Standard for Use of Aircraft at Wildfires

August 2015

National Rural Fire Authority

Operational Standards

RF300

Contents

Part I: General Provisions

1 Purpose

1.1 This Standard is issued by the National Rural Fire Authority pursuant to Section 18(2) of the Forest and Rural Fires Act with the endorsement of the National Rural Fire Officer for the purposes of :

- facilitating the effective, efficient and safe use of aircraft engaged in fire control activities at wildfires
- facilitating efficient interoperability between Rural Fire Authorities and Aircraft Operators
- making provision for the National Rural Fire Officer to adopt or otherwise set formal qualifications that specify required competencies in relation to any aspect of this standard
- adoption by Rural Fire Authorities and incorporation in Fire Plans
- providing related qualification criteria for claims made against the Rural Fire Fighting Fund for the costs of use of aircraft at wildfires
- providing criteria for audit of Aircraft Operators engaged in fire control activities at wildfires
- consolidating in a single document relevant RFA and NRFA practices as applicable to fire control at wildfires.

1.2 This Standard and its purposes are also endorsed by the National Commander of the New Zealand Fire Service, the New Zealand Civil Aviation Authority and the New Zealand Defence Force.

2 Scope

2.1 The Standard sets out minimum requirements for:

- adoption and implementation by Rural Fire Authorities and by Aircraft Operators to enable effective, efficient and safe interoperability when aircraft are involved in fire control at wildfires in New Zealand
- audit of Aircraft Operators to determine compliance with the Standard
- incorporation of aircraft operations at wildfires, in the scope of the routine audit of Rural Fire Authorities by NRFA.

2.2 The requirements of the Standard are additional to the relevant Civil Aviation Rules (CARs) issued pursuant to the Civil Aviation Act 1990 or for military aircraft, the relevant Aviation Orders of the NZDF[1].

[1] Nothing in this Standard shall be interpreted to require compliance with CARs by military aircraft unless this is prescribed by Aviation Orders.

3 Interpretation

3.1 In this Standard, unless the context otherwise requires:

Agricultural Aircraft Operator Certificate (AAOC) means a certificate issued by CAA under CAR Rule Part 137

aircraft includes any piloted fixed-wing or rotary-wing powered aircraft

aircraft operator means a legal entity that operates one or more aircraft intended to be available (whether exclusively or as-required) for fire control operations at wildfires or has entered into an agreement with a Rural Fire Authority to do so – it includes the Royal New Zealand Air Force and the Royal New Zealand Navy

aircrew means persons on board an aircraft required for the aircraft tasking and includes pilots, controllers and observers

Air Attack Supervisor (AAS) means a person whose primary duty is to tactically coordinate and direct the fire attack by aircraft who has been appointed to this role by the Incident Controller and is part of the incident management team

Air Division Commander (ADC) means the member of the Incident Management Team responsible for planning and overseeing air operations at a wildfire. Note: particularly in the early stages of a wildfire the Incident Controller may decide to fulfil this role

air operations means (in this Standard) fire control operations at a wildfire involving the use of aircraft and includes related aircraft support activities

Air Operator Certificate (AOC) means a certificate issued by CAA under CAR Rule Part 119

Air Operations Platform (AOP) is an aircraft designated for aerial observation at a wildfire and/or use by the AAS from which to direct the air attack

Air Support Supervisor (ASS) means a person appointed by the IC or ADC whose primary duty is logistics planning and coordination of human, aircraft and aircraft-support resources to enable efficient and safe deployment of aircraft at wildfires

Aviation Orders means the overarching instructions which direct NZDF aircraft operations

audit means a process of systematic review against predetermined criteria as specified by this Standard

Crew Resource Management (CRM) means practices and an associated culture that facilitates and encourages interpersonal communication and information-sharing between individuals who are collectively involved in an air operation, with the purpose of improving leadership, decision-making and the use of human and physical resources, and reducing the potential for human error

fire control has the meaning defined in Section 2 of the Forest and Rural Fires Act 1977

fire control activities includes for aircraft, the application of water (including any additives) to a fire; providing aerial direction and coordination of aircraft and ground forces; observation or reconnaissance; infrared or other forms of monitoring the extent of a fire; carriage of equipment, stores or manpower associated with fire control; coordination with media or other aircraft operating within the fire area

fire plan means a fire plan developed by a Rural Fire Authority pursuant to the Forest and Rural Fires Regulations 2005

flight crew means the persons required by the aircraft operator for the safe operation of the aircraft

flight following means a system by which the movement of aircraft at a wildfire incident are monitored either by direct observation, periodic aircraft reporting and record keeping by the IMT, or by electronic devices carried on the aircraft that automatically transmit the location of the aircraft at regular but short time intervals and for which the IMT has electronic access

ground crew means persons carrying out necessary duties in support of the operation of aircraft on or near the ground in the immediate vicinity of aircraft

Incident Controller means the person who is for the time being in charge of fire control at a wildfire; it has the same meaning as specified in **CIMS**

Incident Management Team (IMT) means the Incident Controller and any other personnel under the ultimate direction of the Incident Controller who are variously responsible for managing operations, planning/intelligence and logistics at a wildfire and who function as a team

Lead Pilot means the Pilot of an aircraft on the fireground who has a coordination, overview and leadership role to maintain aircraft separation, maintenance of professional standards, effective and efficient fire control performance and effective management of risks associated with aircraft operations

night operations means flight occurring between *evening civil twilight* and *morning civil twilight* as described in CAR Part 1

operations manual means the documented requirements set by the Aircraft Operator for the operation of its aircraft and for related support operations or, in the case of NZDF aircraft, comparable aspects of Aviation Orders

pilot means the person flying the aircraft

risk means *effect of uncertainty on objectives*

[risk] control means a procedure or other measure that is modifying risk

risk management means coordinated activities to direct and control an organisation with regard to risk

risk management framework means the set of components within an organisation that provide the foundations and organisational arrangements for designing, implementing, monitoring, reviewing and continually improving risk management throughout the organisation (Note: depending on its content, a ‘safety management system’ could satisfy this definition)

Rural Fire Authority (RFA) has the meaning prescribed by the Forest and Rural Fires Act 1977

SAR Watch means a system specified by the ADC which, using the system of flight following specified, will detect when any aircraft is either overdue, unable to be contacted or missing and initiate contingency action

stakeholder means a person or organisation that can affect, be affected by, or perceive themselves to be affected by a decision or activity

things of value means things including people, buildings, infrastructure and commercial land uses that could be adversely affected by fire as well as things with environmental, heritage, community and recreational values

unit standard means a Unit Standard published by the New Zealand Qualifications Authority

wildfire means an uncontrolled fire in an area of vegetation

3.2 In this Standard, unless the context otherwise requires, the following abbreviations apply additional to those included in 3.1:

AGL	Above ground level
ALARP	As low as is reasonably practicable
ATC	Air Traffic Control
CAA	Civil Aviation Authority of NZ
CAR	Civil Aviation Rule (NZ)
CIMS	Coordinated Incident Management System
F-CTAF	Fire Common Traffic Advisory Frequencies
IMT	Incident Management Team
NOTAM	Notice to Airmen
NRFA	National Rural Fire Authority
NRFO	National Rural Fire Officer
NVG	Night Vision Goggles
NZDF	New Zealand Defence Force
NZFS	New Zealand Fire Service
PIC	Pilot in Command (of an aircraft)
PPE	personal protective equipment
PRFO	Principal Rural Fire Officer
RFCC	Rural Fire Committee of the (Fire Service) Commission
SAR	Search and Rescue
SOP	Standard Operating Practice
USDA	United States Department of Agriculture/Forest Service
UXO	Unexploded Ordnance
VFR	Visual Flight Rules

4 Administration

4.1 Following approval by the RFCC, this Standard shall be published by the NRFA and made available to those to whom it applies.

Compliance provisions of the Standard (refer Section 5) shall come into effect from a date determined and notified by the NRFO after taking into account the time reasonably required for:

- the NRFA to develop associated documents and protocols and provide stakeholder briefings
- individuals and organisations required to comply with the provisions of the Standard to conduct any training and implement improvements that are necessary to achieve compliance.

As far as is practicable, the NRFO shall avoid setting a commencement date that falls during a wildfire season.

4.2 The NRFO shall publish transition provisions by Notice whereby for a finite period after the compliance provisions of the Standard come into effect:

- aircraft operators with experience in operating at wildfires before the commencement of the Standard, may at the discretion of the NRFO, be granted interim approval to provide such services before obtaining a Certificate of Compliance; the holder of any such interim approval shall be deemed to hold a Certificate of Compliance during the currency of the interim approval
- the NRFO may accept as evidence of compliance by RFAs (pending routine audit) a signed declaration of compliance from the RFA.

4.3 The NRFO administers the Standard by:

- appointing auditors in accordance with the Standard
- arranging for the NRFA to conduct audits of Aircraft Operators seeking issue or renewal of a Certificate of Compliance
- including matters relevant to this Standard in routine audits of RFAs,
- ensuring that audits are conducted in accordance with auditing protocols established by the NRFO
- ensuring there are accurate records of audits
- establishing and maintaining a current national register accessible to RFAs of those Aircraft Operators with current Certificates of Compliance (or per 4.2, interim approval)
- periodically at intervals determined by the NRFA, reviewing the standard and amending it as necessary to reflect contemporary developments, trends and experience to date
- providing a facility for users of the standard to lodge suggestions for consideration in the next revision
- resolving complaints in relation to the conduct of audits in accordance with 4.4
- considering – in consultation with or by referral to CAA as appropriate - any complaints or matters arising from incident reports which may be indicative of non-compliance with the Standard and taking follow up action as necessary including a special re-audit if this is deemed necessary to provide assurance of future compliance
- suspending, cancelling or refusing to issue a Certificate of Compliance if after giving notice of the intention to do so to the Aircraft Operator concerned, the NRFO is of the opinion that the operator is either not complying with the Standard or is unlikely to comply with the Standard in all respects.

4.4 Any complaint made by an Aircraft Operator against the manner in which their audit has been conducted or about the outcome of their audit, shall first be raised with the auditor concerned and if not able to be resolved, may then be made in writing to the NRFO within 60 days of the audit.

4.4.1 The NRFO shall acknowledge receipt of the complaint and promptly and properly investigate the complaint.

4.4.2 If the complaint cannot be resolved to the satisfaction of all parties, the NRFO may appoint an independent person or panel to investigate the matter and make a recommendation to the NRFO whose determination shall in any case be final.

4.4.3 The complainant and other interested parties shall be advised of the NRFO's final determination.

4.5 Any dispute (other than covered by clause 4.4) in relation to the administration or enforcement of this Standard that cannot be resolved by the PRFO concerned shall be referred to the NRFO for advice, mediation or resolution.

4.6 If a dispute or complaint relates in part or in whole to compliance with a CAR, the NRFO shall either consult with, or refer the dispute to, the Director of Civil Aviation.

5 Compliance

5.1 Aircraft operators wishing to provide aircraft and related support services to Rural Fire Authorities will comply with the Standard by:

- holding an AOC or AAOC[2]
- implementing those sections relating to such services
- ensuring that personnel deployed to wildfires can demonstrate understanding of the other requirements of the Standard
- maintaining a current[3] Certificate of Compliance.

5.2 Rural Fire Authorities will comply with this Standard by:

- incorporating the Standard in their Fire Plans
- having arrangements in place to ensure that RFA personnel with roles specified in the Standard or who are likely to interface with aircraft operations at wildfires comply with the related requirements of the Standard and additionally, have a demonstrated understanding of the other provisions of the Standard
- referring to the NRFA national register of Aircraft Operators in order to determine which operators hold current or interim Certificates of Compliance
- only appointing persons to roles in the IMT that have the capabilities required by this standard for that role
- establishing SOPs or other protocols for call out and deployment of aircraft.

RFAs may enter into arrangements with Aircraft Operators with Certificates of Compliance for the purposes of facilitating interoperability and expediting the provision of services when required by the RFA, provided that these do not conflict with this Standard.

5.3 The Incident Controller complies with this Standard by:

- fulfilling the responsibilities of the Incident Controller as specified in 7.1
- only deploying aircraft supplied by Aircraft Operators listed on the NRFA national register as holding a current Certificate of Compliance or NZDF aircraft[4].

[2] This requirement shall not apply to NZDF aircraft.
[3] A Certificate of Compliance is deemed current for a maximum period of 36 months from the date of the audit inspection on which the Certificate is based except where extended by the NRFO for up to three months for the purposes of re-audit and gaining re-certification.
[4] Notwithstanding this provision, aircraft sourced from another country can be approved by the NRFO for deployment at major fire incidents, subject to CAA approval.

5.4 Pilots and the ground crew of Aircraft Operators deployed to carry out fire control tasks at a wildfire comply with this Standard by:

- being demonstrably conversant with all requirements of the Standard relating to pilots, ground crew, aircraft, aircraft operations, incident management and risk management
- complying with the operational requirements of this Standard, relevant CARs, aircraft flight manuals, Operations Manuals (and for military aircraft, NZDF Aviation Orders) throughout deployment to a wildfire.

Part II: Incident Management

6 Incident management generally

6.1 The system for incident management at wildfires shall be consistent with CIMS[5] and therefore utilise the associated basic incident management structure depicted in Annex C.

6.2 Aircraft Operators, their pilots and other key personnel are to be familiar with CIMS and capable of operating effectively in a CIMS environment.

7 Incident Management Team: roles and responsibilities

7.1 Incident Controller (IC)

The Principal Rural Fire Officer, or another Rural Fire Officer or a Fire Officer of the NZFS acting with the authority of the PRFO[6], shall assume the role of Incident Controller and shall manage the incident (including related air operations) in accordance with CIMS – generally ensuring that air operations are conducted in accordance with the Standard.

7.1.1 The IC is responsible for deciding whether and when to deploy and release aircraft (refer 8.2).

7.1.2 If aircraft are deployed, the IC is to decide whether at any stage the efficient, safe and effective management of the incident requires appointment of an Air Attack Supervisor and or Air Support Supervisor and whether to appoint a separate person to fulfil the duties of the Air Division Commander[7] [refer Figure C2 in Annex C for organisational relationships of these positions].

7.1.3 Any expansion or contraction of the Incident Management Team and related structure or changes to the communications protocols shall be advised to the Lead Pilot and (if appointed) the AAS and ASS.

[5] New Zealand's 'Coordinated Incident Management System' for sub-regional incidents is documented in the CIMS 'Blue Book' and in the 'Green Book' for other incidents – both are available from the NRFA.
[6] The authority to act on behalf of the PRFO may be by delegation pursuant to S.36 of the Forest and Rural Fires Act 1977, or to an agreement made pursuant to S.15 of the Act, or by authority of S.28A of the Fire Service Act 1975.
[7] In the absence of a person specifically appointed to this role, the IC shall fulfil the functions of the ADC.

7.2 Air Division Commander (ADC)

7.2.1 Either the IC (at the initial stage of a wildfire) or another person appointed by the IC who is qualified to act in such capacity (refer Annex B.1) shall at all times perform the functions of Air Division Commander as described in 7.2.3.

7.2.2 Depending on the scale and complexity of the wildfire and associated air operations, the IC or ADC may decide that the ADC will also formally fulfil other roles such as ASS.

7.2.3 Subject to the direction of the IC or the Operations Manager, the ADC shall be responsible for the preparation of an air operations plan for the incident and undertaking the tasks listed (a) to (f) as follows:

a) Logistics tasks

- Obtaining aircraft from Aircraft Operators with a current Certificate of Compliance
- Arranging a sufficient and sustained supply and deployment of water additives
- Designation of water filling points, air strips and helipads as required
- Arranging the designation of airspace restrictions or issue of NOTAMS where this is necessary
- Arranging for RFA personnel to assist with ground support such as bucket filling
- Arranging for Police attendance or other arrangements to restrict access to air operations areas where this is necessary to control risk
- Facilitating coordination between Aircraft Operators for the adoption of common arrangements for meeting their obligations for the supply of fuel at long duration incidents
- Arranging relief personnel for air operations positions in the IMT.

b) Appointments

- Appointing a Lead Pilot (refer 20.2) and, if there are to be more than three aircraft deployed or a mix of fixed and rotary wing aircraft, an Air Attack Supervisor[8]
- Additionally, at a large or sustained wildfire, the ADC may appoint an Air Support Supervisor[9] together with such additional assistance as may be required to assist with any aspects of operations, planning and logistics.

c) Operations

- Determining aircraft tasking in consultation with the IC (or IMT Operations Manager) and Lead Pilot (and if appointed, the AAS), including setting priorities and determining where, which and when water additives such as foam or retardant are to be used
- Establishing the aircraft communication plan (refer 10.1)
- Specifying a system for Flight Following and SAR Watch for aircraft deployed to the incident
- Determining whether and when to deploy an Aerial Observation Platform (generally necessary if more than three aircraft are deployed on fire

[8] The minimum competencies for an Air Attack Supervisor are set out in Annex B
[9] The minimum competencies for an Air Support Supervisor are set out in Annex B

suppression and the whole area of the fireground concerned cannot be observed from the ground) and related tasking (refer 13.1)
- Coordinating the movements of non-tactical aircraft (including media aircraft) with those directly involved in fire suppression
- Ensuring effective coordination between Aircraft Operators involved in the fire including ensuring an ongoing supply of fuel
- Liaising with ATC in relation to any issues associated with fire location and proximity to controlled air space
- Designating areas with UXO hazards and related operating procedures
- Flight following and SAR procedures.

d) Compliance monitoring
- Monitoring that pilots hold the necessary competencies (refer Part IV) according to their tasking
- Monitoring that aircraft tasked to carry passengers are certified to do so (refer section 17)
- Monitoring PPE usage
- Monitoring that any RFA personnel boarding an aircraft either hold or are under the direct supervision of a person holding Unit Standard 20388[10]
- Ensuring compliance with Flight Following and SAR Watch procedures by all deployed aircraft.

e) Record keeping
- Maintaining records of which Aircraft Operators have been deployed to the fire, the aircraft used (registration and type) and the time involved (refer 25.1).

f) Contingency arrangements
- Maintaining an operationally current contingency plan to provide SAR assistance to deployed aircraft that are unaccounted for, overdue or which have declared an emergency and to respond to any aircraft accident
- Monitoring the ongoing safety of ground crew with provision for evacuation in emergency.

7.2.4 The ADC shall consult either the Lead Pilot or (if appointed) the ASS before determining aircraft tasking, the system of flight following, water filling points, airstrips, helipads and any airspace restrictions.

7.2.5 At large and sustained incidents, the ADC may need to appoint relief personnel and additional persons to those described in this section to assist with any aspect of operations, logistics or planning. Such appointments shall be in accordance with the CIMS structure.

7.3 Air Attack Supervisor (AAS)

7.3.1 The primary role of an Air Attack Supervisor shall be tactical direction and supervision of the aerial fire attack.

7.3.2 If the IC or IMT determines that the scale, likely duration of the fire or the number and mix of aircraft so warrants (taking into account any such suggestion by the Lead Pilot), an appropriately qualified person (refer Annex B.3) shall be appointed – on the recommendation of the ADC - as Air Attack Supervisor for the purpose of:

[10] Unit Standard 20388 *Work safely with aircraft at emergency incidents* issued by NZQA

- observing and maximising the effectiveness of the air attack
- coordinating the air attack with ground operations and with other aircraft tasking as required
- recommending any changes to the air attack tactics or strategy to the ADC
- monitoring the ongoing adequacy of the communications plan for aircraft operations
- providing an interface between pilots and the ADC.

7.3.3 By agreement with the Lead Pilot, the AAS may carry out or assist with all or some of the functions of the Lead Pilot as specified in 20.2, subject to the division of responsibilities being clear to both persons.

7.4 Air Support Supervisor (ASS)

7.4.1 The primary role of an Air Support Supervisor shall be logistical planning and coordination of human, aircraft and aircraft-support resources to enable efficient and safe deployment of aircraft at wildfires as required by the IMT.

7.4.2 Persons appointed as ASS shall meet the requirements in Annex B.4.

8 Aircraft deployment to wildfires

8.1 RFAs may enter into standing arrangements with any Aircraft Operator holding a current Certificate of Compliance in order to facilitate expeditious deployment of aircraft in the event of wildfires. Such arrangements shall be in writing and may relate to:

- levels of readiness
- location of aircraft and related fire control equipment including buckets
- types of aircraft to be available
- types of communications (including flight following technology) to be provided
- pilot competencies
- which pilots can act as Lead Pilots if required by the IMT
- participation in desk-based or field-based joint exercises
- standby arrangements
- limitations concerning on-duty time
- other matters of a logistical nature including mobilisation arrangements
- scale of charges
- record keeping and invoicing
- other matters the RFA deems relevant.

8.2 The IC shall determine when aircraft are to be deployed to a wildfire and the number and type of aircraft required.

8.3 Deployment decisions shall take into account:

- any relevant criteria in the RFA's fire plan
- the intensity, scale and actual or expected spread of the fire (having regard to vegetation, terrain, FWI, time of day and fire weather forecasts)
- likely duration of the fire
- the safety of fire-fighters and aircraft

- the extent to which there are 'things of value'[11] that are at risk
- the immediacy of the threats to such things of value
- availability of water
- likely effectiveness of aircraft on both fire control and the scale of other resources that might otherwise be required
- accessibility
- availability, proximity and likely time of response of ground firefighting resources (which shall take account of mobilisation and travel times)
- availability and proximity of aircraft, aircrew and logistical support and likely time of response.

8.4 Selection of which aircraft operator(s) from those listed on the NRFA register to use in a particular incident is a matter for the RFA and IC. Selection of aircraft operators should generally take into account:

- relevant provisions of the RFA's fire plan
- relevant provisions of standing arrangements per 8.1
- contactability of the aircraft operator at the time
- availability at the time, of aircraft types and pilots appropriate to the intended tasking,
- response time to the fire ground
- experience of the aircraft operator and pilots relevant to the complexity of the tasking,
- expected operating environment including likely number of aircraft
- costs and efficiency
- known previous performance of the aircraft operator in relation to dependability, skill, risk management, CIMS and CRM performance.

9 Aircraft tasking

9.1 As soon as practicable, the IC, ADC or Sector Supervisor (refer section 7) shall make a reconnaissance of the fire (or the sector of the fire concerned) to establish:

- fire control objectives
- water sources
- the preferred air attack strategies
- options for location of aircraft ground crew and refuelling points.

and to assess risks and determine necessary controls to ensure that risks will remain ALARP throughout air operations (refer 11).

9.2 The ADC will then use a check list to brief all pilots of the following:

- overall fire control strategy
- tasking and tactics
- anticipated weather conditions including forecast changes
- dynamic aspects of the operating environment
- water pick up locations and any designated helipads and airstrips
- fire line elevation
- operating altitudes and height constraints
- entry and departure routes

[11] Refer Section 3 Interpretation for definition

- circuit direction for aircraft
- radio frequencies
- call signs
- location of any ground fire crews
- terrain and identified hazards
- applicable arrangements for Flight Following and SAR Watch
- risks and related controls.

10 Aircraft communications

10.1 The ADC is responsible, in consultation with the IMT, for establishing and maintaining an effective radio communications plan. The frequencies allocated shall allow for communications between:

- All aircraft involved in the wildfire via a F-CTAF (Fire-Common Traffic Area Frequency)
- Lead Pilot and the ADC and AAS
- Lead Pilot/AAS and RFA ground fire crews.

10.2 Frequencies available for the foregoing as follows:

Name	Fire Service Channel	Transmit & Receive	Use
ESX66	Fire 1	143.82500	Ground Operations
ESX63	Fire 2	143.78750	Ground Operations
ESX34	Fire 3	140.92500	Ground Operations
ESX009	**Fire 4**	**140.6125**	**Air Operations**
ESX39	Fire 10	140.9875	Liaison

Table 10.1: Available frequencies

All aircraft undertaking fire control activities at wildfires shall, as a minimum have a VHF radio and an FM radio capable of operating on each of the above channels. Unless otherwise advised by the ADC, Channel ESX009 (Fire 4) shall be used as the F-CTAF which shall be monitored by all aircraft at all times.

10.3 Depending on the number of aircraft operating at the incident and the density of radio traffic, the ADC may designate an additional VHF-AM simplex frequency as an alternative common frequency if there is radio channel overcrowding.

10.4 The Lead Pilot/AAS (or when operating in controlled airspace, ATC) shall specify the frequency to be used for routine air traffic calls.

10.5 Each Aircraft Operator shall arrange discrete frequencies for their own aircraft on which to arrange logistics or conduct other company communications.

10.6 The Communications Plan shall include contingency arrangements for loss of communications. This shall include a requirement for any aircraft suffering complete communications failure to stand down until communications are restored.

10.7 Radio communications between aircraft and aircraft ground crew and RFA fire crews may be supplemented by use of pre-agreed systems of clear hand signals for refuelling, water-

refilling, use of water additives, or close-order water drops on specific targets. This may be supplemented by other visual indicators such as use of flagging tape.

10.8 Unless instructed to the contrary, transponder-equipped aircraft shall activate the transponder whether or not in Transponder Mandatory (TM) airspace, and set the transponder code to 0111 unless instructed otherwise by ATC or the ADC.

11 Risk management

11.1 Persons making decisions concerning the deployment, operation, piloting and support of aircraft at wildfires are to ensure that 'risk' (i.e. the effect of uncertainty on objectives) is understood, and that the following "wildfire-related risks" are therefore managed effectively:

- *risks to the safety of people* (including aircrew, ground crew and others involved in fire control and related activities)
- *risks associated with effective fire-control*
- *risks associated with efficient use of resources at wildfires*
- *risks associated with protection of the environment.*

11.2 'Effective' risk management means that RFAs and Aircraft Operators have frameworks[12] in place to ensure:

- there is a correct and up-to-date understanding of wildfire-related risks associated with each deployment of aircraft to wildfires and of the risks arising from operations at each wildfire
- wildfire-related risks are modified as necessary during both planning and operations so as to be as low as is reasonably practicable (ALARP)[13]
- assessment and modification of wildfire-related risk occurs at each decision-point that is involved in the provision of these services including:
  i. the decision that a particular aircraft operator will be available to provide fire control services to an RFA
  ii. the decision to use aircraft at a particular fire
  iii. decisions relating to deployment of aircraft to the fire ground
  iv. decisions relating to aircraft tasking at the fire ground
  v. decisions relating to implementing the tasking
- the methods of risk assessment used at each decision-point are appropriate to the situation[14] and take into account the dynamic nature of the fireground environment;

[12] The risk management framework of an organisation refers to the collection of policies, practices and competencies within the organisation's systems of management that enable risk to be managed effectively.

[13] Risks are as low as is reasonably practicable (ALARP) when the costs and efforts of further risk controls would be grossly disproportionate to the reduction in risk or other benefits achieved. However, this criteria cannot justify acceptance of risks at a High or Very High level except in the circumstances described in clause D.5 of Annex D.

[14] Risk assessment and treatment of risks associated with decision point (i) in the previous list will typically occur as a desktop study involving both the RFA and the Aircraft Operator with risks recorded in a register. By contrast, risk assessment and

- wildfire-related risks and related controls are under constant review throughout the period of aircraft deployment
- risk assessments involve a 'whole of system' approach such that the significance of specific risk sources[15] are considered in the overall context both within the aircraft and the external operating environment
- risks are considered both singly and in the aggregate
- staff of RFAs and Aircraft Operators who are involved in decision-making of any type (including aircraft piloting decisions) have the necessary competencies to manage risk effectively.

11.3 The Risk Criteria specified in Annex D shall be used to assess risk and to determine whether risks are acceptable.

11.4 Risk management practices are to be consistent with the concepts, language and methods of the New Zealand standard for risk management AS/NZS ISO 31000:2009[16] (as further explained in the companion Handbook HB 436:2013 [17]) as well as being consistent with CARs, CAA Advisory Circular AC-004 Safety Management Systems and CRM practices.

11.5 The risk management framework of Aircraft Operators shall clearly establish the intent of the organisation to manage risk effectively and provide the capacity to do so including:

- having clear communication from top management of the requirement to manage risk effectively
- managers, pilots, other aircrew and ground crew (including contractors) having demonstrated risk management competencies (including those covered by relevant unit standards)
- involvement of stakeholders in risk assessment, selection of risk treatments and implementation of controls
- where provided, incorporation of appropriate elements of the framework in the organisation's Operations Manual
- use of risk-assessed SOPs for common tasks
- ongoing training incorporating use of risk assessment and risk treatment scenarios at the various stages of decision-making (refer 11.2)
- de-briefing and analysis of successes and failures and feedback into risk management practices
- appropriate technical resources being available
- establishing mandatory protocols for fatigue management (and including these in the Operations Manual where provided)

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treatment at the many decision-points associated with (v) will occur as an integral part of the mental decision processes of the Lead Pilot, AAS, PIC and ground crew. Although this latter type of decision making should where possible include discussion with others (see CRM) risks are not recorded.

[15] A risk source is an element that alone or in combination has the intrinsic potential to give rise to risk (for example high terrain might only be a risk source in combination with the presence of smoke)

[16] AS/NZS ISO 31000:2009 *Risk management: Guidelines and principles* published by Standards New Zealand

[17] HB 436:2013 *Risk management guidelines : Companion to AS/NZS ISO 31000:2009*

- systems for record keeping
- continual improvement practices including periodic review of the framework
- exposing aircrew to the DVD 'An Aviator's Guide to Good Decision-making'[18] and to other recognised guides to pilot decision-making theory and practices.

11.6 Aircrew shall constantly assess risks based on objectives, tasking, situational awareness and the risk criteria in Annex D and take into account:

- terrain and terrain hazards (including transmission wires, towers, guy wires and areas which may have unexploded ordnance)
- operating environments including altitude, visibility, turbulence, temperature and smoke accumulations
- nature and situation of any open water bodies proposed for use for bucket dipping,
- directions of the Lead Pilot or AAS concerning circuit direction and other aircraft separation issues
- weather including forecasted weather shifts and related uncertainties,
- general characteristics of wildfire behaviour
- actual and expected fire behaviour and related uncertainties at each wildfire,
- ground crew access and egress
- ground fire crew activity
- alertness and fatigue management
- aircraft performance and limits
- time-limits for aircraft and aircrew
- environmental vulnerability of land and natural water sources
- level of experience of the aircrew of other aircraft and ground crew
- operations of other aircraft (whether or not involved in fire control)
- fuel supply and other logistics support.

11.7 Aviation ground crew shall constantly assess risks (preferably assisted by reminder lists) based on objectives, tasking, situational awareness and the risk criteria in Annex D, taking into account:

- fire behaviour – actual and expected including proximity of ground crew operations to smoke, fire exposure, or downwind fire extension by windborne burning brands ('branding') or embers ('spotting')
- actual and forecast weather and any uncertainties
- flying hazards in proximity to ground crew location including dust and unsecured objects that are vulnerable to rotor or propeller wash
- type of aircraft and equipment being used
- rate of aircraft operations and tasking
- characteristics of airstrips and landing zones
- continuity of fuel supply and other consumables
- sufficiency and experience of people resources
- potential ignition sources in proximity to refuelling
- alertness and fatigue
- environmental vulnerability of land and natural water sources
- site security – vehicles and people
- egress in emergency
- time of day

[18] '*An Aviator's Guide to Good Decision Making*' is a DVD published by AIRCARE™

- any uncertainties relating to the foregoing.

11.8 All personnel involved in air operations shall be familiar with and apply CRM practices to enhance decision-making and reduce the potential for human error. Aircraft operators and RFAs shall actively encourage and support an environment in which CRM practices are the norm, and actively monitor that this is maintained.

Part III: Operations

12 General rules for aircraft operations

12.1 Aircraft shall be operated in accordance with the CARs (or for military aircraft, Aviation Orders), the aircraft flight manual, the Aircraft Operator's operations manual (where provided), CRM practices and in a way that ensures all wildfire-related risks are ALARP.

12.2 Aircraft in transit to a wildfire shall broadcast an all-traffic '5-minute inbound' advisory on the F-CTAF stating aircraft type, identification, altitude, general location, bearing and intentions.

13 Air operations platform

13.1 The ADC shall designate an aircraft to fulfil the role of an air operations platform if any of the following apply:

- it is necessary for the AAS to be airborne in order to adequately perform his/her functions
- the ADC or AAS determines that due to terrain or other situational considerations an AOP is necessary to ensure that wildfire-related risks are ALARP
- more than three helicopters are engaged in fire attack in any sector of a fire and it is not possible to observe air operations over the whole of the operating area from the ground
- helicopters of different categories of load capacity are deployed in the same sector;
- both fixed-wing aircraft and helicopters are deployed in the fire attack
- an AOP would significantly improve fire attack effectiveness
- it is necessary to manage the construction or integrity of a fire retardant line
- an AOP is requested by the IMT Operations Manager.

13.2 The ADC shall specify the technical capabilities required for the AOP aircraft including whether the aircraft is required to generate and downlink GPS shape files.

13.3 The tasking of an AOP shall be established by the ADC and may include

- providing an aerial platform for the AAS to direct and monitor the fire attack and coordinate aircraft movements (refer 7.3)
- reconnaissance and monitoring the progress of the fire
- facilitating coordination with ground attack resources.

13.4 The AOP pilot shall communicate with the Lead Pilot and other aircraft to establish a safe approach and departure for the AOP to the operational area, use a circuit direction opposite to that of the fire attack aircraft, and operate at an altitude (selected in consultation with the Lead Pilot) that is above such aircraft.

13.5 If it is necessary for the AOP to land (for example for ground-truthing of the effect of the fire attack or for safety reasons) or to descend below the selected altitude, the pilot shall first advise other aircraft in that sector by radio.

14 Fuel management and refuelling

14.1 Subject to 14.1.2 for long duration fires, each aircraft operator is responsible for maintenance of a supply of fuel for the uninterrupted deployment of its own aircraft.

14.1.1 The Aircraft Operator's SOPs shall provide for the deployment and reinforcement of fuel supplies including to areas with restricted vehicle access.

14.1.2 For long duration fires, the ADC (or ASS) may facilitate a coordinated approach by the Aircraft Operators with aircraft at the fire for the supply of fuel in bulk. Such arrangements shall include fuel transfer from tankers to the aircraft.

14.2 Refuelling sites shall be selected having regard to:

- proximity to flying hazards
- access including the possibility of use of tanker
- ground crew safety
- the likely environmental effects of spills.

14.2.1 At least one dry powder fire extinguisher of at least 4.5kg capacity shall be located at the refuelling site.

14.2.2 The Aircraft Operators shall have procedures and equipment for ground crew to prevent, contain and clean up fuel spills. Any spills that cannot be contained and cleaned up with available resources shall be reported promptly to the IC.

14.3 Refuelling shall be conducted in accordance with CAR Part 91.15[19] or with the relevant Aviation Orders for military aircraft.

14.3.1 The Aircraft Operator shall establish a standardised system of hand signals for use during refuelling including signals for dealing with emergency situations during hot refuelling.

14.3.2 Only pilots and trained ground crew shall conduct refuelling.

14.4 Specific attention shall be given to avoiding and detecting water contamination of fuel supplies and the aircraft's fuel system.

15 Water pick up

15.1 Pilots using underslung buckets shall:

- only use buckets and related equipment that complies with the technical requirements of Part V

[19] Hot refuelling of turbine powered aircraft is permitted provided there is no-one other than the pilot on board. CARs do not permit hot refuelling of piston aircraft.

- comply with operating instructions and limits set by the bucket manufacturer and have regard to the effect of the bucket on aircraft performance
- exercise additional care in situations in which there are multiple aircraft, aircraft from different operators, aircraft using bucket strops of different lengths, or aircraft with a mix of left and right seat controls dipping from the same water source
- exercise care when dipping from moving water
- wherever safe and practicable to do so, conduct dipping operations close to the shore and where this is not possible take such other measures as are necessary to ensure a good height reference
- avoid flight above other aircraft whenever a bucket is attached
- avoid flight above houses and concentrations of people
- notify the IMT if there are delays occurring at the filling point.

15.2 Unless ground personnel using hose lines to refill buckets, belly tanks or aircraft hoppers hold the relevant unit standard, they shall be briefed and supervised in relation to working safely in proximity to aircraft. This shall include use of hand signals and for night operations, not directing light into the aircraft cockpit.

16 Night operations[20]

16.1 Use of aircraft at night shall only occur with the sole approval of the IC and if all of the following apply:

- the IC determines that there is a pressing need for night operations in order to protect life or other significant things of value[21] and that the proposed night operations are likely to achieve this need
- CAA requirements for night VFR operations can be met
- it has been demonstrated by a formal risk assessment (see 16.2) that the night operations can be undertaken safely
- it will be possible for pilots to maintain continual visual reference with the ground
- there has been a pause in all flying operations before the commencement of night operations and the pilots who are to conduct night operations have attended and participated in the risk assessment.

16.2 The risk assessment of any night operations shall directly involve the IC, IMT Operations Manager (where appointed), Pilots involved, the AAS or ADC and a representative of the air operations ground crews.

The risk assessment shall apply Annex D and use a decision tree approach having regard to:

- the existence of a pressing need for night operations
- the purposes and objectives of the night operations
- level of night flying experience, training and currency of the pilot
- the experience of others to be involved in the night operations
- aircraft instrumentation and availability of aircraft external lighting
- the ability to maintain continual visual reference with the ground
- the expected location of smoke relative to the proposed flight paths
- terrain and the presence of wire or similar obstacles

[20] See definition of 'night operations' in 3.1
[21] See definition of 'things of value' in 3.1

- the number of aircraft that will be operating and the work load involved in maintaining separation and situational awareness
- illumination of air operations ground crew work areas and water refill locations
- avoidance of lights being shone directly into the cockpit
- whether there has been the opportunity during daylight hours for pilots to operate in or conduct a reconnaissance of the intended flight paths
- how the position of ground fire crews will be known
- the communications plan
- the availability of illuminated reference points
- whether NVG will be used
- proposed Flight Following and SAR Watch arrangements
- human factors including fatigue
- relevant CARs and elements of the Aircraft Operator's Operations Manual.

16.3 In addition to consideration of the foregoing, NVG shall only be used when -

- the Aircraft Operator holds an AOC or, in the case of an NZDF aircraft, is authorised for NVG operations by Aviation Orders
- the pilot meets NVG currency requirements
- the aircraft is authorised for NVG operations by its Operations Specifications
- ground crew have been briefed in relation to the implications of NVG
- lighting arrangements, including that of other aircraft, are suited for NVG.

16.4 NVG flight operations by non-NZDF pilots shall be conducted in accordance with AC91-13[22]and procedures in the Aircraft Operator's Operations Manual.

16.5 If it is anticipated that night operations may be required, the pilots concerned shall pay particular attention during the preceding daylight hours to circuit patterns, climb profiles relative to terrain, and to the location of flight path hazards.

For this reason, except for aircraft being flown with NVG, night operations shall not be commenced on a new or unfamiliar fire front unless this is in an area of similar terrain.

16.6 Navigation lights shall be displayed at all times during night operations; anti-collision lights shall be used except where this could cause air crew disorientation; vehicle lights in aircraft operational areas shall be dipped; flashing beacons on vehicles shall not be used.

17 Carriage of passengers

17.1 Only the flight crew shall be on board an aircraft during water bombing operations.

17.2 In other situations, passengers (such as RFA firefighters) shall only be carried if:

- with the exception of NZDF aircraft, the Aircraft Operator is certificated to do so in accordance with CAR Part 119 and the specific aircraft is authorised for such use on the Operations Specifications
- all passengers have received a safety briefing in accordance with CAR Part 91.211 from the pilot or another person delegated by the pilot together with a briefing on any special conditions or techniques that will be involved (such as single skid or hover disembarkation)

[22] CAA Advisory Circular AC91-13 Night Vision Imaging Systems - Helicopter

- the names of all passengers have been recorded prior to the flight
- all passengers are complying with PPE requirements (refer 19.3)
- all passengers are wearing seat belts
- helicopter passengers hold Unit Standard 20388[23] or are under the direct supervision and direction of a person who does so.

17.3 In anticipation that all or some fire crews may at some point need to be transported by air during the course of a wildfire, the RFA shall arrange for such personnel to be able to demonstrate knowledge of the information in *Aircraft Safety – Fire management – working with the aviation sector* [24] .

18 Effects on environment

18.1 The actual and potential effects of aircraft fire control activities on environmental values (see 18.1.1) shall be taken into account in planning for the deployment of aircraft to wildfires and in the selection of aircraft, aircraft tasking and methods of operation. This shall include consideration of –

- the effect of further fire spread on environmental values,
- the potential and extent of soil erosion as a result of water drops,
- the effects of water additives on soil types and vegetation present (including both suppressed and enhanced plant growth),
- the effects of water additives in run-off of fire-fighting water into water-ways,
- the effects of seawater,
- the effects of any contaminants in fire-fighting water (e.g. if drawn from a polluted source),
- the transmission of harmful aquatic pests and organisms between waterways and lakes, and
- the effect of fuel spills.

18.1.1 Environmental values include but are not limited to particular plants and plant communities, soils, waterways and lakes, water and terrestrial habitats, wildlife, fish and birds, farmed animals, commercial crops, air quality, heritage, quality of potable water, and noise levels for nearby communities.

18.2 Aircraft Operators shall brief pilots and support staff regarding the general nature of the obligations of this section and the types of effects that can result from aerial fire control operations and shall provide accurate information regarding the environmental effects of various types of water additives[25].

18.3 To prevent spread of environmentally harmful organisms, the Aircraft Operator shall ensure that buckets, hoppers and other waterway equipment that has been used with water from rivers, dams or lakes is thoroughly cleaned in a location in which run-off into other natural water ways will not occur.

[23] Unit Standard 20388 *Work safely with aircraft at emergency incidents* is published by NZQA

[24] A booklet published by and available from the National Rural Fire Authority.
[25] The USDA publishes a schedule of approved additives

18.4 During water bombing operations, Class A foam shall not be added to the bucket, tank or hopper while the aircraft is filling from or flying over a natural water source.

18.5 The ADC shall ensure that aircraft tasking specifies any restrictions and special requirements to be complied with for the purposes of environmental protection, including but not limited to:

- use of particular types of water additives
- restrictions on use of particular water sources
- limitations on water application rates
- limitations as to where water can be applied
- restrictions on flight paths or hours of operation
- requirements in relation to cleaning protocols for buckets or pickup tubes[26]
- according higher priority for fire control to particular areas in order to protect high environmental values.

19 Personal Protective Equipment

19.1 **Aircrew**

The minimum PPE for all aircrew is:

- either flying suit or overalls, or long trousers with a shirt of fire resistant or natural material extending to wrists or ankles
- leather or fire resistant footwear, ankle length
- natural fibre underclothing.

19.1.1 Additionally:

- seat belts shall be worn while airborne
- protective flying helmets with built-in communications shall be worn for operations below 500' AGL
- life preservers shall be worn when operating over water if the aircraft could not reach the shore in the event of engine failure.

19.2 **Aircraft ground crew**

The minimum PPE for all aircraft ground crew is:

- full length clothing
- safety boots
- high visibility, anti-static, fire resistant outer garment or safety vest
- safety helmet with chin strap
- protective goggles
- hearing protection.

19.2.1 Ground crew members involved in refuelling shall also wear -

- fire resistant or natural fibre outer garments, and
- fuel resistant gloves.

19.3 **Passengers**

[26] Cleaning of equipment may be necessary to prevent the avoidable spread of organisms such as Didymo

19.3.1 RFA personnel being transported in aircraft shall comply with the NRFA National Minimum Standard for PPE.

19.3.2 PPE for other passengers shall be as specified by the IC or ADC according to the purpose and intended profile of the flight.

Part IV: Pilots

20 Roles and responsibilities

20.1 Pilot in Command

20.1.1 The Pilot in Command of an aircraft has ultimate responsibility for the safe operation of the aircraft and the safety of those on board. Although aircraft tasking and related operational procedures at wildfires are determined by the incident management system (in consultation with the Lead Pilot) the PIC shall:

- immediately notify either the Lead Pilot, AAS (if appointed), or IC of any safety concern related to such tasking or procedures
- take such action (including refusing, discontinuing or deferring any requested fire control activity) if this is necessary to maintain the immediate safety of his/her own aircraft and that of other aircraft and ground crew, and notify the Lead Pilot accordingly as soon as practicable
- maintain situational awareness
- maintain high levels of professionalism throughout including disciplined radio communications and use of CRM.

20.1.2 The PIC of an aircraft carrying passengers shall ensure that there is a manifest that documents the names of passengers on each flight[27] and shall broadcast both the number of persons on board on becoming airborne and at the completion of the passenger tasking.

20.2 Lead Pilot

20.2.1 If there are three or more aircraft or both fixed and rotary wing aircraft involved in fire control activities (or a fewer number if so decided by the IC or the pilots), the IC, ADC or AAS shall appoint one pilot who is so qualified to act as Lead Pilot. If there are air operations in more than one sector, it may be appropriate to appoint a Lead Pilot to each sector.

20.2.2 If on the commencement of air operations, there is no IC or ADC present, one pilot with the necessary competencies shall assume the role of Lead Pilot until replaced and shall immediately advise all other pilots of the assumption of that role.

20.2.3 Throughout air operations, the Lead Pilot will:

[27] The pilot need not personally complete the manifest if this is otherwise taking place according to tasking arranged by the IMT. A copy of the completed manifest shall remain on the ground.

- monitor that controls are functioning as intended
- determine whether additional controls are needed or any controls require amendment
- ensure radio communications are disciplined
- promote a high standard of professionalism amongst pilots
- encourage, apply and monitor CRM practices
- continually monitor the operational situation (including any concerns or alerts from other aircraft) to identify new or changed risks
- in the absence of an AAS, provide any necessary tactical coordination with RFA ground personnel involved in fire suppression in the vicinity of the air attack
- advise the AAS, ADC or IC of any fire behaviour observed to be placing ground fire crews in danger (including as a result of unforecasted observed wind shifts)
- adjust aircraft operations to ensure risks remain ALARP
- immediately advise the IMT of any concerns regarding fatigue
- monitor effective and safe coordination of all aircraft in the proximity of the wildfire
- monitor that high levels of professionalism are being maintained at all times and advise the AAS or IC of any concerns.

21 Pilot qualifications and competencies

21.1 The Aircraft Operator and the ADC shall ensure that only pilots holding the qualifications and competencies specified in this section shall be deployed to wildfires.

21.2 Every pilot in command of an aircraft at wildfires shall be legally entitled to fly in New Zealand and, with the exception of NZDF pilots[28], have the following qualifications:

- Current Commercial Pilot Licence (Helicopter or Aeroplane according to aircraft) or Airline Transport Pilot Licence
- Type rating for the aircraft being flown
- Unit Standard 3285.

21.3 Fixed wing pilots shall also have a Grade I Agricultural Pilot rating.

21.4 Helicopter pilots with less than 5 hours experience in wildfire operations shall only operate if they can satisfy the ADC or lead pilot of competency in the tasks concerned. The ADC or Lead Pilot may restrict the tasking of such pilots.

Particularly in fires involving multiple aircraft, both the Aircraft Operator and the Lead Pilot shall ensure that pilots with less than 5 hours experience are carefully briefed and generally avoid high intensity tasks.

21.5 The Aircraft Operator shall have systems in place to ensure that all pilots deployed to wildfires have the following demonstrated competencies:

[28] Aviation Orders determine the competencies of pilots and ability to undertake wildfire tasking.

- ability to assess and treat risks involved in aircraft operations at wildfires (refer section 11)
- ability to maintain alertness in accordance with the Aircraft Operator's fatigue management protocols
- general knowledge of wildfire operations including fire behaviour
- mountain flying
- flying in reduced visibility but above CAR minima
- knowledge of the sections of this Standard that relate to responsibilities and operations of pilots.

Helicopter pilots shall also have the following demonstrated competencies:

- carrying external loads
- confined area operations.

21.6 In consultation with the aircraft operator, an RFA may determine in advance of deployment to wildfires, that a pilot is qualified to act as a Lead Pilot at wildfires within the District and enter his/her name on a register if satisfied that the pilot has the following additional attributes:

- demonstrable competence and experience
- extensive local knowledge of the general terrain, road access, land use, communications black spots and available water sources
- proven skills in leadership, management of other pilots, CRM and aviation professionalism
- holds unit Standard 14564 Fire Environment.

21.7 In the event of a major incident in which the NRFA has approved deployment of aircraft from another country, the requirements of this section may be varied provided that risk remains ALARP.

22 Alertness – managing fatigue

22.1 No aircraft shall be operated at a wildfire or be permitted to operate at a wildfire by the Aircraft Operator, IC or ADC, unless the pilot is fully alert.

22.2 To maintain alertness, the pilot shall:

- conform to the Aircraft Operator's fatigue management protocols including continually monitoring and assessing his or her level of fatigue in the context of the operating environment and workloads
- stay hydrated and take food at regular intervals
- comply with all flight and duty time limitations including, for aircraft carrying passengers, the limitations in CAR Part 135
- immediately notify the AAS (if appointed) or Lead Pilot of any concerns about fatigue;
- act immediately on any signs of loss of alertness
- accurately record flight and duty time
- cooperate with any formal assessment of alertness required by the Aircraft Operator or on behalf of the ADC
- take periodic breaks in consultation with the Lead Pilot.

22.3 The ADC and others involved in the planning and scheduling of aircraft operations shall specifically take into account the obligations of 22.1.

Part V: Aircraft and Equipment

23 Aircraft

23.1 Aircraft Operators shall ensure that aircraft are not deployed to a wildfire unless the aircraft:

- is registered and legally permitted to conduct the intended operations
- is transponder-equipped if it will be operating in Transponder Mandatory airspace
- has a high visibility paint scheme on rotors or rotor tips or propellers
- at the time of deployment, has at least 10 hours to run before any scheduled maintenance is due unless a waiver of this requirement by the ADC has been granted
- is equipped with at least one VHF radio and one FM radio programmed with the frequencies specified in section 10.2 and integrated into the aircraft's audio system so as to enable the pilot to monitor both radios simultaneously
- is carrying sufficient fuel for continued operations until the arrival of support ground crew unless specifically exempted by the IC[29]
- has a pilot with the necessary qualifications to conduct the intended tasking (refer Part IV)

and the aircraft is supported by a ground crew that is immediately dispatched to the wildfire.

23.2 Aircraft to be deployed for water bombing shall have either a belly tank, water hopper or alternatively, a cargo hook together with underslung fire bucket.

23.2.1 The water carrying capacity shall enable the aircraft to reach its maximum permissible weight with one hour's fuel on board.

23.2.2 The aircraft shall have a reliable system for release of water and a system for the pilot to safely jettison the bucket in emergency.

23.3 Aircraft to be deployed in an AOP role shall have a serviceable intercom jack at each seat and the observer/AAS shall be able to communicate directly with other aircraft or the ground on the allocated fire radio channels (refer 10.2) and such other technical equipment as the ADC specifies[30].

[29] Such exemption might be given in a situation where the IC determines that a rapid but limited duration aerial attack would be effective

[30] Other equipment specified by the ADC might include GPS equipment able to generate electronic shape files depicting fire boundaries, hot spots or other features of interest and to downlink that information to the IMT.

24 Equipment

24.1 Underslung buckets shall be of a type that can be filled by dipping and shall be able to be transported within the aircraft. Strop length shall be optimised with the type of bucket to counter rotor wash on the fire.

24.2 Only buckets and associated equipment that have been maintained in accordance with the manufacturer's instructions, CAR Part 133 and are in good working order shall be used.

If no manufacturer's instructions are available, bucket maintenance shall be in accordance with the schedule in Annex E.

24.3 Equipment for injecting or inducting water additives (wetting agents or retardants) shall include an accurate timer (calibrated in seconds) by which to vary the dose.

24.3.1 Such equipment shall be maintained in good working order by whichever party has custody or care of it.

24.3.2 Associated with such equipment, there shall be a conversion chart[31] by which, for each type of additive used by RFAs, the required time setting can be determined according to:

- the volume of the water tank, hopper or bucket in use
- the required concentration of the water/additive mixture as specified by the IMT.

24.3.3 Water additive equipment carried inside the aircraft shall be firmly secured and if operated inside the aircraft, shall be bunded to prevent spillage of the additive into the aircraft.

Part VI: Record Keeping and Charging

25 Time recording

25.1 In addition to completing a Daily Flight Record, a summary sheet[32] shall be completed for each aircraft deployed to wildfires showing, as a separate line item, the aircraft operating time for each tasking (including positioning) or if the tasking is unchanged, the operating time for each refuelling cycle.

25.1.1 For helicopters, time shall be measured from skids or wheels off the ground to skids or wheels on the ground, and for fixed wing aircraft, the start of the take-off roll and completion of the landing roll.

25.1.2 Alternatively, but subject if required, to verification of the resulting data at any time by the by the IC or ADC, time may be measured using an automatic time-in-service

[31] The chart provided in the NRFA 'Orange Book' for this purpose will meet this requirement provided that it is immediately available in the environment in which the additive equipment is being used e.g. on the aircraft.
[32] This may be in the form of NRFA form RF 244 *Air Operations Flight Return.*

recorder which, for helicopters records the time that the collective is raised, and for fixed wing aircraft, the time during which the air switch is activated.

25.2 In addition to the foregoing, the ADC may require the pilot to provide further detail.

26 Invoicing

26.1 Aircraft Operators shall lodge invoices with the RFA within 10 working days supported by a completed Form RF 244 *Air Operations Flight Return*, calculated on the basis of time recorded in accordance with section 25.

Part VII: Conduct of Audits

27 Appointment of auditors

27.1 The NRFO shall appoint suitable persons drawn from the staff of NRFA as Auditors of this Standard or contract the services of suitable persons for this purpose.

27.1.1 In making such appointments, the NRFO shall first be satisfied that the appointee:

- has knowledge and experience in relation to the use of aircraft at wildfires
- can and will competently conduct audits in accordance with the requirements of the NRFO and the provisions of this Standard
- will act with independence and integrity.

27.1.2 Appointments shall be in writing, signed by the NRFO and may be terminated at any time by the NRFO.

27.2 A person contracted as an Auditor shall not audit an aviation operator if he or she is employed by or otherwise engaged - directly or indirectly - by that aviation operator for any other purpose.

27.3 Notwithstanding 27.1, NZDF may elect to appoint suitably qualified NZDF personnel to audit NZDF compliance with this Standard and provide the NRFO with the names and experience of such personnel.

27.4 Auditors shall act independently of the party being audited and the interests of any other party in accordance with the requirements of this Standard.

27.5 Auditors and the NRFA shall protect the confidentiality of all information received and avoid intentional or accidental release to third parties. Note: This shall not preclude the provision of information relevant to the audit to the NRFO or any NRFA person authorised by the NRFO to receive such information.

28 Audit purpose and scope

28.1 The purpose of an audit of an Aircraft Operator is to independently verify, for the purposes of determining whether a Certificate of Compliance can be issued, that:

- the Aircraft Operator has the capacity to deploy aircraft, people and supporting specialist resources to safely, efficiently and effectively assist RFAs at wildfires and to operate at the wildfire in accordance with the requirements of the Standard
- the aircraft, people, supporting resources and methods of operation of the Aircraft Operator will meet the relevant requirements of this Standard
- the management systems of the Aircraft Operator will ensure that this capacity is maintained throughout the currency of the Compliance Certificate.

28.2 The Scope of the Audit includes any matter covered by this Standard that is relevant to the audit purpose and includes but is not limited to -

- ensuring that staff or others contracted to the Aircraft Operator who are involved in any aspect of providing services to RFAs have the qualifications and competencies specified in the Standard and have been trained in and can demonstrate a high level of knowledge of those aspects of the Standard that are relevant to their roles
- obtaining credible evidence that aircraft and equipment meet the technical requirements of this standard
- ensuring that there are operational procedures that comply with both the Standard and any additional agreements entered into with an RFA in relation to readiness and response to requests for service from the RFA
- evaluating the extent to which risk is managed consciously and competently, CRM is encouraged and supported, and continuous improvement is sought and achieved – having regard to the culture and the general practices of the organisation when assessed against industry norms and trends
- ensuring that documentation relevant to the foregoing is correct and current and subject to an assurance system
- feedback from any RFAs that have previously contracted the operator concerned.

29 Audit principles

29.1 An Aircraft Operator shall not submit to audit unless its chief executive, or a director, has first established that it is in compliance with the requirements of the Standard.

29.2 Information obtained by the Auditor is to be treated in confidence by the auditor. With the exception of information required to be provided to the PRFO or NRFO, information shall not be disclosed to any other party.

29.3 The privacy of individuals is to be respected.

29.4 Audits are to be fair and based on open disclosure with the objective being to assist Aircraft Operators to comply with the Standard and work harmoniously with RFAs.

29.5 Auditors shall use the language of the Standard in reports.

30 Audit protocols

30.1 The NRFO shall issue written protocols for the conduct of audits and shall require auditors and Aircraft Operators seeking audit to comply with those protocols.

30.2 Without limiting the scope of the auditing protocols, they shall provide for the auditor in conducting an audit to:

- meet with top management
- have access to all documents including records that are reasonably relevant to the purpose of the audit including any incident reports
- speak in private to any person to whom the Standard applies
- test the relevant knowledge of any person to whom the Standard applies
- conduct a desk top exercise for the purpose of assessing competency
- inspect any equipment
- have the operation of any equipment relevant to the delivery of the services demonstrated.

30.3 If the audit shows that any requirements for issue of a Completion Certificate have not been met, the Auditor shall provide the Aircraft Operator with details of those shortcomings in writing and provide an additional oral explanation if requested.

30.4 If the Aircraft Operator so wishes, it may respond to the shortcomings in writing, signed by its chief executive, or a company director, to -

- provide a description of any remedial action
- an explanation as to why its management system had not detected such shortcomings
- a description of remedial actions in relation to its management systems.

30.5 On receipt of an Aircraft Operator's response to shortcomings, the Auditor shall reassess the application and make such additional enquiries as thought fit and then issue a final decision as to whether or not issue a Completion Certificate.

31 Issue of Certificate of Compliance

31.1 Once satisfied that the purposes of the Audit specified in 28.1 have been met, the Auditor shall issue a signed and dated Certificate of Compliance in the form provided in Annex A and provides a copy to the NRFO.

31.2 The NRFO shall record details of the Certificate in a national register that shall be accessible on an NRFA website.

Annexes A-E

Annex A: Form of Certificate of Compliance

No: ……../……..

National Rural Fire Authority RF305

NRFA Standard for Use of Aircraft at Wildfires

Certificate of Compliance for Aircraft Operator

This is to Certify that the {**name of organisation**} was found on audit to be in Compliance with the requirements of the published NRFA Standard for Use of Aircraft at Wildfires as applicable to an Aircraft Operator.

The Certificate is only valid when the practices of the Aircraft Operator in relation to provision of wildfire services and conduct of wildfire operations are in accordance with documentation reviewed and accepted as part of the Audit. Any changes to such practices are subject to re-audit.

This Certificate remains valid for 36 months from the date of completion of the Audit but this period may be extended for three more months with the written approval of the National Rural Fire Officer for the purposes of re-audit and gaining re-certification.

Date on which audit completed:		
Auditor	**{Name}**	**{Signature}**
The auditor was appointed by the National Rural Fire Authority to conduct independent audits of this Standard in accordance with documented protocols.		
Note: A copy of the current standard, *NRFA Standard for Use of Aircraft at Wildfires* can be downloaded at www.nrfa.org.nz		

Annex B: Competencies for key IMT air support roles

B.1 General

Because the availability and curriculum of formal qualifications such as Unit Standards changes over time, the NRFO, shall from time to time and after consultation with the RFCC, determine which qualifications at which level are the minimum for particular roles associated with air operations at wildfires from that time forward. Without limiting the generality of this authority, such determinations may vary the provisions relating to the key IMT air support roles described in this Annex.

B.2 Air Division Commander

A person appointed as ADC shall have experience in a supervisory capacity of air operations at wildfires at the level of an operations manager. The minimum qualification for this is 'Manage Level 2 Aircraft Operations' as well as experience of operating at Level 2. They must be able to demonstrate the following specific attributes and knowledge sets:

Attributes

- Leadership
- Strategic decision-making
- Planning
- Situational analysis and problem solving
- Risk management
- Interpersonal skills
- Establishing effective working relationships

Knowledge (Unit Standards)

- 22445 (CIMS Level 4) or the previous standard 17280 (CIMS Level 4)
- 3297 (Manage air operations Level 6)
- 4648 (Fire behaviour Level 5)
  and preferably
- 20399 (Legislation Level 3)

B.3 Air Attack Supervisor

A person appointed as AAS shall have first demonstrated to the satisfaction of the PRFO that they have the attributes and knowledge sets specified in this sub-section and either:

(i) Hold the 'Manage Level 1 Aircraft Operations' qualification and have had satisfactory experience in supervising extended air operations at wildfires involving up to three aircraft, or a mix of aircraft types, and have acted as ASS at a complex or large wildfire under the direction of an AAS who holds the 'Manage Level 2 Aircraft Operations' qualification.

or

(ii) Hold the 'Manage Level 2 Air Operations qualification and have had prior satisfactory experience supervising or managing aircraft operations at wildfires involving more than three aircraft.

or

(iii) Holds the Air Attack Supervisor accreditation of the Victorian State Aircraft Unit and has experience as an AAS at wildfires in New Zealand.

Attributes

- Situational analysis and strong understanding of wildfire dynamics
- Ability to remain airborne for extended periods
- Problem solving and tactical decision-making
- Risk management
- Application of CRM
- Interpersonal skills
- Oral communication skills

Knowledge (Unit Standards)

- 22445 (CIMS Level 4) or the previous standard 17280 (CIMS Level 4)
- 4648 (Fire behaviour Level 5)
- 14563 (Support Air Operations Level 5)
- 14565 (Use maps Level 3)
- 3293 (Lead ground support for air operations at vegetation fires Level 4)

B.4 Air Support Supervisor

A person appointed as ASS shall have experience, satisfactory to the PRFO, as either an aircraft ground crew leader or in some other role in an IMT that demonstrates the following attributes and shall also have relevant knowledge as specified below:

Attributes

- Leadership
- Situational analysis
- Problem solving and tactical decision-making
- Logistics
- Risk management
- Interpersonal skills
- Establishing effective working relationships

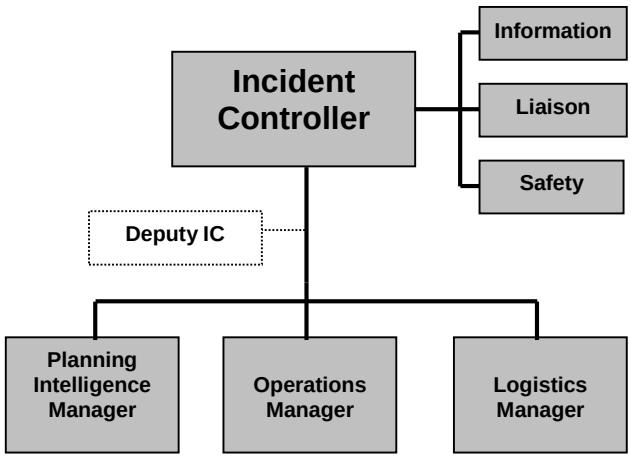
Knowledge (Unit Standards)

- 17279 (CIMS Level 2)
- 14563 (Supervise air operations Level 5)
- 3293 (Lead ground support air operations Level 4)
- 14564 (Fire behaviour Level 4)
- 14565 (Use maps Level 3)

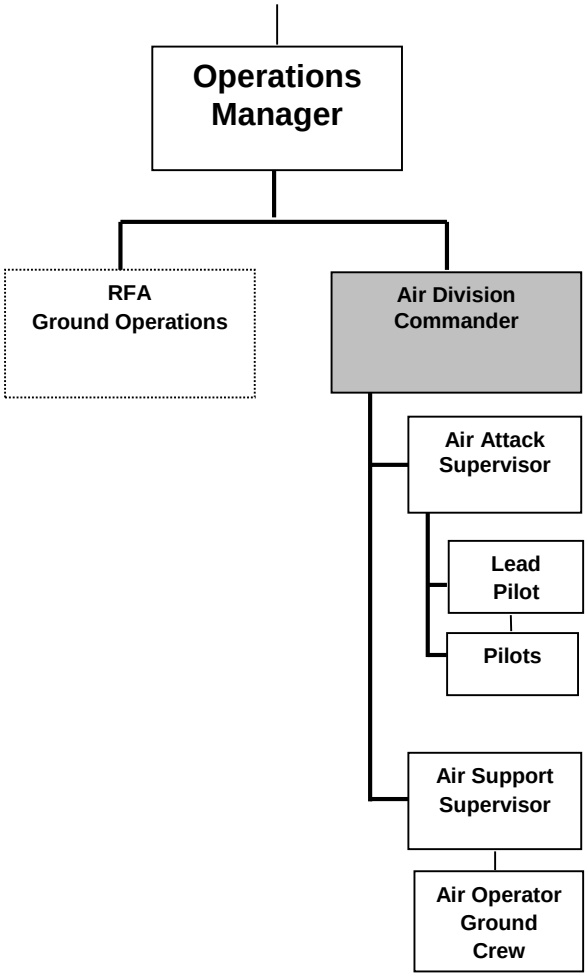
Annex C: CIMS structures

Note: Depending on the scale and complexity of an incident at the time, one person may be tasked to fulfil multiple roles in the structures depicted below.

C.1 Basic CIMS Incident Management Team Structure



C.2 Wildfire IMT structure incorporating air operations



Annex D: Risk criteria

D.1 The level of risk is determined by combining estimates of the magnitude of possible consequences (i.e. the effects of something happening on an objective) of a particular decision with estimates of the likelihood of *experiencing those consequences*. Both estimates must take into account the expected effect of controls[33] and the dynamic nature of the operating environment.

D.2 Table D1 has estimates - arranged on a four point scale (ranked 1 up to 4) - of the magnitude of a selection of consequences of a type that can be expected in wildfire operations. The scale also serves as a *representative* guide because risk assessment may reveal that other types of consequence are possible in which case, those consequences should be assigned a magnitude from the scale which most closely corresponds with the examples in the table.

Scale	Examples of magnitude for representative sample of consequences
1	Aircraft unserviceable; minor injuries; wildfire destruction of things of value
2	Substantial aircraft damage; serious injuries; major wildfire destruction of things of value
3	Single death; Crash with one death
4	Multiple deaths; Crash with multiple deaths

Table D1: Magnitude of consequences

D.3 Table D2 provides a scale of likelihoods that the consequences under consideration will actually be experienced over the course of the operation. To derive this likelihood, it is necessary as part of the risk assessment process to combine at least two sets of likelihoods: the likelihood of an event occurring that could lead to the consequences (for example, an engine failure) and the likelihood that this in turn would lead to consequences.[34]

Scale	Description of likelihood
I	Rare – very uncommon
II	Unlikely – very occasional
III	Possible – foreseeable but not likely
IV	Likely (or greater) – anticipate a strong possibility (or greater)

[33] Controls may not always have the effect assumed. Any uncertainty about a particular control should be taken into account in making this estimate unless the control can be improved to make its effect more certain.

[34] Even though an engine failure over rugged terrain is likely to result in severe consequences, the very low likelihood of engine failure means that overall, the level of risk to aircrew from engine failure may be at most 'medium' whereas operating in a more open environment, although the likelihood of engine failure is similar, the likelihood of severe consequences is lower and hence the level of risk would be 'low' – however, this could be slightly higher for night operations.

Table D2: Scale of likelihood (consequences)

D.4 The level of risk is derived using the matrix provided by Table D3 to combine the estimated magnitude of consequence (derived from Table D1) with its estimated likelihood (from Table D2)[35] [36].

Likelihood ↑					
	IV	Low	Medium	High	Very high
	III	Low	Medium	High	Very High
	II	Low	Medium	Medium	High
	I	Low	Low	Medium	Medium
		1	2	3	4
		Magnitude of Consequence →			

Table D3: Method for combining magnitude of consequences and likelihood to derive the level of risk

D.5 The risk criteria in this Standard, is that risks assessed according to D1-D4, shall be 'as low as is reasonably practicable' (ALARP).

However, *in addition*, risks of a HIGH or VERY HIGH level (even though they are ALARP) may, at the discretion of the person responsible for the decision to do so, be accepted in the following circumstances only:

- VERY HIGH – only for the purposes of protecting people when no other practical option is possible
- HIGH - only for the purposes of protecting people or other things of very substantial value when there is no other reasonably practicable option available.

[35] It is quite common that a decision that could lead to one type of consequence might also, either directly or as a result of experiencing the initial consequence, result in other types of consequence. Each such consequence will have its own likelihood and, as a result, foreseeably produce a different level of risk. All consequence and likelihood pairs should be considered in the risk assessment.

[36] It is not valid to perform any mathematical process to combine the values of the two scales.

Annex E: Bucket maintenance schedule

For use where the bucket manufacturer's instructions are not available. Only a person with the technical competence to do so may sign off this form.

UNDERSLUNG FIRE BUCKET MAINTENANCE SCHEDULE

BUCKET No……

The following checks are required annually or more regularly depending on amount of use. The Company is responsible to track all servicing.

Check

Lifting strops for wear (broken strands) (Note lifting strops shall be strength tested every year when strops and chains are tested in accordance with CAR Part 133.307)	☐
Rated shackles, nuts and bolts for security (properly wire locked)	☐
Pneumatic ram for air leaks, ram alignment, setting, shaft to ram locked, correct cushioning effect and damage	☐
Control hoses (if applicable) for leaks, wear, couplings	☐
Breakaway connections for emergency jettison	☐
Bucket liner for holes, wear, leaks, bungs and water capacity marked	☐
Bucket skirt(s) and adjustable links for wear	☐
Steel frame for security and condition	☐
Open/Close valve for sealing	☐
Overall operation of bucket mechanisms	☐

Record all repairs carried out below.

Comments:

I certify that the work described above has been carried out in a proper manner and that this underslung fire bucket is fit to return to service.

Signed……..……..Name……..……..……Date……

This form is to be filed with the Company compliance records and kept for a period of not less than 2 years