proposed IWSM.

¹ *Building Resilience of Nations and Communities within the UNECE Region to Wildfire Emergencies and Disasters*. Report of the International Working Group on Cooperation in Wildfire Preparedness and Response (Final Draft, October 2013)

² The guidelines are titled the *Fire Aviation Guidelines* as the scope is intended to cover all aviation activities in fire management including fire prevention. Refer to 3.2 "Scope".

- c. Recommend that the UNECE and member states support the continued development of the Fire Aviation Guidelines.
- d. Recommend that the UNECE promote the adoption of the Fire Aviation Guidelines globally as an integral part of a globally expanded IWSM or any other agreement arising from the Forum and thereafter, and also promote the guidelines for independent endorsement and application by individual operators and agencies or within the framework of bilateral and multi-lateral agreements.

The use of aircraft in fire and emergency management has expanded rapidly in recent decades. Aircraft now provide very valuable support to fire management activities around the world. Globally, many countries make very effective use of aircraft in a wide range of roles, however there is evidence to suggest that these specialised, versatile and relatively costly resources could be utilised more effectively and efficiently in many circumstances. There will be increased pressure to ensure that the use of aviation resources is as safe, efficient and effective as possible, particularly as the demand for aerial support grows with the anticipated changes in fire regimes, the increased wildland fire risk across the globe; and the increased expectations of communities regarding effective response.

Sharing of aviation resources between jurisdictions provides the potential to generate considerable economic benefits and to improve effectiveness and efficiency of fire prevention and response. There are current examples around the world of effective protocols for cross-border sharing of fire aviation resources, including between some UNECE member states. In the past there have been many instances of effective international collaboration in fire aviation to support response to wildfire emergencies and wildfire disasters. However it is reasonable to say that there have also been examples of ineffective and inappropriate sharing of aircraft resources. Sharing of aircraft across borders is likely to be an increasing feature of wildland fire management and there are opportunities to significantly enhance resource sharing and improve outcomes by establishing common operating procedures and standards and by embedding robust resource exchange procedures into pre-planned inter-jurisdictional agreements.

The Fire Aviation Guidelines are intended to assist nations across the globe to build resilience to deal with wildfire by improving the safety, effectiveness and efficiency of a principal support capability. The guidelines aim primarily to:

1. Assist in the development and management of appropriate, effective, high quality aviation capabilities through the provision of common guidance to adopting states regarding recommended minimum standards and appropriate best-practices; and
2. Enhance effective sharing of aviation capabilities between states by:
 - a. Developing common standards and common operating practices for fire aviation, thus enhancing interoperability; and
 - b. Providing recommended procedures and supporting information for effective sharing of fire aviation resources.

The Draft Parts I and II of the Guidelines are provided in the Annex to this report.

1. Introduction

In November 2013 the UNECE/FAO Forum on Cross-Boundary Fire Management at the United Nations, Geneva (28-29 November 2013), will consider recommendations to UNECE member states for developing an agreement on international cooperation aimed at enhancing fire management capability within the region.

This paper proposes adoption of a set of voluntary guidelines for the use of aerial means in wildfire prevention and management – the *Fire Aviation Guidelines* as part of the agreement on international collaboration. The Fire Aviation Guidelines aim to build resilience by improving the safety, effectiveness and efficiency of resident fire aviation capabilities in member states, and to enhance the opportunities for transboundary cooperation through the sharing of aviation resources between states.

This report is complementary to, and should be read in conjunction with, the proposal of the International Working Group on Cooperation in Wildfire Preparedness and Response (IWG-CWPR) – *“Building Resilience of Nations and Communities within the UNECE Region to Wildfire Emergencies and Disasters”*.

Fire aviation is only one of a whole range of tools available to fire managers. Although aerial means can provide extremely valuable and effective support to fire managers in many situations, the decision to use aircraft must be appropriate for the prevailing circumstances, and must carefully consider a wide range of contextual factors. It has been well demonstrated that in order to be effective and efficient in fire management, aerial means cannot be considered in isolation and must be integrated with other fire management activities.

As such, the rationale for proposing the adoption of the Fire Aviation Guidelines is common with the other proposals of the IWG-CWPR report, and accordingly is not duplicated in this paper. The effect of changing fire regimes, socio-economic developments, land-use changes and climate change as drivers for improvement are comprehensively outlined in IWG-CWPR report and apply equally to fire aviation as to other wildfire activities. As noted by the IWG-CWPR, the apparent and anticipated future changes of wildland fire regimes and wildfire risk at global level, along with the observed increasing vulnerability of ecosystems and society to wildfires, require appropriate fire and land management solutions to reduce wildfire risk and impacts. In turn there is a need to ensure that appropriate preparedness and response capacity exists in all UNECE member states and globally. This extends to aviation resources.

The need for transboundary cooperation and for wildfire management agencies to share information and resources to become more efficient and knowledgeable is also compelling in the case of fire aviation. The IWG-CWPR proposal observes that there is already a willingness of global society to share expertise and resources in fire management, but that there is a need to streamline and thus strengthen international cooperation. More systematic and formalised cooperation is required. Again this very much applies in the case of fire aviation.

2. Background

“Efficient and effective management of aerial wildfire fighting resources is needed if the twin challenges of growing vulnerability to wildfires and heightened pressure on public finances are to be managed successfully” (GHK Consulting 2010).

2.1 Aviation in fire management

Aviation resources have been used regularly to support wildfire management since the early 1920s, however in recent decades there has been rapid growth in the sector. This growth is partly due to improving technology and to an increase in availability, capability and versatility of aviation resources, but is also due to the increasing risk posed by wildfires in many regions. Aircraft have played an increasingly important role, as fire managers struggle to find ways to deal with more frequent and more extensive fire emergencies and disasters, as well as the increased probability that wildfires will directly impact communities with serious consequences. Changing demographics and settlement patterns in many regions have also significantly influenced the increased use of aircraft, especially with expanding settlement in urban-rural interface areas where aerial means, if used properly, can offer particular advantages in combating wildfires.

The transboundary consequences of wildfires have also seen a greater emphasis on the use of aircraft, in order to mitigate impacts, both political and practical, of fires on neighbouring states in a timely fashion.

It would also be reasonable to say that in some regions of the world the use of aircraft has been partly driven by increased expectations of communities at risk from wildfire and by political leaders who are keen to demonstrate that all practical means are being invoked to protect communities that are perceived as vulnerable to fire. In this respect there may be high expectations of aviation resources – perhaps higher than can reasonably be delivered.

Aviation resources exhibit particular characteristics which can make them very valuable in fire management. They provide speed, accessibility and a perspective that is generally not available through other means.

Used effectively, aircraft provide valuable support to fire managers in fire prevention and suppression, but it is important to recognise that aviation resources are not a universal remedy in wildfire management. Aircraft use must be integrated with ground-based operations. Safe, effective use of aircraft requires intensive management and support and close attention to high quality decision making.

Aircraft are now used regularly and effectively in a wide variety of important support roles in fire management. For example, these may include:

- Direct or indirect attack on the fire, for a range of tactical purposes (e.g., fire suppression, asset protection, ground firefighter support, or “buying time” for other tactics), by dropping water or other suppressants and retardants;
- Delivery of firefighters to the fire by conventional air transport or by specialised means such as parachuting, winching or rappelling;
- Provision of a platform for fire detection and reconnaissance;
- Supervision, command or monitoring of aerial resources or other ground-based resources;
- Gathering of information and intelligence, often using specialised sensors;
- Provision of warnings or evacuation orders to communities;
- Transport of stores, fuel and equipment;
- Aerial ignition of planned fires for fuel management or for wildfire suppression (backburning and burning out);
- Arson prevention and enforcement;
- Fire size and burned area assessment, and rapid damage assessment;
- Provision of communications.

At the same time, operating aircraft safely, effectively and efficiently in a fire environment poses significant challenges. Fire aircraft operate in a hazard-laden situation with low margins for error and significant, unique safety risks that must be closely managed. Aircraft operations require extensive, specialised and highly competent support and supervision. Aviation is, in most states, heavily regulated, requiring additional and often complex limitations to be considered in planning and executing operations.

Worldwide, use of aircraft in wildfire suppression has a poor safety record. Comparable, representative statistics are difficult to obtain and compile, but suggest that the rate of fatal accidents in fire operations is at least five times that of some other related sectors, such as emergency medical transport. Similarly the fatal accident rate is more than five times that experienced in other industries that are often used as benchmarks. In at least one UNECE member state, aircraft accidents have been the leading cause of fatalities in wildland fire operations over extended periods. As far as can be determined from the available information, the key causal factors in the majority of fatal accidents in wildfire aviation are human factors and systemic organizational failures. Most of these accidents would be classified as avoidable. There is considerable opportunity to improve this record through relatively straightforward organizational and human factors improvement programs. One of the benefits of enhanced international cooperation would be the opportunity to better share, collate and analyse aircraft accident information in order identify patterns and “lessons learnt” and to develop and target safety initiatives and operational risk reduction strategies across the region.

Importantly, aircraft are expensive. Whilst the expense of providing an aviation capability to address wildfire risk will be well justified in many circumstances, there is high potential to be wasteful or to divert considerable resources and funding from other means. One could also speculate that a focus on aviation as a wildfire response measure, which will inevitably command a high public profile, may potentially even redirect attention and resources from preventative measures such as fuel management.

A particular challenge for fire managers who utilise aviation assets is assessing relatively recent technological developments in the field. In some cases these developments reflect “trickle-down” of

military technology into the civilian arena. An example is the rapidly growing use of Unmanned Aerial Systems (UAS). Other examples include airborne remote sensing and mapping technologies. In an increasingly competitive global marketplace it is not unusual for new and indeed the more traditional aviation related technologies to be marketed assertively or through political channels. Managers need to be able to deflect marketing pressure and make informed sensible operational decisions regarding adoption and integration of new capabilities. Fire agencies must be in a position to properly evaluate aviation technologies against common standards in a consistent and rigorous way. The adoption of common standards, along with streamlined mechanisms for sharing of information and for collaborating in technology evaluation processes, will provide strong support to agencies in making informed decisions.

2.2 International collaboration in fire aviation

It is not unusual for aircraft to be the first or only resources shared between jurisdictions in a developing wildfire emergency. Currently, the majority of requests for international assistance for wildfire emergencies to the EU Monitoring and Information Centre (MIC) have been in the form of aerial assistance. The inherent characteristics that make aircraft particularly useful in fire management will also often make aircraft the “resource of first choice” for inter-jurisdictional support. Some of the general barriers to the provision of international assistance become of lesser consequence when considering aviation resources. Aircraft are normally able to transit the longer distances required in a reasonable timeframe, and there are well established mechanisms for international movement of civilian and military aircraft. In this context it is important to remember that the most effective assistance will likely be rendered early in the development of a wildfire and that aircraft are often well placed to provide timely assistance. Empirical and experiential research demonstrates that early use of aircraft in wildfire suppression will provide the greatest benefits. Additionally, many aircraft are versatile and can undertake a number of roles, thus enhancing their intrinsic value to the jurisdiction receiving assistance.

Many countries have also recognised that it is not always sensible or cost effective for each and every jurisdiction to establish resident aviation capabilities that provide the means to deal with every likely fire situation. Economic benefits can be achieved by regular, systematic inter-jurisdictional sharing of high-cost, specialised resources such as aircraft. In this sense, the international sharing of aviation resources may be considered slightly differently from some other wildfire resources, in that there is greater potential to “mainstream” or regularise the sharing of aviation resources, rather than regarding inter-jurisdictional deployment as being applicable only in wildfire emergency or disaster situations. Indeed the greater economic and community benefits from sharing aircraft resources are most likely to arise from early intervention in order to prevent incipient wildfires developing into emergencies and disasters.

Effective sharing does however require rigorous, pre-planned bilateral or multilateral arrangements for efficient redeployment of aerial resources between states.

There have been many examples of highly effective international collaboration in fire aviation, and many instances of effective inter-jurisdictional sharing of aviation resources, including aircraft, support infrastructure and specialist supervisory personnel. Unfortunately there have also been many examples of ineffective and unsafe sharing of resources. In particular, political decisions that do not account for operational realities have resulted in inappropriate and ad hoc exchanges of resources. Other difficulties include:

- Lack of clarity in requests for resources, or requests that fail to define the outcomes required;
- Failure of receiving nations to properly supervise aerial resources;
- Failure to provide adequate support systems such as communications, refuelling, supply of water and additives, or water scooping sites;
- Failure of host nations to properly integrate aerial resources, sometimes as a result of lack of knowledge or understanding of specific aircraft capabilities and limitations;
- Language difficulties;
- Absence of a common terminology for wildfire activities;
- The use of different and sometimes incompatible incident management systems;
- The use of different procedures and systems;

- Inappropriate and incompatible training programmes and competencies;
- Lack of interoperability of equipment, especially communications equipment;
- Lack of pre-planning and preparedness for emergency situations;
- Lack of pre-planning and preparedness for the exchange of aircraft resources.

It will be noted that many of these difficulties are common with the general barriers to international mobilization that have been identified in the IWG-CWPR report.

It is also evident that these barriers can be significantly mitigated or removed altogether through pre-planning, shared preparedness and the alignment of standards and operating practices.

2.3 Fire aviation in the UNECE Region

In many ways fire aviation in the UNECE Region mirrors fire aviation elsewhere in the world. Some countries have maintained highly developed, sophisticated aviation capabilities for many decades, with aircraft providing a key defence against wildfire. Other countries have only recently introduced systemised approaches to fire aviation.

As with other fire management activities, many nations within the UNECE region have developed their own approaches to the provision of fire aviation capabilities, and as a result there is some lack of commonality, which in turn reduces interoperability.

One notable feature of the region is the wide variety of ways in which fire aviation capabilities are operated and provided to fire management agencies. The various arrangements for operating aircraft in wildfire operations in the region include, for example:

1. State owned, state operated aircraft, either:
 - owned and/or operated by the fire or land management agency itself, or
 - owned and/or operated by a civil protection agency with services provided to a fire agency through a contract or agreement;
2. State owned aircraft, operated by a civilian private sector contractor;
3. Contractor owned and operated;
4. Military owned and operated, either
 - by a squadron or unit dedicated to fire aviation, or
 - as an adjunct to other military activities.

In many UNECE countries a mixture of these approaches is used – for example a particular class of firefighting aircraft may be operated by the military, with other classes of firefighting aircraft provided by civilian contractors. In some countries a national capability may be provided through a national government organisation, while at the same time regional governments contract fire aviation services directly from civilian contractors.

In countries where the defence forces are not regularly involved in providing a fire aviation capability, they may still be asked to play a role when a wildfire event has escalated to an emergency or disaster situation. This is not always successful, as military units may be called upon to deliver aerial firefighting services for which they have not fully prepared or trained.

These different arrangements reflect internal factors in each country, and are not inherently a barrier to collaborative efforts. The diversity of approaches does however reinforce the critical need for standardisation and common operating practices, embedded in comprehensive pre-planned arrangements, if collaboration is to be effective.

There are examples of effective existing arrangements for sharing of aircraft resources between UNECE member countries, mostly through established bi-lateral agreements between neighbouring countries. A key factor in the success of these arrangements is the use of compatible operating procedures delineated in the pre-planned agreements. It is also worth re-stating the other common factors identified by the IWG-CWPR that contribute to the success of these arrangements, which include:

- The use of compatible incident management systems and procedures;
- Interoperability of equipment (particularly communication equipment) and the standardisation in categorising resources;
- Preplanning of arrangements so that countries are prepared for making and receiving requests for assistance.

One feature of aviation that is unique to the UNECE region is that a significant number of member states subscribe to European Union's European Aviation Safety Agency (EASA). EASA administers civil aviation regulations that are therefore becoming relatively harmonised, at least across the EU. In a world where exceedingly complex and at times conflicting civil aviation legislation can pose insurmountable barriers to sharing of aircraft resources, this has the potential to offer significant efficiencies and to remove a number of obstacles.

The overall geo-political landscape in much of the UNECE Region is also generally conducive to, and would maximise the benefits arising from, effective sharing of aircraft resources. There is a relatively high density of countries, with often relatively short (for aircraft) distances to transit. Countries with currently well-developed capabilities sit alongside countries who are still in the process of initiating a capability – thus maximising opportunities to efficiently share not only actual aircraft resources and supporting infrastructure and systems, but also knowledge and expertise.

2.4 The International Fire Aviation Working Group (IFAWG)

The first draft of the Fire Aviation Guidelines has been developed by the International Fire Aviation Working Group (IFAWG). The IFAWG is a working group of the UNISDR Wildland Fire Advisory Group (WFAG). The background to the UNISDR Global Wildland Fire Network and WFAG is provided in the IWG-CWPR Report.

In brief, the genesis of the IFAWG was at the the 4th International Wildland Fire Conference, hosted by Spain in 2007. During that conference a thematic workshop was held on Aviation Management. The aim of the session was to identify opportunities for multilateral cooperation to improve the safety, effectiveness and efficiency of aerial fire fighting. The recommendations encompassed:

- The need to continue to identify opportunities for sharing of information and resources;
- The need to establish frameworks to properly evaluate the net benefit (including accounting for benefits of prevention of losses) of applying of aerial means;
- The need to ensure that aerial operations are managed, supervised and supported to a high standard, and are properly integrated with other aspects of fire operations;
- The establishment of a formal network to facilitate the continued sharing of information, with a priority on safety-related information;
- The need to standardize approaches to integrated management of aerial means.

One year later the first International Aerial Firefighting Conference was convened in Athens, Greece, in October 2008. The conference brought together the aerial fire community and those working on the ground.

Participants of the conference expressed strong support for continuing the formation of cooperative mechanisms. It was envisaged that this would ultimately lead to the establishment of two groups that would attend to interests of the aerial firefighting community. The first group would be relatively compact and streamlined – based around representatives or key contact points from participating jurisdictions (government or semi-government representatives, nominated by their country / jurisdiction). This anticipated group was notionally designated as the "Fire Aviation Working Group". The second group would be more inclusive, and would provide for membership of all interested parties, including from the supplier industry, and would be more of an "association". It was considered that this second group could be notionally designated as the "Aerial Firefighting Association" and, given that it may include commercial interests, might be best formed either independently or perhaps in conjunction with an existing group like the International Association of Wildland Fire.

During 2009 and 2010 the Global Fire Monitoring Centre (GFMC), on behalf of the WFAG, convened a number of teleconferences of interested parties to develop draft terms of reference for the group

notionally designated as a "Fire Aviation Working Group", which subsequently evolved to be termed the "International Fire Aviation Working Group" (IFAWG). Further work was undertaken at various side meetings to international aerial firefighting conferences and meetings.

As a result, an initial core group met formally at the GFMC offices in Freiburg, Germany on 26 June 2010 and endorsed a mission, terms of reference and action plan for the IFAWG. On 27 June 2010 the mission, terms of reference and action plan were presented to and endorsed by a formal meeting of the WFAG.

The IFAWG met in conjunction with the Fifth International Wildland Fire Conference in South Africa in May 2011. The Group considered the increasingly valuable role being played by aerial means in supporting fire and forest management, and in particular in gathering intelligence and information to support operations, in rapid intervention to incipient wildfires and in fire prevention and risk reduction operations. The group also noted concerns regarding reported incidences of ineffective and potentially unsafe application of aerial means.

The group reinforced the importance of:

- Safe operating practices;
- Deployment decisions made as part of a risk-based framework that properly considers the costs and benefits of deployment;
- Aerial means to be applied as part of a fully integrated approach, working in conjunction with ground-based operations.

The group also considered opportunities for improving the sharing of aircraft and support resources between jurisdictions. It was noted that effective sharing of resources internationally offered potential to utilise relatively expensive and specialised resources in the most efficient and effective manner. The group considered that in order to improve the potential for sharing resources it was necessary to:

- Further develop bi-lateral and multi-lateral agreements that set out pre-planned deployment and operating arrangements;
- Develop and implement consistent standards and operating practices for international deployment.

The meeting considered the development of voluntary guidelines containing standards and consistent operating practices, noting that such guidelines would have the benefits of:

- Identifying best management practices that agencies could adopt to optimise safe and effective aerial operations; and
- Facilitating the development of common standards and operating practices to support safe and effective deployment of aircraft and support resources between jurisdictions.

The group therefore initiated a significant project to identify appropriate standards and best management practices to underpin development of voluntary guidelines.

The recommendations of the Fifth International Wildland Fire Conference³ included the following statement:

"The conference acknowledges the valuable supporting role played by aerial means in fire and forest management. The conference also acknowledges and supports the benefits of sharing aircraft and support resources between jurisdictions. The conference recommends that:

- *Agencies and groups develop methodologies to ensure that aerial means are safely applied as part of an integrated approach to fire and forest management, and are deployed according to assessed risk and sound economic principles.*
- *Agencies continue to develop bi-lateral and multi-lateral agreements that set out pre-planned arrangements and operating practices to facilitate safe and effective deployment of aerial means between jurisdictions.*
- *Agencies and groups work together to develop voluntary guidelines regarding standards and operating practices for aerial means, in order to promote best management practices and in order to support safe and effective deployment of resources between jurisdictions; and that agencies support the International Fire Aviation Working Group's project to*

³ <http://www.fire.uni-freiburg.de/southafrica-2011.html>

identify appropriate standards and best-management practices on which to base the development of voluntary guidelines.”

More information regarding IFAWG is available from www.ifawg.org or from GFMC. The GFMC continues to act as convener and secretariat of the IFAWG.

3. The Fire Aviation Guidelines

3.1 Preparation

The first draft of the proposed Fire Aviation Guidelines accompanies this paper. This draft of the guidelines has been prepared primarily by a core group of the IFAWG comprising representatives of Australia, Canada, Chile, Germany, Italy, Russia, South Africa, South Korea, Spain and the USA. The drafting process included expert consultations with member countries, private sector organisations, and non-governmental and inter-governmental organisations.

3.2 Scope

The Fire Aviation guidelines are intended to apply to all fire related aviation operations associated with landscape-scale vegetation fire management activities, including planned burning for fire prevention as well as wildfire suppression. This is the reason for titling the guidelines the “*Fire Aviation Guidelines*” as distinct from “*Aerial Firefighting Guidelines*” or a similar term of narrower scope.

3.3 Status of development

The draft Fire Aviation Guidelines accompanying this paper are intended to be a “first edition”. This first edition includes the guidance regarded as essential by the IFAWG but it will be noted that many of the specific guidelines for detailed technical and operational matters are still under development and are yet to be included. This is not seen as a barrier to adoption of the Fire Aviation Guidelines at this time. The proposed underlying principles, strategic actions and the key standards required to underpin resource sharing are included in the current draft. In fact endorsement of these principles and the key guidance embodied in the current draft is required in order to continue and finalise the development of the more detailed aspects. The part of the guidelines that deals with more technical and operational matters will in any case be a “living document” that will require ongoing development and regular review. The format of the draft Fire Aviation Guidelines has been designed such that detailed technical guides may continue to be added as they are required, developed and approved.

3.4 Structure of the Fire Aviation Guidelines

The guidelines comprise two main parts:

1. The first part is “*Framework Document*”, which provides background, contextual and supporting information and sets out the Core Principles that underpin the guidelines.

Following on from the Core Principles are a number of Basic Strategies. The guidelines recommend that all jurisdictions developing or maintaining a fire aviation capability adopt these strategies.

2. The second part of the guidelines is the “*International Manual of Common Rules for Fire Aviation*” (IMCR). The IMCR provides key guidelines and further detail to support implementation of the principles and strategies outlined in the first part. The IMCR will also provide some recommended procedures for international deployments of aerial firefighting resources.

The IMCR then incorporates “Practice Guides” which provide even more detailed technical and operational information and recommendations regarding specific activities or situations.

The IMCR is the part of the guidelines that is intended to be a living document that will continue to be added to and updated as procedures and best-practices are developed, improved and refined.

3.5 Core principles

For ease of reference the Core Principles advocated by the Fire Aviation Guidelines are reproduced here:

1. Safety	Safety is a core principle of aerial fire management operations that must not be compromised. The preservation of human life is an overriding consideration.
2. Environmental sustainability	Aircraft use in fire management should be environmentally responsible and sustainable as far as practicable.
3. Efficiency and effectiveness	Aircraft use in fire management should always strive to be as efficient and effective as is practicable. This requires comprehensive management and operational planning of a high standard.
4. Knowledge-based continuous improvement	The use of aircraft for fire management must be underpinned by knowledge and should strive for continuous improvement.
5. Good governance	Safe, efficient and effective aircraft operations must be supported by documented policies, procedures, standards and operating practices that are based on the best available knowledge and are regularly reviewed and updated.
6. Legality	Aerial fire management operations must comply with the relevant laws and regulations of the state pertaining to the use of aircraft.

3.6 Relationship to other guidance material

As far as practicable the Fire Aviation Guidelines have been produced to be consistent with and complementary to other publications that offer international operational guidance in fire and emergency management. Examples include the UNDAC Handbook (UN OCHA 2006), the Host Nation Support Guidelines (EU 2012) and the International Search and Rescue Group Guidelines and Methodology (INSARAG 2012). These guidelines are also complementary to the principles and strategic actions outlined in the broader FAO Fire Management Voluntary Guidelines (FAO 2006).

3.7 Use of the Fire Aviation Guidelines

The Fire Aviation Guidelines draw on material from handbooks, manuals and planning documents that have evolved to guide aerial fire management operations in various countries around the world. Although the Fire Aviation Guidelines have been designed to be able to stand alone and be self-contained if necessary, it is generally intended that individual jurisdictions will incorporate the material from the guidelines into their own internal doctrine as appropriate. Similarly, it is envisaged that operators of aircraft will incorporate appropriate provisions from the guidelines into their own policy and procedure manuals. Countries and aircraft operators that already have well developed fire aviation doctrine may find the guidelines a useful checklist for ensuring their existing material is suitably comprehensive.

3.8 Terminology and definitions

Effective international collaboration on any technical or emergency issue is dependent on the use of common language that is understood by all parties. A key to this is the use of widely agreed definitions, acronyms, and abbreviations.

The IWG-CPWR identified that a key factor generally limiting international assistance and cooperation is the current lack of common language within the UNECE region and globally for wildfire management agencies. There have been attempts to develop common standards and terminology through previous international collaboration projects but there is currently no evidence of widespread adoption and implementation.

The IFAWG drafting team has remained mindful of not creating yet another set of terminology and definitions, and accordingly have attempted to use, as far as possible, definitions and terminology from existing material, in particular:

- FAO/GFMC Wildland Fire Management Terminology (GFMC 2010);
- EU Host Nation Support Guidelines (EU 2012);
- FAO Fire Management Voluntary Guidelines (FAO 2006).

As fire aviation is a specialist area that uses terminology not commonly used in other aspects of fire management, some definitions have however necessarily been developed or adapted specifically for the Fire Aviation Guidelines.

IFAWG is of the view that it is most important for these new or refined definitions, if accepted, to also be included in wider dictionaries and glossaries developed for wildfire agencies and other emergency management agencies in the UNECE region and globally. There is also a need to continue to strive to resolve ambiguities and inconsistencies between existing glossaries.

3.9 Relationship to civil aviation regulation and legislation

The guidelines have been developed, as far as practicable to be complementary to civil aviation legislation and regulation. Generally, the guidelines aim to provide standards and guidance that is not otherwise covered by civil aviation legislation. For example civil legislation will normally provide standards for general pilot training and competency however will not extend to the specific competencies required for firefighting.

The Fire Aviation Guidelines are not intended to prejudice or contravene any laws or regulations that administer or regulate aviation in the state where fire aircraft are operating, or the state in which the aircraft are registered. Where a conflict may exist, the relevant laws of the host country clearly take precedence.

IFAWG is hopeful that as the Fire Aviation Guidelines continue to be developed and refined, aviation legislators will consider opportunities to incorporate appropriate fire aviation practices into state aviation legislation, in order to assure the highest standards of safety.

3.10 Maintenance of the guidelines

As is normally the case in the aviation and fire management sectors, technical doctrine must be regularly reviewed and updated. In turn, documentation must be carefully administered in a quality controlled system to assure version control and to ensure that users are always accessing the most up-to-date information. As the Fire Aviation Guidelines have been drafted by an essentially volunteer advisory group, ongoing administration, development, maintenance and distribution of the guidelines does pose a challenge.

Adoption of the Fire Aviation Guidelines will require a commitment to supporting an ongoing process of reviewing, improving, updating and augmenting the guidelines.

4. Relationship with the proposed International Wildfire Support Mechanism

The IWG-CWPR has operated in cooperation with the IFAWG to develop complementary proposals as it was considered that this approach would better suit the international community's needs for wildfire preparation and response at this time.

As a consequence, the proposed IWSM does not specifically address fire aviation in detail. Nonetheless the guiding principle and the rationale for enhancing cooperative efforts for fire management in the UNECE region does very much apply to the use of aircraft. Likewise the findings of the IWG-CWPR regarding the dichotomy across nations of the essential skills necessary to improve wildfire management are also completely relevant to aircraft operations, so too is the concept of the proposed IWSM to cascade knowledge and good practice throughout the global wildfire community.⁴

Adoption of the Fire Aviation Guidelines would be consistent with and will implement, in part, the aims, objectives and priority actions of the IWSM such as, for example, *“establish agreed standards, competencies, procedures and protocols to improve safety, efficiency and effectiveness of wildfire management organisations.”*⁵

At the same time, implementation of the IWSM or a similar model would facilitate the adoption of the Fire Aviation Guidelines in the UNECE Region and will provide for complementary measures that will further improve the safety, efficiency and effectiveness of fire aviation in the overall context of wildfire management. A culture of shared preparedness across UNECE countries, including the development of pre-planned bilateral and multilateral mutual aid agreements, is particularly critical in respect of aircraft resources. Mechanisms proposed by the IWSM, such as collaborative training and certification schemes, will need to consider aviation roles alongside other ground-based roles and the Fire Aviation Guidelines will provide guidance regarding the content for such schemes as they are developed. Similarly it is expected that concepts outlined the IWSM, such as the development of groups or clusters of national experts, the exchange of experts and the deployment of small teams of advisors would include fire aviation expertise where appropriate.

In particular, it is proposed that the IWSM will define an internationally acceptable vocabulary and when required will ensure that this is provided in the appropriate range of languages. It is important that terminology used in fire aviation be included in this project.

Fire aviation is a support capability which must be integrated with other fire management activities and is only one of various means that are available to fire managers. However there are some particular characteristics of fire aviation and the opportunities for developing cooperation and collaboration which warrant additional focus at this time:

- For the foreseeable future, aircraft will remain the capability that is most likely to be shared between jurisdictions, at least whilst resilience and interoperability is developed in other fields;
- Deployment of aircraft resources to wildfire emergencies within the region and globally is already happening on a reasonably regular basis. Where these deployments happen outside of the existing, generally robust, mutual-aid arrangements, there are significant concerns regarding efficacy and safety aspects. Often these deployments are ad hoc in nature and may be driven in part by less than prudent political decisions. As outlined in the IWG-CPWR report there is a danger that responses made on an ad-hoc basis may be reactive and tokenistic;
- Aircraft are the resource for which inter-jurisdictional sharing is most likely to be mainstreamed – that is, to become a regular component of normal wildfire preparedness and response, not just in times of emergency and disaster. The geo-political landscape of much of

⁴ Note: While the International Working Group on Cooperation in Wildfire Preparedness and Response (IWG-CWPR) initially had suggested to designate the recommended mechanism as “International Wildfire Support Mechanism” (IWSM), it was concluded in the follow-up of the Forum in 2014 that the proposed Mechanism should focus on and emphasize on enhancing “preparedness”. In 2014 the follow-up reports of the Forum therefore designated the proposed Mechanism as “International Wildfire Preparedness Mechanism (IWPM) – see Reports 7 and 8 in this volume of IFFN.

⁵ IWG-CPWR (2013) Actions for Strategic Objective Number 3

the UNECE region is particularly conducive to mainstream sharing of aircraft resources for fire management, and regularised sharing offers potentially significant economic benefits;

- There is a good opportunity to improve the apparently relatively poor safety record in fire aviation;
- Arguably, inappropriate or ineffective use of aircraft has particularly significant negative economic consequences, due to the risks and high costs involved.

It is for these reasons that the IWG-CPWR and IFAWG have taken a complementary approach in the presentation of proposals to the UNECE/FAO Regional Forum on Cross-boundary Fire Management. There is arguably a particularly high priority, even an urgency, to move towards appropriate common standards and practices for fire aviation. A complementary approach ensures that the Fire Aviation Guidelines can stand alone if necessary, while other cooperative mechanisms are developed and refined.

It may be considered that the adoption of guidelines of an operational nature, such as the Fire Aviation Guidelines, is “jumping ahead” of the development of wider agreements on international cooperation and of the implementation of the IWSM or similar agreed arrangements in the UNECE region. The two advisory groups are of the view however, that the adoption of the Fire Aviation Guidelines is an appropriate measure at this time irrespective of the progress of the IWSM or other agreements, given the particular circumstances applicable to aerial means. Indeed the development of more robust collaborative mechanisms for aviation may be a most useful proving ground that will help develop and refine the IWSM and collaboration in other fields of fire management.

While the UNECE/FAO Forum on cross-boundary fire management is an initial activity aimed at serving the UNECE region, there is scope for a future wider, global application of the IWSM or similar mechanisms. Accordingly the Fire Aviation Guidelines should also be promoted for independent endorsement and application by individual operators and agencies or within the framework of bi-lateral and multi-lateral agreements across the world.

Finally, it is important to develop interoperability not only within the UNECE region, but between UNECE members and states in other regions. Adoption of the guidelines within the UNECE region would be an important step to global harmonisation of best-practice and interoperability to support resource sharing across the world.

5. Conclusions and Recommendations

5.1 Conclusions of the IFAWG

Used appropriately, fire aviation has the potential to be an important component in the successful management and prevention of wildfires in many situations. Situations where the use of aerial resources will help improve outcomes are likely to increase in frequency and scale in coming years, in accordance with global and local trends. Accordingly it is prudent for nations in the UNECE region to continue to develop fire aviation capabilities that are appropriate to their particular circumstances. A well-conceived, effective and efficient aviation capability will enhance the resilience to wildfires in the region.

Although many countries in the region have already developed highly effective aviation capabilities, there is a significant variation in capability and in the level of understanding and preparedness to utilise aircraft across the region. Considering current trends in fire risk and economic conditions, there is likely to be a general increase in requests for emergency international assistance in the future. Given the particular suitability of aircraft for servicing requests for assistance, a high proportion of these requests are likely to involve aircraft resources. There is also likely to be a further trend towards mainstreaming the sharing of specialised, relatively expensive aviation capabilities, to the extent that the cross-jurisdictional sharing of aircraft resources becomes a routine operation. Although currently, in some instances, opportunities may be restricted by a lack of interoperability or by the limited ability of a receiving nation to effectively utilise or host specialised resources, the UNECE region is very well placed to take greater advantage of the prospects for sharing aviation resources, whether on a regular basis or in the case of emergencies and disasters.

Fire aviation is a specialised field requiring high quality management and support. Aircraft are expensive. There are many considerations, limitations and risks that need to be recognised and appropriately managed in order to ensure safe, effective and efficient aircraft operations. In particular, resourcing and deployment decisions must be made as part of a risk-based framework that considers costs and benefits, and aerial means must be applied as part of a fully integrated approach, supporting and working in conjunction with other means.

Globally and within the UNECE region, fire aviation has a safety record that is not optimum. Inappropriate use of aircraft, and ad hoc and unplanned inter-jurisdictional sharing of aircraft, has the potential to significantly increase risks in both aircraft and ground operations. There is considerable scope to implement measures that will reduce losses and improve the safety of local and inter-jurisdiction aircraft operations.

Overall, resilience to wildfires in the region will be enhanced by:

- Further developing appropriate, effective, high quality local fire aviation capabilities;
- Streamlining and improving opportunities for inter-jurisdictional sharing of aircraft resources, either as a mainstream activity or in response to emergencies and disasters; and
- Exchanging expert knowledge and experience.

Building and maintaining local fire aviation capabilities that are safe and effective and efficient requires the implementation of standards and consistent operating practices that are based on knowledge and experience in a framework that provides for continuous improvement.

Effective sharing of aircraft resources must be the subject of comprehensive, multi-lateral or bi-lateral agreements which set out robust, pre-planned arrangements. Such agreements must also incorporate agreed common standards and common operating practices.

5.2 Recommendations

In parallel with the findings and recommendations of the IWG-CWPR, the IFAWG is similarly of the view that it is timely to continue to build and enhance capacity and to improve resilience to wildfires within the UNECE Region. The on-going development, maintenance and preparedness of appropriate, safe, effective and efficient fire aviation capabilities, along with robust mechanisms for inter-jurisdictional deployment of those capabilities, will be an important component of this resilience.

The adoption of the Fire Aviation Guidelines is expected to assist in the development and management of appropriate aviation capabilities through the provision of common guidance to states regarding recommended minimum standards and appropriate best-practices.

The Fire Aviation Guidelines are also expected to enhance the effective sharing of aviation capabilities between states within the region, as well as inter-regionally, by providing common standards and common operating practices for fire aviation and therefore improving interoperability. The Fire Aviation Guidelines will also provide recommended procedures and supporting information for effective sharing of fire aviation resources.

As with other aspects of fire management, the knowledge and understanding required to develop and manage high-quality aviation capabilities already exists within the UNECE region. Likewise, in order to fully benefit from this existing knowledge and expertise, there is a need for a mechanism which can facilitate and stimulate the exchange of knowledge and good practice. In part, this mechanism is serviced by the Fire Aviation Guidelines, which will reflect the combined knowledge and experience of UNECE member states and other countries. The implementation of a complementary mechanism, such as the proposed IWSM, will also facilitate the exchange of knowledge and good practice, as will assist in extending appropriate understanding and knowledge of fire aviation within the fire management community generally.

The IFAWG therefore recommends that:

1. The Forum support the adoption of the Fire Aviation Guidelines across the UNECE region for independent endorsement and application by individual operators and agencies, or within the framework of bi-lateral and multi-lateral agreements;
2. Any wider agreement on international cooperation aimed at enhancing fire management capability within the region, such as the IWSM or any other agreement arising from the Forum and thereafter, should incorporate and promote the Fire Aviation Guidelines;
3. Member states support and participate in the continuing development of the Fire Aviation Guidelines;
4. The UNECE promote the adoption of the Fire Aviation Guidelines globally;
5. The IWSM for the UNECE region, if established, considers the Fire Aviation Guidelines and appropriate requirements around fire aviation generally when developing elements such as, for example: steering and advisory groups, collaboration mechanisms and national and international training frameworks; and language and glossaries.
6. The secretariat or umbrella organisation for the IWSM for the UNECE region, if established, incorporate a capacity to assist in administering and coordinating the application of the Fire Aviation Guidelines in the UNECE region; and in the further developing the guidelines, in cooperation with IFAWG.

5.3 Presentation of this proposal to the UNECE/FAO Forum on Cross-boundary Fire Management

This proposal and the recommendations outlined above have been prepared for presentation to UNECE Member States and discussion by participants of the UNECE/FAO Forum on Cross-boundary Fire Management, organized by the Global Fire Monitoring Center (GFMC) and co-sponsored by the UN International Strategy for Disaster Reduction (UNISDR), the Council of Europe (CoE) and the Organization for Security and Cooperation in Europe (OSCE), on 28-29 November 2013 in Geneva, Switzerland.

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