AUSTRALIAN BALLOONING FEDERATION SAFETY ALERT NO 4

Fan Safety - Operations & Maintenance

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1. Introduction

With a spate of recent fan incidents reported to the ABF, including fans tipping over, hitting flying wires and shattering of blades, this safety alert is a reminder to all pilots regarding best practice fan management.

Due to the high speed of blade rotation, inflation fans can cause serious accidents and must be managed with extreme caution. Despite being guarded, the spinning propeller is no less lethal than an aircraft propeller. Inflation fans should be carefully maintained to avoid fuel leaks or loose or broken parts, especially damaged blades that could cause catastrophic failure with broken pieces flying off. The blades should move freely and be protected with strong mesh so that fingers or loose objects cannot contact them. The cut-off switch should be easily accessible to the pilot, and crew members should know how to use it.

2. Fan Build / Construction

Fan blades or propellers should be protected by a protective guard, grill or cage and constructed so that clothing, loose hair or other items cannot be easily drawn in or become entangled with the moving parts.

Fans should be clearly marked with signs or placards indicating danger and the need to keep clear.

All fans should be fitted with a kill switch facilitating an instant shut down.

3. Fan Preventative Maintenance

Refer to your fan engine manufacturer manual for the full maintenance schedule for the motor - in brief, check the oil level before each operation, clean the air filter every 3months/50 hours, change the oil every 6months/100 hours.

In line with engine check, regular inspection should be carried out to ensure there is no structural damage to the fan. This should include:

- Inspect the fan prior to each use for cracking/damage to the fan blade, fan guard(*) and frame and motor.
- Loose screws or bolts, damaged guards etc. all present a serious and immediate risk to personnel and equipment and must be repaired before further operation.
- Ensure that pneumatic tyres are adequately inflated to reduce vibration.

***IMPORTANT NOTE:** Close attention should be paid to inspecting the guards. Guards fail from vibration, road transport fatigue, stone damage during road transport and impact damage while loading onto trailers. The end result is a broken wire that can impact the blade and destroy it.

When cleaning the fan or ban blades, DO NOT use degreaser on fan blades. There have been previous reports of fan blades disintegrating during cold inflation after the application of degreaser.

4. Fan Operation

4.1 Inspection of the fan prior to cold inflation.

Before each use, check there is no structural damage to the fan. Reinspect the items mentioned in paragraph 3.

4.2 Set up of fan and exclusion area.

If a single fan is used, it should be positioned to the left of the basket, so that

- the on/off switch is nearest to the pilot (on most inflation fans the stop button is on the right hand side), which means that the pilot can turn the fan off during inflation or if there is an emergency. **However, avoid positioning personnel in-line with the plane of rotation for the fan blade - ie: to the sides of the fan in case the fan bade comes loose**.
- the fan does not blow the control lines, or so the control lines do not get tangled in the fan, as all control lines should be in position on the right side of the burner frame.

Ensure the fan is on reasonably flat and even ground. All wheels / legs must be in contact with the ground.

CASA has advised Hot Air Balloon pilots that "the immediate area surrounding an operating fan should be marked with a safety cone or cones and/or barrier to define an exclusion zone for all but trained personnel" (CASA Advisory Circular AC131-01 www.casa.gov.au/rules-and-regulations/standard-page/advisory-circulars)

As a minimum, 3 safety cones should be placed around the fan. If there is public on the launch field (e.g. during a fiesta event) then additional barriers are recommended

See Appendix 1 for fan set up suggestions and use of barriers.

See Appendix 2 for barrier examples

4.3 Crew Briefing.

Remember that fan noise will make verbal communication difficult. So, crew should be briefed before use of the fan as running around and shouting over the noise of the fan is not an effective way to communicate. Shouting can also create an impression of fear or that something has gone wrong to nearby public and first time passengers.

Use calm and confident approach with clear and concise language in your briefings. The briefings should ensure that:

- crew have received adequate training in operation of the fan including emergency shut-down (i.e. know how to operate the kill switch); and
- crew are briefed to never lift a fan off the ground or move it suddenly while it is running (fan must be turned off before moving); and
- clear and unambiguous pre-agreed hand signals when the fan is in operation to indicate when hot inflation will commence and a signal to turn the fan off.

If sufficient crew available, assign a competent crew member to operate the fan, especially

- during a windy inflation (the basket might move sideways, causing the fan to tip over), or,
- where public on are on the launch field, to keep bystanders clear.

The PIC or crew member should attend to the fan at all times while it is operating.

4.4 Passenger Management

Passengers should be briefed verbally (or by card in their native language) to stay clear of the fan while it is running and not to approach the fan wearing loose items of clothing. They must be reminded to keep hair, scarves, lanyards, ropes etc well clear so they do not get caught in the fan.

The fan should be well clear of the balloon and turned off before passengers are entering the balloon. Pre-loading of passengers during cold inflation whilst the basket is on its side is not recommended.

4.5 During inflation

During the inflation, it is important to:

• Not move the fan while it is operating.

• Reduce the fan to idle when adjusting the angle on tilt adjustable fans.

In the event of any abnormal noises from the fan during operation the fan must be shut down immediately and inspected for damage before further operation.

During windy inflations, extra care should be taken to avoid a moving basket knocking over a running fan. Care should also be taken to avoid any part of the envelope or control lines coming into contact with the fan. The PIC or person delegated by the PIC should ensure the fan is switched off as soon as it is no longer required and moved away from the basket.

5. Incident Reporting

Reporting of fan Incidents is key to managing fan safety. Fans are one of ballooning's significant hazards and all abnormal events involving fans should be reported. This ensures improvements can be designed, taught, shared and briefed; all at no or low cost to members and operators but with significant benefits for passengers and the public at large. See ABF occurrence reporting link in the next section.

6. Reference and Further Information

CASA Advisory Circular - AC 131-01 Manned free balloons - airworthiness and operations – Paragraph 6 "Inflation Fan"

https://www.casa.gov.au/files/ac-131-01-v12

ABF Student Training Manual – Aerostatics and Airmanship.

Section on inflation fans and fan placement.

http://www.abf.net.au/operations/manuals-and-procedures

Kavanagh Balloons Flight Manual, section 4.6 "Pre-Inflation Checks"

Point 2 says "Inspect the inflation fan for damage and security of the fan guard. Loose / damaged guard wires or damage to the blade will present an injury risk to personnel".

Cameron Balloons Flight Manual, Appendix 5 "Personnel Handling"

Section on "Inflator fan briefing".

ATSB Report – "Flight preparation event involving Kavanagh E-260 balloon, VH-FSR near Alice Springs, Northern Territory on 13th July 2013"

https://www.atsb.gov.au/media/5745217/a0-2013-116_final_report.pdf

CASA Article – "Spiralling danger"

In February 2014 the Civil Aviation Safety Authority (CASA) included an article titled Spiralling Danger in issue 96 of the Flight Safety Australia magazine. That article highlighted the hazards associated with cold-air inflation fans.

https://www.flightsafetyaustralia.com/2014/01/spiralling-danger/

Kavanagh Balloons Service BULLETIN KAV-SB-004 – "Fan exhaust heat shield failure"

Any Kavanagh Balloons inflation fan using a Honda engine where the heat shield for the exhaust passes through the fan guard. Other fans using a Honda engine may also be affected. Also provides good information about general operation of fans.

http://www.kavanaghballoons.com.au/downloads/KAV-SB-004.pdf

Pilot Circular Issue 12. "Smallair fan blades"

Owners of Smallaire fans blades should be aware that if cleaning the fan or blades make sure they do not get degreaser on the fan blades as it could potentially have a reaction with the blades and in turn result in the destruction of the blades.

http://www.abf.net.au/images/docs/safety_advisories/PC12.pdf

ABF Occurrence Reporting

Recording information about accidents, incidents or near miss occurences allows the ABF's Operations Team to monitor trends that may be occurring in the ballooning environment

http://www.abf.net.au/ballooning/occurrence-reporting

ABF Safety Alerts are created by the Australian Ballooning Federation Operations Team. They contain operational and safety information for all ABF pilots & crew. All readers are invited to contribute topics and/or information they feel are important to ABF operations or to make general comments.

Safe flying from the ABF Operations Team

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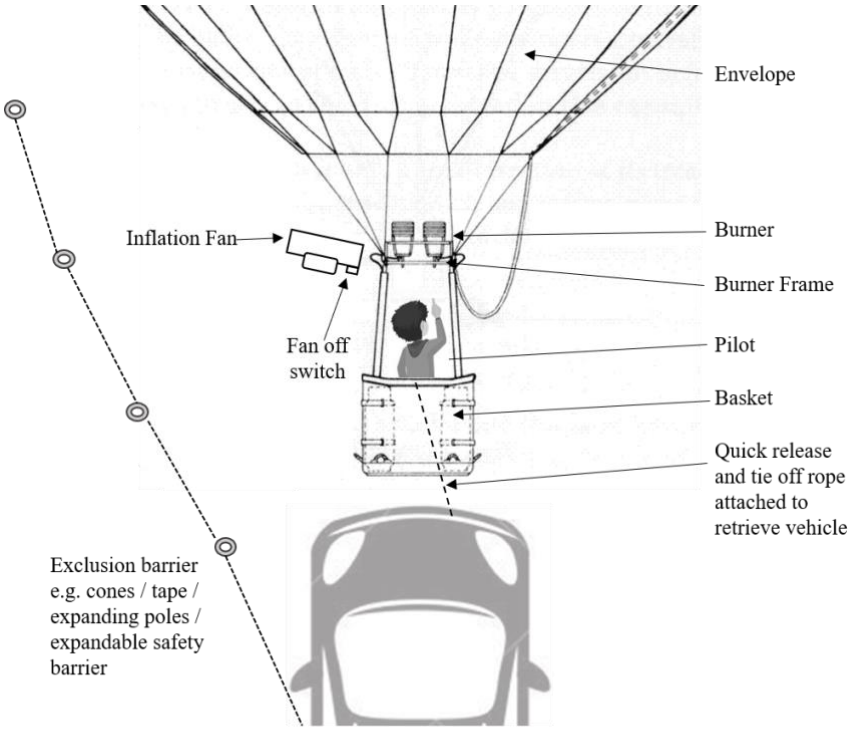
Appendix 1 - Fan Placement

There are a few things to take in mind when placing a fan for cold inflation. Fans should be placed so as to be maximally efficient, whilst maintaining safety. Where the fan is placed will depend on the size of the balloon, the shape, the type of fan, and where the stop button is on the fan. On most inflation fans the stop button is on the right-hand side, which means that it is placed on the left-hand side of the basket, so that the pilot can turn it off during inflation or if there is an emergency.

It is important to avoid positioning personnel in-line with the plane of rotation for the fan blade - ie: to the sides of the fan in case the fan bade comes loose.

There are two suggestions for fan placement outline below.

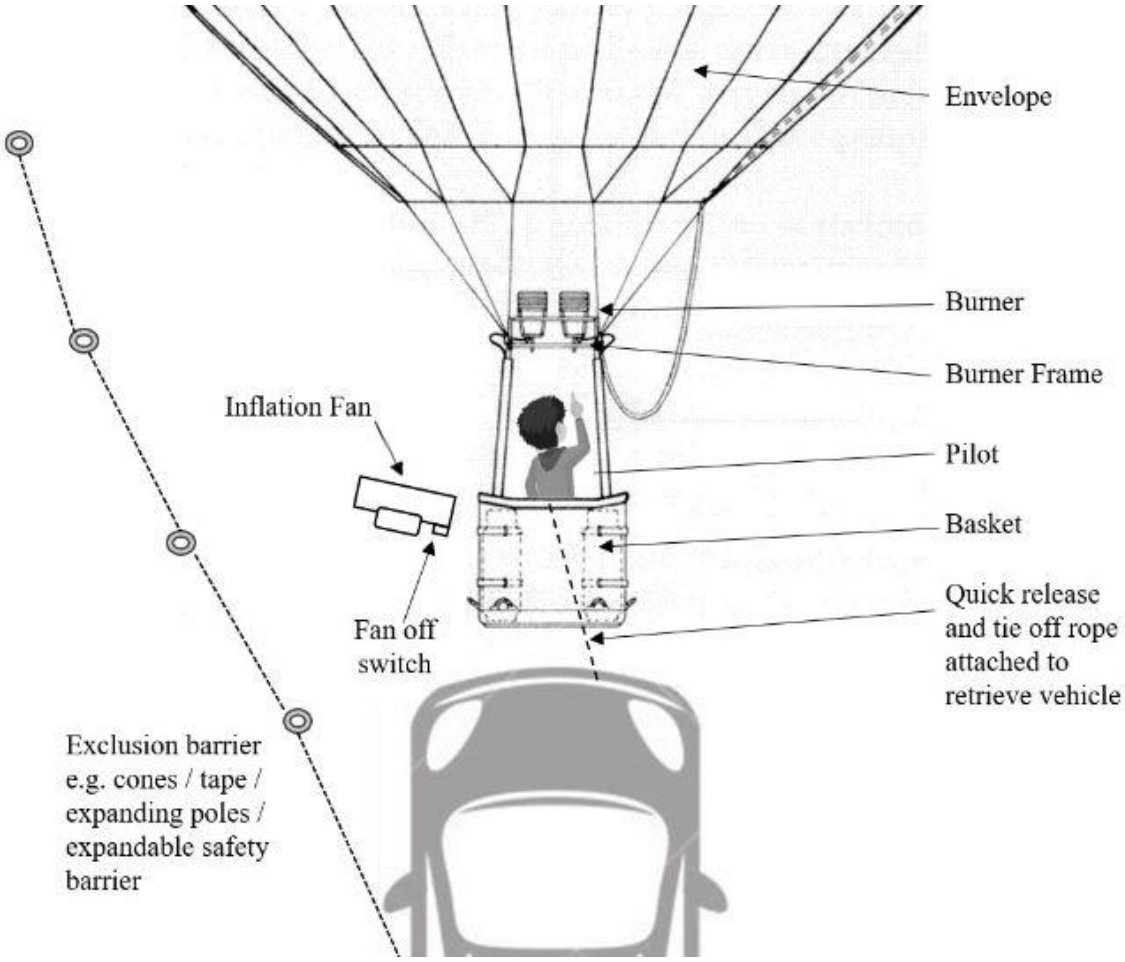
Suggestion 1: Fan blades in line with the burner or burner frame.



In this inflation fan placement diagram the fan off switch is accessible by the pilot and the fan blades are in line with the burners or burner frame in case the fan blade comes loose.

Suggestion 2: Fan beside the basket.

Fan is positioned back beside the basket to maximize airflow and reduce the chance of debris hitting the pilot in the event of a blade failure. It also keeps it well clear of flying wires and control lines. Furthermore, with basket movement in a windy inflation, the fan can be even further back in these situations, preferably with a crew member manning the fan (as the kill switch will be out of reach).


Envelope
Burner
Burner Frame
Inflation Fan
Pilot
Basket
Quick release and tie off rope attached to retrieve vehicle
Fan off switch
Exclusion barrier e.g. cones / tape / expanding poles / expandable safety barrier

Appendix 2 – Barrier Options

Suggestions for complying with the CASA direction regarding keeping members of the public away from inflation fans include the following:-

Expandable Safety Barrier/s

A combination of safety cones and expandable safety cone poles

A combination of safety cones and caution tape

Minimum 3 safety cones around the fan