ISDR

United Nations
International Strategy for Disaster Reduction

International Fire Aviation Working Group

Introducing the

Fire Aviation Guidelines

incorporating the

International Manual of Common Rules for Fire Aviation

International Fire Aviation Working Group
A working group of the UNISDR Wildland Fire Advisory Group

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1.   Introduction

This paper introduces the Fire Aviation Guidelines, a set of voluntary guidelines for the use of aerial means to support fire management. The Fire Aviation Guidelines are intended to apply to all aviation operations associated with fire management, including wildfire suppression and planned burning for fire prevention.

The Fire Aviation Guidelines are intended to assist communities across the globe to manage fire and to build resilience to the effects of wildfire by improving the effectiveness of a specialised support capability – fire aviation.

The guidelines aim primarily to:

1. Assist adopting states to develop and manage appropriate, effective, high-quality aviation capabilities by providing guidance in regard to recommended minimum standards and appropriate best-practices.

2. Enhance the opportunities for transboundary cooperation through the sharing of aviation capabilities between states or jurisdictions by:

    a. developing common standards and common operating practices for fire aviation that will enhance inter-operability; and

    b. providing recommended procedures and supporting information for effective sharing of fire aviation resources.

The effect of changing fire regimes, socio-economic developments, land-use changes, and climate change as drivers for improvement in fire and emergency management practices are well documented. Apparent and anticipated future changes to wildland fire regimes and wildfire risk at global level, along with the observed increasing vulnerability of ecosystems and society to wildfires, requires 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 domestically and at the global scale.

Accordingly, there is a need for transboundary cooperation and for wildfire management agencies to share information and resources. This need is particularly compelling in the case of highly specialised capabilities such as fire aviation. The activities of groups such as the Wildland Fire Advisory Group (WFAG), the Global Wildland Fire Network (GWFN) and the UNECE / FAO Team of Specialists on Forest Fire confirm that global society is already willing to share expertise and resources in fire management, but that international cooperation needs to be streamlined and thus strengthened. This includes more systematic and formalised cooperation protocols.

The use of aerial means in fire and emergency management has expanded rapidly in recent decades. Aircraft now provide valuable support to fire management activities around the world. Many states 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 in many circumstances.

There will be increased pressure to ensure that the use of aviation resources is safe and as 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 offers potential to generate considerable economic benefit and to improve the effectiveness and efficiency of fire prevention and response. There are current examples of highly effective protocols for cross-border sharing of fire aviation resources. 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 also

reasonable to say that there have been examples of ineffective and inappropriate sharing of aviation resources.

Cross-border sharing of aircraft is likely to be an increasing feature of wildland fire management. 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.

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

While aviation resources have been regularly used to support wildfire management since the early 1920s, there has been rapid growth in the sector in recent decades. 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 are playing 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 of wildfires directly impacting communities with serious consequences. Changing demographics and settlement patterns have also significantly influenced the increased use of aircraft in many regions, especially with expanding populations in urban-rural interface areas where aerial means can offer particular advantages in combatting wildfires.

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

There is every reason to believe that these trends will continue. The White Paper "Vegetation Fires and Global Change" (GFMC, 2013), summarises how current predictions indicate that the number and severity of wildfire incidents will increase during the next few decades in many areas of the world, with a potential increase in wildfire disasters. Clearly, fire regimes are altering under the combined influence of socio-economic development, land-use change, and climate change.

It is also reasonable to conclude that in some places the use of aircraft has been partly driven by the increased expectations of communities at risk from wildfire and political leaders keen to demonstrate their commitment to protecting communities perceived as being vulnerable. In this respect there may be high expectations placed on aviation resources – perhaps sometimes higher than can reasonably be delivered.

Aviation resources have capabilities that make them very valuable in fire management. These include speed, accessibility, and a perspective that is generally not available through other means.

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

Aircraft are now used regularly and effectively in a wide variety of important support roles in fire management. These may include, but are not limited to:

- 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;
- seeding of clouds to generate rainfall for fire suppression;
- 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; and
- provision of communications.

Operating aircraft safely and effectively in a fire situation poses significant challenges. Fire aircraft must operate in a hazard-laden environment with low margins for error and significant, unique safety risks that require extensive, specialised and highly competent support and supervision. Aviation is, in most states and jurisdictions, heavily regulated, requiring additional and often complex regulatory limitations to be considered in the planning and execution of operations.

At a world-wide scale, the use of aircraft in wildfire suppression has a poor safety record. While comparable, representative statistics are difficult to obtain and compile, the rate of fatal aviation accidents in fire operations appears to be more than five times that experienced in other industries that are often used as benchmarks. In at least one jurisdiction where aircraft are used routinely, 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 related to human factors and systemic organisational failures. As the majority of these accidents would be classified as 'avoidable', there is considerable scope to improve this record through relatively straightforward organisational and human behavioral 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 to identify patterns and "lessons learnt" and to develop and target safety initiatives and operational risk reduction strategies.

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. It has been speculated that a disproportionate focus on aviation as a high profile wildfire response measure, will inevitably redirect attention and resources from preventative measures such as fuel management.

A particular challenge for fire managers utilising aviation assets lies in assessing relatively recent technological developments in the field. In some cases these developments reflect a "trickle-down" of military technology into the civilian arena. An example is the rapidly growing use of Remotely Piloted Aircraft. 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. For example, the majority of requests to the EU Emergency Response Coordination Centre (ERCC) for international assistance for wildfire emergencies have been in the form of aerial assistance.

The inherent capabilities which make aircraft particularly useful in fire management will also often make them the resource-of-first-choice for inter-jurisdictional support. Some of the general barriers to the provision of international assistance become less significant when considering aviation resources. Aircraft are normally able to transit the longer distances required in a reasonable timeframe, and there are already 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 rapid response. 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 from developing into emergencies and potential disasters.

Additionally, many aircraft are versatile and can undertake a number of roles, thus enhancing their intrinsic value to the state or jurisdiction receiving assistance.

Many states or jurisdictions have also recognised that it is not always sensible or cost effective 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 emergency or disaster situations.

Effective sharing of aerial resources requires rigorously pre-planned bilateral or multilateral arrangements for redeployment between states or jurisdictions.

There have been many examples of highly effective international collaboration in fire aviation, and many instances of effective inter-jurisdictional sharing of resources, including aircraft, support infrastructure and specialist supervisory personnel.

Unfortunately there have also been examples of ineffective and unsafe sharing of resources. In particular, political decisions that don't account for operational realities have resulted in inappropriate and ad hoc resource exchanges. These difficulties have been caused by:

- lack of clarity in requests for resources, or requests that fail to define the outcomes required;
- delayed or late requests for aerial resources, resulting in reduced effectiveness;
- failure of receiving states 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;
- lack of readily available, accurate information regarding the situation for which the aerial resources are required (for example: regarding current status of the emergency, resources allocated etc);
- 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 or incompatible training programs and competencies;
- lack of interoperability of equipment, especially communications equipment;
- lack of pre-planning and preparedness for emergency situations; and
- lack of pre-planning and preparedness for the exchange of aircraft resources.

It will be noted that many of these difficulties are not specific to aviation and are common barriers to international mobilisation to support fire and emergency response.

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   The global state of fire aviation

Improving cooperation and coordination of international fire aviation efforts first requires an understanding of the domestic arrangements currently in place in various countries and the challenges posed when trying to harmonise these practices.

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 systematic approaches to fire aviation.

As with other fire management activities, many nations have developed divergent approaches to the provision of fire aviation capabilities and as a result there is some lack of commonality, which in turn reduces inter-operability.

One notable feature 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 a jurisdiction, state, or region may include:

1. State-owned, state-operated aircraft, either:
    - owned and/or operated by the relevant fire or land management agency itself, or
    - owned and/or operated by a civil protection agency with services provided to a fire or land management agency through a contract or agreement;
2. State-owned aircraft, operated by a civilian, commercial 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 countries a mixture of these approaches is used – for example, a particular class of firefighting aircraft may be operated by a military unit, 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 civil or military 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 adequately 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 arrangements for sharing of aircraft resources between countries, mostly through established bi-lateral agreements between neighbouring states. A key factor in the success of these arrangements is the use of compatible operating procedures delineated in the pre-planned agreements. The common factors identified as generally contributing to the success of resource sharing arrangements include:

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

An important feature of aviation is that it is typically strongly regulated. International civil aviation standards and agreements are also well established in some parts of the world, and such standards generally support inter-operability. For example, a significant number of countries subscribe to the European Aviation Safety Agency (EASA) which administers civil aviation regulations that are therefore becoming relatively harmonised. 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 some efficiencies and to remove a number of obstacles.

It is worth noting that there are many regions where the overall geo-political situation is generally conducive to, and would maximise the benefits arising from, effective sharing of aircraft resources. For example in Europe there is a relatively high density of countries within often relatively short transit distances. Countries with currently well-developed capabilities may be sitting alongside countries that are still in the process of initiating an aerial capability – thus maximising opportunities to efficiently share not only actual aircraft resources with supporting infrastructure and systems, but knowledge and expertise.

2.4 The International Fire Aviation Working Group (IFAWG)

The Fire Aviation Guidelines have been developed by the International Fire Aviation Working Group (IFAWG). The IFAWG is a sub-group of the UNISDR Wildland Fire Advisory Group (WFAG).

The genesis of the IFAWG harks back to the 4th International Wildland Fire Conference, hosted by Spain in 2007. During that conference a thematic Aviation Management workshop was held with the aim of identifying opportunities for multilateral cooperation to improve the safety, effectiveness and efficiency of aerial firefighting. The recommendations expressed a need to:

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

One year later an International Aerial Firefighting Conference convened in Athens, Greece, brought together the aerial fire community and those working on the ground. Conference delegates expressed strong support for continuing the formation of cooperative mechanisms.

Subsequently, 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 to endorse a mission, terms of reference, and action plan for the IFAWG. The following day these 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. It also noted concerns regarding reported incidences of ineffective and potentially unsafe application of aerial means.

Subsequently, the IAFWG 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; and
- 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.

Accordingly, the Group 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 Conference[1] 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.*

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[1] http://www.fire.uni-freiburg.de/southafrica-2011.html

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

More information regarding the IFAWG is available from www.ifawg.org or from the GFMC which acts as the IFAWG's convener and secretariat.

3. The Fire Aviation Guidelines

3.1 Preparation

The first edition of the Fire Aviation Guidelines has been prepared primarily by a core group of IFAWG representatives from Australia, Canada, Chile, Germany, Italy, Russia, South Africa, South Korea, Spain and the USA. The drafting process included expert consultations with all 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 why the guidelines have been called the *"Fire Aviation Guidelines"* as distinct from, for example, the *"Aerial Firefighting Guidelines"* or a similar term of narrower scope.

3.3 Status of development

The first edition of the Fire Aviation Guidelines includes the guidance regarded as essential by the IFAWG but many of the specific guidelines for detailed technical and operational matters are still under development and are yet to be included. This is not regarded as a barrier to the adoption of the Fire Aviation Guidelines at this time.

The proposed underlying principles, strategic actions, and key standards required to underpin resource sharing are included in the first edition. The section of the guidelines which deals with more technical and operational matters will in any case be a living, dynamic document requiring ongoing development and regular review.

The format of the Fire Aviation Guidelines has been designed to enable detailed technical guides to be added as they are required, developed and approved.

3.4 Structure of the Fire Aviation Guidelines

The Guidelines are comprised of two main parts:

1. The *"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 these strategies be adopted by all jurisdictions which are developing or maintaining a fire aviation capability.

2. 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 (ie. the *Framework Document*). The IMCR also provides some recommended procedures for international deployments of aerial firefighting resources.

   The IMCR 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, designed for continual addition and updating 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 UN 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 standalone 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.

Ideally, adoption of the Fire Aviation Guidelines will also be referenced by, or form part of, wider agreements on international cooperation aimed at enhancing fire management capability across the globe. For example, it is envisaged that bi-lateral or multi-lateral resource sharing agreements might incorporate appropriate parts of the Fire Aviation Guidelines.

3.8 Voluntary nature of the Guidelines

It should be stressed that compliance with the Fire Aviation Guidelines is entirely voluntary. However there is nothing to prevent, for example, two or more states agreeing in a bi-lateral or multi-lateral agreement that all or part of the guidelines must be complied with in circumstances specified in the agreement – such as when sharing aircraft resources between participating states. Similarly a state may require a contracted provider of aviation services to comply with relevant parts of the guidelines.

3.9 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.

Various analyses in recent years have identified that a key factor generally limiting international assistance and cooperation is the current lack of common language in use by wildfire management agencies.

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 the following documents:

- FAO/GFMC Wildland Fire Management Terminology (GFMC 2010);
- European Glossary for Wildfires and Forest Fires (EUFOINET 2012);
- EU Host Nation Support Guidelines (EU 2012);

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

The 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 internationally. There is also a need to continue striving to resolve ambiguities and inconsistencies between existing glossaries.

3.10   Relationship to civil aviation regulation and legislation

The guidelines have been developed, as far as practicable to be complementary to domestic civil aviation legislation and regulation. Generally, the guidelines aim to provide standards and guidance that is not otherwise covered by civil aviation legislation.

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

As the Fire Aviation Guidelines continue to be developed and refined, aviation legislators may consider opportunities to incorporate appropriate fire aviation practices into state aviation legislation, in order to assure the highest standards.

3.11   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 document.

3.12   The UNECE/FAO Forum on Cross-boundary Fire Management

A draft of the Fire Aviation Guidelines was presented to the UNECE/FAO Forum on Cross-boundary Fire Management held in Geneva, Switzerland in November, 2013. The forum was 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).[2]

Recommendation 4[3] of the forum included: "……. *the Forum recommends that UNECE member states adopt in principle the Draft Fire Aviation Guidelines and support their continued development. The Forum recommends that in order to fully realize the potential benefits of consistent and standardized approaches in this field, the global wildland fire community also consider adoption of the guidelines.*"

3.13   International collaboration and relationship with the International Wildfire Preparedness Mechanism (IWPM)

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, in the context of international collaboration and sharing of resources there are some particular characteristics of fire aviation which warrant a high priority, even an urgency, to move towards appropriate common standards and practices. These are that:
- for the foreseeable future, aircraft will remain the capability that is most likely to be shared between jurisdictions;

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[2] Financial support was provided by the German Government through the grant to UNECE entitled *"Safeguarding Sustainable Forest Management in the UNECE Region through International Cooperation in Fire Management"*
[3] The full conclusions of the forum are available from http://www.fire.uni-freiburg.de/intro/UNECE-FAO-Crossboundary-Fire-Forum-Conclusions-Final.pdf

- inter-jurisdictional deployment of aircraft resources to wildfire emergencies is already happening on a reasonably regular basis. Where these deployments happen outside of the existing, generally robust, mutual-aid arrangements, there are concerns regarding efficacy and safety aspects. At times these deployments are ad hoc in nature and may be driven in part by less than prudent political decisions. 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;

- there is a good opportunity to improve the relatively poor safety record in fire aviation;

- inappropriate or ineffective use of aircraft has particularly significant negative economic consequences, due to the risks and high costs involved.

The International Wildfire Preparedness Mechanism (IWPM) has been created to assist wildfire agencies around the world to develop and implement common and more sustainable solutions to wildfire prevention, preparedness, response and recovery.

Its mission is to support, on request, agencies and countries to build national capacity and resilience to wildfire through the exchange of best practice. It achieves this by utilising existing expertise and builds upon the success of previous knowledge exchanges by establishing a more formal approach to voluntary international collaboration and cooperation on wildfire issues.

Like the IFAWG, the IWPM is hosted by the UNISDR Wildland Fire Advisory Group (WFAG). The current priority of the IWPM is to encourage the international adoption and development of best practice and guidance in particular in:

- terminology

- training standards

- voluntary guidelines

- cross-border assistance (i.e. mutual aid agreements).

These priorities are consistent with, and are in-part implemented by the Fire Aviation Guidelines. To avoid duplication, the cooperative mechanisms promoted by the IWPM do not specifically address fire aviation in detail. Nonetheless, the guiding principles and the rationale for enhancing international cooperative efforts for fire management equally apply to the use of aircraft. Likewise the disparity across nations of the essential skills necessary to improve wildfire management are also completely relevant to aircraft operations, so too is the ethos of cascading knowledge and good practice throughout the global wildfire community.

A culture of shared international preparedness, including the development of pre-planned bilateral and multilateral mutual aid agreements, is particularly critical in respect of aircraft resources. Mechanisms that may flow from the IWPM, for example such as collaborative training and certification schemes, will still need to consider aviation roles alongside other ground-based roles. The Fire Aviation Guidelines will provide guidance regarding the content for such schemes as they are developed. Similarly it is expected that concepts promoted by the IWPM such as the exchange of expertise would include fire aviation expertise where appropriate.

In particular, it is proposed that an internationally acceptable wildland fire vocabulary be defined and provided in the appropriate range of languages. It is important that terminology used in fire aviation is included in this project.

More information regarding the IWPM is available from http://www.fire.uni-freiburg.de/iwpm/ or from the GFMC.

5. Conclusion and recommendations

5.1   Conclusion

Used appropriately, fire aviation can be an important component in the successful management and prevention of wildfires in many situations. The situations where aerial resources can 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 individual nations 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 domestic resilience to wildfires.

Although many countries have already developed highly effective fire aviation capabilities, there is substantial variation in their utility and in the level of preparedness to utilise aircraft. Considering current trends, 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 an extent where the cross-jurisdictional sharing of aircraft resources becomes a routine undertaking. 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 benefits of such sharing arrangements have already proven to be clear.

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, fire aviation has a sub-optimal safety record. Inappropriate use of aircraft, and ad hoc and unplanned inter-jurisdictional sharing of aircraft, has the potential to significantly increase risks in both aerial and ground operations. There is considerable scope to implement measures that will improve the safety of local and inter-jurisdiction aircraft operations.

Overall, the resilience of communities to wildfires across the globe will be enhanced by:
- further developing appropriate, effective, high quality 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, effective, and efficient requires the implementation of consistent standards and operating practices that are based upon 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 operating practices.

5.2   Recommendations

It is timely to take further steps to build and enhance capacity and to improve resilience to wildfires at an internationally-coordinated level. 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 integral to achieving this.

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 by providing common standards and operating practices for fire aviation that will improve 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 largely already exists in many jurisdictions. In order to fully benefit from this existing knowledge and expertise, there is a need for mechanisms which can facilitate and stimulate the exchange of knowledge and good practice. In-part, the Fire Aviation Guidelines can meet this need by reflecting the combined knowledge and experience of experts from across the globe.

The development of complementary initiatives proposed through mechanisms such the International Wildfire Preparedness Mechanism will also facilitate the exchange of knowledge and good practice, and will assist in generally extending appropriate understanding and knowledge of fire aviation within the fire management community.

The IFAWG therefore recommends that:

1. Individual states and jurisdictions endorse and adopt the Fire Aviation Guidelines and incorporate the appropriate provisions in their domestic doctrine.
2. That appropriate provisions of the Fire Aviation Guidelines be incorporated within bi-lateral and multi-lateral resource sharing agreements;
3. States and jurisdictions support and participate in the continuing development of the Fire Aviation Guidelines;
4. States and regional networks promote the adoption of the Fire Aviation Guidelines globally;
5. Any wider agreements on international cooperation aimed at enhancing fire management capability should incorporate and promote the Fire Aviation Guidelines;
6. Any wider agreements on international cooperation consider the Fire Aviation Guidelines and appropriate requirements around fire aviation more generally when developing elements such as steering and advisory groups, collaboration mechanisms, national and international training frameworks, and language and glossaries.

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