



Human Factors in Air Displays: Transfer of Behaviours and Error Path Study (Module 2)

Q: What can influence your
performance?

Sam Whatmough

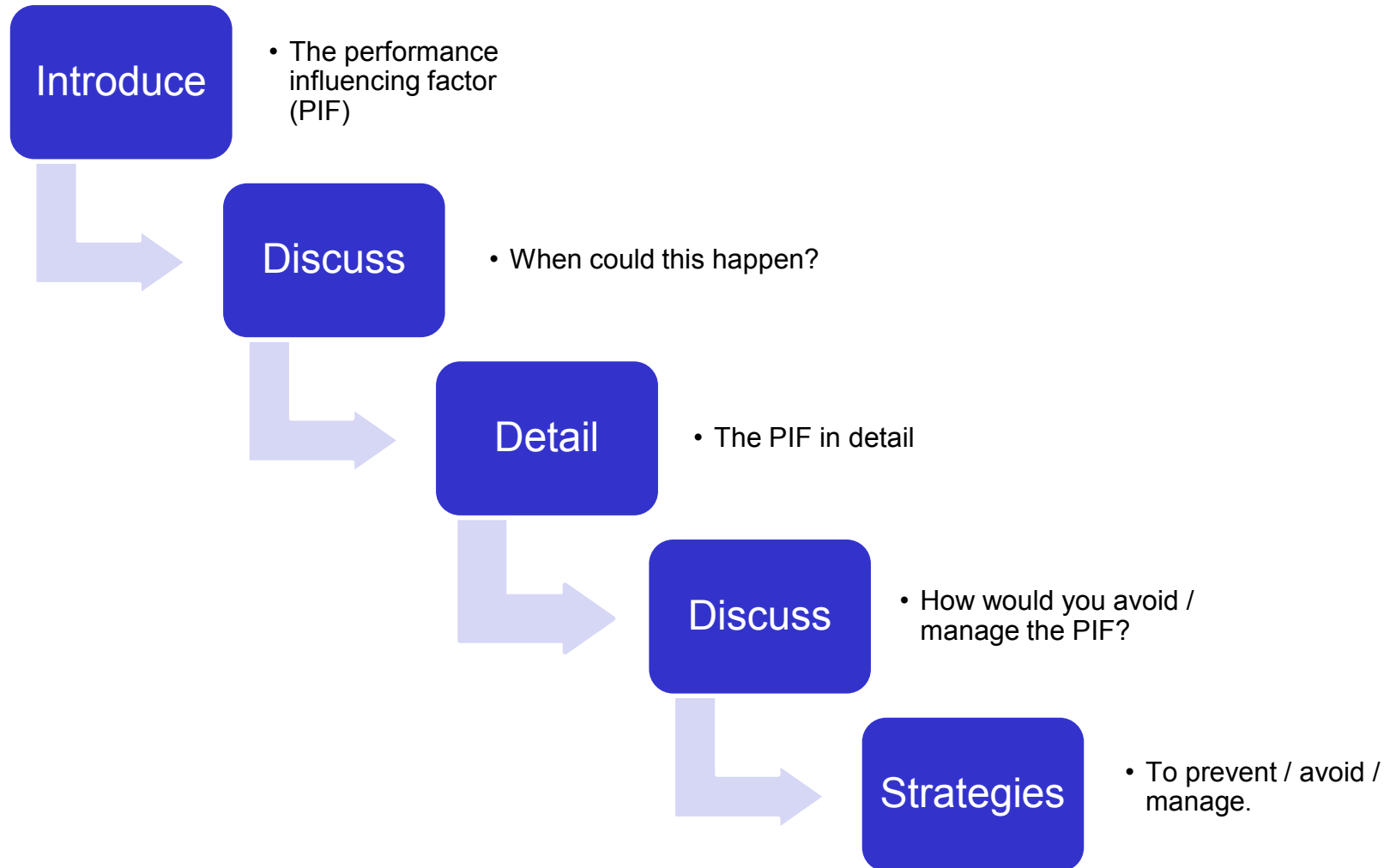
Why are you here?

The CAA commissioned HSE's Science Division, the Health and Safety Laboratory (HSL) to carry out a research study to...

...explore the potential for negative transfer of pilot behaviour between aircraft types

...identify the potential for error, and the factors that have (and could) contribute to air display accidents.

Today's plan...



Key terms



Human Factors

The organisational, job factors, and individual characteristics, which influence behaviour in a way that can affect individual, team and organisational performance



Performance Influencing Factors (PIFs)

The circumstances or conditions that can make it more or less likely that an error occurs during task performance



What does this mean for the air display community?

Pilots:

Design differences (possibility of negative transfer), currency on aircraft, time pressures, distractions on display day (e.g. changes to display plan, weather), stress and pressures to display

DAEs and the DAE process:

To ensure display pilots were suited to display flying in terms of their attitude, skills, behaviour and knowledge

FDD's activities, roles, and responsibilities:

Including the variation in content and delivery of display briefs

Event organisation:

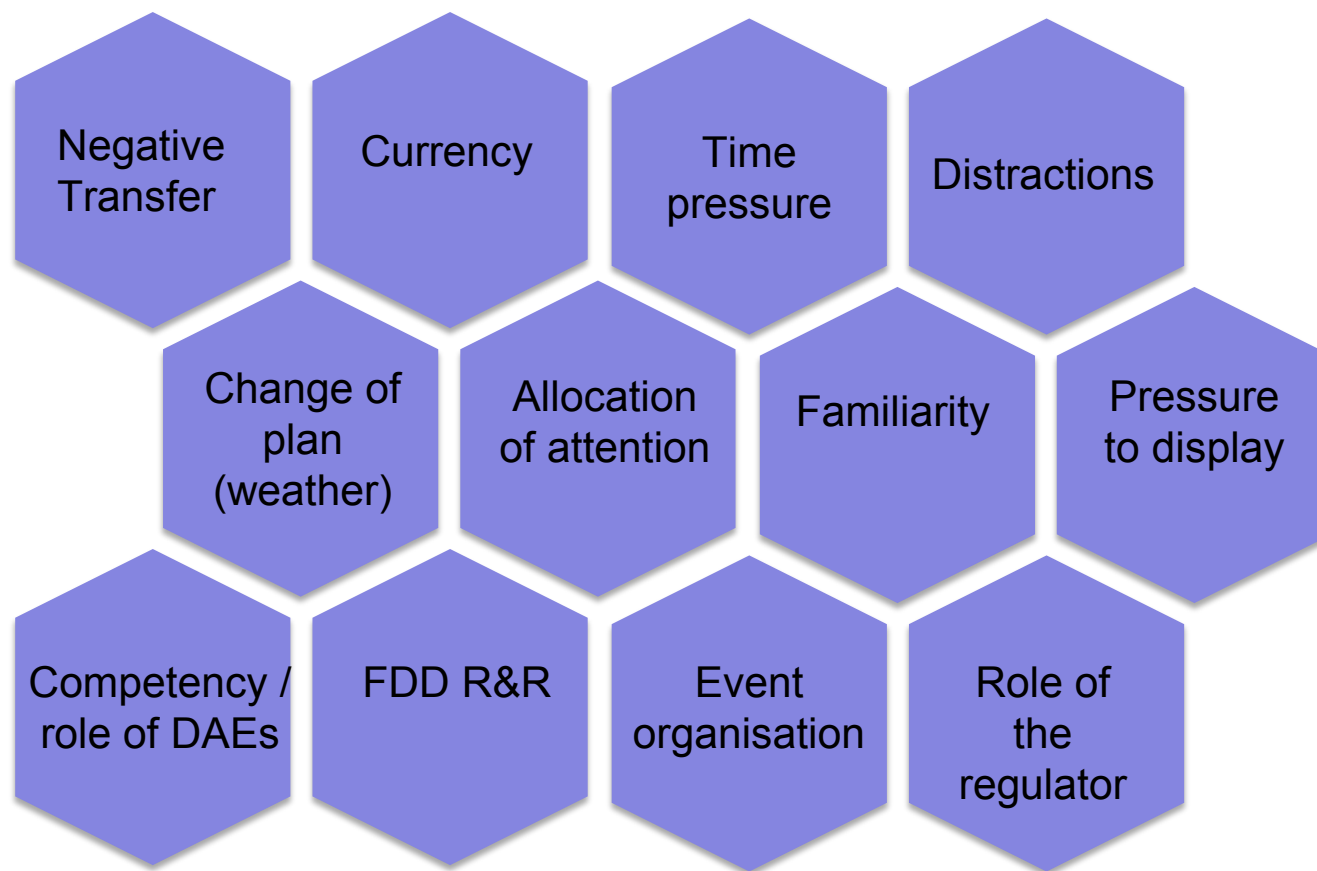
This varies in how well pilots' needs are considered, which can then impact safety and performance

The role of the regulator and their impact on the display community:

E.g. how and when information is shared

What are the main PIFs in Air Display?

In consultation with the display community, they are...





Human Factors in Air Displays: Transfer of Behaviours and Error Path Study (Module 2.1)

Q: How can negative transfer
influence your performance?

Sam Whatmough

Performance Influencing Factors –

NEGATIVE TRANSFER OF BEHAVIOUR

What is transfer of behaviour?

Transfer of behaviour

Behaviour learned in one setting is transferred to other settings, particularly those that are contextually similar.

Why is this a good thing?

You don't have to re-learn how to fly each time you change aircraft

This is part of how we build knowledge and experience.

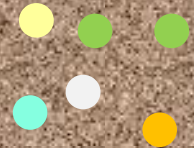
What is negative transfer?

Negative transfer

When a learned behaviour from one setting is used in a contextually similar setting, but with key differences that could impact performance and safety.

Why is this a bad thing?

Negative transfer of behaviour can occur between aircraft and can increase the likelihood of errors.



Why should you be concerned?

- If something works in the opposite way to your expectations you can be up to 6 times more likely to make an error

USA - down is off



UK - down is on



- and up to 8 times more likely to make an error if it doesn't conform to spatial stereotypes



Examples of negative transfer - driving

- Most European cars have the direction indicator and light controls to the left of the steering wheel with the windscreen wiper switches on the right.



- In earlier designs, Japanese cars had the location of these controls reversed.

What does this mean for display pilots?

- There are **important operating and handling differences** between and within types and categories of aircrafts that can impact safety;
- There is **potential for pilots to lose awareness** of the specific design features of the aircraft they are flying.

Changing Between Aircraft Types/Categories

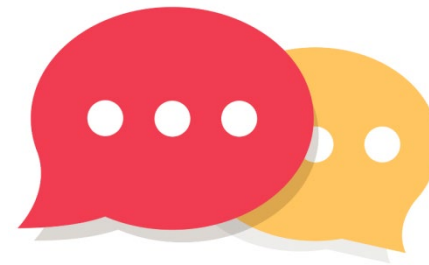
Spitfire Mk IX



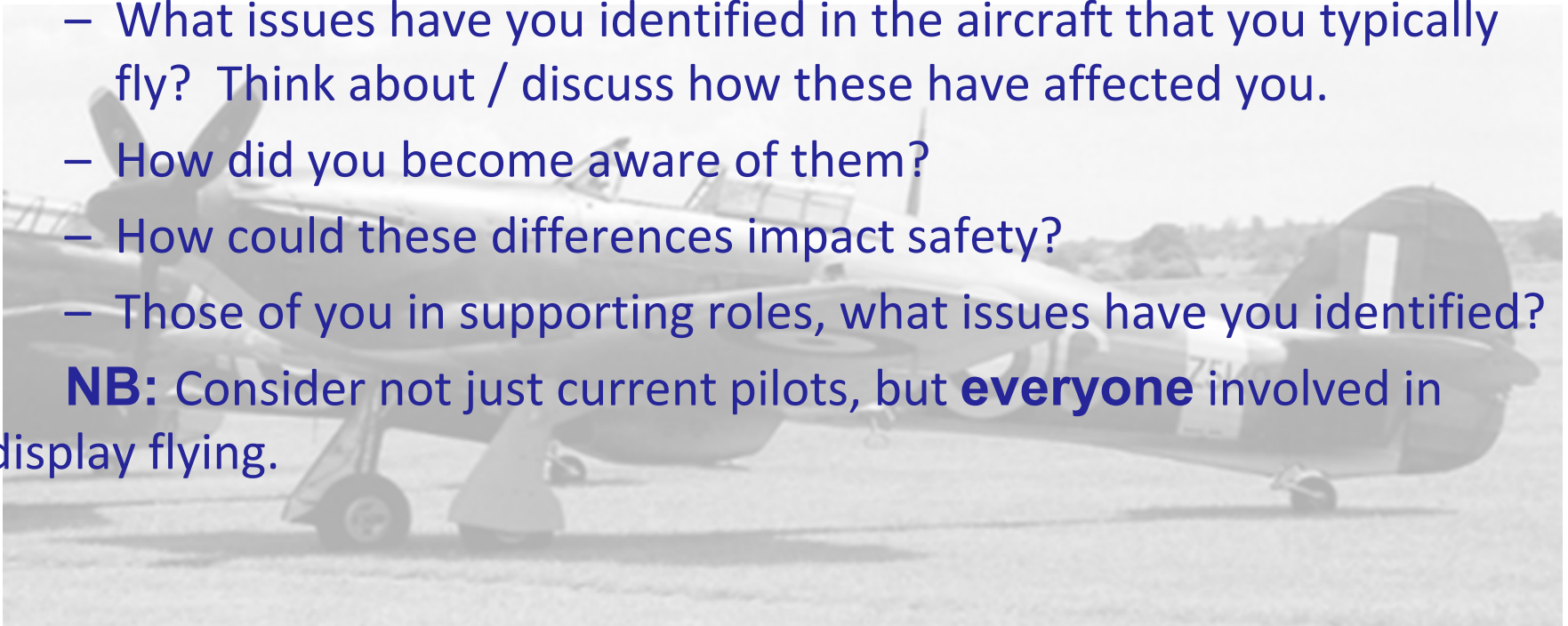
Spitfire Mk Vc



Discussion



- **Purpose:** To reflect on when this could happen/impact on you and others
 - **Task:** In groups, discuss the following questions:
 - What issues have you identified in the aircraft that you typically fly? Think about / discuss how these have affected you.
 - How did you become aware of them?
 - How could these differences impact safety?
 - Those of you in supporting roles, what issues have you identified?
- NB:** Consider not just current pilots, but **everyone** involved in display flying.



Example Handling & Operating Differences

- Energy management
- Required parameters
- Limitations on manoeuvres
- Engine husbandry
- Maintaining height
- Throttle settings
- Metrics

Particular situations when risk of transfer is more likely



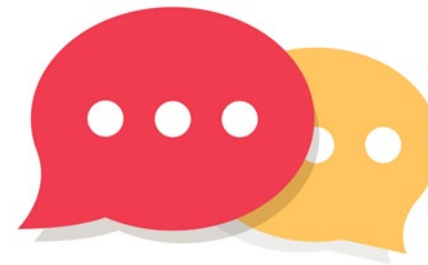
- With aircraft of the same type (and therefore aircraft that are most similar in design) and / or
- When the unexpected occurs (e.g. an engine failure) and/or
- In the phases of take-off and landing because of operational differences

Performance Influencing Factors –

How do you limit, manage, prevent

NEGATIVE TRANSFER OF BEHAVIOUR?

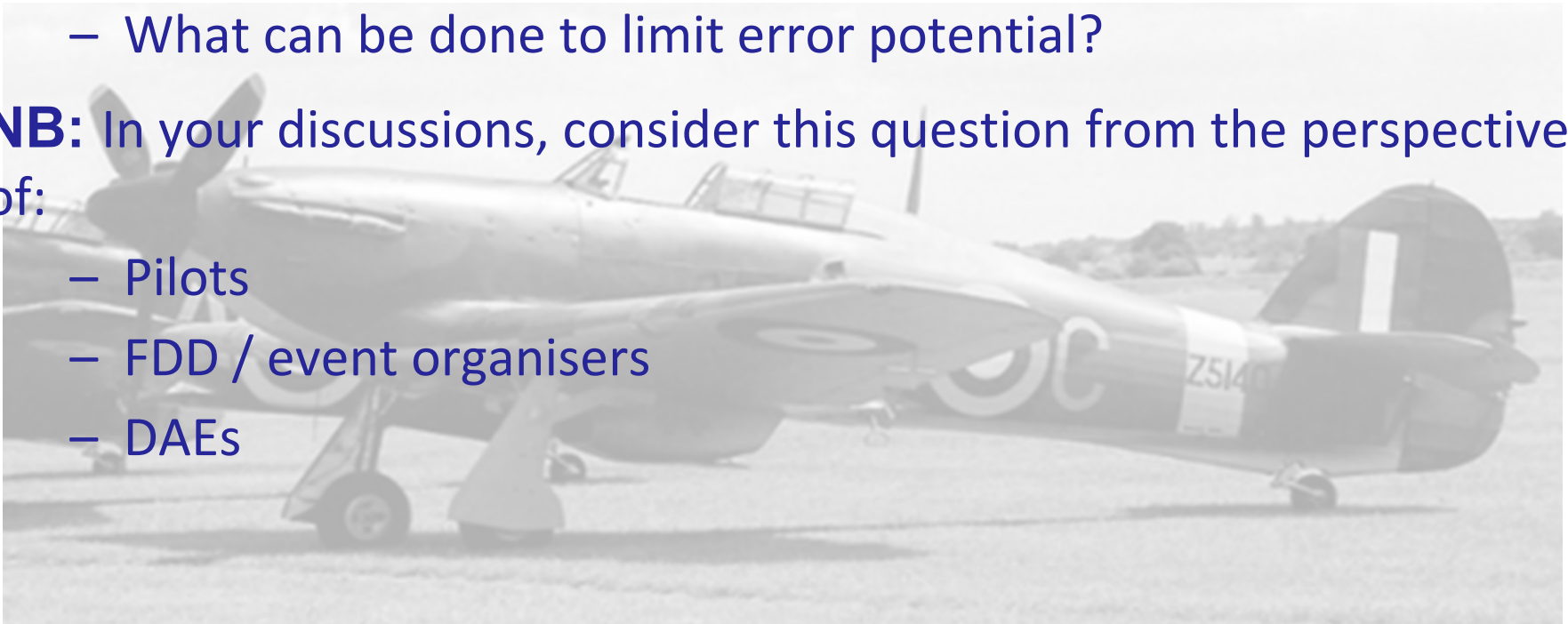
Discussion



- **Purpose:** To reflect on what can be done to prevent / manage / limit negative transfer
- **Task:** In groups, discuss the following question:
 - What can be done to limit error potential?

NB: In your discussions, consider this question from the perspective of:

- Pilots
- FDD / event organisers
- DAEs



Performance Influencing Factors – *Some suggested strategies*

NEGATIVE TRANSFER OF BEHAVIOUR

Pre-display day mitigation measures

- Currency to ensure aircraft familiarisation
- Awareness and refresh on aircraft limitations
- Self-administered essential knowledge quiz
- Peer review / supervision and discussion of display practice
- Planning and assessment – time and weather considerations

Display day mitigation measures

- Consideration of how changes could impact plans
- Quiet time pre-display
- Visualisation / Walkthroughs
- Cockpit familiarisation techniques and use of mnemonics
- Use of kneeboards with accessible aircraft information and checklists
- Use of visual, kinaesthetic and auditory sensory feedback

Post-display mitigation measures

- Review your own display for continuous improvement
 - E.g. filming all displays for post display review

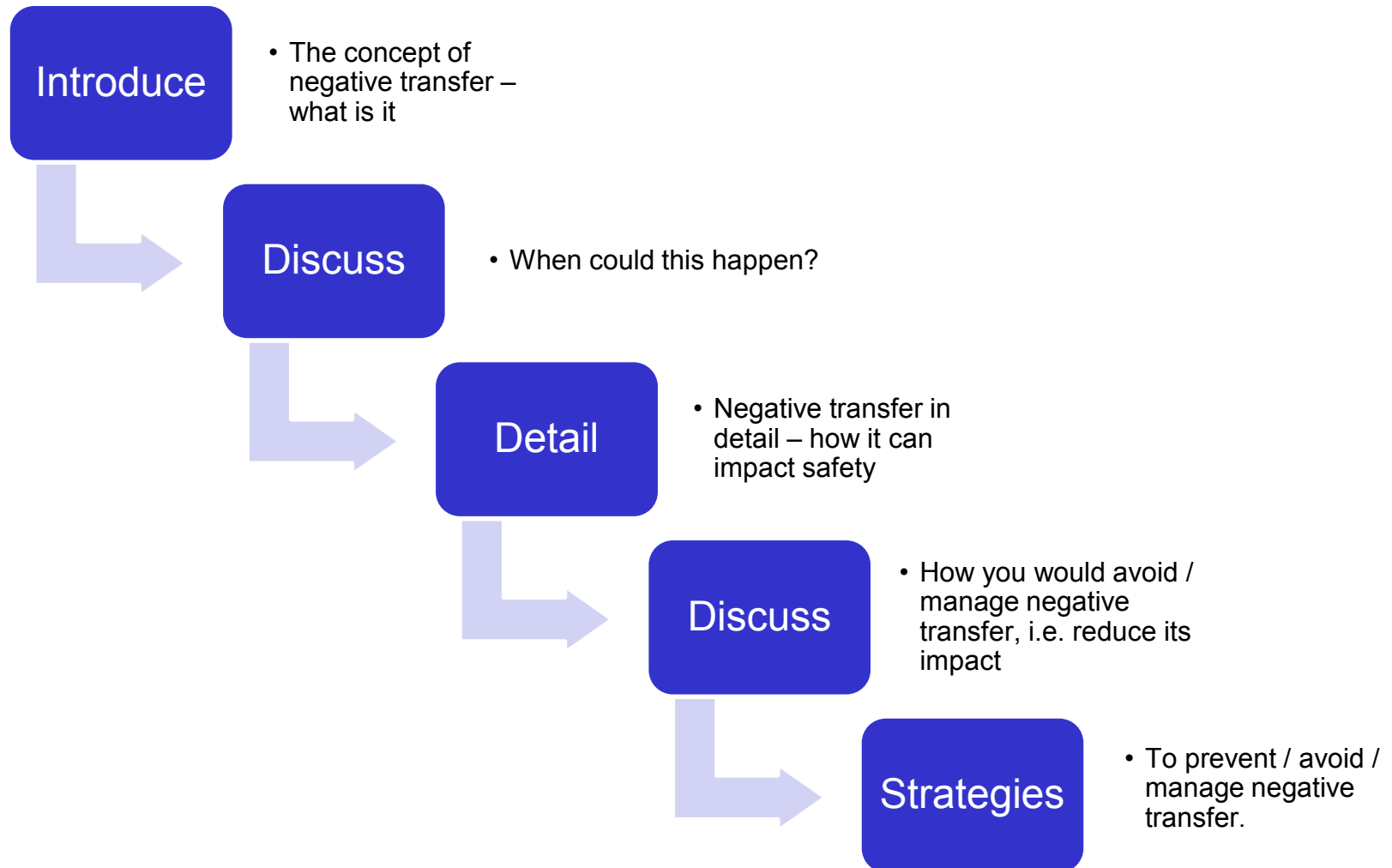
Session summary

NEGATIVE TRANSFER OF BEHAVIOUR

KEY MESSAGES...

- Transfer of behaviour is part of how we learn
- Negative transfer can happen to anyone and can impact on safety
- There are specific conditions that make it more likely that negative transfer can occur
- There are strategies you can use to limit the likelihood of negative transfer

Today we have provided...



What actions we would like YOU to take over the upcoming display season



- ✓ Think about potential for negative transfer
- ✓ Think about what you do to manage the risk
- ✓ At the post season session we will be talking about how to enhance our performance
 - Best way for us to learn is from each other
 - Please be prepared to discuss your experiences over the season
 - And / or to challenge your thinking

THANK YOU FOR YOUR PARTICIPATION

Pilot Workshop

Dan Griffith

Flt Lt Stu Kynaston

'The CAA is keen to encourage open feedback and reporting from any member of the Flying Display community operating in any capacity in an attempt to increase the safety and performance of the Flying Display industry as a whole.'

Military Aviation Authority



Introductions

- Dan Griffith
 - 27 display seasons
 - 650+ displays
 - Most categories displayed (light pistons to fast jets)
 - DAE (since 2000)
 - Worked on 3 of the post-Shoreham CAA working groups

Introductions

- Flt Lt Stu Kynaston
 - 2018 Chinook Display Captain
 - Tier 2 (Mil) & Tier 1 (Civ) FDD



Scope

- Risk
- Arrivals and Departures
- Warning Calls
- Display Areas
- Weather Considerations
- What can FDDs do to help pilots?
- Questions

**THE MAIN AIM IS TO STIMULATE DISCUSSION ABOUT ANY
ASPECT OF DISPLAY FLYING
DON'T HOLD BACK!**

Risk

- Working groups post Shoreham
- Mentoring
- What do the public want
- Types of manoeuvres
- Risk reduction
- Half aerobatic Rating

Arrivals and Departures


NEWS

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England | Local News | Regions | Shropshire

Spitfire and Chinook in near miss at RAF Cosford

20 November 2018



A photograph included in a report following the incident shows the aircraft in close proximity.

A Chinook and Spitfire had a near miss after a practice display ahead of an air show.

The helicopter was cleared to land on a runway at RAF Cosford, Shropshire on 9 June but had to move after the co-pilot saw the Spitfire coming in.

The Spitfire pilot said he only saw the aircraft as he approached the runway.

A UK Airprox Board report said the aircraft came within 40ft (12m) of each other.

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'Vacate immediately!' Spitfire comes just 40ft from smashing into Chinook helicopter hovering at 25ft

- World War Two Spitfire has near miss with giant Chinook helicopter in RAF base
- Chinook's co-pilot shouted 'vacate immediately' when he saw it coming closer
- The Spitfire came within 40ft of the Chinook, whose pilot hurled it out the way of danger to avoid accident

By ANDREW YOUNG FOR THE MAIL ON SUNDAY
PUBLISHED: 01:08, 18 November 2018 | UPDATED: 01:59, 18 November 2018

156 shares | 28 View comments

This is the dramatic moment a Spitfire came within 40ft of smashing into a giant Chinook helicopter.

According to a report into the near miss, the helicopter's co-pilot shouted 'Vacate immediately' when he spotted the Second World War fighter plane heading towards them.



Arrivals and Departures

- CAP403: Arrivals and Departures from Flying Displays (page 60)
- 6.32 All Flying Display arrivals and departures **must be in accordance with the aerodrome procedures and relevant regulation**. Pilots **must not be permitted to use the privileges of their DA / PDA** during arrivals or departures unless arriving into a pre-organised display practise or display. Unbriefed and unexpected manoeuvres are equally, if not more, dangerous during arrivals and departures to and from a Flying Display as those carried out during a display. Pilots of civilian aircraft who do not hold a DA are not permitted to use the SERA 5005(f) Exemption over MOD Occupied Property
- 6.33 The FDD should ensure that static display aircraft captains are briefed to comply with normal arrival and departure procedures to avoid any nonstandard arrivals or departures
- 6.34 It is suggested that to avoid confusion, the standard arrival and departure procedures for the airfield in question are detailed in the Display Pilot's written brief and emphasised during verbal briefings

Warning Calls

- Used by the FDD/FCC to recalibrate the display pilot
- A warning call should be viewed as assistance, not criticism
- Consistent breaches or safety concerns will lead to the display being stopped

Warning Calls

- **TOO LOW**

- A 'Too Low' call shall be made at an appropriate time if the FDD / FCC assess that an aircraft has descended below the pilot's DA minima or the minima in place for the Flying Display

- **TOO CLOSE**

- A 'Too Close' call shall be made at an appropriate time if the FDD / FCC assess that an aircraft has breached the minimum lateral separation distance appropriate to that display item

Warning Calls

- **TERMINATE**

- A Terminate call shall be made when it is necessary to stop a Display for a reason other than their fitness or competence (e.g. intruder aircraft, birds, etc). A Terminate call can also be used by a pilot to notify intention to halt a display if deemed necessary for any reason. At the discretion of both the FDD and the Display Pilot, the display may be resumed if safe to do so

Warning Calls

- STOP

- A STOP call must be made where primarily the FDD / FCC has a safety concern related to a pilot's fitness or competence. When a STOP call is made, the pilot is required to stop their display and not recommence it. A STOP call can be made outright, or as a result of the need to issue a third warning call

- CAA to be informed, MOR / DASOR to be completed, DA is provisionally suspended

Warning Calls

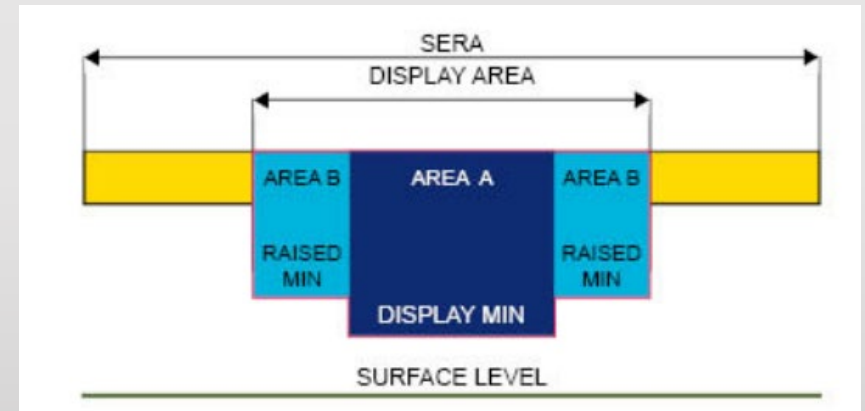
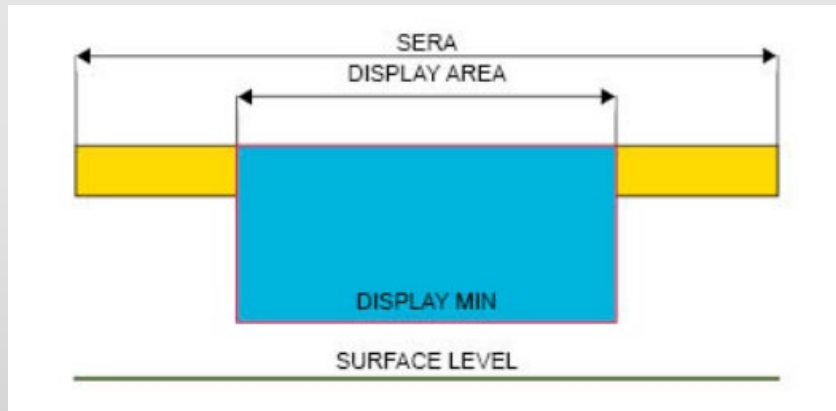
FDD / FCC Warning call	Pilot response
"(call sign) TOO LOW"	"ROGER (call sign)"
"(call sign) TOO CLOSE"	"ROGER (call sign)"
FDD / FCC Terminate call	Pilot response
"(call sign) TERMINATE"	"WILCO (call sign)"
FDD / FCC STOP call	Pilot response
"(call sign) STOP, STOP, STOP acknowledge"	"WILCO (call sign)"

Display Areas

- The Display Area is the **ground area footprint** of the airspace within which **displaying aircraft** may be manoeuvred **at a height** below that imposed by SERA.5005(f)(1), SERA.5005(f)(2), **subject to the limits of the flying display permission, any further restrictions imposed by the FDD, and the pilot's DA / PDA**. All flight outside the Display Area must comply with SERA.5005(f)(1), SERA.5005(f)(2)

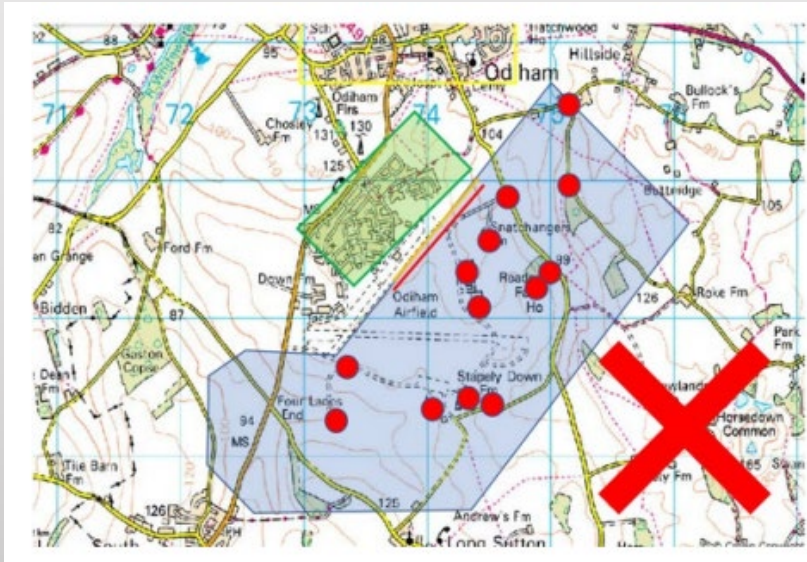
Display Areas

- Cross section

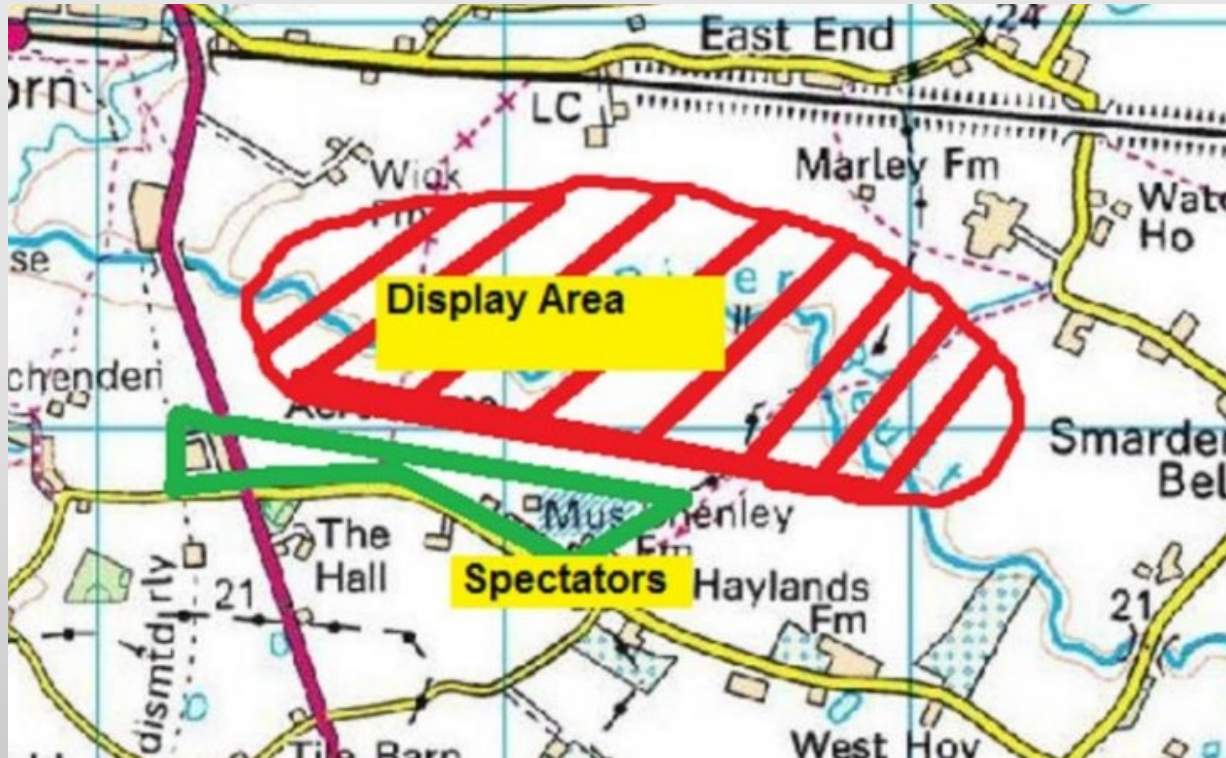


Display Areas

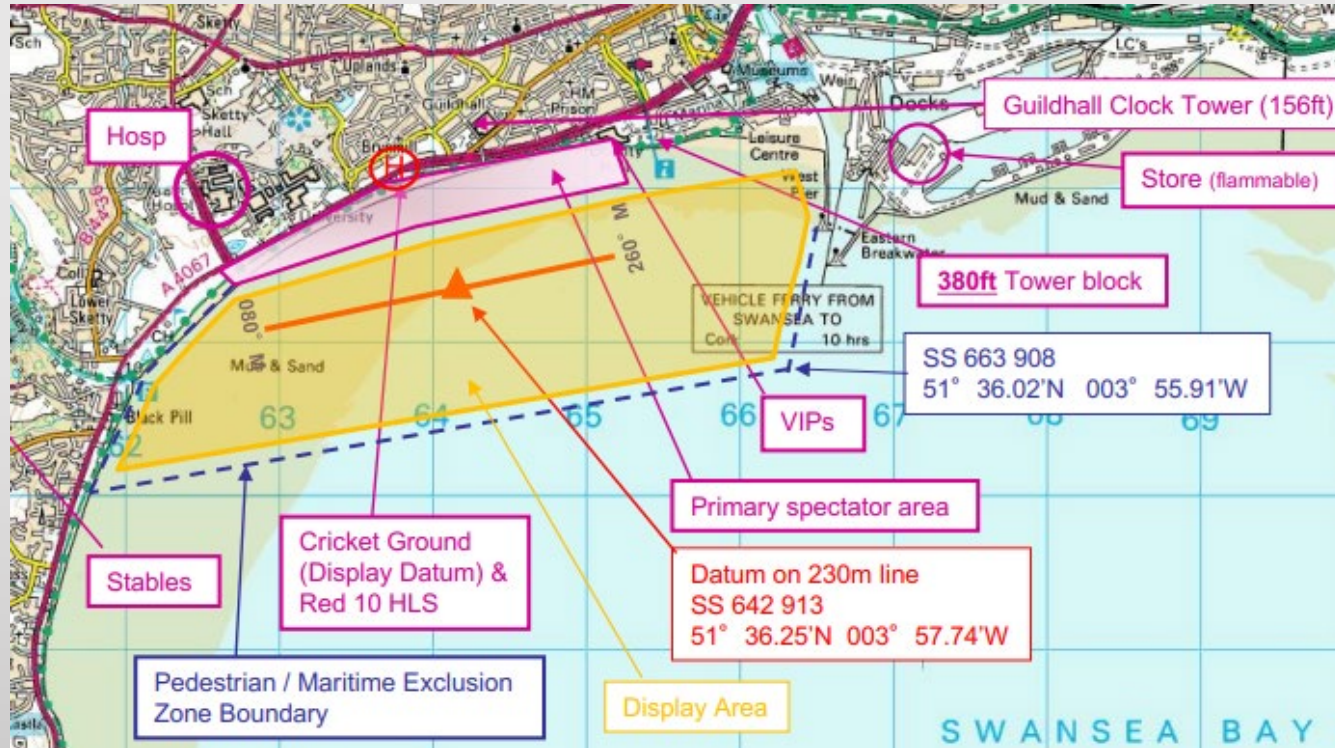
- Avoids



Display Areas



Display Areas



Display Areas



Brynmill

Weather Considerations

- Transits
- Wind – on-crowd vs off-crowd
- Visibility vs defined horizon
- Overwater
- FDD well placed to make weather decisions
- **Captain's decision**

What can FDDs do to help pilots?

- Pilots' Notes
- Minimise avoids within the display area
- Clearly mark the display venue
- RA(T)
- Briefing
- Dedicated display frequency
- Weather calls

Conclusions

- DA heights do not apply to arrivals & departures
- Warning calls are to enhance safety, not criticise
- Display areas can be varied, and detailed study will be required to ensure a venue is fully understood
- Weather can cause real issues and change rapidly
- Challenge FDDs to deliver products of the required standard

Any Questions?

Any Thoughts?

THE ROYAL INTERNATIONAL
AIR TATTOO

Media & Comms

Helen Webb

Head of Marketing

RAFCTE



My Background

- Marketing, Customer Experience & Event Management Professional
- Over 20 years experience in the technology and airshow sectors
 - Air Tattoo - Head of Marketing – 11 Years
 - Commercial/Corporate Marketing – 11 years
- Degree in Business & Marketing
- Fellow of the Chartered Institute of Marketing (only 1500 in UK)
- Chair of the local Business Club and involved in the TV Chamber

Customer Champion - Data Junkie - Digital Advocate

Air Tattoo 2018 in Numbers

Full 3 day show

- 185,000 attendance
- 79 official military delegations (64 Chiefs)
- 302 aircraft representing 43 Air Arms
- 4 Royal parties

Outstanding and safe 8 hour flying displays each day

- RAF Centenary flypasts (BBMF & 617 Squadron)

Excellent customer feedback

- Flying Display rated Very Good or Good 98% (91% in '17)
- Static Display rated Very Good or Good 97% (96% in '17)
- Overall experience rated Very Good or Good 97% (94% in '17)
- Definitely & Probably attend in 2019 82% (88% in '17)

TECHNO ZONE with youth STEM focus

>7,500 school children hosted on Friday

Another 26,000 children with family - under 18s FREE policy



2018 Campaign - Digital First Strategy



Facebook - 109K followers

- 16M Reach
- 37M Impressions



Twitter - 49K followers

- 7M Impressions



Instagram - 40K followers



YouTube - 10K subscribers

- Views 10.4 Million

Website - airtattoo.com

- **770,000** users
- Over **7,000,000** pageviews

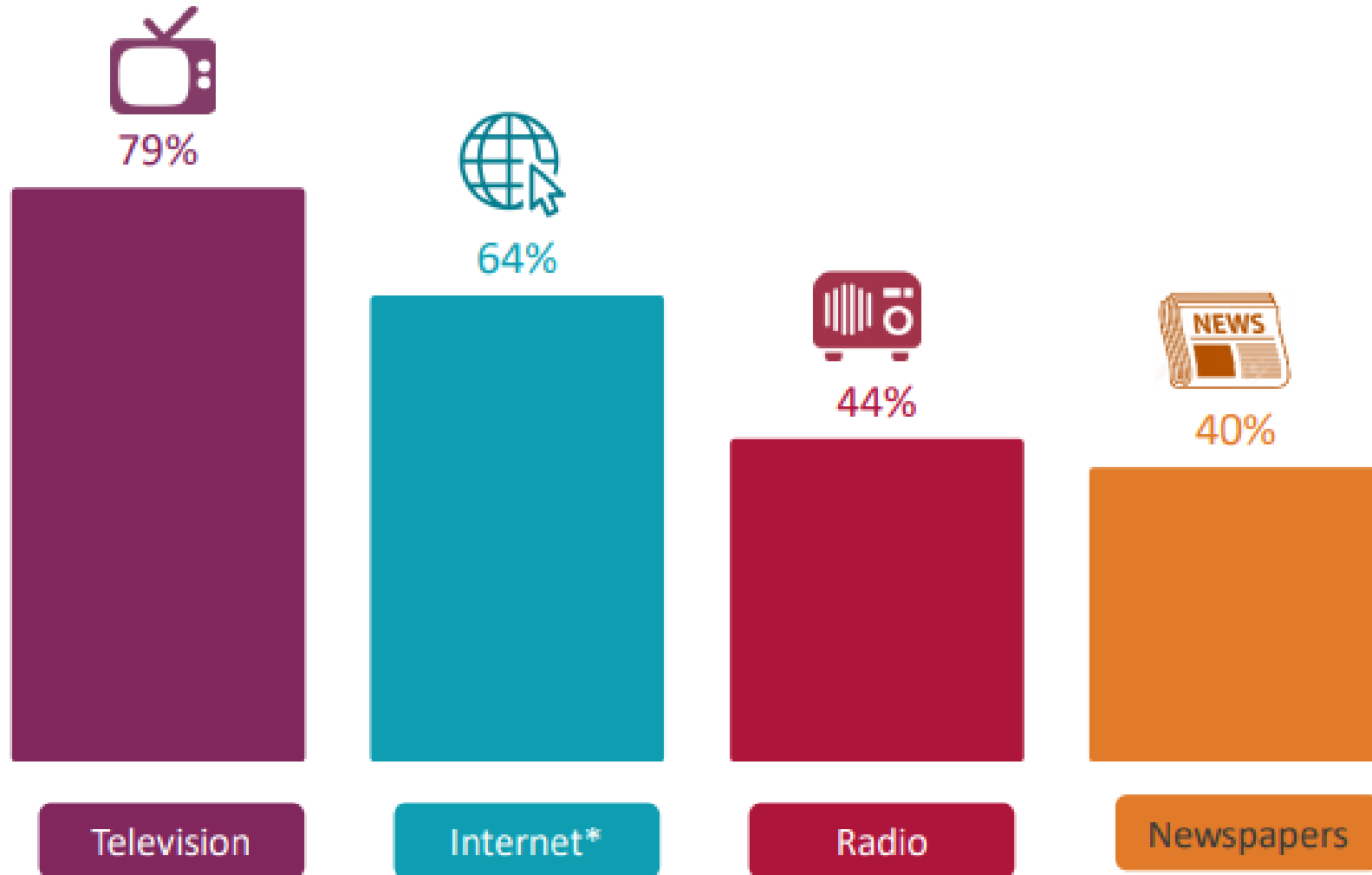


Emails - 90K database

- 109 - average open rate 25%

Media & Comms Has Changed

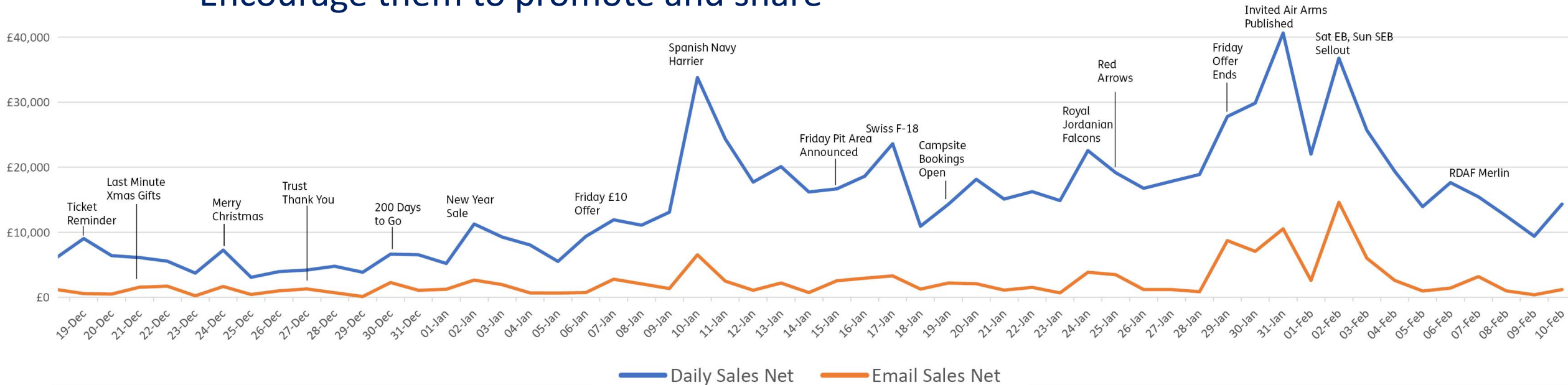
Latest OFCOM Report - Use of main platforms for news - UK Adults



*However qualitative research suggests that the frequency with which people consume online news could be under-reported

Why Does This Matter?

- No control - TV, Radio, Newspapers
- Total control - website, social channels, emails, vlogs, blogs
- Be your own news channel - your version of the truth!
 - Create user generated content that engages
 - Develop and grow your own audience of ambassadors/fans
 - Encourage them to promote and share



Build Your Content Strategy

- Useful, interesting, fun – what should people do when they read it?
- Create a plan/schedule but still be reactive
- Aircraft announcements – each Thursday and then surprises!
- Tickets – on sale, selling out, price changes, only 200 remain
- Key dates – anniversaries, Top Gun day, Father's Day
- Competitions – particularly photography sharing – involve people
- See what works and do more of it - use your stats/insights)
- Post with photos or video – take at the event to use all year
- Organic content rather than shares get a higher engagement
- Efficient to spend time drafting posts and scheduling to appear
- Re-purpose content – use it more than once

Reach: Organic / Paid



Post Clicks

Reactions, Comments & Shares



Published	Post	Type	Targeting	Reach <i>i</i>	Engagement	Promote
03/03/2019 4:00 PM	 Did you see the F-22A Raptor arrive at the Air Tattoo in 2016? Make sure			17.5K 	1.5K 223 	Boost Post
03/02/2019 4:00 PM	 Ticket Update! Cotswold Club is now SOLD OUT for Saturday! But don't			12.7K 	122 28 	Boost Post
03/02/2019 11:00 AM	 50 years ago today - #Concorde flew for the first time!			33.9K 	970 1.2K 	Boost Post
03/01/2019 6:00 PM	 We've probably all seen the F-117's magically reappearance this week!			12.5K 	2.9K 545 	Boost Post
03/01/2019 4:00 PM	 You all seriously impress us with your photography skills every week! This			15.1K 	671 192 	Boost Post
02/28/2019 4:19 PM	 Tornado action at RAF Marham!			23.8K 	3.5K 487 	Boost Post
02/28/2019 12:01 PM	 This week we can confirm our first heavy metal addition to the static line			21.6K 	1.3K 502 	Boost Post
02/28/2019 10:46 AM	 We have less than 20 FRIAT memberships left and we anticipate			12.3K 	233 77 	Boost Post
02/27/2019 4:00 PM	 We loved seeing the Thunderbirds take to the sky at the 2017 Air Tattoo.			30.7K 	2K 874 	Boost Post
02/27/2019 2:07 PM	 Great to see the 9 ship flying together for the first time this year!			14K 	507 185 	Boost Post

Number 1 Facebook Post - 2018

Frecce Tricolori Video

- 606,482 people reached
- 234,060 video views
- 26,044 reactions, comments and shares



The screenshot shows a Facebook post from the page "The Royal International Air Tattoo". The post is published by Zoe Moulding on July 15, 2018, at 10:17. The text of the post reads: "The Italians are here! 🇮🇹 Frecce Tricolori yesterday at this year's Air Tattoo! See them today at 11:30." Below the text is a video player showing a formation of four Frecce Tricolori fighter jets flying over a field. The video has a play button overlay and a duration of 02:26. The video title is "Frecce Tricolori at RIAT18".

The Royal International Air Tattoo
Published by Zoe Moulding (?) - 15 July at 10:17 · 🌐

The Italians are here! 🇮🇹
Frecce Tricolori yesterday at this year's Air Tattoo! See them today at 11:30.

Frecce Tricolori at RIAT18
02:26

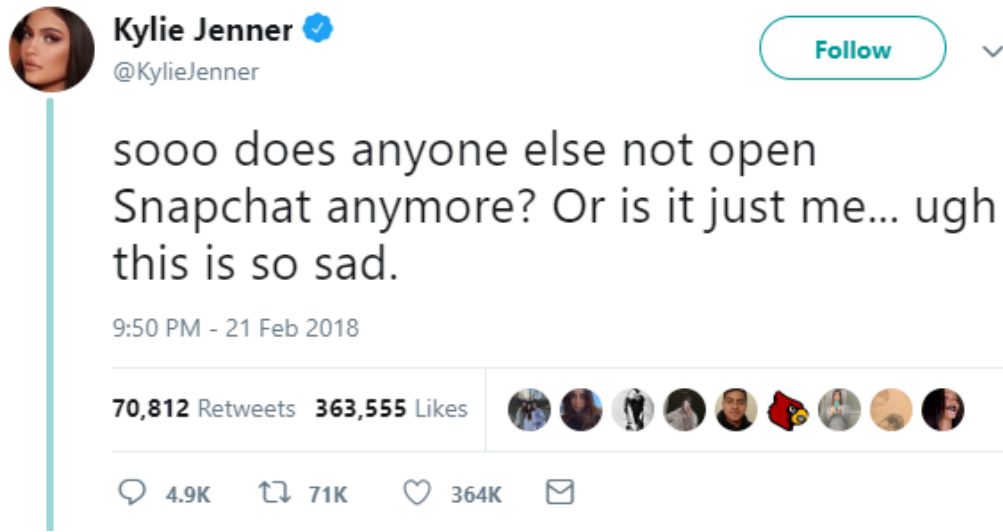
The Power of Digital Comms

- On 29 November 2013, a Police Scotland EC135 helicopter, crashed onto the roof of the Clutha Vaults pub in Glasgow
- All three on board and seven inside the pub were killed, 31 injured
- Within 11 Seconds a video of the crash was on YouTube and being shared across social media

When Social Media Goes Bad....

- All publicity is good publicity - not true!
- If you get it wrong this gets amplified – goes viral and gets picked up by traditional media and the press

This tweet cost Snapchat \$1.3 Billion



US Air Force tweet backlash



Minimising the Risk to your Reputation

- Don't make offensive jokes or try and jump on the band wagon
- Create clear social media posting guidelines
- Know what you do and don't respond to – standard responses
- Use a social media workflow that requires junior team members to go through an editing process and get approval before posting
- Have a social media policy for your followers – hide posts/ban people!
- Check your profanity settings!
- If you have volunteers make sure they know the boundaries
- Have an incident response plan, see how others handle it, best practice

Air Tattoo – Setting the Record Straight



The Royal International Air Tattoo

Published by Jonny Salmon [?] · June 29, 2017 ·

Thanks to all of you that have explained to others why certain aircraft are not taking part in the flying display, which is already full.

Just to reiterate, there is no process to 'book' foreign military display items as you can with a commercial act. We request, we negotiate and we work hard to build relationships (this can take years!) and to entice 'special' aircraft. Ultimately we are allocated whatever aircraft that nation wishes to participate with and we are informed whether that is flying or static.

Unfortunately some nations do not have a worked up and approved display for a specific aircraft however, we are still hugely grateful to all air arms that support the event by sending aircraft to the Air Tattoo in whatever capacity they can. Some of the recent comments on this page have been disrespectful to those air arms, pilots and crew who participate in the event and also read this page so we kindly request that you please think before you post. Thank you!

34,280

People Reached

5,455

Engagements

Boost Post

Joao Castelo, Patrick Williot and 324 others

78 Comments 16 Shares

Like

Comment

Share

View 5 more comments

Oldest



Nigel Broster And I bet most of them ar the free loaders who stand at the end of the runway so want them to fly else they will not see them if they are on static 😞😞

Like · Reply · Message · 1y

10

1 Reply



Jaron Matthews I'd like to repeat what others have stated, well done on all the confirmations so far, it's looking to be a cracking year for flying and static (although my legs may testify against this 😅) and keep up the great work!

Like · Reply · Message · 1y

5



Mike Andrew Davies Amazing lineup. Great flying & love getting close to the static aircraft. 👍👍

Like · Reply · Message · 1y

2



Mark Edwards Well said. If the keyboard warriors had the slightest inking of what is involved behind the scenes they wouldn't be so dismissive and disrespectful. If they are not happy with the opportunity to see some amazing aircraft up close and personal then they can do us all a favour and not attend. Whatever the line up it is always an amazing event with an unrivalled atmosphere. Good value I think!!

Like · Reply · Message · 1y

7

2 Replies

When someone beats you to it!



The Royal International Air Tattoo ✓



Published by Helen Webb [?] · January 25 · 🌐

It's the news that you've all been waiting for...

The RAF Red Arrows will have their last public display at the Air Tattoo before they fly to North America for the Western Hawk 19 Tour! They will be flying all three days of the show!

You probably are already aware of this, as it was announced earlier in the week by the Minister of Defence, in his statement about the Red Arrows Tour of the USA and Canada.

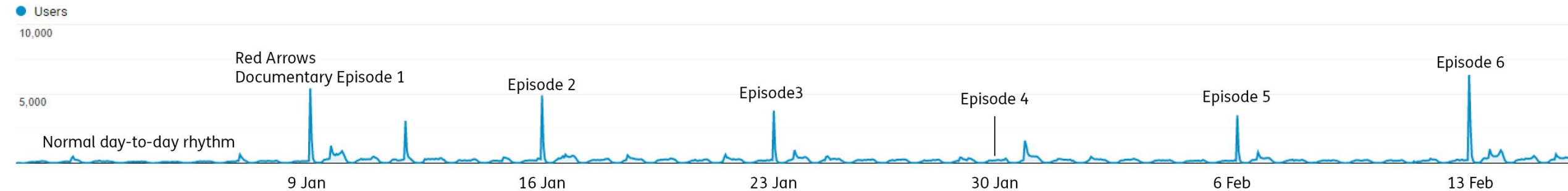
This isn't how we normally announce aircraft but we've spoken to our friends at the Red Arrows and they've confirmed that we can announce their participation at the Air Tattoo!

Book your tickets here: <https://bit.ly/2Ui8LWW>



And Finally...

- Online and offline channels are connected
- Effect of the RAFAT Channel 5 TV documentary on airtattoo.com visits



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Thank You
Any Questions?