

**HAWKER HUNTER T7,
G-BXFI**

**A27, Shoreham
Bypass, at the
junction with Old
Shoreham Road, North
of Shoreham Airport**

22 August 2015

Accident

Investigation Synopsis

Summary:

At 1222 UTC (1322 BST) on 22 August 2015, Hawker Hunter G-BXFI crashed on to the A27, Shoreham Bypass, while performing at the Shoreham Airshow, fatally injuring eleven road users and bystanders. A further 13 people, including the pilot, sustained other injuries.

The AAIB investigation considered the circumstances in which the aircraft came to be in a position from which it was not possible to complete its intended manoeuvre, and the reasons for the severity of the outcome.

The investigation identified the following causal factors in the accident:

The aircraft did not achieve sufficient height at the apex of the accident manoeuvre to complete it before impacting the ground because the combination of low entry speed and low engine thrust in the upward half of the manoeuvre was insufficient.

An escape manoeuvre was not carried out, despite the aircraft not achieving the required minimum apex height.

The following contributory factors were identified:

The pilot either did not perceive that an escape manoeuvre was necessary, or did not realise that one was possible at the speed achieved at the apex of the manoeuvre.

The pilot had not received formal training to escape from the accident manoeuvre in a Hunter and had not had his competence to do so assessed.

The pilot had not practised the technique for escaping from the accident manoeuvre in a Hunter, and did not know the minimum speed from which an escape manoeuvre could be carried out successfully.

A change of ground track during the manoeuvre positioned the aircraft further east than planned producing an exit track along the A27 dual carriageway.

The manoeuvre took place above an area occupied by the public over which the organisers of the flying display had no control.

The severity of the outcome was due to the absence of provisions to mitigate the effects of an aircraft crashing in an area outside the control of the organisers of the flying display.

Safety Recommendation 2015-041

Safety Recommendation 2015-041

It is recommended that the Civil Aviation Authority require operators of ex-military aircraft fitted with ejection seats or other pyrotechnic devices operating in the United Kingdom, to ensure that hazard information is readily available which includes contact details of a competent organisation or person able to make the devices safe following an accident.

Date Safety Recommendation made: 22 December 2015

LATEST RESPONSE

Response received: 08 April 2016

The CAA accepts this recommendation. To ensure that hazard information is readily available for aircraft participating in flying displays, the CAA will amend the certificate supplied to the Flight Display Director by a pilot participating in a flying display to identify the pyrotechnic devices fitted to the aircraft and the contact details of a competent organisation or person able to make the devices safe (or advise on doing so) following an accident. The revised form will be published before the end of April 2016 as part of an amendment to CAP 403.

The CAA is currently reviewing how best to ensure that the same information is readily available for aircraft not participating in flying displays. This review will be completed before the end of June 2016.

Safety Recommendation Status Closed

AAIB Assessment Adequate

RESPONSE HISTORY

N/A

(SRIS Reference: GB.SIA-2015-0041)

Safety Recommendation 2015-042

Safety Recommendation 2015-042

It is recommended that the Civil Aviation Authority review the guidance in CAP 632 with respect to ejection seats and the means by which operators of ex-military aircraft equipped with them comply with this guidance. This review should include:

- The benefits and hazards of aircrew escape systems in civilian operated aircraft
- The use of time-expired components
- The availability of approved spares
- The seat manufacturer's guidance on deactivating its historic products
- Adoption of a dedicated Maintenance Approval for persons or organisations competent to perform ejection seat maintenance

Date Safety Recommendation made: 22 December 2015

LATEST RESPONSE

Response received: 08 April 2016

The CAA accepts this recommendation and is undertaking a review of ejection seat safety as part of the Air Display Review. This review includes consideration of each of the specific points highlighted by this recommendation and will be completed before the end of December 2016.

Safety Recommendation Status Closed

AAIB Assessment Adequate

RESPONSE HISTORY

N/A

(SRIS Reference: GB.SIA-2015-0042)

Safety Recommendation 2015-043

Safety Recommendation 2015-043

It is recommended that the Civil Aviation Authority promote a process for the effective dissemination of ex-military jet aircraft experience and type-specific knowledge between individual maintenance organisations.

Date Safety Recommendation made: 22 December 2015

LATEST RESPONSE

Response received: 08 April 2016

The CAA accepts this recommendation. By December 2016, the CAA will establish and promote a process for the more effective dissemination of ex-military jet aircraft experience and type-specific knowledge between individual maintenance organisations.

Safety Recommendation Status **Closed**

AAIB Assessment **Adequate**

RESPONSE HISTORY

N/A

(SRIS Reference: GB.SIA-2015-0043)

Safety Recommendation 2015-044

Safety Recommendation 2015-044

It is recommended that the Civil Aviation Authority establish a minimum amendment standard for the technical publications for each ex-military jet aircraft operated on the United Kingdom civil register.

Date Safety Recommendation made: 22 December 2015

LATEST RESPONSE

Response received: 24 January 2017

Working in conjunction with industry, the CAA will establish a minimum amendment standard for the technical publications for each individual ex-military jet aircraft operated on the UK civil Register. The established standard will be recorded in the Airworthiness Approval Note (AAN) for each aircraft.

The CAA will complete this work by December 2018.

Safety Recommendation Status Closed

AAIB Assessment Adequate

RESPONSE HISTORY

Response received: 08 April 2016

The CAA does not accept this recommendation. Each ex-military aircraft accepted by the CAA is on the basis of its individual build and modification standards and as such, examples of the same type may be operated and maintained to different manual amendments perfectly justifiably – it may not be desirable or even possible to establish a minimum standard for each publication.

However, the sharing of information at type or class forums and the review of maintenance programmes mentioned in the Air Display Review may result in some aircraft adopting a later standard of publication, where appropriate.

AAIB Assessment – Not Adequate Open

(SRIS Reference: GB.SIA-2015-0044)

Safety Recommendation 2015-045

Safety Recommendation 2015-045

It is recommended that the Civil Aviation Authority require that the maintenance programme relating to an ex-military jet aircraft is transferred with the aircraft when it moves to another maintenance organisation to ensure continuity of the aircraft's maintenance.

Date Safety Recommendation made: 22 December 2015

LATEST RESPONSE

Response received: 24 January 2017

The CAA is developing a proposal for consultation with industry to introduce a new requirement into BCAR Section A to require a maintenance programme to be transferred with an ex-military jet aircraft if it moves to a new maintenance/continuing airworthiness management organisation, or new owner/operator. Subject to the outcome of the process of industry consultation, the CAA intends to implement this requirement by April 2018.

Safety Recommendation Status Closed

AAIB Assessment Adequate

RESPONSE HISTORY

Response received: 08 April 2016

The CAA does not accept this recommendation. The maintenance programme for an individual aircraft is customised to the particular operation of the aircraft at a given time so continuity may not always be appropriate. This is not unique to the ex-military aircraft community but is common across the aviation industry.

The maintenance programme is the proprietary information of its author(s), though an organisation may opt to transfer it with an aircraft. The owner and maintenance organisation to which an aircraft is transferred are required to establish a maintenance programme that is suitable for the aircraft, with consideration to its operation and previous maintenance history, which is recorded in the logbooks and technical records that are transferred upon a change of ownership and/or maintenance organisation. The CAA considers that this facilitates an appropriate level of continuity of the aircraft's maintenance, where appropriate.

AAIB Assessment – Not Adequate Open

(SRIS Reference: GB.SIA-2015-0045)

Safety Recommendation 2015-046

Safety Recommendation 2015-046

It is recommended that the Civil Aviation Authority review the effectiveness of all approved Alternative Means of Compliance to Mandatory Permit Directive 2001-001.

Date Safety Recommendation made: 22 December 2015

LATEST RESPONSE

Response received: 24 January 2016

The CAA will require ex-military jet aircraft maintenance organisations and/or continuing airworthiness management organisations to conduct a review of their approved Alternative Means Of Compliance (AMOC) to MPD2001-001. Following such a review, each of these affected organisations must make application for a new AMOC in accordance with a new MPD to be issued which will supersede MPD2001-001.

The review process will be completed by April 2018.

Safety Recommendation Status **Closed**

AAIB Assessment **Adequate**

RESPONSE HISTORY

Response received: 08 April 2016

The CAA does not accept this recommendation. There have been no changes to the design of the engine, nor any inadequacy in the effectiveness of associated inspection and monitoring methods identified.

AAIB Assessment – Not Adequate Open

(SRIS Reference: GB.SIA-2015-0046)

Safety Recommendation 2015-047

Safety Recommendation 2015-047

It is recommended that the Civil Aviation Authority review its procedures to ensure that a 'Permit to Fly-Certificate of Validity' is valid when it is issued.

Date Safety Recommendation made: 22 December 2015

LATEST RESPONSE

Response received: 24 January 2017

Responsibility for ensuring that a 'Permit to Fly-Certificate of Validity' is valid when issued sits with the approved maintenance organisation and not the CAA. An organisation approved by the CAA to conduct an airworthiness review on such aircraft is granted the privilege, under its approval, to declare to the CAA that a particular aircraft complies with the requirements of BCAR Section A Chapter A3-7, which includes completing a physical survey of the aircraft and a documented review of its records to determine its airworthiness status. The CAA is not required to validate the work carried out under this approval before a Certificate of Validity is issued. Instead, an organisation's compliance with these requirements, including the adequacy of declarations, is audited as part of CAA's continued oversight activity.

Therefore, in order to deliver the intent of this safety recommendation, the CAA will review both the design and implementation of its oversight activity in respect of approved maintenance organisations and the process by which documents such as Permit to Fly Certificates of Validity are issued by approved organisations.

By April 2018, the CAA will conclude this review, and, should any changes be necessary, identify the date by which they will be implemented.

Safety Recommendation Status Closed

AAIB Assessment Adequate

RESPONSE HISTORY

Response received: 08 April 2016

The CAA does not accept this recommendation. The procedure to ensure that a 'Permit to Fly-Certificate of Validity' is valid when issued sits with the approved organisation as set out below. Where a Certificate of Validity is recommended by such an organisation for issue by the CAA, the CAA conducts a quality check to verify the technical and editorial content of the Certificate in accordance with the supporting information provided by the applicant.

An organisation approved by the CAA to conduct an airworthiness review on such aircraft is granted the privilege, under its approval, to declare to the CAA that a particular aircraft complies with the requirements of BCAR Section A Chapter A3-7, which includes completing a physical survey of the aircraft and a documented review of its records to determine its airworthiness status. The CAA, under the current oversight regime, is not required to validate the work carried out under this approval before a Certificate of Validity is issued.

An organisation's compliance with these requirements, including the adequacy of declarations, is audited as part of CAA's continued surveillance activity.

The current process is consistent with that in place for both National and EASA aircraft operating under a Certificate of Airworthiness.

AAIB Assessment – Not Adequate Open

(SRIS Reference: GB.SIA-2015-0047)

Safety Recommendation 2016-031

Safety Recommendation 2016-031

It is recommended that the Civil Aviation Authority review and publish guidance that is suitable and sufficient to enable the organisers of flying displays to manage the associated risks, including the conduct of risk assessments.

Date Safety Recommendation made: 10 March 2016

LATEST RESPONSE

Response received: 24 January 2017

The CAA will review the findings contained in the HSL reports on the management of risk, in conjunction with the conclusions of its post-implementation review of UK Civil Air Displays.

The CAA will complete this review and publish any updated guidance by April 2017.

Safety Recommendation Status Closed

AAIB Assessment Adequate

RESPONSE HISTORY

Response received: 09 June 2016

The CAA has accepted the recommendation that it should review its guidance. It remains the responsibility of the organisers of flying displays to follow this guidance and conduct risk assessments that are suitable and sufficient to manage the risks associated with the air displays that they are organising.

The CAA reviewed its guidance and published updated guidance on 3 May 2016 in an updated version of the CAA's document 'Flying displays and special events: A guide to safety and administrative arrangements'.

AAIB Assessment – Partially Adequate Open

(SRIS Reference: GB.SIA-2016-0031)

Safety Recommendation 2016-032

Safety Recommendation 2016-032

It is recommended that the Civil Aviation Authority specify the safety management and other competencies that the organiser of a flying display must demonstrate before obtaining a Permission under Article 162 of the Air Navigation Order.

Date Safety Recommendation made: 10 March 2016

LATEST RESPONSE

Response received: 09 June 2016

The CAA accepts this recommendation.

The CAA will specify the safety management and other competencies that the organiser of a flying display must demonstrate before obtaining a Permission under Article 162 of the Air Navigation Order. This will be completed by the end of March 2017.

Safety Recommendation Status Closed

AAIB Assessment Adequate

RESPONSE HISTORY

N/A

(SRIS Reference: GB.SIA-2016-0032)

Safety Recommendation 2016-033

Safety Recommendation 2016-033

It is recommended that the Civil Aviation Authority introduces a process to ensure that the organisers of flying displays have conducted suitable and sufficient risk assessments before a Permission to hold such a display is granted under Article 162 of the Air Navigation Order.

Date Safety Recommendation made: 10 March 2016

LATEST RESPONSE

Response received: 24 January 2017

The CAA has already introduced enhanced risk assessment guidance to assist event organisers when conducting such risk assessments. The CAA cannot carry out its own risk assessments in respect of every application for a display (and so cannot “ensure” that suitable and sufficient risk assessments have been carried out) and has introduced a process so that, when considering an application for a Permission to hold a display under Article 86 of the Air Navigation Order 2016 (previously Article 162 of the Air Navigation Order 2009), the CAA considers whether the application aligns with the CAA’s guidance.

The CAA intends also to review the findings of the HSL reports in conjunction with the conclusions of the CAA’s own post-implementation review of UK Civil Air Displays in order to consider whether any updated guidance on the management of risk is necessary (see FACTOR response to Safety Recommendation 2016-031 above).

The CAA will clarify the responsibilities of organisers / FDDs in this respect during this review and complete and publish any updated guidance by April 2017.

For the 2017/2018 seasons the CAA will review each risk assessment submitted with an application for a display against the specified criteria notified in CAP 403. Where those criteria are not met, the CAA will request further information from the applicant or, where necessary, not grant a permission for that display.

Safety Recommendation Status **Closed**

AAIB Assessment **Adequate**

RESPONSE HISTORY

Response received: 09 June 2016

The CAA accepts this recommendation that organisers of flying displays must conduct suitable and sufficient risk assessments.

It remains the responsibility of organisers of flying displays to conduct suitable and sufficient risk assessments. The CAA has introduced a new risk assessment process for display applications together with a new risk assessment template and a revised display application form. These are designed to make it clearer to organisers of flying displays the nature of the risk assessment that must be completed.

The revised process was published alongside the guidance 'Flying displays and special events: A guide to safety and administrative arrangements' in March 2016.

AAIB Assessment – Not Adequate Open

(SRIS Reference: GB.SIA-2016-0033)

Safety Recommendation 2016-034

Safety Recommendation 2016-034

It is recommended that the Civil Aviation Authority specify the information that the commander of an aircraft intending to participate in a flying display must provide the organiser, including the sequence of manoeuvres and the ground area over which the pilot intends to perform them, and require that this be done in sufficient time to enable the organiser to conduct and document an effective risk assessment.

Date Safety Recommendation made: 10 March 2016

LATEST RESPONSE

Response received: 24 January 2017

The risk assessment conducted by the FDD is required to be informed by and take account of both the manoeuvres intended to be flown and the area of ground over which they will be flown.

The CAA has amended CAP 403 Appendix B "Certificate to be supplied to the event organiser by a pilot participating in a flying display", to specify the information that the commander of the aircraft intending to participate in a flying display must provide to an organiser in advance of a display, including the manoeuvres intended to be flown. Appendix B must be supplied in sufficient time to enable the event organiser to conduct a risk assessment for the display. The risk assessment (to be submitted with the application for a Permission) must also take account of the ground area over which the display will be performed, which in turn will enable the CAA to specify the boundaries of a flying display within which any permission applies.

The CAA has introduced a requirement, in CAP 403 for any pilot intending to fly aerobatic manoeuvres to notify the FDD of the series of the linked manoeuvres that they intend to perform at least one day prior to a display. If the information is not provided, the FDD must not allow the pilot to fly in the display. This information, together with the prior notification of a defined area within which the permission applies, will support the implementation of an effective risk assessment.

CAP 403 was amended in June 2016. Completed.

Safety Recommendation Status Closed

AAIB Assessment Partially Adequate

RESPONSE HISTORY

Response received: 09 June 2016

The CAA understands the intent here is to define the area of ground over which the commander of an aircraft will be permitted to display that aircraft. This can be done in a number of ways. The CAA does not accept that it should specify information in the manner set out in the recommendation. The CAA has concluded that the FDD's risk assessment should be informed by and take account of both the manoeuvres to be flown and the area of ground over which they will be flown.

The CAA now requires pilots to confirm to the FDD well in advance of the display briefing that their air display conforms to the air display permission granted by the CAA. If the series of linked manoeuvres or the area of ground over which the aircraft will fly is outside the areas already risk assessed by the FDD, the FDD will be able to take this into account in their risk assessment and document it accordingly.

It remains the responsibility of the organisers of flying displays to follow this guidance and conduct risk assessments that are suitable and sufficient to manage the risks associated with the air displays that they are organising.

AAIB Assessment – Not Adequate Open

(SRIS Reference: GB.SIA-2016-0034)

Safety Recommendation 2016-035

Safety Recommendation 2016-035

It is recommended that the Civil Aviation Authority require operators of Permit to Fly aircraft participating in a flying display to confirm to the organiser of that flying display that the intended sequence of manoeuvres complies with the conditions placed on their aircraft's Permit to Fly.

Date Safety Recommendation made: 10 March 2016

LATEST RESPONSE

Response received: 09 June 2016

The CAA accepts this recommendation. The CAA now requires operators of Permit to Fly aircraft participating in a flying display to confirm to the organiser of that flying display that the intended sequence of manoeuvres complies with the conditions placed on their aircraft's Permit to Fly.

As set out in the March 2016 edition of the CAA's guidance "Flying displays and special events: A guide to safety and administrative arrangements", all pilots participating in a flying display must supply the FDD of the air display with a certificate confirming that the display that they intend to perform complies with the conditions placed on the aircraft's Certificate of Airworthiness and Permit to Fly. A template for the certificate is at Appendix B of the guidance.

Safety Recommendation Status Closed

AAIB Assessment Adequate

RESPONSE HISTORY

N/A

(SRIS Reference: GB.SIA-2016-0035)

Safety Recommendation 2016-036

Safety Recommendation 2016-036

It is recommended that the Civil Aviation Authority remove the general exemptions to flight at minimum heights issued for Flying Displays, Air Races and Contests outlined in Official Record Series 4-1124 and specify the boundaries of a flying display within which any Permission applies.

Date Safety Recommendation made: 10 March 2016

LATEST RESPONSE

Response received: 24 January 2017

The CAA has removed the general exemption to flight at minimum heights issued for civil air displays, air races and contests, outlined in Official Record Series 4-1124.

Display Permissions granted by CAA under Article 86 of the Air Navigation Order 2016 now specify the boundaries of a flying display within which the permission applies.

Safety Recommendation Status Closed

AAIB Assessment Adequate

RESPONSE HISTORY

Response received: 09 June 2016

The CAA accepts the recommendation to remove the general exemptions to flight at minimum heights issued for Flying Displays, Air Races and Contests outlined in Official Record Series 4-1124. The CAA has removed the general exemptions.

Official Record Series 4-1124 was removed on 6 June 2016.

The AAIB recommends also that the CAA specify the boundaries of a flying display within which any Permission applies. The CAA does not accept this recommendation. The CAA currently specifies a display line or display area in Section 1 of each Permission that it issues. This means that while the pilot is flying on the specified display line or within the specified display area the rules of the Permission apply. When the pilot is not flying on the specified display line or within the specified display area then the normal rules of the air apply.

AAIB Assessment – Partially Adequate Open

(SRIS Reference: GB.SIA-2016-0036)

Safety Recommendation 2016-037

Safety Recommendation 2016-037

It is recommended that the Civil Aviation Authority require that displaying aircraft are separated from the public by a sufficient distance to minimise the risk of injury to the public in the event of an accident to the displaying aircraft.

Date Safety Recommendation made: 10 March 2016

LATEST RESPONSE

Response received: 15 May 2019

The combined response above contained in FACTOR F4/2016 Issue 2 was assessed by AAIB as 'Adequate-Closed' in 'Aircraft Accident Report (AAR) 1/2017 – G-BXFI'.

Since the January 2017 update, the CAA has:

- Further reviewed the analysis contained in the 1993 Cranfield Report into Airshow Separation Distances.
- Conducted a review of the MAA's own Study into Air Display Crowd Distances (Frazer-Nash), to consider whether any changes were required to the minimum distance that (civil) display aircraft are to be separated from the public
- Incorporated actions to prevent the gathering of secondary crowds to protect third parties into CAP 403: Flying Displays and Special Events: Safety and Administrative Requirements and Guidance.

Whilst the Frazer-Nash study is concerned with display distances from the primary crowd, there remains a requirement to ensure that displaying aircraft are suitably separated from any secondary crowds or third parties. To ensure that aircraft do not pose a risk to secondary crowds, CAP 403: Flying Displays and Special Events: Safety and Administrative Requirements and Guidance has been updated to incorporate a number of changes that achieve this. The amendments include:

- The designing of a display area prior to the event within which non-essential personnel are not permitted.
- The identification and management of areas of potential secondary spectator build up, along with actions that can be put in place to help prevent such gatherings.
- Highlighting any specific areas of concern such as major / minor roads, adjacent congested / built up areas, likely areas for gatherings of secondary spectators, terrain, etc. Once identified these issues will assist in the production of the Flying Display Risk Assessment and help define appropriate mitigating actions.
- The prevention of Display Pilots performing over any building, vessel or vehicle which the commander has reason to believe is occupied by non-essential personnel or known secondary spectator crowds.

Therefore, the analysis conducted by both the MAA and CAA does not indicate that separation distances should be revised. It determined that moving the display line closer to the crowd would increase the risk to the public.

The CAA considers that it would be beneficial to conduct further analysis of the aircraft in the Light Aircraft category to establish whether exemptions issued inside 150m require revision. The CAA believes there are no safety concerns arising from the existing protocols for applying separation distances in this category.

Therefore, the CAA will not change the minimum distance that display aircraft are to be separated from the public and continue to use the extant display distances.

As such there is no requirement for the CAA to revise the application process for Permissions granted under Article 86 of the Air Navigation Order 2016.

Safety Recommendation Status **Closed**

AAIB Assessment **Adequate**

RESPONSE HISTORY

Response received: 24 January 2017

The CAA will conduct a review, within six months of publication by the MAA of a study by Frazer-Nash, to consider whether any changes are required to the minimum distance that display aircraft are to be separated from the public (primary and secondary crowds) to effectively minimise the risk of injury to the public in the event of an accident to the displaying aircraft. In the event that this study does not deliver a clear output or is terminated, for any reason, the CAA will consider what additional work will be needed to resolve this Recommendation. Subject to the findings of the study and the outcome of the review, the CAA shall make any necessary revisions to the application process for Permissions granted under Article 86 of the Air Navigation Order 2016.

AAIB Assessment – Adequate Closed

Response received: 09 June 2016

The CAA understands that this recommendation relates to members of the public attending a flying display.

The CAA accepts this recommendation.

The MAA has commissioned an independent study into crowd separation distances. This research is ongoing and should report in 2017. As the MAA research is ongoing, the CAA decided in its review of UK civil air displays that, as an interim measure, where current MAA crowd separation distances are higher it would align with them. The increased distances were announced in April this year in the final report of the CAA's Review of UK Civil Air Displays. The CAA will confirm crowd separation distances after the independent study commissioned by the MAA into crowd separation distances reports in 2017.

AAIB Assessment – Not Adequate Open

(SRIS Reference: GB.SIA-2016-0037)

Safety Recommendation 2016-038

Safety Recommendation 2016-038

It is recommended that the Civil Aviation Authority specify the minimum separation distances between secondary crowd areas and displaying aircraft before issuing a Permission under Article 162 of the Air Navigation Order.

Date Safety Recommendation made: 10 March 2016

LATEST RESPONSE

Response received: 15 May 2019

The combined response above contained in FACTOR F4/2016 Issue 2 was assessed by AAIB as 'Adequate-Closed' in 'Aircraft Accident Report (AAR) 1/2017 – G-BXFI'.

Since the January 2017 update, the CAA has:

- Further reviewed the analysis contained in the 1993 Cranfield Report into Airshow Separation Distances.
- Conducted a review of the MAA's own Study into Air Display Crowd Distances (Frazer-Nash), to consider whether any changes were required to the minimum distance that (civil) display aircraft are to be separated from the public
- Incorporated actions to prevent the gathering of secondary crowds to protect third parties into CAP 403: Flying Displays and Special Events: Safety and Administrative Requirements and Guidance.

Whilst the Frazer-Nash study is concerned with display distances from the primary crowd, there remains a requirement to ensure that displaying aircraft are suitably separated from any secondary crowds or third parties. To ensure that aircraft do not pose a risk to secondary crowds, CAP 403: Flying Displays and Special Events: Safety and Administrative Requirements and Guidance has been updated to incorporate a number of changes that achieve this. The amendments include:

- The designing of a display area prior to the event within which non-essential personnel are not permitted.
- The identification and management of areas of potential secondary spectator build up, along with actions that can be put in place to help prevent such gatherings.
- Highlighting any specific areas of concern such as major / minor roads, adjacent congested / built up areas, likely areas for gatherings of secondary spectators, terrain, etc. Once identified these issues will assist in the production of the Flying Display Risk Assessment and help define appropriate mitigating actions.
- The prevention of Display Pilots performing over any building, vessel or vehicle which the commander has reason to believe is occupied by non-essential personnel or known secondary spectator crowds.

Therefore, the analysis conducted by both the MAA and CAA does not indicate that separation distances should be revised. It determined that moving the display line closer to the crowd would increase the risk to the public.

The CAA considers that it would be beneficial to conduct further analysis of the aircraft in the Light Aircraft category to establish whether exemptions issued inside 150m require revision. The CAA believes there are no safety concerns arising from the existing protocols for applying separation distances in this category.

Therefore, the CAA will not change the minimum distance that display aircraft are to be separated from the public and continue to use the extant display distances.

As such there is no requirement for the CAA to revise the application process for Permissions granted under Article 86 of the Air Navigation Order 2016.

Safety Recommendation Status **Closed**

AAIB Assessment **Adequate**

RESPONSE HISTORY

Response received: 24 January 2017

The CAA will conduct a review, within six months of publication by the MAA of a study by Frazer-Nash, to consider whether any changes are required to the minimum distance that display aircraft are to be separated from the public (primary and secondary crowds) to effectively minimise the risk of injury to the public in the event of an accident to the displaying aircraft. In the event that this study does not deliver a clear output or is terminated, for any reason, the CAA will consider what additional work will be needed to resolve this Recommendation. Subject to the findings of the study and the outcome of the review, the CAA shall make any necessary revisions to the application process for Permissions granted under Article 86 of the Air Navigation Order 2016.

AAIB Assessment – Adequate Closed

Response received: 09 June 2016

The CAA does not accept this recommendation. It is the responsibility of the flying display organiser and FDD to identify all the risks to which the public may be exposed, from wherever they may choose to view the air display, and to mitigate or manage those risks. Details of how the flying display organiser and FDD have identified the risks and then intend to mitigate or manage them must be set out in the risk assessment they submit to the CAA when requesting Permission to hold an air display.

AAIB Assessment – Not Adequate Open

(SRIS Reference: GB.SIA-2016-0038)

Safety Recommendation 2016-039

Safety Recommendation 2016-039

It is recommended that the Civil Aviation Authority require the organisers of flying displays to designate a volume of airspace for aerobatics and ensure that there are no non-essential personnel, or occupied structures, vehicles or vessels beneath it.

Date Safety Recommendation made: 10 March 2016

LATEST RESPONSE

Response received: 09 June 2016

The CAA does not accept this recommendation.

The CAA expects the organisers of flying displays and in collaboration with FDDs to identify and then mitigate or manage all the risks to the public arising from their air display. It is for the organiser of the display and the FDD to decide what course of action is necessary and how they will implement it. Furthermore the pilot is responsible for performing their display in accordance with the Permission granted under Article 162 of the Air Navigation Order and their own display authorisation.

Safety Recommendation Status Closed

AAIB Assessment Superseded

RESPONSE HISTORY

N/A

(SRIS Reference: GB.SIA-2016-0039)

Safety Recommendation 2016-040

Safety Recommendation 2016-040

It is recommended that the Civil Aviation Authority require Display Authorisation Evaluators to have no conflicts of interest in relation to the candidates they evaluate.

Date Safety Recommendation made: 10 March 2016

LATEST RESPONSE

Response received: 09 June 2016

The CAA does not accept this recommendation as it is impractical to achieve in the relatively small air display community and maintain a working display evaluation system.

The CAA believes that it is better to identify any potential conflicts of interest, such as personal or commercial connections, and manage them. In its Action Report of its Review of UK Civil Air Displays, published in January 2016, the CAA strengthened the display authorisation process by requiring, after the first two years, a pilot holding a display authorisation to be revalidated by a different DAE, selected by the CAA. The CAA believes this will reduce the risks of conflicts of interest.

Safety Recommendation Status Closed

AAIB Assessment Partially Adequate

RESPONSE HISTORY

N/A

(SRIS Reference: GB.SIA-2016-0040)

Safety Recommendation 2016-041

Safety Recommendation 2016-041

It is recommended that the Civil Aviation Authority require a Display Authorisation to be renewed for each class or type of aircraft the holder intends to operate during the validity of that renewal.

Date Safety Recommendation made: 10 March 2016

LATEST RESPONSE

Response received: 16 February 2018

The CAA has reviewed the renewal process for different categories of aircraft relevant to pilot Display Authorisation renewal and proposed amendments to the latest version of CAP 403, which is due to be published in March 2018.

The study of error paths, referred to below in response to recommendation 2017-006, has been expanded to incorporate the impact of operating differences between aircraft categories and the potential for inappropriate transfer of behaviours between aircraft types. The CAA will consider introducing any relevant findings into the ongoing training and assessment requirements for display pilots, including the requirements for Display Authorisation renewal.

Due to the complexity of this study, the CAA will conclude its review and publish its findings by 31 July 2018.

Safety Recommendation Status Closed

AAIB Assessment Adequate

RESPONSE HISTORY

Response received: 24 January 2017

The CAA will review the list of different categories of aircraft relevant to pilot Display Authorisation renewal and assess the impact of operating differences between each category. The CAA will expand this work to include a study of the potential for inappropriate transfer of behaviours between aircraft types. The CAA will consider introducing any relevant findings into the ongoing training and assessment requirements for display pilots, including the requirements for Display Authorisation renewal.

The CAA will conclude this review and publish its findings by April 2018.

AAIB Assessment – Adequate Closed

Response received: 09 June 2016

The CAA does not accept this recommendation.

From January 2016 the CAA has required that, display pilots authorised to perform above standard level aerobatics in more than one aircraft category must renew the display authorisation in each category, rather than type.

In the action report the CAA set out the six categories for renewal purposes:

- Jet powered aircraft;
- Turboprop;
- Multi-engine piston (MEP);
- Single-engine piston (SEP);
- Helicopters; and
- Others.

In the final report of its Review of UK Civil Air Displays, published in April 2016, the CAA further strengthened the requirements placed on display pilots authorised to perform standard level aerobatics. Display pilots authorised to perform standard level aerobatics in multiple categories, including jet powered and helicopter categories, must now renew in those categories at least every two years. Where that authorisation also includes one or more turboprop, MEP or SEP categories they must rotate their renewal across those categories year on year. The CAA retains the right to specify the type of aircraft within a category that a pilot is permitted to renew on.

AAIB Assessment – Not Adequate Open

(SRIS Reference: GB.SIA-2016-0041)

Safety Recommendation 2016-042

Safety Recommendation 2016-042

It is recommended that the Civil Aviation Authority publish a list of occurrences at flying displays, such as 'stop calls', that should be reported to it, and seek to have this list included in documentation relevant to Regulation (EU) No 376/2014.

Date Safety Recommendation made: 10 March 2016

LATEST RESPONSE

Response received: 09 June 2016

The CAA does not accept this recommendation.

The CAA is developing a positive reporting culture - a Just Culture – for the air display community. Within the air display sector the CAA believes that this is the most effective way to identify and address potential safety issues before they lead to accidents.

In support of this, from April this year the CAA required all event organisers and FDDs to submit, within seven days, a post-air display report to the CAA. This report must include what went well at the display, as well as information on any lapses or breaches from the required standards. Pilots must also report any aspect of their display that could have caused a significant safety risk. The CAA will record all this information. Key information will be shared with the civil air display community through briefings, the pre- and post-season seminars that the CAA jointly hosts with BADA and the MAA, and the annual seminar that the CAA organises for DAEs.

Safety Recommendation Status **Closed**

AAIB Assessment **Partially Adequate**

RESPONSE HISTORY

N/A

(SRIS Reference: GB.SIA-2016-0042)

Safety Recommendation 2016-043

Safety Recommendation 2016-043

It is recommended that the Civil Aviation Authority introduce a process to immediately suspend the Display Authorisation of a pilot whose competence is in doubt, pending investigation of the occurrence and if appropriate re-evaluation by a Display Authorisation Evaluator who was not involved in its issue or renewal.

Date Safety Recommendation made: 10 March 2016

LATEST RESPONSE

Response received: 09 June 2016

The CAA accepts this recommendation.

In its final report of its Review of UK Civil Air Displays, published in April 2016, the CAA announced that where a stop is called because an FDD, or member of the Flight Control Committee, has reason to doubt the fitness or competence of a pilot that pilot will be subject to a provisional suspension of their display authorisation pending an investigation by the CAA of the circumstances leading to the stop being called. In its investigation, the CAA will determine whether the suspension of the display authorisation should be withdrawn or further regulatory enforcement action taken against the pilot concerned.

Safety Recommendation Status Closed

AAIB Assessment Adequate

RESPONSE HISTORY

N/A

(SRIS Reference: GB.SIA-2016-0043)

Safety Recommendation 2016-044

Safety Recommendation 2016-044

It is recommended that the Civil Aviation Authority establish and publish target safety indicators for United Kingdom civil display flying.

Date Safety Recommendation made: 10 March 2016

LATEST RESPONSE

Response received: 16 February 2018

The CAA has concluded a study to identify meaningful safety indicators for civil display flying. The CAA finalised an initial study in September 2017 and then embarked on an enhanced process of review and study, which has been completed and the safety indicators have been recently published.

Safety Recommendation Status Closed

AAIB Assessment Adequate

RESPONSE HISTORY

Response received: 24 January 2017

The CAA will undertake a study to identify and publish meaningful safety indicators for civil display flying. The CAA will conclude this study and publish safety indicators by September 2017.

AAIB Assessment – Adequate Closed

Response received: 09 June 2016

The CAA does not accept this recommendation. The CAA does not believe that a safety target for UK civil display flying is appropriate.

Air display flying carries inherent risks. The purpose of the CAA's comprehensive review of UK civil air displays has been to assess whether it is possible to minimise further the risks at and around civil air displays in the UK. The series of improvements that the CAA has put in place as a result of its review of UK civil air displays will further enhance public safety.

AAIB Assessment – Not Adequate Open

(SRIS Reference: GB.SIA-2016-0044)

Safety Recommendation 2017-001

Safety Recommendation 2017-001

It is recommended that the Civil Aviation Authority amend CAP 403 to clarify the point at which an aerobatic manoeuvre is considered to have been entered and the minimum height at which any part of it may be flown.

Date Safety Recommendation made: 24 February 2017

LATEST RESPONSE

Response received: 03 May 2017

The CAA will amend CAP 403 to specify clearly the point at which an aerobatic manoeuvre is entered and to which the aerobatic minimum height applies rather than the flypast minimum. CAP403 will be amended accordingly by 01 May 2017.

Safety Recommendation Status Closed

AAIB Assessment Adequate

RESPONSE HISTORY

N/A

(SRIS Reference: GB.SIA-2017-0001)

Safety Recommendation 2017-002

Safety Recommendation 2017-002

It is recommended that the Civil Aviation Authority require pilots intending to conduct aerobatics at flying displays to be trained in performing relevant escape manoeuvres and require that their knowledge and ability to perform such manoeuvres should be assessed as part of the display authorisation process.

Date Safety Recommendation made: 24 February 2017

LATEST RESPONSE

Response received: 03 May 2017

The CAA will develop and set out specific requirements for pilots intending to conduct aerobatics at flying displays to be appropriately trained in performing escape manoeuvres. Once the requirements have been set, CAP 403 will also specify the level of assessment of a pilot's knowledge of, and ability to perform, such manoeuvres as part of the display authorisation process.

The CAA will work with air display pilots to develop additional requirements by August 2017; as an interim step, CAP 403 will be amended by 01 May 2017 to introduce an assessment of the performance of escape manoeuvres as part of the display authorisation process.

Safety Recommendation Status Closed

AAIB Assessment Adequate

RESPONSE HISTORY

N/A

(SRIS Reference: GB.SIA-2017-0002)

Safety Recommendation 2017-003

Safety Recommendation 2017-003

It is recommended that the Civil Aviation Authority review the grouping of aircraft types in display authorisations to account for handling and performance differences it considers significant.

Date Safety Recommendation made: 24 February 2017

LATEST RESPONSE

Response received: 03 May 2017

The CAA will review the list of different categories of aircraft relevant to a pilot display authorisation, including renewal, and assess the impact of differing handling techniques between each category. This is a complex piece of work and so we will conduct this review, publish our findings and amend our procedures by December 2017.

Safety Recommendation Status **Closed**

AAIB Assessment **Adequate**

RESPONSE HISTORY

N/A

(SRIS Reference: GB.SIA-2017-0003)

Safety Recommendation 2017-004

Safety Recommendation 2017-004

It is recommended that the Civil Aviation Authority remind operators, whose activities are subject to the guidance published in Civil Aviation Publication 632, of the need to maintain detailed training records for pilots and check their compliance during inspections it carries out.

Date Safety Recommendation made: 24 February 2017

LATEST RESPONSE

Response received: 03 May 2017

The CAA will write to all operators whose activities are subject to the guidance published in CAP 632 of the need to maintain detailed training records for pilots. Furthermore the CAA will amend audit procedures to check for the proper maintenance of training records during audit. We will write to all operators and amend our procedures by 31 May 2017.

Safety Recommendation Status **Closed**

AAIB Assessment **Adequate**

RESPONSE HISTORY

N/A

(SRIS Reference: GB.SIA-2017-0004)

Safety Recommendation 2017-005

Safety Recommendation 2017-005

It is recommended that the Civil Aviation Authority specify that the flight demonstration requirement of a display authorisation evaluation, other than to assess formation following, cannot be satisfied by the pilot following another aircraft during the evaluation.

Date Safety Recommendation made: 24 February 2017

LATEST RESPONSE

Response received: 03 May 2017

The CAA will amend CAP 403 to specify that the flight demonstration requirements of a display authorisation evaluation, other than to assess formation following, cannot be satisfied by the pilot following another aircraft during the evaluation. CAP 403 will be amended accordingly by 01 May 2017.

Safety Recommendation Status Closed

AAIB Assessment Adequate

RESPONSE HISTORY

N/A

(SRIS Reference: GB.SIA-2017-0005)

Safety Recommendation 2017-006

Safety Recommendation 2017-006

It is recommended that the Civil Aviation Authority undertake a study of error paths that lead to flying display accidents and integrate its findings into the human factors training it requires the holders of display authorisations to undertake.

Date Safety Recommendation made: 24 February 2017

LATEST RESPONSE

Response received: 16 February 2018

The CAA has commissioned a study of error paths that lead to flying display accidents, the findings of which will be published together with guidance material for pilots and flying display directors. The CAA commitment to integrate the findings into the display authorisation process and associated training and practice, remains as indicated in the initial response. The CAA is developing appropriate process to introduce the findings to the air show community, which will include incorporating the material into post-display season seminars and 2019 pre-season symposia.

Due to the complexity and breadth of the study, the CAA will publish its findings by 31 July 2018.

Safety Recommendation Status Closed

AAIB Assessment Adequate

RESPONSE HISTORY

Response received: 03 May 2017

The CAA is working with external experts to understand the influence of human factors on air displays. We will expand this work to include a study of error paths that lead to flying display accidents and integrate the findings into the display authorisation process and associated training and practice. This is a complex piece of work, requiring us to develop appropriate process and roll out to the air show community for safe implementation. We will complete this work by December 2017.

AAIB Assessment – Adequate Closed

(SRIS Reference: GB.SIA-2017-0006)

Safety Recommendation 2017-007

Safety Recommendation 2017-007

It is recommended that the Civil Aviation Authority review the arrangements for safety regulation and oversight of intermediate and complex ex-military aircraft operated in accordance with Civil Aviation Publication 632, to ensure that they are consistent and appropriate.

Date Safety Recommendation made: 24 February 2017

LATEST RESPONSE

Response received: 07 August 2018

Since its initial response, the CAA has reviewed the safety, regulation and oversight of 'intermediate' and 'complex' ex-military aircraft. Specifically, by:

- Focussing on the Categories for Acceptance for the Initial issue of a Permit to Fly for ex-military aircraft (under Air Display Review action number 24: 'A review of the criteria and requirements for the acceptance of ex-military aircraft on the civil register').
- Reviewing the Regulatory Framework with the intent of ensuring the validity of a Permit to Fly in both issue and continuing airworthiness (under AAIB Recommendation 2015-047).
- Conducting a review in conjunction with the requirements set out in CAP 632. Specifically, a review of the requirements for operational oversight as detailed in CAP 632 'Operation of 'Permit-to-Fly' ex-military aircraft on the UK register'.
- Working with the ex-military aircraft community in formulating the outcomes of this work.

As a result of the review, the following have been implemented:

- A new industry guidance document, CAP1640 'Ex-Military Aircraft Design, Restoration and Continuing Airworthiness Approval' has been published.
- The oversight of ex-military A8-25 CAMO organisations (as detailed in response to AAIB Safety Recommendation 2015-047) has been enhanced.
- A comprehensive revision to CAP 632 was published in May 2018.
- A programme of actions within the CAA to integrate the operational and airworthiness elements of the oversight of CAP 632 Organisations has been identified, which includes:

-The adoption of a 'team' approach to approval and oversight by identifying the responsible CAMO/Maintenance Organisation / Airworthiness Surveyor for each CAP 632 approval and scheduling joint/sequenced audits in accordance with a defined internal procedure.

-The introduction of a new airworthiness checklist to be used during the application and oversight of CAP 632 Approvals.

-The introduction of a template contract, based on EASA (Part M) regulations, to define the responsibilities and interrelationship of the Operator and CAMO/maintenance organisation.

Safety Recommendation Status **Closed**

AAIB Assessment **Adequate**

RESPONSE HISTORY

Response received: 03 May 2017

The CAA will conduct a review of the safety regulation and oversight of intermediate and complex ex-military aircraft in conjunction with the requirements set out in CAP 632. We will work with the ex-military aircraft community on this complex and comprehensive piece of work, which will be completed by November 2018.

AAIB Assessment – Partially Adequate Open

(SRIS Reference: GB.SIA-2017-0007)

Safety Recommendation 2017-008

Safety Recommendation 2017-008

It is recommended that the Civil Aviation Authority consider implementing the changes outlined in Health and Safety Laboratory report MSU/2016/13 'Review of the risk assessment sections of CAP 403'.

Date Safety Recommendation made: 24 February 2017

LATEST RESPONSE

Response received: 03 May 2017

The CAA has considered the changes outlined in the HSL report on the 'Review of the Risk Assessment Sections of CAP 403' and included updated risk management guidance reflecting that in an amended CAP 403 published in February 2017. Additionally the risk assessment process is part of the new Flying Display Director (FDD) accreditation process.

Safety Recommendation Status Closed

AAIB Assessment Adequate

RESPONSE HISTORY

N/A

(SRIS Reference: GB.SIA-2017-0008)

Safety Recommendation 2017-009

Safety Recommendation 2017-009

It is recommended that the Civil Aviation Authority require operators of aircraft used for flying displays to identify, and where practicable remove, any hazardous materials.

Date Safety Recommendation made: 24 February 2017

LATEST RESPONSE

Response received: 03 May 2017

The CAA will ask operators of aircraft used for flying displays to identify and where practicable remove any hazardous materials. Operators are already required to notify the Flying Display Director (FDD) of hazardous materials. The work on identification or alternatives and removal of hazardous materials will be more complex and we will aim to complete this work by April 2018.

Safety Recommendation Status Closed

AAIB Assessment Adequate

RESPONSE HISTORY

N/A

(SRIS Reference: GB.SIA-2017-0009)

Safety Recommendation 2017-010

Safety Recommendation 2017-010

It is recommended that the Civil Aviation Authority prohibit the use of phenolic asbestos drop tanks on civil registered aircraft.

Date Safety Recommendation made: 24 February 2017

LATEST RESPONSE

Response received: 30 April 2018

Since their initial response, the CAA has:

- Undertaken a review which has considered: the materials and construction methods; the post-crash health risks to the occupants of the aircraft and third parties (including first responders); the practical effects of prohibition on operational safety; the practicalities of retrofitting alternative tanks and the practicality of manufacturing new tanks.
- Published a revision to CAP403 which states 'All operators of aircraft used for flying displays are required to identify, and where practicable replace or remove any materials that may be hazardous to first responders and other personnel should an accident occur.' Additionally, Flying Display Directors are now directed to promulgate hazardous material information to emergency services¹
- Published a new document, CAP1640 'Ex-Military Aircraft Design, Restoration and Continuing Airworthiness Approval', which includes further guidance.

In conclusion, the CAA has determined:

- The prohibition of PA drop tanks could increase operational risk, due to the potential for more take-offs and landings (increased fatigue) and less diversion options from the reduction in range with the tanks removed.
- Following a review of relevant publications, discussion with the affected industry and noting the civil trend towards increasing composite airframe content, prohibiting phenolic asbestos drop tanks on ex-military jets would be disproportionate to the level of risk reduction.
- That there are no viable alternatives to phenolic asbestos drop tanks on civil registered ex-military aircraft due to manufacturing and cost issues.

Safety Recommendation Status Closed

AAIB Assessment Partially Adequate

RESPONSE HISTORY

Response received: 03 May 2017

The CAA will work with industry to see if and how alternatives to phenolic asbestos drop tanks on civil registered aircraft could be introduced. If there are no practical alternatives the CAA will instruct aircraft operators to ensure that hazard information is available to interested third parties. This is a complex piece of work, involving significant engagement with industry. We will report our outcomes by April 2018.

AAIB Assessment – Partially Adequate Open

(SRIS Reference: GB.SIA-2017-0010)

Safety Recommendation 2017-011

Safety Recommendation 2017-011

It is recommended that the Department for Transport commission, and report the findings of, an independent review of the governance of flying display activity in the United Kingdom, to determine the form of governance that will achieve the level of safety it requires.

Date Safety Recommendation made: 24 February 2017

LATEST RESPONSE

Response received: 19 March 2018

The Department for Transport accepts this recommendation to commission and publish the findings of an independent review of the governance of flying display activity in the United Kingdom. This review will determine the form of governance that will achieve the level of safety that flying display activities require, and is expected to conclude in June 2018.

Safety Recommendation Status Closed

AAIB Assessment Adequate

RESPONSE HISTORY

Response received: 16 October 2017

The Department for Transport accepts this recommendation to commission and publish the findings of an independent review of the governance of flying display activity in the United Kingdom. This review will determine the form of governance that will achieve the level of safety that flying display activities require. DfT will confirm the review's terms of reference and its timescales for reporting by November 2017.

AAIB Assessment – Partially Adequate Open

Response received: 26 June 2017

The Department is considering the recommendation carefully, and will make an announcement in due course after the election period.

AAIB Assessment – Partially Adequate Open

(SRIS Reference: GB.SIA-2017-0011)